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## Ⓜ Watchful Waiting in the ICU? Considerations for the Allocation of ICU Resources

The emergence of value-based health care—a reckoning of the benefits and costs of clinical and organizational interventions—has included an interest in the optimal use of critical care resources. Understanding the ideal allocation of costly and often limited resources, such as ICU beds, is essential to a hospital’s daily operation and sustainability (1). When faced with uncertainty about the best triage decision for a sick patient, clinicians must ask: Does this patient benefit from ICU admission? They may also ask: What is my hospital’s ICU bed availability at present? Conversely, toward the end of a patient’s ICU course, clinicians must routinely consider: Is this recovering ICU patient ready for transfer to the medical ward (i.e., does this patient no longer benefit from the ICU)? They may also, and often do, ask: Is there another patient who needs this ICU bed more?

These latter questions, related to the timing of ICU discharge, are informed by 1) a clinical assessment of “readiness for discharge” and 2) the availability of ICU and ward beds at that time. High ward occupancy is a common source of healthcare capacity strain (2, 3). When present, this strain can delay both ICU discharge and, in turn, likely delay upstream new ICU admissions to those still-occupied beds. Thus, some typical ICU patients may instead be admitted to the ward or

may “board” in the emergency department or in a specialty ICU that is not ideally matched with their needs. These scenarios may be associated with higher mortality relative to timely, appropriate ICU admission (4, 5).

In this issue of the *Journal*, Forster and colleagues (pp. 1399–1406) shed new light on the timing of ICU discharge as an explicit component of ICU resource allocation (6). The authors sought to understand the impact of an unintended delay in ICU discharge on patient outcomes. ICU discharge delay was defined as time between a patient being deemed “ready” for ICU discharge by the clinical team and actually leaving the ICU. Implicit in this definition is that the delay was driven by system-level factors, such as high ward occupancy or infection control needs, and not patient-level factors, and the patient remained ready and awaiting discharge during this delay. The authors performed a thoughtful retrospective cohort study using the Australian and New Zealand Intensive Care Society Adult Patient Database. They studied over 1 million patients from 190 ICUs who were discharged alive from the ICU to the ward after their first ICU admission. The authors developed a hierarchical model to estimate the association between discharge delay and mortality or ICU readmission. In sensitivity analyses, the investigators examined outcomes among three prespecified subgroups stratified by predicted risk of death upon ICU admission.

Forster and colleagues report that 75% of patients were discharged within 6 hours of being deemed ready, 13% were discharged after a 6- to 12-hour delay, and 2% were delayed 48–72 hours. Relative to discharge within 6 hours, risk-adjusted mortality was lower, with a discharge delay of 24–48 hours (adjusted odds ratio, 0.94; 95% confidence interval, 0.90–0.99), and reached its lowest estimated value at 48–72 hours of delay (adjusted odds ratio, 0.87; 95% confidence interval, 0.79–0.94). However, mortality was not significantly lower than the reference group when discharge

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was delayed between 6 and 24 hours or greater than 72 hours. In a subgroup analysis, the association between prolonged discharge delay and lower mortality was only observed among the strata with the highest (>5%) predicted risk of death upon admission to ICU. Finally, the authors reported a progressively lower adjusted odds of ICU readmission in association with increasing duration of discharge delay.

Earlier work examining patient outcomes under conditions of ICU capacity strain suggested that ICU readmission risk is greater when patients are discharged earlier in their ICU course as a result of high demand for ICU beds (7). Discharge delay has varied in its association with mortality in prior studies, with some suggesting no association, whereas others observed lower mortality in association with discharge delay, particularly among patients at high predicted risk of death (7–9).

When appraising the new results, we first consider the classification of discharge readiness. The exposure of discharge delay depends on two main factors: proximally, a clinical team must determine that a patient is ready to leave the ICU, while distally, ward capacity must accommodate that patient. The authors share that patients classified as discharge ready may have the decision reversed and be intentionally kept in the ICU for continued care; however, they would still be coded as if they are simply waiting for a ward bed and benefiting from that waiting period. This could explain some benefit of delay.

Another related concern is the possibility that ICU teams could intentionally label patients as “ready for discharge” prematurely. If ICU teams are frequently facing long ICU discharge delays, they might be inclined to put in “deemed ready to leave” assessments earlier to “start the clock,” with the option to cancel a transfer out if the patient got a ward bed but were truly not yet ready. In that case, the “benefit” seen in a “delayed” ICU discharge is really the true benefit of appropriate ICU time. Conversely, early discharge in this scenario could explain increased mortality, driven by ICU strain, rather than delayed discharge driving benefit (7). Measures of strain, most importantly ward capacity strain, are not incorporated into the current study; therefore, it is difficult to assess the impact of this potential source of bias.

Finally, we consider generalizability. Critical care bed availability varies significantly across regions and countries (10). Thresholds for “discharge readiness” will vary on a hospital-by-hospital basis given varied policies regarding ICU and ward admission, differing medical ward acuity, availability of step-down beds, and other factors. Transferring these findings to any individual hospital is therefore challenging and must take into consideration local patient acuity and system-level factors.

The work by Forster and colleagues raises several important questions. First, does prolonged ICU monitoring beyond a clinician’s intuition of true discharge readiness cause improved outcomes, or could this difference in outcomes be driven by inappropriately early discharge for some patients under conditions of capacity strain? If discharge delay is causal, we will need to factor in the costs of additional ICU care and the opportunity cost of lost ICU capacity for incoming patients. We would also want to know what elements of distal ICU care contribute most to improved outcomes and assess whether they can be exported to wards to maintain clinical benefit and ICU

throughput. And finally, we would want to reliably identify clinical subgroups of patients who would benefit most from prolonged care in the ICU. ■

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