Understanding Costs When Seeking Value in Critical Care

Meeta Prasad Kerlin[1,2,3] and Colin R. Cooke[4,5,6]

[1]Pulmonary, Allergy, and Critical Care Division, Department of Medicine, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania; [2]Leonard Davis Institute of Health Economics, University of Pennsylvania, Philadelphia, Pennsylvania; [3]Center for Clinical Epidemiology and Biostatistics, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania; [4]Division of Pulmonary and Critical Care Medicine, [5]Center for Healthcare Outcomes and Policy, Institute for Healthcare Policy and Innovation, and [6]Michigan Center for Integrative Research in Critical Care, University of Michigan, Ann Arbor, Michigan

ORCID ID: 0000-0001-9713-5371 (C.R.C.)

Despite ongoing national efforts to improve the value of health care delivery, spending on critical care continues to grow. Most policies and research efforts aimed at maximizing value have targeted improving the quality of critical care delivery, with less attention focused on ways to reduce costs. Yet the importance of understanding intensive care unit (ICU) costs is unquestionable. A nuanced understanding of the true costs of critical care could help policymakers and health system leaders efficiently organize ICUs and streamline patient flow, measure and compare ICU performance, and ensure that use of (and coverage decisions for) new medical therapies are cost-effective. Fortunately, there is growing awareness in the critical care community that providers have a responsibility to provide high-value care, and that scientists should consider costs an important outcome (1).

Although critical care costs are infrequently studied, prior data have driven an evolution in our understanding in the last few decades. Early studies of costs focused on length of stay in the ICU as a composite measure of costs and resource use (2). Therapies were occasionally promoted on the basis of reducing ICU length of stay, even when clinical benefits are otherwise uncertain (3). However, use of length of stay as a surrogate measure of ICU costs was quickly recognized as imperfect (4), in part because not all ICU days are created equal with respect to actual costs.

This day-by-day cost differential was highlighted in several follow-up studies, which demonstrated that the first few days in an ICU stay generally cost more than the later days (5–7). Cost savings attributed to reductions in length of stay in cost analyses, therefore, may be lower than what were typically calculated using average daily costs. In addition, shorter lengths of stay in a typical ICU should increase patient throughput, freeing beds for patients in the high-cost beginning of their ICU stay. By reducing days on the tail end of an ICU stay, but increasing total early days (through increased admissions), therapies that reduce length of stay could paradoxically increase average daily costs, and potentially total costs, for a typical ICU. Naturally, these studies were observational and were often limited to a few ICUs within a small number of institutions.

In this issue of *AnnalsATS*, Gershengorn and colleagues (pp. 1831–1836) add to the body of evidence about ICU costs with a study of daily costs in five ICUs within a single medical center (8). In contrast to previous studies, they examined daily costs separately for each ICU. The authors hypothesized that the ICU type (and more important, the types of patients in an ICU) modified the relationship between costs of care and day of ICU stay. Consistent with their hypothesis, they demonstrated that the steep reduction in ICU costs after the first hospital day evident in previous studies was in fact not uniform across ICUs in their hospital. Medical and mixed (medical/surgical) ICUs typically had more uniform daily costs throughout the ICU stay, whereas surgical ICUs had high first-day costs that dropped thereafter, which are trends similar to those seen in previously published studies of pooled ICUs (5–7).

The authors speculate the high first-day costs of surgical ICUs are related to high resource use in the perioperative period: greater ordering of labs and other diagnostic tests, greater blood transfusions, and generally more active acute management immediately during and after a major procedure. After postoperative stability is achieved, day-by-day costs decrease. The absence of a similar pattern in medical patients is not totally surprising, where the costs of active management (such as diagnostic testing, bedside procedures instead of major operations, and conservative blood transfusion strategies) early in the course of critical illness differ, in absolute terms, less compared with the daily costs of management once clinical stability is achieved.

There are a few notable limitations to the analysis by Gershengorn and colleagues (8). First, the study was limited to ICUs within a single academic medical center. By including just one center, the study fails to address concerns of generalizability that exist with much of the previous literature on this topic. As such, we should be cautious in generalizing the findings more

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Correspondence and requests for reprints should be addressed to Meeta Prasad Kerlin, M.D., M.S.C.E., Perelman School of Medicine, University of Pennsylvania, Pulmonary, Allergy, and Critical Care Division, 3600 Spruce St, 5011 Gibson Bldg, Philadelphia, PA 19104. E-mail: prasadm@uphs.upenn.edu

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broadly because we cannot discern whether the observed cost differences by ICU type are representative of hospitals more broadly or are an epiphenomenon of care provided in the single center studied.

Second, as with any study of ICU costs, assigning costs accurately to care provided within the ICU is challenging. For example, as the authors describe, costs were assigned according to the calendar day. Thus, costs from the operating room were likely assigned to the first ICU day, contributing to and potentially responsible for the greater estimated day one costs in surgical patients. Costs were also determined according to cost-to-charge ratios and were not actually directly measured. Room and board costs, which were included in primary analyses, were based on staffing ratios across the ICU and were not patient-specific. Individual ICUs likely have similar, but not identical, issues with calculating costs, making it difficult to translate data from one ICU to others.

Despite the concerns of generalizability, the results of Gershengorn and colleagues have important implications for research and clinical practice (8). Their study suggests that the effect on costs of reducing ICU length of stay differs in medical and surgical ICUs. As a consequence, therapies discovered to reduce length of stay for common ICU conditions may only be cost-effective in a medical ICU (because daily costs are relatively static and higher patient throughput is cost neutral), but not in a surgical ICU (where higher patient throughput results in greater average daily costs as a result of more high-cost "day 1" patients). In such cases, do we offer the therapy only in medical ICUs, and not surgical ICUs? Although this example is overly simplistic, it highlights how the conversation becomes more complex, and even ethically charged, when length of stay is targeted in cost-reduction efforts. Future efforts to quantify costs should attempt to unpack how and why they differ between ICUs to inform cost-effectiveness-based clinical decisions and policies.

Although the authors should be commended on advancing our understanding of ICU costs, we should also recognize that efforts to reduce ICU length of stay will necessarily be insufficient to make a real dent in our health care economy. Total ICU costs are composed of both fixed and variable costs. The fixed costs are those that are independent of patient throughput and include overhead costs (e.g., utilities and infrastructure) and staff salaries; variable costs are those that vary by patient throughput, whether directly (e.g., diagnostic testing and supplies) or indirectly (e.g., equipment) related to the patient (9). Studies of ICU costs have generally focused on the variable costs related to the patient, as they are the marginal costs that differ from patient to patient and day to day and are the costs that would be affected by policies and interventions to reduce ICU length of stay. However, nearly 80% of ICU costs, and in fact hospital costs overall, are actually fixed (10). The direct-variable costs contribute little to the total cost of an ICU stay, so modifying the duration of a stay may not actually result in significant cost differences in the end. Instead, larger cost savings will occur through changes to fixed costs, such as improving appropriate use of ICU beds, or even potentially eliminating some of them.

Gershengorn and colleagues highlight that our understanding of ICU costs is still superficial (8). With costs of health care skyrocketing, we are obligated to seek deeper understanding of the drivers of such increases and how to use cost analyses in our research and policy-making (11). The practice of using length of stay alone as a proxy for costs or resource use is shortsighted and must end. Instead, researchers and administrators should include more sophisticated cost assessments in their studies and evaluations of implemented policies. Doing so will enhance the understanding of how such studies and policies might benefit our most vulnerable patients, and also support our economically tenuous health care system. ■

Author disclosures are available with the text of this article at www.atsjournals.org.

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