Comparing Dialysis Modalities for Critically Ill Patients: Are We Barking up the Wrong Tree?

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During the past two decades, continuous renal replacement techniques (CRRT) have altered the landscape of dialysis options for critically ill patients. Adoption of these techniques has been fairly rapid in developed countries with advanced intensive care unit support systems and is gradually expanding to the developing world (1). However, not everyone has been enamored with the advancements; the main reason cited is a lack of evidence for a benefit in mortality (2). Consequently, nephrologists and critical care physicians are periodically subjected to debates among prominent experts on the superiority—or lack thereof—of these techniques. In this issue, Ronco et al. (3) make a case for the superiority of CRRT, whereas Himmelfarb (2) provided a contrary viewpoint. Although the debate is informative, it is not focusing on the major issues about which we should be concerned.

During the past four decades, the mortality that is associated with acute kidney injury (AKI) in critically ill patients has not substantially changed (4). Dialysis imparts an additional risk to that imposed by uncomplicated AKI regardless of the modality used (5,6). It is unclear how AKI confers an increased risk for adverse outcomes and why dialysis adds to that risk. Answers to the former are emerging from recent studies that demonstrated the profound downstream effects of even minor alterations in renal function and the recognition of “organ cross-talk” (7,8); however, no studies have evaluated the latter. Despite advancements that have occurred in intermittent and continuous dialysis technology (volumetric machines, biocompatible membranes, bicarbonate dialysis, blood volume monitoring, sterile solutions, etc.), there has not been any mortality benefit. This begs the question, “What are we doing wrong?” The traditional reasons of increasing severity and complexity of the patients emerge as obvious answers. However, we should consider alternatives, including the following: Do we know how to prescribe and deliver optimally any form of dialysis in critically ill patients? Do we have adequately trained and knowledgeable physicians, nurses, and other caregivers to deliver quality dialysis consistently? Do we have any metrics for monitoring dialysis delivery and ensuring quality of dialysis in critically ill patients? Have we standardized the treatment of dialysis patients with respect to additional concurrent interventions that likely are influenced by the dialysis technique (e.g., drug dosing, nutritional support, ventilator management)? The likely answer to all of these questions is a resounding, “No!” There is wide variation in dialysis care delivery worldwide, represented by a lack of any consensus on timing of initiation, dosage of dialysis, duration of therapy, standards for monitoring, training and performance assessments of caregivers, and industry standards for machine performance (1,9,10).

Is it any wonder that we are unable to show any benefit in outcomes using these techniques?

We can now more readily understand the limitations of the dialysis modality studies to date and develop strategies to address them. Variations in research studies are generally addressed by randomization to balance each group at study entry and through specific protocols for study procedures. However, neither of these strategies addresses variations in care delivery related to caregiver competence and training, concurrent management, and facility-specific factors (e.g., availability of ancillary support services such as a pharmacy or nutrition). One hopes that the effect size for the study interventions is large enough to overcome the “noise” that is introduced by these variations, but given the results to date, it is doubtful that we have controlled for these factors (11). How can we address these issues? First, we must focus on understanding the areas of variation. Because the prescription and the care delivery are done by different people, knowledge deficits on the fundamentals of dialysis techniques, appropriate training, and performance monitoring are key areas to be addressed. Although CRRT techniques are inherently subject to more variation given the duration and that several caregivers handle the CRRT sessions, intermittent and hybrid techniques are not immune from these events (1,9). Variable knowledge and experience of the team may limit optimal care delivery, particularly when hand-off procedures are not well defined. Second, a comprehensive plan of system-based approaches and standardized protocols should be developed. These include developing global industry standards for dialysis machine performance, providing knowledge and training to all caregivers for the safe and effective use of dialysis machines, credentialing caregivers on dialysis procedures, developing and applying metrics for monitoring care delivery, and minimal standards for nurse-to-patient ratios (12). Each center should critically appraise its dialysis practice to ensure that it has the best approach and all members of the team are knowledgeable and trained and use a standard approach. Third, we need to provide evidence-based recommendations for best practice while ongoing research studies accumulate evidence for the ultimate development of practice guidelines. Centers that have successfully
adapted and used these techniques worldwide can contribute best practice approaches and disseminate this information through web-based programs, conferences, publications, and regional training centers. New users of any dialysis technique should be required to meet minimal standards before initiating a program and to develop a plan for ongoing training of the team with access to educational material and best practice protocols. In addition, we should focus on promoting multidisciplinary interactions among physicians, nurses, pharmacists, nutritionists, and industry to foster collaborative training and a team approach to management.

Although these tasks seem daunting, it is worthwhile to remember that in the past 5 years, major progress has been made in critical care with protocol-based management of ventilators, hyperglycemia, and sepsis (13–15). This has required education and training of all caregivers and adoption of these standards for outcome benefits. There is no reason that similar strategies and protocols for dialysis in critically ill patients could not be established (16). In the interim, should we stop comparing dialysis techniques? Two large trials are already under way and should have results in the next year or two (17,18). Although they will shed light on some of these questions, they are still constrained by their study designs. As we await these trials, we should recognize that intermittent, continuous, and hybrid techniques all offer specific advantages that can be tailored to fit the varying needs in a critically ill patient’s course. Regardless of our conviction on which technique is best, each of these has a role, provided that we know how and when to use them (19). Rather than lamenting the lack of evidence for superiority of CRRT, we should focus on understanding why we have not made any difference with intermittent hemodialysis. We need to learn how to use optimally each dialysis technique that we offer and invest in education, training, and standardization to make progress. Having the keys to a Ferrari does not make one a race car driver, and certainly, without the proper training and pit crew, one cannot compete in NASCAR. It is time that we recognize that dialysis in critically ill patients is akin to a medley relay race, and we must put the best team forward to win.

Disclosures
None.

References