**Careers in Critical Care Nephrology**

**Opportunities and Challenges**

*Sarah F. Sanghavi*¹ and *Kirk N. Campbell*²

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**Introduction**

For the last few decades, advances in medicine have enabled physicians to alter the natural history of previously terminal diseases. These innovations have led to a population of patients with severe chronic illness at risk for acute life-threatening deterioration, which often requires multiple forms of mechanical life support. The need for highly specialized minute to minute care for these patients sparked the emergence of the intensivist, a physician trained in critical care who provides onsite coverage. Evidence demonstrating that intensivist staffing of intensive care units (ICUs) is associated with reduced mortality and length of stay (1,2) prompted the Leapfrog group, a consortium of over 100 Fortune 500 companies representing 34 million covered individuals, to create health care purchasing specifications, including the Intensive Care Unit (ICU) Physician Staffing Standard in 2000 (3). The standard requires that intensivists are certified in critical care medicine and present 8 h/d for 7 d/wk without concomitant responsibilities.

Although half of critically ill patients develop AKI, an independent risk factor for mortality (4), the model for kidney consultative care in the ICU has evolved very little over the last few decades. In many practice environments, nephrologists caring for critically ill patients are also juggling outpatient clinics and patients on dialysis, preventing prompt interventions. Patient hemodynamics may change throughout the day, affecting kidney perfusion and the KRT prescription. Therefore, iterative reassessment of the patient and frequent communication with the ICU team are essential. Nephrologists must also possess advanced knowledge of static and dynamic measures of volume responsiveness, vasopressors/inotropes, and ventilator settings. There is clearly a need for a subset of nephrologists who are experts in critical care. Here, we describe the opportunities and challenges in training such physicians and securing rewarding, sustainable careers for them.

**Transforming Education**

Critical care medicine is a key area of interest for trainees considering a career in nephrology (5). Data from the Electronic Residency Application Service show that candidates applying to nephrology fellowships concurrently apply to pulmonary and critical care fellowships more than any other specialty. In the most recent American Society of Nephrology (ASN) fellows survey, critical care was second only to transplant as the most popular subspecialization pursued following nephrology fellowship (6). Furthermore, for fellows who plan to pursue careers exclusively in clinical nephrology, caring for critically ill patients was noted by 69% to be a reason that they were “very or extremely satisfied” with their career choice (7).

These findings are not surprising given the considerable overlap of expertise, including electrolyte, acid-base, and volume disorders. Both specialties are rooted in physiology and offer the opportunity to perform life-saving procedures. This natural pairing of nephrology and critical care in conjunction with the growth of critical care medicine into its own distinct field has paved the way for combined training tracks.

The first track offers additional training in critical care medicine for trainees who plan to practice consultative nephrology. It prepares fellows to collaborate with intensivists in leading the hospital’s continuous KRT program and develop protocols in AKI as advocated by the ASN AKI Advisory Group (8). In addition to this administrative role, graduates would be responsible for educating colleagues and trainees to help reassert the nephrologist’s place in the ICU. We envision a curriculum that tailors the fellow’s second year of training to education in point-of-care ultrasound, KRT, plasmapheresis, toxicology, and advanced heart failure therapies, including extracorporeal membrane oxygenation. An optional third year would allow for additional training in research, quality improvement, or teaching because many fellows on this track will pursue academic careers. Although some may contend that this type of training should be the standard for all nephrology fellows, it may not be practical or desirable for fellows planning to pursue careers in research, transplantation, or outpatient nephrology.

The second track differs from the first in that the fellow is trained to practice the full scope of both nephrology and critical care. The Accreditation Council for Graduate Medical Education (ACGME) does not currently recognize integrated nephrology/critical care as an accredited pathway as it does pulmonary/critical...
care, but there are 45 ACGME accredited 1-year fellowships in critical care medicine that nephrology fellows may pursue after completing 2 years of general nephrology training. Institutions, such as Henry Ford and the University of Texas Southwestern, offer combined tracks that enable residents to interview and gain acceptance to both programs simultaneously rather than sequentially. This approach may reduce costs and anxiety for applicants and gives the fellowship programs the opportunity to integrate training over 3 years. For these reasons, we recommend that other institutions adopt this model.

It would be expected that, like anesthesiologists and surgeons with critical care training, critical care nephrologists would apportion their time between ICU attending services and consultative nephrology services. In this way, weeks of high-volume nephrology consultation and comprehensive documentation could be balanced by ICU weeks of shiftwork and time-based billing. Similarly, the emotional burden and moral distress of end of life care in the ICU may be offset by caring for less acute patients in the nephrology clinic.

Dedicated training in critical care medicine will enable nephrologists to take a more active role in the ICU. Recognition and standardization of these tracks by the ASN and the ACGME would provide quality control of the programs and supply the channels needed to reach interested trainees. A central repository for information about critical care nephrology training programs would also facilitate research on curriculum development and graduate outcomes.

**Disrupting Conventional Practice Models**

Reliable data on the number of practicing critical care nephrologists are sparse. There are currently 96 physicians in the Medicare physician database who list both nephrology and critical care as specialties. Of these, 49 denote nephrology as their primary specialty, and 32 specify critical care. These data do not provide details on whether these physicians are currently involved in both specialties, but anecdotally, there are barriers to this practice. In academic hospitals, critical care medicine typically falls under the division of pulmonary medicine, and leadership may be hesitant to accept faculty candidates with different training backgrounds. Dual appointments in nephrology and critical care also present obstacles due to fragmented remuneration. In private practice, intensivists may be required to cover inpatient pulmonary consults, restricting career opportunities for nephrology-trained intensivists. Informal discussions with internal medicine residents reveal significant job prospect concerns among those considering training in critical care nephrology. Many prefer nephrology to pulmonary medicine, but the latter proves a safer bet for employment opportunities. Others do not have a keen interest in ESKD but assume that rounding at outpatient dialysis centers is built in to most job contracts.

The development of independent critical care organizations (CCOs) is one potential solution to workforce challenges. This model brings all of a hospital’s ICUs under one central leadership with the shared goal of improving health care delivery. The Institute for Critical Care Medicine at the Icahn School of Medicine at Mount Sinai is 1 of 27 identified CCOs in the United States and Canada (9). Here, physicians board certified in fields, such as anesthesiology, neurology, cardiology, and nephrology, with dual certification in critical care medicine are centrally recruited to staff cardiac, medical, neurosurgical, and surgical ICUs in addition to the hospital’s Rapid Response Team and Vascular Access Service. The institute enables the hospital system to recruit physicians for their excellence in critical care medicine, pool resources among the various ICUs, and promote innovation and research. Most CCOs manage their own revenue stream to pay intensivists and reinvest in the organization (9). Organizations like this have the potential to expand career opportunities for nephrologists, especially if, as expected, they continue to proliferate, as best practices for their expansion and integration in academic institutions continue to be developed (10).

In the private sector, large multispecialty group practices have greater flexibility to allow dual practice because there is less effect on call schedules and no financial disincentives. For nephrologists with expertise in critical care who practice consultative nephrology, concurrently treating outpatients with ESKD may negatively affect response time. We advocate for protection from outpatient duties while attending on inpatient services.

As the complexity and number of hospitalized patients requiring nephrology consultation grow, subspecialization...
is necessary to keep pace with advances in medicine. This is especially true and overdue in the care of the critically ill. It is clear that although there is enthusiasm among trainees for specialized critical care nephrology training, numerous gaps remain. Details regarding the critical care nephrology workforce and job market outlook are lacking and sorely needed. Future research efforts should investigate the career paths of fellows graduating from combined programs, job satisfaction, and the hiring practices of nephrologists to CCOs compared with traditional employment models. Annual conferences, such as the International Conference on Advances in Critical Care Nephrology, are moving the specialty forward, but more avenues for professional networking are needed. Expanding the intellectual and procedural expertise of nephrologists in critical care medicine is one important step in ongoing efforts by the ASN toward reasserting the specialty.

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Disclosures

The authors have nothing to disclose.

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