Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Lessons Learned: Nephrology Training Program Adaptation in the Time of COVID

Nisha Bansal, Yoshio N. Hall, Kamalanathan K. Sambandam, and Amanda K. Leonberg-Yoo

The COVID-19 (coronavirus disease 2019) pandemic has prompted rapid changes to medical education. Across the United States, graduate medical education programs have had to navigate abrupt declines in outpatient medical care, marked fluctuations in inpatient volume and acuity, and a rapid shift to online education.[1] Through our shared experiences across nephrology fellowship programs in 3 different US regions, we identified 3 domains in which we faced the greatest challenges: changes in care delivery models, curricular adaptation, and fellow wellbeing. Here, we outline the specific challenges in these areas and highlight opportunities for innovation in nephrology fellowship training, stimulated by the COVID-19 disruption (Box 1).

Changes in Care Delivery Models

During the pandemic, outpatient nephrology practices rapidly pivoted to alternative care delivery models, with an emphasis on telemedicine. The Centers for Medicare & Medicaid Services expanded telemedicine coverage on March 6, 2020 to include inpatient and outpatient consultation and in-center hemodialysis.[2] While isolated telemedicine programs existed pre-COVID for rural and transplant care, the rapid adoption of telemedicine left many nephrology training programs scrambling to simultaneously provide care and train fellows (and faculty) in the practice of remote medicine.[3,4] The unexpected shift to telemedicine disrupted the traditional ambulatory teaching models that relied heavily on interaction with patients and preceptors in clinics and dialysis units. Moreover, trainees lost valuable training opportunities for situations that require in-person contact (eg, serial assessments of the maturing hemodialysis access, participation in home dialysis training and quality improvement initiatives) and interaction with nephrology's multidisciplinary care teams of nurses, technicians, pharmacists, social workers, and dieticians. Finally, there were challenges in assessing fellow performance, since traditional models relied on direct observation and feedback from faculty as well as other members of the care team.[5]

Despite these challenges, telemedicine enhanced several key elements of fellowship training in the understanding, coordination, and delivery of nephrology care. It encouraged collaborative care by allowing multiple providers, including home health care workers, to join the visit. Telemedicine also facilitated outreach to rural constituents who may not have previously accessed nephrology care owing to geographic barriers. Importantly, it also highlighted disparities in technology access, the home environment, family structures, and other critical health determinants that often go unnoticed in a clinic visit.[6]

Owing to the disproportionate impact on urgent and maintenance dialysis care, the pandemic exposed nephrology fellows to several novel learning opportunities.[7] For example, the critical importance of infection control in dialysis units was highlighted early in the pandemic, after the first reported death from COVID-19 in the United States occurred in a patient receiving in-center hemodialysis in Washington state.[8] Our fellows received early education in infection-control policies and witnessed their evolution, implementation, and shortfalls within and outside of the dialysis unit. Moreover, in areas that experienced critical shortages in intensive care, nephrology fellows often faced the need to ration kidney replacement therapy. Some received training in urgent-start peritoneal dialysis in order to manage the surge of patients with COVID-19–related acute kidney injury. Others witnessed and participated with infectious disease specialists, pharmacists, surgeons, intensivists, and bioethicists, among others, in developing multidisciplinary protocols for providing kidney replacement therapy (Box 1).

These unique training experiences arising in the context of the pandemic could substantially change nephrology training and practice (Box 1). The effective use of telemedicine in outpatient clinical settings and dialysis settings should now be part of the core education of fellows. Programs should develop new tools to assess fellow progression in this realm towards readiness for unsupervised practice.[9] Telemedicine training should also teach fellows to better identify, prioritize, and utilize resources to assist vulnerable patients with broad social needs, including those who lack access to technology, suffer from food insecurity, or face housing instability. In so doing, fellows may gain important insights into the social determinants of health that disproportionately sustain racial-ethnic and socioeconomic disparities in chronic kidney disease.[10] Finally, we hope these new multidisciplinary experiences will lead to hybrid electives (eg, pharmacology and nutrition), additional fellowships (eg, nephrology–infectious disease, nephrology–critical care, nephrology–palliative care), and increased opportunities for cross-disciplinary scholarship.

Curricular Adaptation

The COVID-19 pandemic disrupted traditional models of in-person instruction in nephrology and replaced them with virtual conferencing. With this shift from interactive, in-person sessions to online learning, we faced the common challenge of how best to promote and sustain learner

Box 1. Challenges, Solutions, and Opportunities in Nephrology Training Programs, in Response to COVID-19 Pandemic

Changes in Care Delivery Models

Challenges and Solutions

Telemedicine
- Develop operating system platforms that can incorporate both in-person and virtual visits
- Promote greater fellow autonomy and develop innovative approaches to precepting
- Identify and utilize existing resources to assist vulnerable patients

Novel Training Opportunities
- Focus education on infection control, particularly in dialysis units
- Incentivize stakeholder collaborations (eg, hospital administration, pharmacy, dialysis units) to develop multidisciplinary care protocols
- Enhance fellow exposure to subspecialty areas of interest
- Pursue innovation in cross-disciplinary fellowship training
- Promote scholarly collaborations for novel treatment approaches to multiorgan diseases

Future Opportunities
- Increase educational training for delivery of telemedicine within kidney disease populations, including CKD, transplant, and dialysis
- Review competence in telemedicine and its effects on future practice using data-driven approach
- Employ telemedicine to more effectively address disparities due to social determinants of health
- Design hybrid fellowship training models that facilitate cross-disciplinary training and competence

Curricular Adaptation

Challenges and Solutions

Adaptation to Virtual Conferences
- Review operating platform with program coordinators, fellows, and faculty using dedicated lecture time
- Leverage online pathology slide review and other existing nephrology online resources
- Create online discussion boards for informal teaching opportunities
- Use virtual white boards for renal physiology concepts
- Use live polling platforms and audience response technology
- Encourage "teach-back" during lectures

Alternative Learning Resources
- Leverage existing free online educational material—see Table S1
- Increase regional educational program collaborations

Future Opportunities
- Encourage hybrid approach to teaching by leveraging online platforms
- Increase national collaboration/shared resources for education across nephrology programs
- Increase research in nephrology medical education using hybrid models to appeal to new generations of learners

Fellow Wellbeing

Challenges and Solutions

Risk of Burnout
- Reduce inpatient rotation length & ensure time off between inpatient rotations
- Use web-based on-demand behavioral health initiatives, including local or other resources

Risk of Depersonalization & Isolation
- Communicate routinely with leadership and trainees using frequent huddles or town hall meetings
- Collaborate with consult teams and with family members using virtual platforms
- Encourage community engagement with virtual happy hours and social gatherings

Future Opportunities
- Establish tools for assessment of fellow well-being
- Encourage innovation for inpatient rotation models in training programs
- Promote cross-institution social engagement

engagement. We attempted to address this challenge by first optimizing technological elements (eg, bandwidth, cameras, microphones) and ensuring that participants were familiar with functions to facilitate interaction (eg, polling, chat, breakout rooms, screen share, virtual whiteboard). We found that having a faculty facilitator for each session helped to support the presenter and to minimize the impact of technological disruptions and

other distractions. Furthermore, to reduce potential screen fatigue, we reduced the duration of each presentation and leveraged "pre-assignments" such as review of a key article, framework, quiz, or "board-style" questions prior to conference. Needless to say, our programs worked hard to cultivate an expectation of participation and a safe space for questions and interaction.

We also discovered several learning resources that functioned extraordinarily well in the virtual format. For example, fellows can now "meet" with a renal pathologist using a virtual platform to view biopsy slides in real time. An alternative approach leverages several high-quality online case files in renal pathology to provide tools for continued learning, either in a group setting or individually. There are a multitude of additional online resources (Table S1) that can be integrated into a program's curriculum, including nephrology blogs, online prerecorded lectures, question banks, and other novel learning tools.

The pandemic should inspire nephrology programs to rethink traditional approaches to nephrology education and promote further curricular development (Box 1). We hope to see programs evolve a more multidimensional approach to fellow didactic learning, instead of relying solely on self-directed reading and passive lectures. We suggest that the community lean into virtual conferencing as a tool that will facilitate cross-institutional exchanges of ideas and education through more guest lecturers.[11] Accompanying each of these innovations in curriculum development are research opportunities to study their effects.

Fellow Wellbeing

Although not unique to nephrology training programs, the COVID-19 pandemic highlighted threats to physician trainee wellbeing. A major challenge to our programs centered on the need for nephrology to contribute to COVID-related surge coverage in other areas of medicine while balancing the increased demands of our own inpatient consultative services.[12,13] Trainees caring for patients with COVID-19 reported higher stress and increased burnout.[14] In order to mitigate workforce exposure and quarantine disruptions, our training programs shortened inpatient rotations. We also leveraged virtual technology to host regular meetings and town halls between leadership and trainees on all levels to foster community, both within nephrology and the broader institution. Moreover, added attention to fellow wellbeing served to stimulate initiatives to address determinants of burnout unrelated to the pandemic. Several institutions enabled online access to wellness and mental health resources specific to health care workers. The most comprehensive program offered individual support, group sessions, and self-directed resources.

The pandemic has forced a checkpoint for fellow wellbeing and has provided opportunities to prioritize interventions to address burnout within our field.[15,16] The pandemic has incentivized many programs to develop more tools to assess and monitor fellow wellness. These initiatives align with the ACGME (Accreditation Council for Graduate Medical Education) requirements for the inclusion of wellbeing initiatives in the learning and workforce environment.[17] Data collection on the impact of these tools should be prioritized.

Conclusion

The COVID-19 pandemic has undoubtedly disrupted traditional models for nephrology fellowship training. While the acute phase of the pandemic resulted in marked changes in care delivery, curriculum development, and fellow wellbeing, we should leverage this opportunity to re-evaluate and evolve nephrology training. We encourage additional collaboration among fellowship training programs nationwide to promote discussions around educational innovation.

Supplementary Material

Supplementary File (PDF)

Table S1: Online educational resources in nephrology.

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Support: None.

Financial Disclosure: The authors declare that they have no relevant financial interests.

Acknowledgements: We would like to acknowledge the commitment to patient care, education, and support for each other that has been exhibited by nephrology fellows across the country during this unprecedented time.

Peer Review: Received July 31, 2020 in response to an invitation from the journal. Evaluated by 2 external peer reviewers, with direct editorial input from an Associate Editor, who served as Acting Editor-in-Chief. Accepted in revised form March 19, 2021. The involvement of an Acting Editor-in-Chief was to comply with AJKD's procedures for potential conflicts of interest for editors, described in the Information for Authors & Journal Policies.

 Published online April 19, 2021 with doi 10.1053/j.ajkd.2021.03.012

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