



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.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Adapting Urology Residency Training in the COVID-19 Era



Young Suk Kwon*, Alexandra L. Tabakin*, Hiren V. Patel*, Jeffrey R. Backstrand, Thomas L. Jang, Isaac Y. Kim, and Eric A. Singer

The novel coronavirus (COVID-19) pandemic has affected the lives of many health care workers (HCW), including resident physicians. Residents comprise a large portion of the workforce in many academic centers and have become critical in the front-line response for COVID-19 patients. As hospitals experience surges in admissions, residents in many disciplines, including urology, have been asked to function outside their specialty training to join COVID-19 treatment units. As the pandemic unfolds, urology residents will face challenges regarding personal safety and well-being, disruptions in their urology training, and relationship strain. Given the uncertain duration of the COVID-19 pandemic, and the possibility of multiple waves of infection,¹ long-term action plans can help prepare training programs and residents during these unprecedented times. In this commentary, we discuss different elements affecting urology resident training during the COVID-19 pandemic and strategies to minimize the impact of these factors. We recognize urology programs are heterogeneously affected by the COVID-19 pandemic; these suggestions should be adapted to programs' individual needs and capabilities.

PERSONAL AND WORKPLACE SAFETY

Access to Personal Protective Equipment and COVID-19 Testing

The large number of HCW infections and deaths from COVID-19 has underscored the importance of access to personal protective equipment (PPE). As a result of PPE shortages, many institutions have encouraged employees to reuse single-use PPE items for several days or longer, in

accordance with Centers for Disease Control and Prevention guidance.² The Accreditation Council for Graduate Medical Education (ACGME) has acknowledged the national PPE shortage, but maintains that resident physicians are to only participate in clinical environments if they have appropriate PPE.^{3,4} Proper fit-testing and training, especially when multiple types/brands of PPE are being utilized, are also critical safety factors. These PPE lessons will be especially important for the PGY-1 class of 2020, as well as some early medical school graduates,⁴ as any errors in technique or judgment can have significant consequences.

Many HCW are asymptomatic carriers of COVID-19 and can spread the virus to others. Access to COVID-19 testing for both HCW and patients is variable, and testing policies differ by region and institution. It is critical that residents who experience symptoms suggestive of a COVID-19 infection self-quarantine, only return to work after cessation of symptoms, and obtain testing if available. Until access to testing increases, clinicians should assume patients requiring an operation have COVID-19 until proven otherwise and take the proper precautions. Urology residents should exercise precautions in the operating room, as bag mask ventilation, endotracheal intubation, and laparoscopic surgery are aerosol-generating procedures that carry an increased risk of airborne viral transmission. Resident surgeons should leave the room during intubation when possible, wear proper PPE, avoid excessive use of electrocautery, and suction surgical smoke liberally.⁵ Hospitals should develop protocols for testing patients going to the operating room (OR) based on testing availability and speed of result acquisition.⁵ COVID-19-related precautions should be integrated into standard surgical time outs to ensure that all OR staff are properly protected.

Temporary Residency Restructuring

Many residency programs have responded to the pandemic by assembling rotating teams to cover their urology services, reducing the risk of COVID-19 exposure to patients and residents alike.⁶ Through such a strategy, urology teams maintain a "healthy reserve" of residents who are available to fill in if a co-resident falls ill. Teams should consider virtual handoffs and assigning individual

* These authors contributed equally to the work in this manuscript.

Disclosure: None.

Funding Support: This work is supported by a grant from the National Cancer Institute (P30CA072720).

IYK receives research support from US Department of Defense (W81XWH-17-1-0359).

EAS receives research support from Astellas/Medivation.

From the Division of Urology, Rutgers Robert Wood Johnson Medical School and Rutgers Cancer Institute of New Jersey, New Brunswick, NJ; and the Rutgers School of Public Health, Newark, NJ

Corresponding author: Eric A. Singer, M.D., M.A., M.S., F.A.C.S., Rutgers Cancer Institute of New Jersey, 195 Little Albany Street, New Brunswick, NJ 08903. E-mail: eric.singer@rutgers.edu

Submitted: April 16, 2020, accepted (with revisions): April 17, 2020

residents to round on patients, rather than traditional team rounds.⁷ We encourage urology residents to refer nonurgent consults directly to telemedicine outpatient appointments to minimize patient exposure to hospitals and clinics.⁶

Additionally, some institutions are running under ACGME Stage 3 surge protocols, which temporarily lift common program- and specialty-specific requirements, thereby allowing the deployment of urology residents to the emergency room, intensive care units (ICUs), and other areas of heightened need.^{3,7,8} Urology residents rotating outside of their specialty must have adequate supervision in these new environments, as is mandated by the ACGME.^{3,9} Many urology residents have not rotated on medical or ICU services since medical school or internship. Therefore, trainee experience should be considered when deploying residents to COVID-19 units. Residents should also undergo training regarding COVID-19 treatment, complications, assessment/management algorithms, airway and ventilator management, palliative care resources, PPE conservation, and ongoing clinical trials at their respective institutions.

CLINICAL TRAINING

With the deployment of urology team members to non-urologic services, many questions exist concerning the future of urology training.⁶ During this time, the American Board of Urology (ABU) is actively examining the impact of the COVID-19 pandemic on trainees and will aim to provide fair alternatives for residents who require extended time away from work. The ABU also indefinitely postponed the qualifying exam for graduating urology residents.¹⁰ With the unclear natural history of COVID-19 and potential for future epidemic waves, the development of sustainable alternatives to traditional resident educational activities is paramount.

Telemedicine

One way to supplement clinical training is through active participation in telemedicine clinics. As of March 17, 2020, the Centers for Medicare and Medicaid Services (CMS) temporarily expanded telehealth coverage for Medicare patients as part of the Coronavirus Preparedness and Response Supplemental Appropriations Act.^{11,12} With this policy, many hospitals have encouraged clinicians to transition their clinics to telemedicine platforms for patients who do not require physical exams or procedures.¹²

We encourage residents to partake in telehealth initiatives, as permitted by their institutions. By participating in these virtual visits, residents can review charts and engage in patient counseling under the supervision of an attending urologist. A number of studies have demonstrated the feasibility and success of telemedicine clinics for urologic conditions, both in pediatrics and adults.^{13,14} To our knowledge, no studies have examined the incorporation of telemedicine into urology residency curricula. However, telemedicine clinics have been effectively implemented in other specialties.¹⁵⁻¹⁷

Surgical Simulation

In order to preserve PPE and decrease transmission of COVID-19, the American College of Surgeons issued a statement recommending that surgeons curtail elective surgeries.¹⁸ While what constitutes an “elective” case is often left to the discretion of the surgeon, many institutions have published protocols for surgical triage, although there is heterogeneity among the recommendations.^{19,20} With a dearth of cases in which residents can participate, there may be a role for at-home surgical simulation.

Simulations have been used to train residents in fundamental surgical skills for open, endoscopic, laparoscopic, and robotic procedures.^{21,22} While some high-fidelity urologic simulations use equipment not readily available for use at home,²² some low-fidelity models can be constructed from

Table 1. Summary of select online educational materials for urology residents

Didactic resources	AUA Core Curriculum	https://auau.auanet.org/core
	AUA Course Catalog	https://auau.auanet.org/courses
	Urology Collaborative Online Video Didactics (COVID)	https://urologycovid.ucsf.edu/
	USC Urology 60 Minutes	Youtube channel: Urology 60 minutes
	Educational Multi-Institutional Program for Instructing Residents (EMPIRE)	https://nyaua.com/empire/
Research resources and online courses	Evidence-based Decisions in Surgery	http://www.ebds.facs.org/
	AUA Research Overview	https://www.auanet.org/research/research-overview
	Writing A Successful Career Development Award Application (2018)	https://auau.auanet.org/content/writing-successful-career-development-award-application-2018
	Big Data and 'Omics' Analysis in Urology (2020)	https://auau.auanet.org/content/big-data-and-omics-analysis-urology-2020
	Introduction to the Principles and Practice of Clinical Research (IPPCR)	https://ocr.od.nih.gov/courses/ippcr.html

Table 2. Summary of factors affecting urology residents and action items during the COVID-19 pandemic

	Factors Affecting Urology Residents	Action Items
Personal and workplace safety	Access to PPE and COVID-19 testing	<ul style="list-style-type: none"> • Ensure proper fit-testing • Practice donning and doffing PPE • Exercise caution in the operating room: leave OR during intubation, avoid excessive electrocautery, and suction surgical smoke • Assume all patients requiring an emergent operation have COVID-19 until proven otherwise, and take proper precautions
	Temporary residency restructuring	<ul style="list-style-type: none"> • Incorporate COVID-19 precautions into OR time outs • Assemble rotating skeleton crews • Perform virtual patient handoffs • Assign individual residents to patient rounds; forego traditional team rounds • Refer nonurgent consults to telehealth visits • Residents deployed to COVID-19 services should complete training in institutional algorithms for COVID-19 management, clinical trials, etc.
Education	Clinical training	<ul style="list-style-type: none"> • Enable resident participation in telehealth clinics • Encourage residents to engage in surgical simulation exercises and guided virtual surgery lectures • Supplement urology curriculum with education in medical ethics, health policy, global health, and other surgical disciplines
	Didactics	<ul style="list-style-type: none"> • Continue departmental education using virtual platforms • Attend publicly available virtual lectures given by providers at outside institutions
	Research	<ul style="list-style-type: none"> • Maintain detailed log of daily educational activities • Continue ongoing research projects, if permitted by institution and clinical demands; encourage inter-institutional collaborations • Participate in online research-focused courses by AUA or NIH
Personal wellness	Social relationships	<ul style="list-style-type: none"> • Virtually present at and attend national conferences • Practice social distancing • Maintain close social relationships with family and friends despite physical isolation
	Mental health	<ul style="list-style-type: none"> • Educate residents about mental health challenges they may face in a pandemic • Hold forums for residents to express their concerns • Consider periodic screenings for psychological conditions • Establish readily accessible mental health services, including 24-hour hotlines

household items.²¹ Additionally, many surgery residency programs support the use of home laparoscopy box trainers, which may be a suitable replacement for virtual reality simulators only available at the hospital.²³ Several groups have described makeshift laparoscopic trainers that can be used at home.^{21,23-25} While these simulations are not substitutes for live surgeries, they may allow residents to maintain their skill set. To further approximate the surgical environment, we suggest experienced surgeons hold interactive virtual review sessions of surgical videos to discuss operative techniques and procedural nuances.

Training Outside of Urology

As urology residents are reassigned to the emergency room, medical floors, and ICUs, trainees have the unique opportunity to gain exposure to other disciplines that can enhance their medical knowledgebase and interoperability with other services. Residency programs should encourage learning opportunities outside of urology in fields such as clinical ethics, health policy, and global health, all of which have direct applications to the COVID-19 pandemic.^{1,26} Residents should share with each other how their institutions are handling surgical triaging, resource allocation, and patient care management innovation. Ensuring we have an adaptable, resilient surgical workforce will benefit us now and when we inevitably face future crises.

DIDACTICS

The COVID-19 pandemic has stimulated worldwide educational collaboration within the urology community. The American Urological Association (AUA) and other organizations continue to offer a multitude of online didactic resources including the AUA core curriculum and virtual courses (Table 1). Most residency programs have transitioned their tumor boards and didactic lectures to digital platforms.⁶ Select centers have extended access to their virtual lectures on social media permitting hundreds of resident viewers in their audiences. For example, the University of California at San Francisco founded the Urology Collaborative Online Video Didactics (COViD), a series of daily online lectures given by urologic educators across the country covering a variety of topics.²⁷ Participants have the opportunity to engage in discussion and ask questions, thereby receiving state-of-the-art education and gaining exposure to how urology is practiced outside their institutions.²⁷ These digital lectures also promote networking and resident camaraderie. Urology residents working on a flexible clinical schedule should maintain a daily log of their educational activities that can be monitored by their program directors. Ultimately, virtual platforms could lead to the implementation of a standardized national urology resident curriculum with interactive modules, where trainees have access to expert faculty in

all areas of urology, regardless of their program size, location, or faculty composition.

RESEARCH

The COVID-19 pandemic has drastically changed many research practices. Some institutions have limited their laboratory staff, and many institutional review boards are not approving non-COVID-19 studies for the foreseeable future,⁹ while others continue to maintain their portfolios of therapeutic clinical trials. These delays are likely to have consequences for both clinical and basic science research, but faculty mentorship and many current projects can continue.^{9,28} We encourage urology residents to enhance their knowledge of research design and analysis by participating in free online courses offered by the AUA, American College of Surgeons, and National Institutes of Health (NIH) (Table 1).

PERSONAL WELLNESS

During the COVID-19 pandemic, many urology residents have been deployed to unfamiliar clinical environments, faced with challenges that may threaten their physical and mental health. Many trainees are living separately from their families to reduce the risk of viral transmission. During this time of physical separation, it is essential that residents attempt to maintain their social relationships despite physical isolation.⁹

Trainees should be briefed on the possibility of moral injury, anxiety, and depression. Program leaders are encouraged to hold recurring forums for residents to acknowledge and discuss their daily challenges. Health care systems should consider regular housestaff screenings for psychiatric conditions including anxiety, depression, insomnia, and distress; mental health services, including emergency hotlines, should be readily available to those in need.

CONCLUSIONS

The timeline for resolution and the long-term effects of COVID-19 on our patients and health systems are still unknown. Therefore, urology training programs must respond in innovative and dynamic ways. It is critical to ensure safety via adequate PPE and COVID-19 testing and provide adequate mental health assessment for urology trainees. While this pandemic has altered clinical duties, urology residents are encouraged to continue ongoing academic endeavors through digital medical education and research. Ultimately, the challenges created by COVID-19 pandemic will be overcome through novel solutions that can empower the next generation of urologists.

References

1. Bauchner H, Sharfstein J. A Bold Response to the COVID-19 Pandemic Medical Students, National Service, and Public Health. *JAMA*. 2020. <https://doi.org/10.1001/jama.2020.6166>.

2. Recommended Guidance for Extended Use and Limited Reuse of N95 Filtering Facepiece Respirators in Healthcare Settings. <https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceeetuse.html;2020>.
3. Stage 3: Pandemic Emergency Status Guidance. <https://acgme.org/COVID-19/Stage-3-Pandemic-Emergency-Status-Guidance;2020>.
4. ACGME Statement on Early Graduation from US Medical Schools and Early Appointment to the Clinical Learning Environment. <https://www.acgme.org/Newsroom/Newsroom-Details/ArticleID/10184/ACGME-Statement-on-Early-Graduation-from-US-Medical-Schools-and-Early-Appointment-to-ACGME-Accredited-Programs;2020>.
5. Zheng MH, Boni L, Fingerhut A. Minimally invasive surgery and the novel coronavirus outbreak: lessons learned in China and Italy. *Ann Surg*. 2020. <https://doi.org/10.1097/SLA.0000000000003924>.
6. Vargo E, Ali M, Henry F, Kmetz D, Krishnan J, Bologna R. Cleveland Clinic Akron General Urology Residency Program's COVID-19 Experience. *Urology*. 2020. <https://doi.org/10.1016/j.urology.2020.04.001>.
7. Nassar AH, Zern NK, McIntyre LK, et al. Emergency Restructuring of a General Surgery Residency Program During the Coronavirus Disease 2019 Pandemic: The University of Washington Experience. *JAMA Surg*. 2020. <https://doi.org/10.1001/jamasurg.2020.1219>.
8. Zarzaur BL, Stahl CC, Greenberg JA, Savage SA, Minter RM. Blueprint for Restructuring a Department of Surgery in Concert With the Health Care System During a Pandemic: The University of Wisconsin Experience. *JAMA Surg*. 2020. <https://doi.org/10.1001/jamasurg.2020.1386>.
9. Alvin MD, George E, Deng F, Warhadpande S, Lee SI. The Impact of COVID-19 on Radiology Trainees. *Radiology*. 2020 201222. <https://doi.org/10.1148/radiol.2020201222>.
10. ABU Response to COVID-19. <https://www.abu.org/news/detail/abu-response-to-covid-19;2020>.
11. Medicare Telemedicine Health Care Provider Fact Sheet. <https://www.cms.gov/newsroom/fact-sheets/medicare-telemedicine-health-care-provider-fact-sheet;2020>.
12. Gadzinski AJ, Ellimoottil C, Odisho AY, Watts KL, Gore JL. Implementing Telemedicine in Response to the 2020 COVID-19 Pandemic. *J Urol*. 2020. <https://doi.org/10.1097/JU.0000000000001033>.
13. Finkelstein JB, Cahill D, Young K, et al. Telemedicine for Pediatric Urologic Postoperative Care is Safe, Convenient and Economical. *J Urol*. 2020. <https://doi.org/10.1097/JU.0000000000000750>.
14. Safir IJ, Gabale S, David SA, et al. Implementation of a Tele-urology Program for Outpatient Hematuria Referrals: Initial Results and Patient Satisfaction. *Urology*. 2016;97:33–39. <https://doi.org/10.1016/j.urology.2016.04.066>.
15. Papanagnou D, Stone D, Chandra S, Watts P, Chang AM, Hollander JE. Integrating Telehealth Emergency Department Follow-up Visits into Residency Training. *Cureus*. 2018;10:e2433. <https://doi.org/10.7759/cureus.2433>.
16. Moore MA, Jetty A, Coffman M. Over Half of Family Medicine Residency Program Directors Report Use of Telehealth Services. *Telemed J E Health*. 2019;25:933–939. <https://doi.org/10.1089/tmj.2018.0134>.
17. Tipton PW, D'Souza CE, Greenway MRF, et al. Incorporation of Telestroke into Neurology Residency Training: "Time Is Brain and Education". *Telemed J E Health*. 2019. <https://doi.org/10.1089/tmj.2019.0184>.
18. COVID-19: Elective Case Triage Guidelines for Surgical Care. <https://www.facs.org/covid-19/clinical-guidance/elective-case;2020>.
19. Proietti S, Gaboardi F, Giusti G. Endourological Stone Management in the Era of the COVID-19. *Eur Urol*. 2020.
20. Stensland KS, Morgan T, Moinzadeh A, et al. Considerations in the Triage of Urologic Surgeries During the COVID-19 Pandemic. *Eur Urol*. 2020.
21. Rowley K, Pruthi D, Al-Bayati O, Basler J, Liss MA. Novel use of household items in open and robotic surgical skills resident education. *Adv Urol*. 2019;2019: 5794957. <https://doi.org/10.1155/2019/5794957>.
22. Timberlake MD, Garbens A, Schlomer BJ, et al. Design and validation of a low-cost, high-fidelity model for robotic pyeloplasty simulation training. *J Pediatr Urol*. 2020. <https://doi.org/10.1016/j.jpuro.2020.02.003>.
23. Yiasemidou M, de Siqueira J, Tomlinson J, Glassman D, Stock S, Gough M. "Take-home" box trainers are an effective alternative to virtual reality simulators. *J Surg Res*. 2017;213:69–74. <https://doi.org/10.1016/j.jss.2017.02.038>.
24. Jaber N. The basket trainer: a homemade laparoscopic trainer attainable to every resident. *J Minim Access Surg*. 2010;6:3–5. <https://doi.org/10.4103/0972-9941.62525>.
25. van Duren BH, van Boxel GI. Use your phone to build a simple laparoscopic trainer. *J Minim Access Surg*. 2014;10:219–220.
26. Angelos P. Surgeons, Ethics, and COVID-19: Early Lessons Learned. *J Am Coll Surg*. 2020. <https://doi.org/10.1016/j.jamcollsurg.2020.03.028>.
27. Urology Collaborative Online Video Didactics (COViD). <https://urologycovid.ucsf.edu;2020>.
28. Puliatti S, Eissa A, Eissa R, et al. COVID-19 and Urology: A Comprehensive Review of the Literature. *BJU Int*. 2020. <https://doi.org/10.1111/bju.15071>.