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Publication Date

2022-09-01

DOI

10.1016/j.urology.2022.02.032

Peer reviewed



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Evaluation of the Educational Impact of the Urology Collaborative Online Video Didactics Lecture Series



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OBJECTIVE	To assess the impact of the Urology Collaborative Online Video Didactic (COViD) lecture series on resident knowledge as a supplement to resident education during the coronavirus disease 2019 pandemic.
METHODS	One hundred thirty-nine urology residents were voluntarily recruited from 8 institutions. A 20-question test, based on 5 COViD lectures, was administered before and after watching the lectures. Pre- and posttest scores (percent correct) and score changes (posttest minus pretest score) were assessed considering demographic data and number of lectures watched. Multiple linear regression determined predictors of improved scores.
RESULTS	Of residents recruited, 95 and 71 took the pre- and posttests. Median number of lectures watched was 3. There was an overall increase in correct scores from pretest to posttest (45% vs 57%, $P < .01$). Watching any lectures vs none led to higher posttest scores (60% vs 44%, $P < .01$) and score changes (+16% vs +1%, $P < .01$). There was an increase in baseline pretest scores by post-graduate year (PGY) ($P < .01$); however there were no significant differences in posttest or score changes by PGY. When accounting for lectures watched, PGY, and time between lecture and posttest, being a PGY6 ($P = .01$) and watching 3-5 lectures ($P < .01$) had higher overall correct posttest scores. Watching 3-5 lectures led to greater score changes ($P < .001-.04$). Over 65% of residents stated the COViD lectures had a large or very large impact on their education.
CONCLUSIONS	COViD lectures improved overall correct posttest scores and increased knowledge base for all resident levels. Furthermore, lectures largely impacted resident education during the coronavirus disease 2019 pandemic. UROLOGY 167: 36–42, 2022. © 2022 Elsevier Inc.

Coronavirus disease 2019 (COVID-19) has had an enormous impact on all aspects of healthcare, from care delivery to the training of future practitioners. To prevent hospital transmission of COVID-19, residency training programs rapidly limited patient contact and minimized in-person activities.¹ To this end, in-person lectures and educational conferences were largely transitioned to remote video learning.² For urology residency programs, the cancellation of elective surgeries starting in March 2020 resulted in increased teleconferencing

initiatives with individual programs struggling to provide residents with ample educational support.³⁻⁵

Due to the educational deficiency created by the pandemic, a nationwide coalition of Urology residency program directors created the Collaborative Online Video Didactics (COViD) lecture series to provide high-quality didactics for urology residents beginning in March 2020.⁶ The COViD lecture series started as a collaboration between University of California-San Francisco, University of Washington, University of California-Davis, Stanford University, University of Minnesota, University of Michigan, Northwestern University and the University of Virginia. Urology faculty members across the country volunteered to deliver lectures via Zoom webinar. Initially lectures were offered once or twice a day between March and June 2020, and then once a week from September 2020 to June 2021. These lectures were freely available to the greater urology community, but designed specifically for Urology trainees. All lectures were available live and later posted to YouTube, and the program continues to create and release new lectures.

Disclosures: None.

Funding Support: None.

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Submitted: April 21, 2021, accepted (with revisions): February 27, 2022

Our previous investigation reported high satisfaction rates with the COVID lecture series from trainees of all levels,⁶ but the question of whether it was an effective learning tool for residents still remained unanswered. Given the transition to remote web-based lectures, the authors were interested to understand whether this new style of didactic learning would translate to improvement in trainees' subject knowledge. This study aimed to evaluate the effectiveness of this lecture series by measuring residents' knowledge through test questions administered before and after viewing the lectures. We hypothesized that viewing the lectures would increase resident test scores and hence could possibly be translated to improved knowledge base.

MATERIALS AND METHODS

Internal review board approval was obtained as well as permissions from the graduate medical office from the main institution conducting the study. During the conception phase of the study, faculty members of the above 8 sponsoring institutions of the COVID Lecture Series allowed permission to contact their residents for recruitment for the study. These residents then volunteered their participation in the study. A nonvalidated 20-question test, based on educational content of 5 COVID lectures held the week of April 27, 2020, was created in collaboration between the 5 lecture speakers and the senior author. The COVID lecture content included: (1) Benign and Malignant Conditions of Adrenal Gland, (2) Genitourinary Pediatric Oncology, (3) Anterior Vaginal Wall Masses, (4) Trauma to the Lower GU Tract, and (5) Penile Neoplasms.

Resident participation was voluntary only as stated in the resident contact email. Residents were asked to only watch the live lectures or recorded version between April 27th and May 3rd, 2020 to allow for a time lapse between the last lecture watched and completion of the knowledge-based test. Otherwise residents were not asked if they viewed lectures on demand or live. Residents were asked to complete the test twice, once before viewing the relevant COVID lectures and again after. "Pretest" is defined as the test taken for baseline knowledge before watching any lectures. "Posttest" is defined as the test taken after viewing any of the designated 5 lectures. Residents were advised to complete the posttest even if they did not watch any lecture videos. Only the residents who took the pretest were asked to take the posttest. Lecture videos could be watched live or via YouTube later on their own time. The posttest was made available 1.5 weeks after the fifth and last live COVID lecture on May 13, 2020 and remained open for 8 weeks. Demographic data including postgraduate year (PGY), American Urological Association (AUA) section, and the impact of the COVID on resident education measured by Likert scale from 1 to 5 (1 = very little impact, 5 = very large impact) were collected at baseline. In the posttest, residents were asked to identify which lectures they had watched. Data was collected in highly sensitive data Qualtrics (Drive Provo, UT).

Our primary outcome was to determine the impact on resident knowledge after watching the COVID Lecture Series based on test scores. Mean pretest and posttest percentage correct and percentage change (posttest minus pretest percentage correct) were compared by if any lectures were watched using Student's *t* Test and by number of lectures watched, resident perception of the lectures by Likert scale, PGY, and AUA section using analysis of variance analysis. A

pairwise comparison post hoc analysis of variance analysis using Tukey's Honestly Significant Difference was performed to determine which pairs of mean test scores were significantly different from each other amongst different PGY levels and number of lectures watched. Median number of lectures watched by AUA section and by PGY were compared using Kruskal Wallis H Test.

Multiple linear regression was performed to determine factors which predicted posttest scores and changes in scores (pretest and posttest score difference). Factors included in the regression were based on results of the univariate analysis in addition to the importance of length of time between presentation of the last lecture and posttest survey. Number of lectures were included in the regression rather than lecture topic type due to possibility of influence of various teaching styles of the lecturers. Data is presented as mean percentages (standard deviation) if normally distributed or median (interquartile range) if data were skewed. Within the regression, 95% confidence intervals (CI) are also reported. Statistical analysis was performed using R version 4.0.3 (Boston, MA). For all tests, a $P < .05$ was considered statistically significant.

RESULTS

Demographics

Of the 139 residents contacted, 95 (68%) voluntarily completed the pretest prior to the lectures. Of these residents, 71 (53% of 139) completed the post test. The 3 AUA sections that participated in the pretest and posttest were Mid-Atlantic ($N = 11$, 11.6%; $N = 11$, 15.5%), North Central ($N = 40$, 42.1%; $N = 29$, 40.8%), and West ($N = 44$, 46.3%; $N = 31$, 43.7%). Posttest surveys were taken at a median 23 days (interquartile range [IQR] 17, 37) after the last lecture was given. On the pretest survey, greater than 65% of residents stated the COVID series had a large or a very large impact (56% and 13% respectively) on their education (Supplementary Figure 1). Very little impact, little impact, and neutral responses were reported in 4%, 0%, and 27% of residents respectively.

In the entire cohort, there was no difference in number of lectures watched by residents by AUA section ($P = .26$, Figure 1A) or by PGY ($P = .07$, Figure 1B); although there was a trend for more junior residents to watch a higher number of lectures. Overall, the median number of lectures watched by resident was 3 (IQR 1, 5) (Table 1). 32% of residents who took the posttest watched all 5 lectures. PGY-1 residents watched more lectures (median 5, IQR 4.5, 5) compared to their co-residents, in particular when compared to PGY-6 residents (median 1, IQR 0, 2) ($P = .002$). There were no differences in median number of lectures watched by AUA section ($P = .05$).

Primary Outcome

There was a significant overall increase in test scores after viewing the COVID lectures (pretest $45 \pm 11\%$ correct vs. post-test $57 \pm 14\%$ correct, $P < .01$) (Table 2). Those who watched 1 or more lectures compared to those who watched no lectures had a significantly higher posttest score ($60 \pm 13\%$ vs $44 \pm 14\%$ correct, $P < .01$) and increase in test score ($16 \pm 15\%$ vs $1 \pm 11\%$ increase, $P < .01$). Residents who watched 4 or 5 lectures compared to those who did not watch any lectures had significantly higher posttest scores ($65 \pm 11\%$ or $66 \pm 12\%$ vs $44 \pm 14\%$ correct, $P < .01$ respectively). In addition, watching 5 lectures compared to no lectures or 2 lectures had a significantly higher increase in test score ($25 \pm 17\%$ vs $1 \pm 11\%$ or $5 \pm 10\%$ increase respectively, $P < .01$).

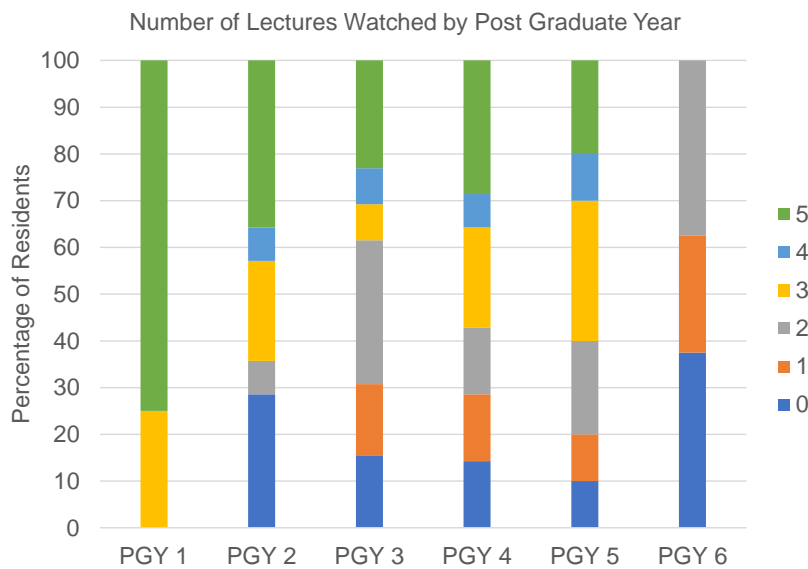
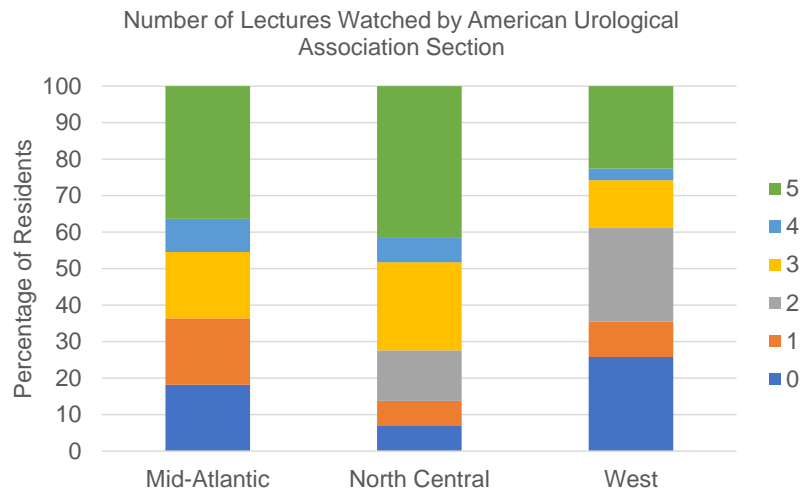


Figure 1. (A) Overall number of lectures watched by American Urological Association Section, (B) Overall number of lectures watched by post graduate years. (Color version available online.)

Table 1. Median number of lectures watched by post graduate year and American Urological Association Section

	Median Lectures Watched (IQR)	P value	Median Number Days Between Lecture and Posttest Survey (IQR)
Overall	3 (1, 5)		23 (17, 37)
PGY			
1	5 (4.5, 5.0)	P = .002	-
2	3 (0.5, 5.0)		
3	2 (1.0, 4.0)		
4	3 (1.3, 4.8)		
5	3 (2.0, 3.8)		
6	1 (0.0, 2.0)		
AUA section			
Mid-Atlantic	3 (1.0, 5.0)	P = .05	-
North Central	3 (2.0, 5.0)		
West	2 (0.5, 3.5)		

AUA, American Urological Association; IQR, interquartile range; PGY, post graduate year.

Table 2. Resident demographics and test scores

		Number of Residents Completing Posttest (Percentage)	Mean Pretest Percent Correct (n = 95) (SD)	P value	Mean Posttest Percent Correct (n = 71) (SD)		Mean Percent Pre- and Posttest Difference (SD)	
Mean overall percent correct			44.6 ± 10.9	—	57.2 ± 14.0	<.0001	13.5 ± 15.1	—
Did watch any lectures?	Yes	59 (83.1)	43.8 ± 10.5	.08	59.8 ± 12.5	.003	16.0 ± 14.7	.0005
	No	12 (16.9)	42.9 ± 11.4		44.2 ± 14.1		1.3 ± 10.5	
#Lectures watched	1	7 (9.9)	40.7 ± 6.1	.23	50.7 ± 9.8	.0001 [†]	10.0 ± 7.1	<.0001 ^{††}
	2	12 (16.9)	50.4 ± 11.4		55.8 ± 9.3		5.4 ± 10.1	
	3 (median)	13 (18.3)	43.8 ± 10.0		56.2 ± 13.3		12.3 ± 10.3	
	4	4 (5.6)	45.0 ± 9.1		65.0 ± 10.8		20.0 ± 9.1	
	5	23 (32.4)	41.1 ± 10.8		65.9 ± 11.9		24.8 ± 16.5	
PGY	1	12 (16.9)	37.8 ± 11.5	.006*	62.1 ± 16.7	.31	24.2 ± 20.9	.19
	2	14 (19.7)	41.4 ± 8.4		49.6 ± 14.2		10.4 ± 14.3	
	3	13 (18.3)	43.4 ± 10.1		57.3 ± 11.1		12.3 ± 16.2	
	4	14 (19.7)	47.8 ± 10.5		58.9 ± 17.1		11.4 ± 13.5	
	5	10 (14.1)	49.3 ± 9.8		57.5 ± 11.1		12.0 ± 10.1	
	6	8 (11.3)	51 ± 11.5		59.4 ± 7.3		10.6 ± 7.3	
AUA section	Mid-Atlantic	11 (15.5)	45.5 ± 11.9	.58	61.4 ± 10.0	.53	15.9 ± 17.4	.26
	North Central	29 (40.8)	42.7 ± 11.5		57.1 ± 16.0		16.2 ± 16.3	
	West	31 (43.7)	46.0 ± 10.3		55.8 ± 13.2		10.2 ± 12.6	

#, number; AUA, American Urological Association; PGY, post graduate year; SD, standard deviation.

* $P < .05$ for PGY 1 vs PGY 5 or 6.

[†] $P < .05$ for 0 lectures vs 4 or 5 lectures.

^{††} $P < .05$ for 0 lectures or 2 lectures vs 5 lectures.

Table 3. Multiple variable regression on posttest and pre-and posttest score changes

		Effect on Posttest Score Percentage			Effect on Pre- and Posttest Change in Score Percentage		
			95% CI	P value		95% CI	P value
Number of lectures watched	0	REF	REF	REF	REF	REF	REF
	1	3.3	-7.8, 14.4	.55	7.2	-5.4, 19.7	.26
	2	9.4	<-0.1, 18.8	.05	3.1	-7.6, 13.7	.57
	3	15.5	5.7, 25.2	<.01	11.8	0.8, 22.9	.04
	4	23.1	9.8, 36.4	<.001	20.1	5.0, 35.1	<.01
	5	26.1	16.5, 35.8	<.001	23.3	12.4, 34.3	<.001
PGY	1	REF	REF	REF	REF	REF	REF
	2	-3.9	-13.4, 5.6	.41	-5.9	-16.7, 4.9	.28
	3	6.1	-4.1, 16.2	.23	-1.1	-12.6, 10.4	.85
	4	6.1	-3.6, 15.7	.21	-4.3	-15.2, 6.5	.42
	5	4.8	-6.0, 15.6	.38	-3.5	-15.7, 8.7	.57
	6	16	3.7, 28.4	.01	4.3	-9.7, 18.3	.54
#Days between lecture and posttest survey		0.04/d	-0.1, 0.2	.67	-0.03/d	-0.2, 0.2	.75

#, number; CI, confidence interval; PGY, post graduate year.

While there was a significant increase in baseline, pre-test scores by increasing PGY ($P < .01$), there was no significant difference found in posttest ($P = .31$) or change in pre- and posttest scores ($P = .19$) by PGY. There was also no statistically significant difference between AUA Sections by pretest ($P = .38$), posttest ($P = .53$), or change in pre- and posttest scores ($P = .26$). There was also no difference seen in pretest ($P = .98$), posttest ($P = .09$), or change in scores ($P = .48$) based on resident perception of the lectures' educational impact.

Multiple linear regression was performed for posttest scores and change in pre- and posttest scores (Table 3). Variables included were number of lectures watched, PGY, and number of days between last lecture and post-test completion. Number of days between last lecture and day of posttest completion did not influence change in scores ($P = .75$) or posttest scores ($P = .67$). There was a statistically significant trend of improving both posttest scores and score improvement by increasing the number of lectures viewed. Overall, watching 3 or more lectures demonstrated higher posttest scores by 15.5% (3 lectures; 95% CI 5.7, 25.2; $P < .01$), 23.1% (4 lectures; 95% CI 9.8, 36.4; $P < .001$), and 26.1% (5 lectures; 95% CI 16.5, 35.8; $P < .001$) compared to those who watched no lectures. Posttest scores increased from pretest scores by 11.8% after watching 3 lectures (95% CI 0.8, 22.9; $P = .04$), 20.1% after watching 4 lectures (95% CI 5.0, 35.1; $P < .01$), and by 23.3% after viewing 5 lectures (95% CI 12.4, 34.3; $P < .001$) compared to those who watched no lectures. In the multi-variable analysis, only a PGY-6 level demonstrated a higher posttest score compared to a PGY-1 by 16% (95% CI 3.7, 28.4; $P = .01$). However, changes in pre- and posttest scores were not statistically significant by PGY level after accounting for number of lectures watched and days between lecture and post-test completion.

DISCUSSION

The challenges of in-person learning generated by the COVID-19 pandemic have required all medical specialties to change the way resident didactics is conducted. Prior to the pandemic, previous studies have highlighted that medical student knowledge can be gained equally through in-person versus remote lectures.^{7,8} However, traditional

residency training programs have not needed to utilize remote learning until mandating the need for social-distancing. At the start of the pandemic, the authors piggy-backed the idea of creating a national online lecture series for Urology education from Otolaryngology who created the Collaborative Multi-Institutional Otolaryngology Residency Education Program.⁹ Urology's COVID lecture series was created within a week in mid/late-March 2020 with the first lecture held on March 30, 2020. Soon after, the New York Section of the AUA created the Educational Multi-institutional Program for Instructing Residents.¹⁰ These lectures theoretically serve a great need by providing Urology residents and students educational content from a diverse set of faculty whom they would not normally have access to outside of conferences. Additionally, residents and students are able to interact with these esteemed faculty members in real time without having to travel.

The question lies in if these online lecture series are providing educational benefit, and therefore, are they a worthwhile, long-term effort when the pandemic subsides? On a short-term basis, this study demonstrated the benefits of the online lecture series on resident knowledge. Residents tended to benefit the most by viewing a greater number of lectures. More importantly, an interesting phenomenon was observed. As to be expected, a gradient of baseline knowledge was seen with increasing PGY, prior to viewing the lectures. However, after watching the lectures, the knowledge gap equalized across PGY, demonstrating the intended effect of the lectures. Residents seemed to be able to recall the information similarly after watching the lectures. It could also be interpreted that junior residents benefited more from the lectures compared to senior residents with the residents being on more equal footing after the lecture series. This seems to support that these lectures are, in fact, a worthwhile endeavor. Furthermore, residents' perception was that the lecture series are impactful to their education (Supplementary Figure 1).

While the COVID-19 pandemic increased the implementation of online video lecture series across many specialties, video-based lectures have been utilized and studied on effectiveness for years. In a randomized control trial, Davis et al found that computer-based teaching is as good as face-to-face teaching based on test scores.⁷ They cited that advantages of video lectures included that they are more flexible to fit into a learning program, their ability to pause or revisit areas of a session, they address the issue of standardizing the quality of teaching material across a region, and they deal with the cost and logistical difficulties of specialist lecturers teaching large cohorts of students in different locations.⁷ In a different study by Brockfeld et al, while students preferred live lectures over pre-recorded lectures, there were again no differences seen in effectiveness based on scholastic testing.⁸

Implementing and sustaining these online lecture series are not without cost or drawbacks. These online lectures can be harder to engage the learner, and interactions between the lecturer and learners may be limited. The attention of the learner may also be diminished with video learning. Furthermore, the coordination it takes to deliver these lectures is time-consuming. These lecture series require a dedicated, organized team to select speakers, schedule the lectures, advertise the event, coordinate the logistics on the day of the event, post the recording for later viewing, etc. Other collaborative groups who created online didactics in response to COVID-19 have felt similarly. A multi-institutional collaboration for general surgery didactics quoted “producing didactic webinars with consistent high quality is labor-intensive and can be difficult to maintain over the long-term, particularly when offered without cost to viewers.”¹¹ However, this group found that asynchronous viewing was particularly valuable given roughly 90% of their learners viewed the lectures at a later date from the live viewing.¹¹ The ability to have these videos as a resource and study guide may be one of the strongest benefits of these lecture series and may justify its perpetuation.

Initially with reduced time in the operating room, urology resident education during the pandemic took an unavoidable toll. Yet, this study indicates that there may be a bright side to the pandemic for urologic academic medicine. Medical education may be positively changed forever as residents will have both the benefit of sufficient surgical experience and in-person patient interaction and the newfound learning tools developed during the pandemic. Much like how COVID has taught us how to conserve personal protective equipment, it has also taught us how to be better educators and improve the efficiency of education. Our hope is that even as social distancing and universal mask use may slowly phase away, the increased collaboration across institutions and increased independent learning options for urology trainees will continue. In the past, collaboration between institutions were limited to urology regional or national conferences or through visiting professorship lectures. With the COVID lecture series, these expert discussions can be brought into the homes of any urology trainee. Standardization of

resident education is dictated by both the AUA’s Core Curriculum and AUA guidelines. Supplementation of the COVID lecture series to these two resources for weekly resident didactic sessions can help residents prepare for both the in-service and board examinations. In addition, including expert discussion panels and topics on nonmedical but life topics (finance, wellness, healthcare, etc) can further be explored by this lecture series. The COVID lecture series and similar initiatives will ensure that urology residents have training that goes beyond the traditional lecture model: one where residents at all programs can benefit from the expertise of faculty at other institutions.

There were several limitations to this study. Resident participation was limited to the 8 institutions that were part of the coalition and thus may not be generalizable to all residency programs. However, it was reassuring that there were no differences seen in knowledge base between AUA sections. Though the multiple-choice questions were written by experts in each topic area and revised uniformly by one author, they were not validated or in-service-approved questions. Additionally, only 5 lectures were used for the study, and therefore, the effect of the lectures on resident education could change if more or less lectures were tested. Another limitation of this study is that there was no set time frame for when residents took the pre- and posttests. The residents were asked to take the pre-test prior to viewing any lectures, and the posttest was administered at minimum 1.5 weeks after the last live lecture viewing. This time lapse was intentional in attempts to assess for retention of knowledge. The variance in timing was taken into account for the analysis but could have confounded the results to some degree and affected recall abilities of participants. Otherwise, time decay was not assessed. It is also unknown if residents watched the lectures via YouTube later than the designated week of live-viewing; therefore, they could have ascertained the educational material closer to the time of their post-test. Furthermore, the study only looked at short-term acquisition of knowledge from the lectures and not longer term. It certainly would be interesting to see the long-term effects of the lecture series on retaining resident knowledge. These limitations aside, the resident participants came from a diverse sampling of residency programs across the country. The response rate was also fairly good which may demonstrate the enthusiasm residents have on their own education.

CONCLUSION

Despite the COVID-19 pandemic’s effect on urology resident education, collaboration between institutions in creating a national online expert lecture series has been instrumental in sustaining resident education. The COVID lecture series appears to be a beneficial educational tool in increasing resident knowledge with increasing lecture attendance having greater effects. Furthermore, the lecture series appeared to equalize knowledge across the years.

CONFLICTS OF INTEREST: No conflicts.

Future studies are needed to evaluate the long-term effects of these online lectures on resident education.

Acknowledgment. This work is part of a large collaborative effort, and we appreciate the help of our many collaborators. This project was partially supported from resources through the VA Puget Sound Health Care System, Seattle, Washington.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.urology.2022.02.032>.

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During the coronavirus disease 2019 pandemic, the field of Urology demonstrated its adaptability, dedication, and grit through continued patient care and resident training, in addition to a number of other ways. The Urology Collaborative Online Video Didactic (COViD) lecture series is one example of this. The learning resource was developed by a nationwide group of educators in Urology to fill the training void created by the cancellation of in-person conferences and elective Urological procedures.

This study showed that utilizing COViD lectures provided gains in Urological knowledge according to a pretest/posttest design where assessments were given to participants before and after the use of COViD lectures. As expected, baseline knowledge (pretest score) was greater at higher post graduate yearlevels, however this trend disappeared following COViD lectures (posttest score). The self-reported degree of COViD lecture use also influenced outcomes, as knowledge after COViD lecture use (posttest score) and knowledge gained (change from pretest to posttest) increased with the number of COViD lectures used.

These findings suggest the use of COViD lectures successfully increased the Urological knowledge specifically assessed on the tests given. The COViD lectures appeared to eliminate differences in knowledge level that existed across post graduate yearstatus at baseline and also provided knowledge gains in a “dose-dependent” manner. The development of such educational resources and their unrestricted availability for trainees will be a lasting benefit to the field of Urology. This is especially helpful in the era of mounting evidence of the effectiveness of video-based education¹ and the consideration that most surgical trainees now have grown up in the “digital age” and often prefer or benefit more from multimodality learning.²

Bradley C. Gill, Lerner College of Medicine, Education Institute, Cleveland Clinic, Cleveland, OH; Department of Urology, Glickman Urological and Kidney Institute, Cleveland Clinic, Cleveland, OH

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<https://doi.org/10.1016/j.urology.2022.02.036>
UROLOGY 167: 42, 2022. © 2022 Elsevier Inc.

EDITORIAL COMMENT



This work by Tuong and team provided a timely look into the use of video-based education for Urology resident training.