Impact of Urology Resident Involvement on intraoperative, Long-Term Oncologic and Functional Outcomes of Robotic Assisted Laparoscopic Radical Prostatectomy

Jacob Baber, Ilene Staff, Tara McLaughlin, Joseph Tortora, Alison Champagne, Akshay Gangakhedkar, Kevin Pinto, and Joseph Wagner

OBJECTIVE To evaluate the impact of resident involvement in robot assisted laparoscopic prostatectomy on oncologic, functional, and intraoperative outcomes, both short and long term.

METHODS We queried our prospectively maintained database of prostate cancer patients who underwent robotic-assisted laparoscopic prostatectomy from November 20, 2007 to December 27, 2016. We analyzed cases performed by 1 surgeon on a specific day of the week when the morning case involved at least 1 resident (R) and the afternoon case involved the attending physician only (nonresident [NR]). We compared R versus NR on a number of clinical, perioperative, and oncological outcomes.

RESULTS A total of 230 NR and 230 R cases met inclusion criteria and were included in the analysis. Over one third (36.7%) of the NR group was Gleason 4+3 (Grade Group 3) or higher, relative to 25.9% of the R group, P = .015. Median operative time (OT) was significantly longer for R versus NR (200 minutes versus 156 minutes, P<.001) as was robotic time (161 minutes versus119 minutes, P<.001). No significant differences were noted for any other measure. Median follow-up for oncological outcomes was 30 and 33.5 months for NR and R, respectively (P= .3). Median OT and median estimated blood loss were both significantly greater in later years relative to the earlier years for R (2012-2016 versus 2007-2011; P< .001 for OT; P= .041 for median estimated blood loss) but not for NR.

CONCLUSION Neither safety nor quality is diminished by R involvement in robot assisted laparoscopic prostatectomy. UROLOGY 132: 43–48, 2019. © 2019 Elsevier Inc.

The goal of a surgical residency is to teach competence in the diagnosis, evaluation, and management of specific medical conditions and processes; surgical procedures are a critical part of the management component. While the Accreditation Council for Graduate Medical Education (ACGME) requires trainees in surgical residencies to log a specified number of procedures prior to graduation,[1] attaining the minimal number of logged cases does not necessarily correlate with procedural competence or confidence. [2,3] Resident involvement is key to ensuring that residents leave their programs with the competence and confidence needed to succeed in the surgical arena. Changes in resident work hour restrictions and in supervision policies, as well as an intensified focus on quality outcome measures including patient safety, has led to an increased focus on the impact that resident involvement may have on surgical quality.[4-6]

In the arena of urologic surgery, a number of studies have indicated that resident involvement is associated with prolonged operative time (OT) but that complication rates do not vary on this basis.[5-10] Urological oncology cases present complex and unique challenges for residents and attending physicians as the evaluation must include oncologic outcomes and most of these cases are performed using minimally invasive techniques. [6,10] While resident involvement in these cases has been associated with prolonged OTs, rates of complications, reoperations, and readmissions are not affected.[6] Findings are similar for resident involvement in robot assisted laparoscopic radical prostatectomy (RALP), where supervised resident involvement on the console has been associated

Financial Disclosures: *This research did not receive financial support. JW serves on the speaker's bureau for Genomic Health and as a consultant for Covidien.*

From the Urology Division, Hartford Healthcare Medical Group, Hartford Hospital, Hartford, CT; and the Hartford Hospital Research Program, Hartford Hospital, Hartford, CT

Address correspondence to: Tara McLaughlin, PhD, Urology Division, Hartford Healthcare Medical Group, 85 Seymour Street, Suite 416, Hartford, CT 06106. E-mail: Tara.McLaughlin@hhchealth.org

Submitted: January 16, 2019, accepted (with revisions): May 16, 2019

with longer OT and no concomitant increase in excess blood loss (EBL), complications, reoperations, or length of stay.[11,12] Functional and short-term oncologic outcomes (ie, positive surgical margins; PSM) are acceptable with no differences in PSM and no differences in urinary or sexual functioning at 3 months and 1 year postsurgery. [11]

The purpose of our investigation was to further evaluate the impact of resident involvement in RALP cases on several oncologic, functional, and intraoperative outcomes, both short and long term. Our study is unique in that we present long-term oncologic outcomes while controlling for variables that can affect OT, such as variation in anesthesiology staff, nursing staff, and bed side assistants.

MATERIALS AND METHODS

Case identification. After obtaining Institutional Review Board approval, we queried our prospectively maintained database of prostate cancer patients who underwent robotic-assisted laparoscopic prostatectomy from November 20, 2007 to December 27, 2016. We specifically analyzed cases performed by 1 surgeon (JW) on a specific day of the week (Tuesdays) when the morning case involved at least 1 (resident [R]; meaning that at least 1 resident was present for the case and performed some part of the case on the robotic console) and the afternoon case involved the attending physician only (nonresident; NR).

Robotic surgery training. Training of residents in robotic surgery at our institution follows the best practices described by Lee et al,[13] a 2-stage approach which includes preclinical as well as clinical components. The training starts with on-line and hands on tutorials acclimating students to the components of the robot and affording them the opportunity to practice docking, insertion, and exchange of instruments and interfacing with the robot through the console. Dry and animate lab practice allows students to repeat basic tasks and to teach procedure-specific skills, such as those needed to perform RALP. Prior to participating on the surgical console, residents first serve as the bedside assistant to the main console surgeon, a step that helps to consolidate basic knowledge and skills as well as the specific steps of the RALP. After assisting in 10 cases in this manner, residents progress to the console. Time on the console involves a step-wise progression of tasks according to degree of difficulty and performed under the direct supervision of an expert robotic surgeon. Residents do not move on to progressively difficult surgical steps of the RALP until they have demonstrated proficiency in earlier steps.

Residents begin dissecting out the seminal vesicles and dropping the bladder. They move on to portions of the lymph node dissection and the anastomosis. Finally, they perform bladder neck transection, management of the prostatic pedicles and neurovascular bundles, and apical dissection. Senior level residents perform as much of the surgery as possible depending on their skill level and ability to complete tasks in a reasonable timeframe.

The vast majority of residents involved in this study were PGY 5 in the 5-year residency program. A smaller number were PGY 4. A minimal goal for all surgeries was for the resident to perform 1 side of the seminal vesicle dissection, 1 side of the lymph node dissection, drop the bladder, and complete the majority of the anastomosis. The maximal goal was for the resident to perform the entire procedure. Most surgeries fell somewhere between these 2 goals.

Outcomes. We compared the R and NR cases on a number of outcomes: overall OT, robotic time (RT), EBL, any complications within 7 days, 30 days, and 90 days of surgery, margin status (PSM), biochemical recurrence (BCR), potency, and continence. We used the traditional definition of biochemical recurrence as a postsurgical prostate-specific antigen (PSA) rising to 0.2 ng/mL or higher. In addition, a broader outcome variable, referred to as "surgical failure" was defined to include patients who receive external beam radiation or other treatment as salvage after showing a pattern of postsurgical PSA readings that are increasingly rising but do not reach a value of 0.2 ng/mL prior to treatment. Surgical failure would also include patients who do not reach a postprostatectomy PSA nadir below 0.2 ng/mL.

Continence and potency. Continence and potency at 1 year after surgery were the primary functional outcomes, defined according to subjects' responses to items from the Expanded Prostate Index Composite.[14] Patients were categorized as continent if, at 1 year postsurgery, they reported use of 0 pads per day over the past month or if they reported using 1 pad per day over the past month with total urinary control or only occasional dribbling. Patients were categorized as incontinent if they reported using 3 or more pads per day over the past month or if they reported using 1 or 2 pads per day over the past month with no urinary control or frequent dribbling. Patients were considered potent if they reported sexual intercourse or erections firm enough for intercourse within the past 4 weeks. Patients using phosphodiesterase inhibitors were considered potent, while patients using vacuum devices, penile injections, and urethral suppositories were considered impotent.

Statistical analyses: Chi-square tests, 2-sample t tests, and Wilcoxon rank-sum tests were used to make comparison between the R and NR groups, as appropriate. SPSS version 21 was used for all analyses. Multiple linear regression was used to evaluate the impact of resident involvement on OT and RT. We undertook preliminary analyses to identify possible confounds that were associated with OT ($P \leq .20$), including surgery year and a number of clinical characteristics. We also included clinical characteristics that were deemed to be of clinical relevance.

RESULTS

A total of 460 cases (230 NR and 230 R) met inclusion criteria and were included in the analysis. Comparisons between NR and R cases are presented in Table 1. NR was associated with higher grade disease, but no statistically significant differences were found for any of the other preoperative patient variables. In terms of perioperative outcomes, median OT was statistically significantly longer for R versus NR (200 minutes versus 156 minutes, $P<.001$) as well as was RT (161 minutes versus 119 minutes, $P< .001$). Positive surgical margins, EBL, and median length of stay did not differ between the groups. In terms of postoperative outcomes, no statistically significant differences were observed for percentages of patients experiencing any complication at 7, 30, or 90 days, or for continence /potency rates within 1 year postsurgery. In terms of oncologic outcomes, there were no statistically significant differences for PSM (NR: 20.6% versus R: 20.4%, $P= 1.00$), BCR (NR: 9.3% versus R: 9.0%, $P= 1.0$), or surgical failure (NR:12% versus R: 10.4%, $P= .653$). Median follow-up for oncological outcomes was 30 and 33.5

Table 1. Outcomes from RALP on the basis of resident presence (R) or absence (NR)

Outcome	NR (*n* = 230)		R (*n* = 230)		*P* value
Median age, years (IQR)	62 (57,66)		61 (56,66)		.349
Median BMI (IQR)	28.1 (25.6, 30.97)		27.6 (25.5, 31.5)		.820
Median highest pre-operative PSA (IQR) NR, *n* = 228; R, *n* = 227	5.60 (4.29, 7.18)		5.30 (4.00, 7.44)		.367
Extra capsular extension, % NR, *n* = 230; R, *n* = 229	30.0		28.4		.703
Gleason 4+3 (Grade Group 3) or higher, % NR, *n* = 229; R, *n* = 228	36.7		25.9		.013
Nerve sparing (bilateral), % NR, *n* = 228; R, *n* = 229	73.2		73.8		.897
Median EBL, mL (IQR) NR, *n* = 228; R, *n* = 229	200 (100-300)		200 (100-350)		.138
Median operative time, min (IQR) NR, *n* = 229; R, *n* = 230	156 (135,180)		200 (174,229)		<.001
Median robotic time, min (IQR)	119 (103,140)		161 (137,186)		<.001
Positive surgical margins, % NR, *n* = 228; R, *n* = 225	20.6		20.4		1.000
Median length of stay, days (IQR)	1.00 (1.00, 1.00)		1.00 (1.00, 1.00)		.332
Any complication within 7 days, %	2.6		3.5		.787
Any complication within 30 days, %	7.8		6.5		.718
Any complication within 90 days, %	8.7		7.4		.732
Clavien grade 3 or higher within 90 days, %	3.5		3.5		1.00
BCR, %; NR, *n* = 225; R, *n* = 222	9.3		9.0		1.00
Surgical failure, %; NR, *n* = 225; R, *n* = 222	12.0		10.4		.653
Potent within 1 year post surgery, %; NR, *n* = 213; R, *n* = 204	50.2		47.1		.557
Continent within 1 year post surgery, %; NR, *n* = 213; R, *n* = 204	91.5		91.2		1.00
Further analysis by years					.349
	2007-2011 (NR)	2012-2016 (NR)	2007-2011 (R)	2012-2016 (R)	
Median operative time, min (IQR)	160 (135,179)	155 (137,181)	185 (160,211)	215 (192,240)	.892 (NR); <.001 (R)
Median EBL, mL (IQR)	200 (100,300)	200 (100,300)	200 (100,300)	250 (106,400)	.672 (NR); .041 (R)

Chi-square, *t* test or Wilcoxon Ranked Sum used to analyze categorical, continuous variables meeting assumption of normality and continuous variables not meeting assumption of normality, respectively

BCR, biochemical recurrence; BMI, body mass index; EBL, excess blood loss; IQR, interquartile range; PSA, prostate-specific antigen; RALP, robot assisted laparoscopic prostatectomy.

n = 230 per group, unless otherwise noted.

Table 2. Results of multiple regression on operative time and robotic time

Variable	Operative time Standardized β	P
Surgery year category	0.119	.003
Gleason Grade Group	0.110	.014
Extracapsular extension	−0.043	.346
Nerve sparing status	−0.140	.001
Margin status	0.050	.227
BMI	0.231	<.001
Resident involvement	0.447	<.001

Variable	Robotic time Standardized β	P
Surgery year category	0.178	<.001
Gleason Grade Group	0.122	.005
Extracapsular extension	−0.035	.423
Nerve sparing status	−0.133	.001
Margin status	0.039	.327
BMI	0.209	<.001
Resident involvement	0.472	<.001

Surgery year category: 2007-2011 vs 2012-2016; Gleason Grade Group: Gleason 4+3 (Grade Group 3) or higher vs lower grade groups; Extracapsular extension: present vs not; Nerve sparing status: bilateral vs other; Margin status, positive vs negative.
BMI, body mass index.

months for NR and R, respectively (P= .3). When the cohorts were analyzed by year, the median OT and median EBL were both significantly greater in the later years relative to the earlier years for the R group (2012-2016 versus 2007-2011). No differences were observed in the NR cases for these time periods. Multiple linear regression (Table 2) indicated that resident involvement significantly predicted OT and RT, even after controlling for a number of other factors that were either associated with OT in preliminary analyses or were of clinical relevance to OT.

DISCUSSION

Urology residency training is multi-faceted, encompassing open procedures, cystoscopy/endourology, minimally invasive approaches, and robotics. Robotic procedures have become a large part of urology residency training, and the learning curve can be quite steep. This is particularly true for robotic prostatectomy, where surgeons may need to perform over 150 cases to achieve outcomes comparable to the open approach.[15] A handful of studies have specifically examined resident involvement with RALP cases. Consistent across these studies, resident involvement is associated with longer OTs compared to cases involving an attending physician only.[11,16] Corresponding to previous studies, we noted that resident involvement in RALP was associated with longer OTs both overall and on the robot but that it was not associated with increased EBL, longer length of stay, or higher complication rates. Variation in staffing levels for bedside assist, anesthesiology, and nursing can dramatically affect OT; our study is unique in that these staffing levels do not vary between the morning (R) and afternoon (NR) cases thus accounting for this potential source of variability. Previous analyses of the ACS NSQIP database tracked complications out to 30 days postsurgery,[5] noting no significant differences on the basis of resident involvement. Our analyses extended the observation period to 90 days postsurgery and indicate that complication rates were still comparable between the groups. When we analyzed functional outcomes at 1 year after surgery, we noted no differences in potency or continence on the basis of resident involvement.

Few studies have addressed oncological outcomes after RALP on the basis of resident involvement, and those that have were hampered by lack of long-term follow-up. Lee and colleagues[11] noted that group differences in rates of PSM approached significance on the basis of who was involved in the case (PSM rates for attending only = 9.0%, for attending and chief = 15.9%, and for attending and fellow = 20.40%; P= .058). In our study, rates of PSM did not differ on the basis of resident involvement (NR = 20.6% versus R = 20.4%, P= 1.00). Using a 6-month PSA of < 0.15 ng/mL a cut-off for comparison, Schommer et al failed to note a difference between groups on the basis of resident involvement.[12] With a longer median follow-up of 30 months for NR and 33.5 months for R, we similarly failed to note significant differences for BCR or surgical failure. To our knowledge, our follow-up time periods of 30 and 33.5 month are the longest time intervals at which the impact of resident involvement on oncologic outcomes has been addressed after RALP.

Due to the fact that robotic procedures have been increasingly incorporated into resident training overtime,[10] we assessed OT and EBL for the 2 groups separately, comparing the first 4 years to the latter 4 years. For the NR group, rates of OT and EBL did not differ. However, we noted significant differences for the R group with the later years characterized by longer OTs and increased EBL. We believe these differences are evidence of increased resident involvement in robotic procedures during the later years.

Our study has several limitations. First, it represents a retrospective review of a single institution, involving cases performed by a single surgeon, a design element that hampers the generalizability of the findings. Within this context, we maintain consistency regarding day of week, operative staff, and order of cases to reduce possible confounding variables. Second, we were not able to analyze the degree of resident involvement in each case (we know only that a resident performed part of the case on the robotic console but we do not know how much of the surgery he or she performed). As stated, a minimal goal was for the resident to dissect out 1 seminal vesicle and vas, perform a portion of the lymph node dissection, drop the bladder, and perform a portion of the anastomosis. A maximum goal was to perform the entire procedure. While the maximum goal was only achieved by chief residents with superb surgical skills, the majority of cases fell somewhere

between these 2 goals. While residents were PGY 4/5, we were not able to determine exactly which resident did which portions of the procedure. On some days, multiple residents were present and the operative notes did not detail the portions of the procedure done by the resident/s or the attending physician. Finally, although this study includes 1 year follow-up of functional outcomes, future studies may be strengthened by the inclusion of a longer follow-up period.

CONCLUSIONS

Academic urologists have a responsibility to ensure that the quality of medical care stays high while at the same time offering training that will equip the next generation of urologists with the skills they need to succeed in an ever advancing surgical arena. These results suggest that neither clinicians nor patients undergoing RALP should be alarmed by the involvement of a resident as neither safety nor quality is diminished by resident involvement in RALP procedures.

References

1. Accreditation Council for Graduate Medical Education. Common Program Requirements.Available at http://www.acgme.org/What-We-Do/Accreditation/Common-Program-Requirements. Accessed July 30, 2018.
2. Elfenstein DM. Confidence crisis among general surgery residents: a systematic review and qualitative discourse analysis. *JAMA Surg*. 2016;151:1166.
3. Coleman JJ, Esposito TJ, Rozycki GS, et al. Early subspecialization and perceived competence in surgical training: are residents ready? *J Am Coll Surg*. 2013;216:764.
4. Curet MJ. Resident work hour restrictions: where are we now? *J Am Coll Surg*. 2008;207:767.
5. Matulewicz RS, Pilecki M, Rambachan A, et al. Impact of resident involvement on urologic surgery outcomes: an analysis of 40,000 patients from the ACS NSQIP database. *J Urol*. 2014;192:885.
6. Ruhotina N, Dagenais J, Gandaglia G, et al. The impact of resident involvement in minimally-invasive urologic oncology procedures. *Can Urol Assoc J*. 2014;8:334.
7. Meyer CP, Hanske J, Friedlander DF, et al. The impact of resident involvement in male one-stage anterior urethroplasties. *Urology*. 2015;85:937.
8. Loppenberg B, Cheng PJ, Speed JM, et al. The effect of resident involvement on surgical outcomes for common urologic procedures: a case study of uni- and bilateral hydrocele repair. *Urology*. 2016;94:70.
9. Allard CB, Meyer CP, Gandaglia G, et al. The effect of resident involvement on perioperative outcomes in transurethral urologic surgeries. *J Surg Educ*. 2015;72:1018.
10. Duchene DA, Rosso F, Clayman R, et al. Current minimally invasive practice patterns among postgraduate urologists. *J Endourol*. 1797;25:2011.
11. Lee Z, Lightfoot AJ, Mucksavage P, et al. Can robot-assisted radical prostatectomy be taught to chief residents and fellows without affecting operative outcomes? *Prostate Int*. 2015;3:47.
12. Schommer E, Tonkovich K, Li Z, Thiel DD. Impact of resident involvement on robot-assisted radical prostatectomy outcomes. *J Endourol*. 2016;30:1126.
13. Lee JY, Mucksavage P, Sundaram CP, McDougal EM. Best practices for robotic surgery training and credentialing. *J Urol*. 2011;185:1191.
14. Wei JT, Dunn RL, Litwin MS, et al. Development and validation of the expanded prostate cancer index composite (EPIC) for comprehensive assessment of health-related quality of life in men with prostate cancer. *Urology*. 2000;56:899.
15. Herrell SD, Smith JA. Robotic-assisted laparoscopic prostatectomy: what is the learning curve? *J Urol*. 2005;66:105.
16. Thiel DD, Francis P, Heckman MG, et al. Prospective evaluation of factors affecting operating time in a residency/fellowship training program incorporating robot-assisted laparoscopic prostatectomy. *J Endourol*. 2008;22:1331.

EDITORIAL COMMENT

This retrospective study by Baber et al[1] analyzed 460 robotic assisted laparoscopic radical prostatectomies (RALP) to examine the effect of resident involvement in the procedure on operative time, complications, as well as patient functional and oncologic outcomes. All cases were performed by a single attending surgeon between 2007 and 2016. Residents underwent graduated robotic training, including a step-wise progression of tasks according to degree of difficulty. Not surprisingly, operative and robotic time increased with resident involvement compared to cases with only an attending surgeon. However, there was no difference in postoperative complication rates and functional/oncologic outcomes between resident and nonresident cases.

Treatment at an academic facility presents an innate tension: while it is important to provide high-quality patient care and reasonable operative efficiency, it is equally imperative to allow for training of residents. Without adequate training of residents today, attending surgeons in the future will not be able to provide high-quality care. Thus, within the realm of academic surgery, patient safety, and efficiency must be balanced with resident training. RALP is a reasonable model to assess this issue as it is commonly performed procedure in both the community and academic setting. As a result, most residents participate (at least in part) in >100 RALPs during their training and many will be expected to perform a RALP following graduation. While previous studies have shown that resident involvement in RALPs does not increase the complication rate or diminish functional outcomes,[2,3] few studies have examined long-term oncologic outcomes. Patients in this study were followed 90 days for postoperative complications, 1 year for functional outcomes, and a median 30 and 33.5 months for oncologic outcomes for nonresident and resident cases, respectively. The lack of significant long-term differences (biochemical recurrence/positive surgical margins) between attending only and resident cases adds additional support to resident involvement in RALPs.

Despite numerous studies, including a meta-analysis of 40,000 urologic surgeries suggesting that resident involvement does not endanger patients,[4] operative time is generally increased across urologic procedures with resident involvement.[3,5,6] The authors noted that there was a significant increase in operative time between the first and last 4 years of the study, speculating that this effect was due to increased resident involvement in RALPs in more recent years. Schommer et al[7] found that resident's robotic skills significantly increased between 2012 and 2015, which is a result of increased utilization of robotic surgery. An analysis of surgical flow disruptions in urologic robotic surgeries showed that while resident participation increased the amount of disruptions, the majority of disruptions in resident cases were for training purposes.[8]

Being cognizant of the demands for operative time, a core mission of academic urology is the training of residents to become competent urologic surgeons and operative experience is irreplaceable in the development of surgical competency. Limitations of the current study notwithstanding, it provides further evidence that operative time is likely the only significant detraction of involving residents in robotic procedures. In light of the data supporting the safety of resident involvement in surgery and the necessity of experience, residents should continue to participate in procedures appropriate for their level of training, with attending intervention reserved for critical portions of the procedure.

John Z. Benton, Atul Lodh, Christopher J.D. Wallis, Zachary Klaassen, Medical College of Georgia, Augusta, GA; Division of Urology, Department of Surgery, University of Toronto, Toronto, ON; Division of Urology, Medical College of Georgia – Augusta University, Augusta, GA; Georgia Cancer Center, Augusta, GA

References

1. Baber J, Staff I, Tortora J, et al. Impact of urology resident involvement on intraoperative, long-term oncologic and functional outcomes of robotic assisted laparoscopic radical prostatectomy. *Urology*. 2019.
2. Lee Z, Lightfoot AJ, Mucksavage P, Lee DI. Can robot-assisted radical prostatectomy be taught to chief residents and fellows without affecting operative outcomes? *Prostate Int*. 2015;3:47–50.
3. McMillan DT, Viera AJ, Matthews J, et al. Resident involvement and experience do not affect perioperative complications following robotic prostatectomy. *World J Urol*. 2015;33:793–799.
4. Matulewicz RS, Pilecki M, Rambachan A, Kim JY, Kundu SD. Impact of resident involvement on urological surgery outcomes: an analysis of 40,000 patients from the ACS NSQIP database. *J Urol*. 2014;192:885–890.
5. Slopnick EA, Hijaz AK, Henderson JW, Mahajan ST, Nguyen CT, Kim SP. Outcomes of minimally invasive abdominal sacrocolpopexy with resident operative involvement. *Int Urogynecol J*. 2018;29:1537–1542.
6. Mitsinikos E, Abdelsayed GA, Bider Z, et al. Does the level of assistant experience impact operative outcomes for robot-assisted partial nephrectomy? *J Endourol*. 2017;31:38–42.
7. Schommer E, Patel VR, Mouraviev V, Thomas C, Thiel DD. Diffusion of robotic technology into urologic practice has led to improved resident physician robotic skills. *J Surg Educ*. 2017;74:55–60.
8. Jain M, Fry BT, Hess LW, Anger JT, Gewertz BL, Catchpole K. Barriers to efficiency in robotic surgery: the resident effect. *J Surg Res*. 2016;205:296–304.

https://doi.org/10.1016/j.urology.2019.05.041
UROLOGY 132: 47–48, 2019.