



Resident Impact on Patient & Surgeon Satisfaction and Outcomes: Evidence for Health System Support for Urology Education

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OBJECTIVE	To assess the effect of resident involvement on patient and physician satisfaction, we evaluated the outcomes from a private urology group both prior to and after initiation of resident coverage.
METHODS	Urologic procedures completed by attending surgeons without residents from October 2010 to December 2011 were compared to the same surgeons working with residents from January 2012 to March 2013. Surgical case times, postoperative complications, readmission rate, length of stay, Press-Ganey consumer assessments, resident and physician self-report of training quality and quality of life were collected.
RESULTS	3316 operative and nonoperative cases were measured. Total 1565 were in preresident periods and 1751 were in postresident periods. With resident coverage, there was an increase in OR times. There was no difference in complications for surgical and nonsurgical cases ($P = .2269$ and $P = 1.000$, respectively). There was a statistically significant improvement of readmission rate in nonsurgical patients with resident coverage ($P = .0344$). Patients' satisfaction scores were higher in every category and they more often reported that they "always" received quality care (78.6 % vs 82.5%) with resident coverage. Resident and faculty perceptions of training, patient care, and satisfaction increased with resident coverage.
CONCLUSION	Resident coverage of a private practice urology group resulted in no difference in surgical complications and improvement in readmission rates in nonsurgical patients. It resulted in longer OR times but greater satisfaction of faculty, residents and most important, patients. Our data demonstrate the beneficial effect of resident participation in patient care and provides further justification of residency financial support. UROLOGY 132: 49–55, 2019. Published by Elsevier Inc.

Involvement in patient care and surgical procedures is an integral part of resident training, which requires the acquisition of a complex set of skills in a time constrained environment. The goal of training is to become an efficient surgeon while maintaining the highest standards of patient care. Although there are many models that emulate OR experience, it is widely accepted that there is no substitute for surgeons in training than actual hands-on experience in the OR.

Because of the current climate in health care, the financial impact of resident training is becoming a topic of

interest as patients and reimbursement agencies are requiring proof of cost efficient and quality medical care.¹ The role of medical training must be defined, demonstrating adequate patient safety along with sufficient resident education. However, something that is frequently overlooked by both patients and policy makers is the fact that experienced surgeons must gain that experience at some point in time, whether that be under the guidance of an experienced mentor in residency or during their own practice with no supervision. In other words, one cannot become an experienced and skilled surgeon without being a novice at one time. Thus, it is incumbent upon the resident training community to provide evidence for continued financial support for resident education.

Several studies have looked at the impact of resident participation on surgery times and patient outcomes with findings of increased operative times and mixed results on other outcome measures.^{1–16} Yet no studies to our

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knowledge have looked at resident, attending, and patient satisfaction along with operative outcomes before and after resident involvement, which this study aims to accomplish.

METHODS

Urologic procedures completed by 4 attending surgeons of a private practice urology group were observed over a 30-month period (October 2010-March 2013). Fifteen of these 30 months were spent working without residents followed by another 15 months working with SIU urology residents. Resident roles with these surgeons were purely hospital based. They assisted in surgery and covered call for the attending surgeons. They did not participate in clinic or clinic based procedures.

Attending physicians and residents reported their job satisfaction, quality of life, and perceptions of patient care using a

5-point scale of significantly worse/decreased, somewhat worse/decreased, unchanged, somewhat improved/increased, and significantly improved/increased. All questionnaires were completed after the conclusion of 15 months with resident involvement. Specifically, attending physicians were asked about their perception on: quality of patient care, clinical volume, income, stress level, lifestyle, and overall job satisfaction (Fig. 1). Residents were asked their perceptions on: duty hours, stress level, time for research, time for study, patient management skills, case volume, surgical training, and overall quality of training (Supplementary Fig. 1). In-service scores were compared before and after as well. Additionally, results from Press-Ganey consumer assessments were compared between the 2 time periods (Table 3).

This study also analyzed readmission rates, mortality, and complications observed, before and after resident involvement, for both patients that required an operation and those that did not (eg trial of stone passage) along with average time per

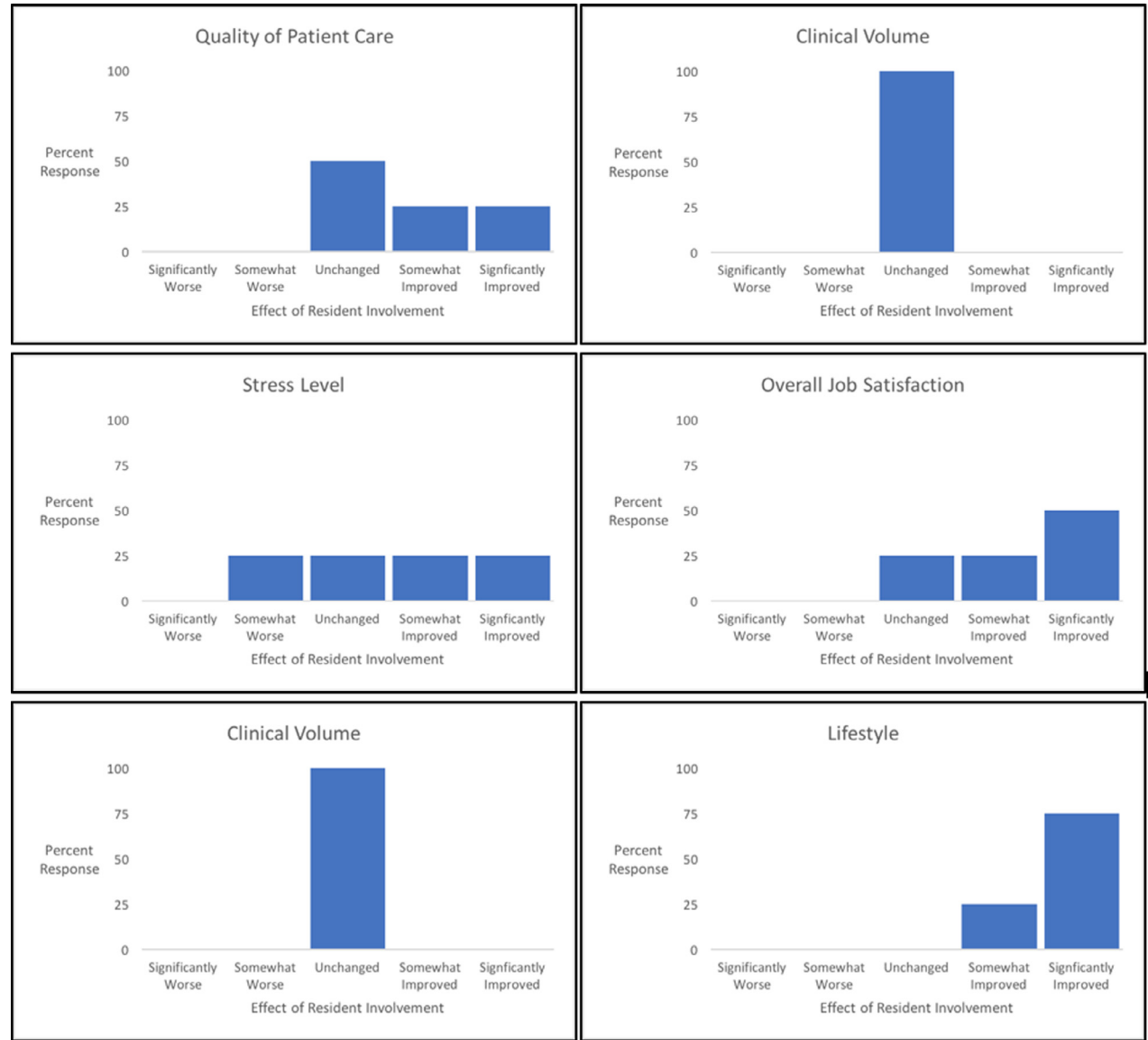


Figure 1. Attending physician survey after the addition of SIU Urology Residents presented as percentages. All questions scored on a 1-5 scale (significantly worse, somewhat worse, unchanged, somewhat improved, significantly improved). Y axis is the percent (0-100) while x axis the 1-5 scale. (Color version available online.)

Table 1. Surgical times of procedures both before and after resident involvement.

Procedure	October 2010-December 2011			January 2012-March 2013			Change in Time (min)	P Value
	N	Mean Time (min)	SD	N	Mean Time (min)	SD		
Excision of hydrocele	13	28.1	7.1	20	44.2	22.7	16.1	0.019
Nephrectomy	67	83.7	58.1	58	141.4	52.8	57.7	<0.0001
Transurethral resection of the prostate	100	41.6	22.9	98	56.6	31.2	15	<0.0001
Partial nephrectomy	25	118	36.3	44	165.2	58.7	47.2	0.001
Radical cystectomy	6	261.7	71.1	9	417.1	112.8	155.4	0.011
Radical prostatectomy	72	149.7	27.8	52	218.2	44.7	68.5	<0.0001
Scrotal lesion excision	4	28.3	13.2	6	37.8	18.1	9.5	0.393
Scrotum and tunica	7	14.7	6.6	11	20.7	10.4	6	0.192
Transurethral prostatectomy	66	44.4	21.6	102	54	25.9	9.6	0.014
Transurethral resection of bladder tumor	189	15.8	11	179	26.3	16.1	10.5	<0.0001
Transurethral removal of obstruct from ureter/renal pelvis	337	26.4	18.2	355	32.6	21.3	6.2	<0.0001

Surgeries completed from October 2010-December 2011 did not include residents, while those done from January 2012-March 2013 included residents.

surgical case (Tables 1 and 2). The variables were compared before and after resident involvement using *t*-test with *P* value significance of <.05.

RESULTS

The survey of the attending physicians showed that 75% reported a significantly improved lifestyle and that 50% thought quality of patient care and overall job satisfaction improved significantly. Total 100% of the physicians reported their clinical volume was unchanged. There was mixed results on their level of stress while 75% reported a somewhat worse income (Fig. 1). Surveying of the residents revealed that 83% thought their duty hours somewhat increased. There were mixed results on stress level, time for research, and time for study but 50% of residents in each of these 3 categories thought there was no change. Total 100% of residents reported a significant increase in of case volume and surgical training. Regarding patient management skills and overall quality of resident training, 100% reported an increase with 66.6% reporting a significant increase in each of these categories (Supplementary Fig. 1). The average in-service score, expressed as a percentile, was 76 before resident implementation and 71 after, although these results were not statistically significant.

Twelve surgical procedures were chosen to be evaluated before and after resident implementation. Nine of these procedures saw statistically significant increases in operative time. Some procedures had a greater absolute increase in time than others. For example, the increase in time for radical cystectomy was 155.4 minutes (*P* = .011), nephrectomy was 57.7 minutes (*P* < .0001), and partial nephrectomy was 47.2 minutes (*P* = .001). Other procedures only saw a marginal increase in operative time. An increase of 6.2 minutes (*P* < .0001) for transurethral removal of obstruction from ureter/renal pelvis, 9.6 minutes (*P* = .014) for transurethral prostatectomy, and 10.5 minutes (*P* < .0001) for transurethral resection of bladder tumor (Table 1).

When cystectomies performed by the same surgeon were analyzed, we found that 6 were performed prior to resident participation while 9 were performed in the period after resident participation. Regarding the radical cystectomies in which residents were involved, 1 underwent a concurrent abdominoperineal resection secondary to colorectal cancer, another experienced complications with pneumoperitoneum at the beginning of the case, and in an instance in which a neobladder was created, anatomical issues necessitated an anastomotic revision increasing the operative time by approximately 2 hours. These causes greatly increased the operative time of 3 of the

Table 2. Patients presenting from the emergency department, mortality, readmission rates, and complications observed both before and after resident involvement.

	October 2010-December 2011	January 2012-March 2013	P value
	N (%)	N (%)	
Attending practitioner with surgery	553	639	
Cases with ED charge	164 (29.7)	169 (26.4)	0.2197
Mortality	4 (0.7)	10 (1.6)	0.2807
Readmission	42 (7.6)	59 (9.2)	0.3483
Complications observed	42 (7.6)	61 (9.5)	0.256
Attending practitioner without surgery	124	175	
Cases with ED Charge	65 (52.4)	82 (46.9)	0.3505
Mortality	1 (0.8)	0 (0)	0.4147
Readmission	11 (8.9)	5 (2.9)	0.0344
Complications Observed	6 (4.8)	5 (2.9)	0.5348

Cases are stratified based on if the patient did or did not undergo a surgical procedure.

Table 3. Press-Ganey consumer reports taken from patients both before and after resident involvement with the percent change from prior.

	Without Residents (percentile)	With Residents (percentile)	% Change
Time physician spent with you	31	43	+39
Physician concern, questions/worries	31	43	+39
Physician kept you informed	27	37	+37
Friendliness/courtesy of physician	36	54	+50
Skill of physician	36	61	+69

9 cystectomies and thus increased the average operative time by a significant amount. Of the cystectomies done prior to resident involvement, one was a neobladder, without the need for an intraoperative revision, and none were concomitant surgeries with colorectal surgery. In the cystectomies with no resident involvement, there was 1 case of significant adhesions that increased the operative time by approximately 2 hours.

For patients requiring an operation; mortality, readmission, and complications observed increased with resident involvement, but these results were not statistically significant. When looking at patients whose care did not involve an operation; mortality, readmission, and complications observed all decreased with resident participation. The decrease in readmission was the only variable attaining significance ($P = .0344$) (Table 2).

The Press-Ganey results for all 5 questions showed increases with the implementation of residents (ranges from 37%-69%). The overall skill of the physician showed the highest improvement after the addition of resident coverage with a score rising from 36 to 61; a 69% increase (Table 3).

DISCUSSION

When considering the current climate of health care and the focus on fiscal austerity and patient outcomes,¹ it is imperative to provide evidence of the benefits of resident education on the overall quality of patient care. Most recent studies of surgical residents have utilized data from the American College of Surgeons National Surgical Quality Improvement to determine their effect on surgical cases.^{1-5,7,9-13,15} In contrast this study is the only one to our knowledge that looks at surgical and patient outcomes from the same group of surgeons both before and after resident implementation.

Nearly all previous studies across multiple surgical fields report increased operating times with resident involvement which is in concordance with this study. Interestingly, it has been found that these increases are most significant with more senior residents likely due to their increased participation.^{3,8} It is important to keep in mind that the more senior the resident is, the more complex procedures they will be involved in. Furthermore, it is possible that in this study the attending physicians could be more likely to perform more complex surgeries with the assistance of residents as compared to if they were to perform the same procedure with no resident assistance. For example, the number of robotic nephrectomies increased 3-fold after resident implementation while the number of laparoscopic nephrectomies remained constant, and the

number of open nephrectomies decreased. It could be argued that the learning curve for robotic and laparoscopic approaches is steeper than for open approaches, thus this could account for a disproportionate time increase in these cases.

Furthermore, the number of cystectomies performed with resident assistance increased by 50%. As a cystectomy is one of the more complex urologic procedures, there are areas during the case which can result in an increase in operative time, many of which are outside of resident and/or physician control. For example, in 1 case there was difficulty with establishing pneumoperitoneum and another case was a joint procedure with colorectal surgery in which an abdominoperineal resection was performed concurrently. Both of these cases had residents involved, but it can be argued that these factors do not represent the impact residents have on operative time. On the other hand, of the 6 cystectomies performed without residents, only 1 case had a reported intraoperative complication — adhesions. Another potential issue with our analysis of cystectomies is that because the number analyzed was small and any 1 outlier could skew the results.

The role of resident involvement in surgical patient outcomes is more inconsistent. Jordan et al found that residents tend to assist in surgeries with a higher relative value unit, a proxy for surgical complexity, which may play a role in findings of poorer patient outcomes in some studies when not otherwise accounted for.¹ Although most studies report no significant difference in overall complications^{1,2,4,5,7,10-13} and some even show a decrease in patient morbidity^{9,14} with resident involvement which is in agreement with our findings. Of note, a few studies in the fields of general surgery, vascular, and plastic surgery residents found slight increases in patient complications, most commonly surgical site infections and, specifically in plastic surgery, an increase need for reoperation.^{1,3,15} Similarly, most studies across surgical specialties found no difference in patient mortality when residents were involved^{1,3-5,11,12,16} in agreement with our study. We hypothesize that this is the result of the residents' ability to be more directly involved in the patient's care and day to day activities while the patient is hospitalized. Moreover, Matulewicz et al reported a reduced patient mortality with resident assistance on urologic surgeries when controlling for case complexity, suggesting that residents may even provide a protective effect in some instances.⁹

Attending and resident perception of the rotation was overall very positive. The addition of a resident covering call and aiding in the pre- and postoperative tasks is likely the cause of the improved lifestyle the attending surgeons reported. The attending surgeons did report an overall decrease in income. This is most likely due to the increased operative time, although all surgeons report their clinical volume did not change. The surveys were subjective so it is unknown by what amount the income decreased or if this was simply a perception by the attending surgeons. The increased exposure to surgical techniques and cases offered by the addition of new attending surgeons is likely, in part, due to the overall positive perceptions from the residents. This did result in an overall increase in duty hours for the residents. The in-service score decreased, but the decrease was not by a significant margin and could be explained by the low number of residents. The 100% response of increased patient management skills, surgical skills, and overall quality of the residency program is a strong support for the addition of a private practice rotation into a residency program.

There are multiple limitations of our study. The nature of this being such a novel study causes us to have small numbers. The private practice had only 4 attending surgeons to complete surveys. It was a retrospective study and thus patients were not equal to the time period before and after the addition of residents. This adds to the difficulty in interpreting some results, specifically operative time during the larger surgeries such as cystectomies as discussed previously. While limitations are present and must be considered, this study still presents a unique evaluation of a private practice rotation and the benefits for patients, attending surgeons, and residents.

CONCLUSION

In conclusion, the addition of a private urology group improved case volume and resident impression of surgical training without a significant impact on duty hours or academics. Although an increase in operative times was observed, resident involvement in patient care did not have a negative impact on patient outcomes. Furthermore, patient satisfaction scores as well as attending physician satisfaction improved with addition of residents. Thus, this study shows the benefits of resident involvement and thus provides evidence for continued financial support for resident education.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.urology.2019.04.043>.

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EDITORIAL COMMENT



Resident education is dependent on a graduated responsibility in medical and surgical decision-making. Physician visionaries Dr. Edward Churchill and Dr. William Halsted had differing models on surgical training, however, the core tenant of each man's curriculum was the ever increasing autonomy in order to graduate well-trained, independent surgeons.^{1,2} How we get there is a continual work-in progress, and evaluating the cost-benefit of any program is important to its optimization.

The authors of this manuscript recorded both objective and subjective data to assess the impact of adding residents to a private practice group on patient care and provider quality of life. Their data validates existing data showing that the addition of resident training generally increases operative time.^{3–5} In this study, patient complications and readmission rates were not statistically



AUTHOR REPLY

increased with the addition of residents. The quoted article by Matulewicz showed an increase in overall complication rate, yet these seemed to largely be explained by a corresponding increase in patient and procedure complexity.⁴ Curiously, length of stay was not mentioned in the study and it would be interesting to know how the addition of residents impacted that parameter. The reasons for the slight decrease in service scores are unclear and could potentially be a result of low numbers of residents in this study, increased workload with less study time, or clinical experience that may not reflect testing material.

Perhaps the most interesting nuance of this study is the subjective experience of all parties after the addition of resident physicians to a private practice. The overall experience of attendings, residents, and patients were either unchanged or slightly improved by the addition of residents. However, the study does not mention the number of resident or patient respondents in their study. The attendings in this study reported a slight pay decrease which is curious given that more cases were done after the addition of residents. It is unclear if the perceived pay decrease is related to residents or was an incidental finding.

The surveys used were only given at the end of the study period which introduces several possible biases which must be considered when interpreting this data. The patient's perspective is roughly estimated with a consumer report that was administered to all patients who visited the hospital during those time periods. While the authors do not clearly state how many patients responded to these surveys, it is admirable to have included a measure of patient experience.

Several factors must be considered when academic training centers are considering introducing residents into private practice environments. Certainly, the quality of the mentors must be considered as well as the clinical volume. It is certainly true that most residents will pursue private practice, and therefore incorporating this exposure in training may be beneficial as a means of preparing for private practice careers. This study indicates that the addition of academic urologic residents into a urologic private practice training environment appears to have a positive impact on the quality of life of private practice urologists, residents, and patients alike.

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We appreciate the thoughtful invited commentary (Ref to be added once known) regarding our study on resident impact on patient and surgeon satisfaction and outcomes (Ref to be added once known). Resident training approaches in the field urology continue to evolve as does the number of required procedures to learn and their associated administrative burden.¹ Thus it is incumbent upon surgical trainers to continue to optimize not only how we train but garner continued financial support for our surgical learners.

Patients will often ask me if residents are participating in their operation wondering who exactly does the surgery. I make a concerted effort to remind patients that indeed a team approach involving more hands and eyes at the operating table is better than fewer. Eventually, all residents must pay the piper and undergo the surgical learning curve. Which is preferable for one's family member: one in which an attending is there to prevent or control a surgical misstep immediately or one where a young inexperienced surgeon is alone in her or his first staff job?

Our study of 10 Urology residents involved with 4 private practice Urologists is novel in that it truly analyzes patient care and outcomes before and after they began working together. No statistically significant changes were seen for patients requiring an operation in mortality, readmission, and complications. Operative time did increase with resident involvement, but so did the willingness of the private practice faculty to take on complex cases. For nonoperative patients seen in the ED, the readmission rate improved from 8.9% to 2.9% ($P = .0344$) after residents became involved. No significant changes were found in mortality or complications. Length of stay data was not analyzed.

Residents from the study uniformly stated that surgical training and overall quality of resident training improved when working with the private practice group. This came at the cost of increased duty hours, somewhat worse stress, and somewhat decreased time for research and study. In service scores did not change significantly. From an attending standpoint, all reported improved lifestyle and almost all reported increased job satisfaction and quality of patient care. Patient perceptions of care in the study were averaged from hundreds of Press-Ganey consumer reports obtained monthly in both halves of the study. Residents positively influenced all patient satisfaction categories examined by a mean of 47%.

In summary, our study revealed several tangible benefits by incorporating resident training into a private practice urology group. Residents and program directors alike label residents as novices or inadequately trained in the business side of medicine and practice management.^{2,3} As surgical education continues to offer greater challenges in less time, integration of residents into a private practice training environment may positively impact both future academic or private practice urologists alike.

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