Minimally invasive surgery fellowship does not adversely affect general surgery resident case volume: a decade of experience

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Abstract

BACKGROUND: With the advent of clinical fellowships in general surgery, there has been a continual debate over the effect on general surgical resident training. Will a fellowship interfere with a chief resident’s experience or case volume? The aim of this study was to test the hypothesis that the presence of an advanced laparoscopic fellow in a tertiary care hospital and residency has had no deleterious effect on chief resident laparoscopic case volume.

METHODS: The operative case logs of graduating residents and fellows from 2001 to 2011 were reviewed, focusing on laparoscopic basic and complex cases and comparing between those 2 groups and comparing residents’ case numbers with the national average published by the Accreditation Council for Graduate Medical Education.

RESULTS: Residents graduating from 2001 to 2011 (4–6 chief residents per year) performed an average of 989 ± 76.2 laparoscopic cases per graduating chief class, with each chief averaging 207.7 ± 10.7. The average number of laparoscopic basic cases per graduating chief year was 555.3 ± 42.1, with each chief averaging 116.2 ± 4.9. The average number of laparoscopic complex cases per graduating chief year was 434.4 ± 39.2, with each chief averaging 91.5 ± 7.2. Over the same period of time (1 or 2 fellows per year), fellows performed an average of 336 ± 23.3 cases per year. When comparing residents’ total average cases with the national data, the residents performed a similar number of cases (209.9 ± 11.9 vs 195.0 ± 19.5, P = .53). When comparing years when there were 2 clinical fellows vs years with 1 fellow, there was no change in the total number of laparoscopic cases per chief (224.2 vs 195.6, P = .26) and no change in the number of complex laparoscopic cases (97.1 vs 88.7, P = .63). There was a significant difference for basic laparoscopic cases, with a slight decrease when there were 2 fellows (127.8 vs 106.9, P = .04).

CONCLUSIONS: A laparoscopic fellowship has not had an adverse impact on the complex or basic laparoscopic case experience of surgical residents. In a busy academic practice, laparoscopic fellowships and general surgical residency can coexist.

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With the increasing demand for and breadth of laparoscopic procedures, the need for adequately trained minimally advanced surgeons is expected to rise. Each year, >2 million patients undergo laparoscopic procedures in the United States, according to a report by the US Food and Drug Administration. In 2008, the National Resident Matching Program reported that 126 minimally invasive surgery (MIS) programs participated in the Fellowship Council match, with 176 applicants. There has been a steady increase in the demand for such specialized training, as evidenced by the number of existing fellowship positions in the past decade. The Fellowship Council was established in 1997 to organize the few programs teaching MIS and to foster the development of high-quality fellowships in gastrointestinal surgery. Today, there are 156 accredited programs with 210 fellowship positions. After the recent increase in 2007 by the Accreditation Council for Graduate Medical Education (ACGME) for the number of required basic and advanced laparoscopic cases during residency training, there has been an ongoing debate as to the effects of fellowships on general surgical resident training. Specifically, there is continued concern that fellowships, especially MIS fellowships, may interfere with chief resident experience or case volume.

We hypothesized that the presence of an advanced laparoscopic fellow in our tertiary care hospital and residency has had no deleterious effect on chief resident laparoscopic case volume.

**Methods**

The University of Virginia general surgery program is an ACGME-accredited, 5-year residency program with an average of 5 chiefs graduating each year since 2005. Before 2005, our program was approved to finish 4 chief residents in surgery. Subsequently, we have been approved to finish 5 chief residents. Variance in the finishing numbers of chiefs occasionally occurred because of individual educational goals, and those variances were ACGME approved. The program is based at the University of Virginia and the University of Virginia Health System in Charlottesville, an academic tertiary care center. The surgical residents rotate at 2 other hospitals, the Salem Veterans Affairs Hospital during postgraduate years (PGYs) 2 and 5 and the Augusta Medical Center (a nearby regional care hospital in Fishersville, VA) in PGY 4. The fellowship is housed in the Division of Advanced Laparoscopic Surgery and is a Fellowship Council–approved MIS fellowship program with 1 to 2 fellows graduating each year (1 from 2001 to 2003, 2 from 2004 to 2007, and 1 since 2007). Fellows in our program have faculty privileges and clinical appointments at the instructor level. They participate in general surgery on-call responsibilities, admit and care for their own patients, and also participate with other faculty members in fellowship cases. The learning curves of both technical and clinical aspects of MIS as well as being an independent practicing surgeon are accomplished through this system.

The Division of Minimally Invasive Surgery is composed of 2 attending surgeons, an advanced laparoscopic fellow, a rotating intern, a midlevel (PGY 3) resident, and a chief resident. Residents spend an average of 1 month (PGY 1), 2 months (PGY 3), and 2.5 months (PGY 5) on the advanced laparoscopic service. Other general surgery services (colorectal, hepatobiliary and endocrine, oncology, and emergency general surgery) as well as the Salem and Augusta rotations have rotations of comparable lengths. Residents also perform complex laparoscopic or thoracoscopic procedures on their pediatric surgery (PGY 4) and thoracic surgery (PGY 3) rotations, as well as on night float (PGY 3 and PGY 4 or 5).

A retrospective study was performed by reviewing the operative case logs of our graduating residents and fellows from 2001 to 2011. The operative case numbers were provided by year, without identification of the resident, and were based on the operative logs turned in to the American Board of Surgery for residents and to the Fellowship Council case log system for fellows. Fellows at our institution who predated the Fellowship Council case log system had cases recorded by our program coordinator or data administrator annually for administrative, teaching, and funding purposes.

The total number of cases performed per year was recorded, as well as the number of laparoscopic basic and complex cases. These were stratified by location (University of Virginia, Salem, and Augusta). We also compared our residents’ case numbers with the national average published by the ACGME (http://www.acgme.org/residentdatacollection/documentation/statistical_reports.asp) and the minimum case number defined by the American Board of Surgery.

Laparoscopic basic cases were defined as laparoscopic cholecystectomy and laparoscopic appendectomy, as defined by the ACGME. Laparoscopic complex cases were defined as laparoscopic gastrostomy or jejunostomy, laparoscopic inguinal and incisional herniorrhaphy, laparoscopic bariatric cases, laparoscopic antireflux procedures, laparoscopic enterolysis, laparoscopic small or large bowel resection, laparoscopic renal and adrenal procedures, and laparoscopic splenectomy.

All statistical analyses performed in this study were designed to test the null hypothesis that resident laparoscopic case volume was not significantly different depending on the presence of a laparoscopic fellow. Statistical significance was determined at an α level of .05. Study outcomes and variable comparisons were established a priori. Inferential statistics were calculated using appropriate univariate hypothesis testing. All continuous data are expressed as mean ± SD and were compared using independent-samples analysis of variance. Calculated test statistics were used to derive reported 2-tailed P values. P values <.05 were considered statistically significant. Data manipulation and statistical analyses were performed using Predictive Analytics Software version 18.0.0 (IBM Corporation, Somers, NY).
Results

From 2001 to 2011, a total of 47 residents and 14 fellows graduated from our program.

Residents graduating from 2001 to 2011 (4–6 chief residents per year) performed an average of 989 ± 76.2 laparoscopic cases per graduating chief class, with each chief averaging 207.7 ± 10.7. The average number of laparoscopic basic cases per graduating chief year was 555.3 ± 42.1, with each chief averaging 116.2 ± 4.9. The average number of laparoscopic complex cases per graduating chief year was 434.4 ± 39.2, with each chief averaging 91.5 ± 7.2. On further breakdown of these cases per graduating resident, an average of 168.85 ± 12 laparoscopic cases (82%) were performed at the University of Virginia Hospital. An average of 23.07 ± 4.1 laparoscopic cases (12%) were performed at the Augusta Medical Center, and an average of 13.48 ± 1.9 laparoscopic cases (6%) were performed at the Salem Veterans Affairs Hospital.

Over the same period of time, our fellows performed an average of 336 ± 23.3 cases per year. Of these cases, the fellows averaged 118.3 ± 10.8 as fellows, which were mainly complex laparoscopic cases, and 118.1 ± 20.9 as attending surgeons, which included both basic and complex laparoscopic cases.

When comparing our residents’ total average cases with the national data, our residents performed a similar number of cases (209.9 ± 11.9 vs 195.0 ± 19.5, \(P = .53\)). During the study period, laparoscopic cases increased for both groups, as expected.

When we compared years when there were 2 clinical fellows vs years with 1 fellow, there was no change in the total number of laparoscopic cases per chief resident (224.2 vs 195.6, \(P = .26\)) and no change in the number of complex laparoscopic cases (97.1 vs 88.7, \(P = .63\)). There was a significant difference for basic laparoscopic cases, with a slight decrease when we had 2 fellows (127.8 vs 106.9, \(P = .04\)).

<table>
<thead>
<tr>
<th>Year</th>
<th>UVA average basic (minimum)</th>
<th>UVA average complex (minimum)</th>
<th>UVA average total cases</th>
<th>National resident average</th>
<th>UVA average fellows</th>
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<tr>
<td>2001–2002</td>
<td>95.3 (34)</td>
<td>29 (0)</td>
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<td>135.9</td>
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<td>2002–2003</td>
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<td>115.8 (0)</td>
<td>233.8</td>
<td>158.7</td>
<td>218.5</td>
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<td>2004–2005</td>
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<td>83.3 (0)</td>
<td>188.3</td>
<td>160.3</td>
<td>205.5</td>
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<td>2005–2006</td>
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<td>104.0 (0)</td>
<td>220.8</td>
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<td>51.8 (0)</td>
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<td>107.3 (60)</td>
<td>82.8 (25)</td>
<td>190.1</td>
<td>233.6</td>
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</table>

UVA = University of Virginia.

Comments

The model of American surgical training has been relatively unchanged since the first residency program was initiated by William Halsted in the late 1800s. Residents are trained by clinical immersion and graduated clinical responsibility over a period of years, which is now defined as 5 clinical years. During the past 2 decades, a variety of factors have decreased the independent clinical operative experience of the average finishing chief resident. Although case numbers may not be drastically down, most surgeons in leadership positions agree that the ability to practice independently and the breadth and type of cases performed by residents have definitely changed over this time frame. Factors that have contributed to this include the loss of many “bread-and-butter” general surgery cases to other treatment forms, including common bile duct exploration, open vascular arterial surgery, and gastric surgery for peptic disease. The volume of operative trauma has decreased nationally over those years. The advent of laparoscopic surgery has taken many of the advanced gastrointestinal surgical operations from the resident to the attending surgeon level during the time frame of the introduction of this technical approach, while attending surgeons were becoming facile with it. The number of advanced laparoscopic cases done by residents in training has subsequently increased but still lags far behind the penetration of the technology. Residents are now usually, for purposes of billing and reimbursement, unable to operate for even short portions of operations independently, even in their final years. The explosion of medical knowledge, the increased role of specialization, and the 80-hour work week restriction have also all placed great strain on this model of residency training. The combination of all these factors has led graduating residents with the feeling that they are incapable of independent practice on finishing residency or that they are not viable candidates in the job market without further specialized training. This combination of factors has led graduating residents to seek further
training in unprecedented numbers; this in turn has led to an explosion of postgraduate training opportunities or fellowships in a variety of surgical specialties. In 2001, Rattner et al found that 65% of residents felt they needed additional training. Subsequently, an increase in the number of residents seeking fellowships was noted, reaching 77% in 2005 and remaining at that level in 2008. Bucholz et al found that residents who are worried about their skills are more likely to enroll in fellowships. The popularity of postgraduate fellowship training in general surgical subspecialties appears to be here to stay, unless there is a radical change to some different model of surgical training such as early tracking, advocated by Stain et al. It is currently estimated by the American Board of Surgery that nearly 90% of finishing chief residents will seek further training upon completion of their chief resident year.

With more fellowships, an increased minimum case requirements by the Residency Review Committee for Surgery as representing the ACGME, and work-hour restrictions, great concern has arisen from some program directors and educators of surgical residents about the ability of graduating residents to achieve both case requirements and proficiency at these cases, especially with increasing numbers of fellows. An example of such a situation was reported by Linn et al, who described the experience at Northwestern University, where they elected to discontinue their MIS fellowship because of concerns of resident case volume.

Our fellowship design allows residents and fellows to coexist. The 2 attending surgeons on the advanced laparoscopic surgery service primarily operate on the same days. This provides a larger variety of cases from which the residents and fellows can choose. We have a high clinical volume, with >1,000 cases per year. The ratio of 2 attending surgeons to 1 fellow sets up availability of cases, allowing our residents to achieve a large number of procedures. Furthermore, when a fellow is serving in the role of attending surgeon for his or her own cases, it further allows opportunities for resident participation. Occasionally, conflict will arise; it is important that the expectations are set at the start of the rotations. We have found that this proactive approach minimizes disputes over participation in operative cases. The fellow in our program also operates as an attending surgeon, providing further laparoscopic opportunities for the residents, and we would agree with Kothari et al that the presence of a fellow in our system has likely increased the number of laparoscopic cases. In contrast, Linn et al found an increase in resident volume after discontinuation of the fellowship from 21 advanced laparoscopic cases to 61. At our institution, the average number of advanced laparoscopic cases was significantly higher even with a fellowship (Table 1). We further compared our experience of residents and fellows in a single complex laparoscopic case, gastric bypass (Table 2).

Our data have some limitations. This was a retrospective, single-institution study and may not be applicable to all residencies with fellowships. Second, we focused on resident case volume as a surrogate for an adequate learning experience. We have no objective data on the residents’ perceptions of their experience. Bucholz et al showed a decrease in the confidence of residents who come from programs with fellows. Third, our conclusions on the basis of our data may not be applicable to programs with more than 1 fellow. We had 2 fellows from 2003 to 2007, during which time our bariatric surgery case volume was at its zenith. Recognition of the decreasing volume of bariatric surgery cases led us to decrease our fellowship number from 2 to 1. Although the case volume remained high from 2003 to 2007, there was a slight impact on the laparoscopic basic cases for residents. We would caution that there is a limit to the addition of fellows; a program must ensure that resident training is not adversely affected before adding a fellow.

Conclusions

In our experience, a laparoscopic fellowship has not had an adverse impact on the complex or basic laparoscopic case experience of surgical residents. In a busy academic practice, laparoscopic fellowships and general surgical residency can coexist.

Adequate case volume for both fellows and residents is essential to ensure a proper laparoscopic experience. The model of having a fellow serve as an instructor and provide his or her own cases as part of the formula is advantageous and to be recommended. Monitoring trainees’ experience and case volumes serves as an ongoing confirmation that the operative experiences of both residents and fellows are being met in an ongoing fashion.

References


Discussion

James Madura, II, M.D. (Phoenix, AZ): Since 2007, when institution numbers dropped, resident numbers dropped in favor of fellowship personnel maintaining their operative case volume. Number 2, yesterday, Dr Mittal showed an exponential, some would argue linear, increase in laparoscopic cases by his residents over essentially the same time period. Why were your residents and fellowship numbers essentially flat over the decade? Third, have you broken down complex cases by the individual cases, or, in other words, is there a difference in the high end for cases such as bariatric cases, and solid organ cases being favored by the fellows, whereas simple cases or noncomplex cases, like G-tube and J-tube placements are being done by residents. If upwards of 80% of general surgery cases are now being done laparoscopically, why do we need a fellowship? Finally, on a positive note, quality is not necessarily synonymous with quantity. Some argue fellowships enhance general surgery training in addition to giving the fellows additional experience. Can you comment on how your fellows enhance your general surgery residents’ laparoscopic training?

Peter T. Hallowell, M.D. (Charottesville, VA): I think we did realize early on when we went to 2 fellows, we had a large number of bariatric laparoscopic cases coming in and to meet that volume, increased the fellowship. As that wave began to pass, we realized that the volume was not going to sustain 2 fellows and stopped taking 2 fellows at that point. In 2011, we had an interesting period with our residency, in that we had 6 chief residents that year that was approved by the board after multiple discussions for a particular resident who was doing unique educational and training opportunities. So I think the cases that year were spread amongst a number of surgeons and resulting in a decrease in the volume there. As far as the exponential increase, I think there are 2 factors that come into play here that are not shown in the exponential increase. Number 1, we are on the forefront of doing laparoscopic surgery and we are doing more laparoscopic surgery. Secondly, our residency increased by 1 resident, so that’s going to flatten out our average numbers also. We did not divide out the complex cases, but I think that would be very informative to do so. Even though 80% of operations are done laparoscopically, our residents are voting for fellowship. About 90% of our residents finishing general surgery are going into a fellowship. Quantity is not necessarily synonymous with quality. We do believe that we are giving a quality experience, but we are using what the board is using: quantity.

Dr James G. Tyburski (Detroit, MI): A chief resident and a fellow cannot have primary responsibility for the same patient. Were these cases that the fellow was scrubbing with chief residents, and how do you separate the chief residents from the fellow? How did you handle that for your next RRC visit?

Dr Hallowell: So we have had some legalese. The fellow is hired as a clinical instructor, in essence junior faculty, and can perform cases on their own. They’re frequently performed not with the chief resident. However, if the chief resident wished to do a case with the fellow, I’m sure that they would not have that much of a problem with it. The chief resident has primary responsibility for the patients on the service.

Dr Jeffrey Claridge (Cleveland, OH): I have a unique opportunity as I trained at UV under Bruce Schirmer when they just started to get fellows and I’ve moved to where you were in Case. Do you measure the quality of fellows that came through over a year at a time? Because there’s been some difference in quality of the fellows—has that impacted your outcome? What I loved about my residency, was that we worked with Bruce. We would get our own room. He would be next door and pop in and help as needed. Do you think you could revert back to that model and actually train the residents to finish and actually have that experience under their belt without doing an additional fellowship?

Dr Hallowell: I think with the constraints of what we’re doing with the Medicare regulations, it’s gotten a lot harder for a resident to be independent in a room with an attendant popping in and out. That in this day and age does not happen nearly like it did when you were a chief resident, when I was a chief resident and when many of the members in this audience who are older, you know, can remember that they never called an attending to come do a case. One of the things that I think is driving chief residents to seek fellowships is that independence and that ability to do some things on their own that you just are not seeing in the way that residency is constructed today.