Trends and disparities in education between specialties in thyroid and parathyroid surgery: An analysis of 55,402 NSQIP patients

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Purpose. *To determine practice patterns/outcomes and educational opportunities in endocrine surgery by resident involvement in general surgery (GS) and otolaryngology (ENT).*
Methods. *We queried the American College of Surgeon National Surgical Quality Improvement Program for thyroid/parathyroid operations. Resident involvement was categorized by postgraduate year (PGY) and specialty.*
Results. *Of 38,257 thyroid patients, attendings alone performed 28% in GS versus 65% in ENT, and of 17,145 parathyroid patients, 22.1% vs 66.5%. Of GS cases done with housestaff, the percentages with junior residents (PGY1–3), senior residents (PGY4,5), and fellows were 42%, 50%, and 7%, respectively, whereas for ENT operations, the percentages were 35%, 46%, and 16%. For parathyroidectomies, the percentages were 41.1%/46.8%/12.1% vs 38.7%/45.9%/15.5%. Operative time was less for GS (115 minutes) versus ENT (123 minutes). Time in the operating room increased with increasing PGY in ENT, but not in GS. Case complexity and outcomes were similar. Duration of hospital stay was greater in ENT.*
Conclusion. *No differences exist in case complexity between specialties. More thyroid/parathyroid operations are performed with residents in GS; junior residents in GS perform a large percentage of these cases (~40%), indicating early exposure to endocrine surgery and balanced experience between resident levels with minimal effect of fellows. Although junior residents receive exposure in ENT, a greater proportion is performed by fellows. Outcomes were similar by resident level, except operative time, which was greater for ENT at all levels. Ultimately, equal outcomes but lesser operating times and durations of hospital stay are seen with GS residents than their ENT counterparts. (Surgery 2013;154:720-9.)*

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THE INCIDENCE OF ENDOCRINE DISEASE has increased, whether from increased occurrence or increased diagnosis, with a concomitant increase in the number of endocrine operations performed over the last decade.[1] Although approximately 60% of thyroid and parathyroid cases are being performed at community hospitals,[2] endocrine operations are taking place at tertiary centers in greater numbers. Additionally, endocrine procedures are now being performed not only by general surgeons (GS), with an increasing number of residency training programs having fellowship training in endocrine surgery, but also by other specialists, chiefly otolaryngologists (ENT).

In addition, ENT programs have surpassed GS residencies in terms of individual case volumes. Harness et al[3] have previously demonstrated an inadequate operative experience of graduating GS residents in the United States in thyroid and parathyroid surgery. Also, Zarebczan et al[4] have shown that the proportion of endocrine cases performed by ENT has increased with the average graduating ENT resident performing more than twice the thyroid and parathyroid operations of their general surgery (GS) counterparts.

Henry et al[5] noted that operative technique for thyroid and parathyroid procedures differed depending on physician training in surgical oncology, head and neck, and endocrine surgery, as well as by operative volume. We sought to assess the effect of increasing endocrine surgical volume on resident education using the American College of Surgeon National Surgical Quality Improvement Program

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(ACS-NSQIP) database. Additionally, practice patterns and differences in outcomes between GS and ENT were reviewed. Because the NSQIP database will no longer be recording resident data, our study will likely be the largest sample that will be used to answer these questions.

METHODS

Database. The ACS-NSQIP is the first nationally validated, risk-adjusted, outcomes-based, and peer-controlled database containing data on preoperative risk factors, intraoperative variables, and 30-day perioperative morbidity and mortality outcomes for patients undergoing inpatient and outpatient operations.[6] Within this database, however, given the different sampling method used for the GS versus multispecialty NSQIP program, there was potential to sample a different proportion of cases done by GS versus ENT.

Data retrieval. Retrospective data in ACS-NSQIP Participant User Files were extracted between 2005 and 2010. The database was queried by primary Current Procedural Terminology codes (CPT) to identify all patients who underwent thyroid (60200, 60210, 60212, 60220, 60225, 60240, 60252, 60260, 60270, and 60271) and parathyroid operations (60500, 60502, 60512, and 60505) using JMP9 statistical software (SAS Institute, Inc, NC). Total thyroidectomy with modified radical neck dissection was excluded, because outcomes are more driven by lymphadenectomy than thyroidectomy; however, these comprised only 0.9% of cases. The data extracted include demographic information, preoperative comorbid conditions, resident involvement in the procedure by postgraduate level, operative times, 30-day postoperative complications, duration of stay, morbidity, and mortality. Involvement by surgery residents in the operating room was classified as none, junior resident (postgraduate year [PGY]1–3), senior resident (PGY4,5), or fellow (clinical PGY≥6).

Statistical analysis. Data were analyzed using JMP9 to determine differences stratified by specialties and PGY. Chi-square analyses were used for comparisons between nonparametric variables, and 2-way *t* tests and analysis of variance were used for comparisons between continuous variables.

RESULTS

A total of 38,257 (34,865 GS and 3,392 ENT) thyroid operations and 17,145 (16,605 GS and 540 ENT) parathyroid operations were recorded from 2005 to 2010. Thyroid operations comprised 68% of GS cases as opposed to 86% of ENT cases ($P < .0001$). A greater proportion of GS thyroid operations were bilateral (61%) versus ENT (54%; $P < .0001$; Fig 1, *A*). Parathyroid operations were almost entirely of standard parathyroid explorations for both specialties (Fig 1, *B*). The most common procedures performed were thyroid lobectomy (20% GS and 26% ENT; $P < .0001$), total thyroidectomy (31% GS and 36% ENT; $P < .0001$) and parathyroid exploration (31% GS and 13% ENT; $P < .0001$). These 3 operations represented 81% of the total sample.

Age, race, and gender were similar between specialties, although the mean age was greater for parathyroid operations than thyroid operations (59.4 vs 51.4 years; $P < .0001$; Table). Review of preoperative risk factors in NSQIP (diabetes, smoking, hypertension, chronic obstructive pulmonary disease, etc) showed no clinically significant difference between specialties, although ENT showed a slightly greater proportion of patients with ASA class 3–4 for both thyroid and parathyroid operations (24% GS vs 27% ENT for thyroid [$P < .0001$]; 37% vs 44% for parathyroid [$P < .0001$]).

Attendings alone performed only 28% of cases in GS, whereas this was true in 65% in ENT for thyroid surgery ($P < .0001$; Fig 2, *A*). A similar trend was seen in parathyroid surgery, with 22% of cases being performed by attendings alone in GS versus 67% in ENT ($P < .0001$; Fig 2, *B*). Of GS thyroid cases performed with resident assistance, the percentage of operations performed by junior residents, senior residents, and fellows were 42%, 49%, and 9%, respectively; for ENT operations, these percentages were 35%, 47%, and 18%, respectively ($P < .0001$; Fig 2, *A*). Of parathyroid operations involving house staff in GS, 41% were done by junior residents, 47% senior, and 12% fellows, whereas for ENT, the numbers were 39%, 46%, and 16%, respectively ($P = .37$; Fig 2, *B*).

In GS, a greater proportion of a junior resident's cases were parathyroid operations (34%), although this comprised only 14% of ENT junior cases ($P < .0001$). For unilateral thyroid surgery, juniors were involved in 28% of cases in GS versus 50% in ENT ($P < .0001$), and in bilateral surgery, 39% of cases in GS versus 36% in ENT ($P < .0001$). Case mix did not change significantly between resident levels within each specialty with GS senior caseload composed of 33% parathyroid surgery versus 13% in ENT ($P < .0001$). For unilateral thyroid surgery, GS senior caseload was 27% vs 45% for ENT ($P < .0001$). For bilateral thyroid surgery, senior caseload was 40% in GS versus 42% in ENT ($P < .0001$). The case distribution of fellows contained the greatest proportion of parathyroid cases at 41% in GS, whereas ENT fellows performed the least, at 12% ($P < .0001$). Unilateral thyroid operations composed 22% of the cases in GS versus 48% in

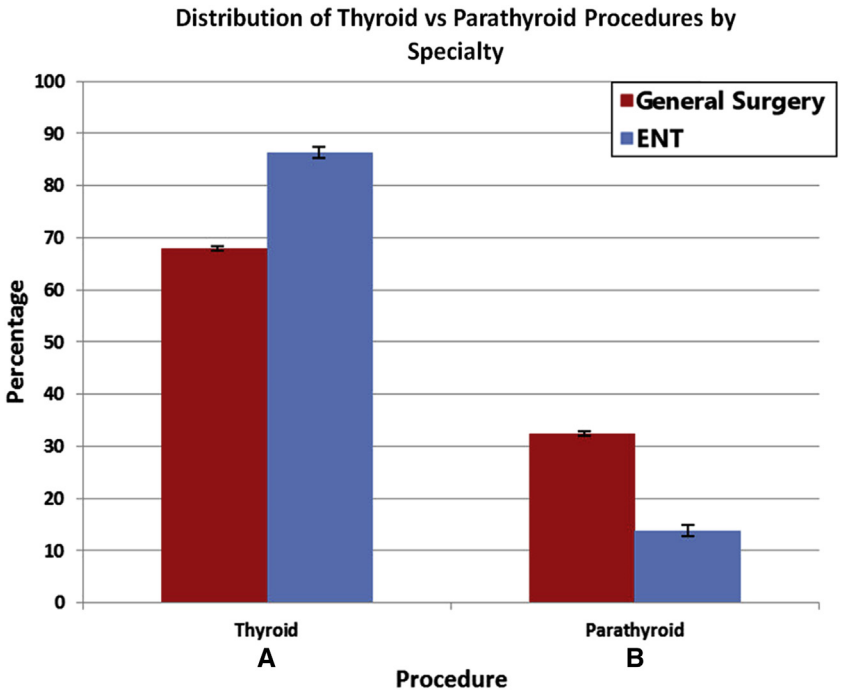

Fig 1. *A*, Case proportions of thyroid operations differed significantly between general surgery (GS; 68%) and otolaryngology (ENT; 86%) specialties ($P < .0001$). GS performed a greater proportion of bilateral and/or more complex cases than ENT ($P < .0001$). *B*, Parathyroid operations represented a higher proportion of GS case mix (32%) than ENT (14%; $P < .0001$). Parathyroid exploration accounted for the majority of these cases. (Color version of figure is available online.)

ENT ($P < .0001$). In GS, bilateral thyroid operations consisted of 37% of fellow cases, versus 41% in ENT ($P < .0001$). In short, case distribution was similar between resident years, but significant differences were noted between specialties with GS composed of a greater proportion of parathyroid operations versus ENT, which showed a preference for unilateral thyroid cases.

With all cases combined, mean operative time was less for GS (115 minutes) versus ENT (123 minutes; $P < .0001$), with attendings alone decreasing operative time by 20 minutes compared with cases done with house staff for thyroid surgery in GS versus 30 minutes in ENT ($P < .0001$). A similar trend was seen for parathyroid surgery with lesser operative times for GS (93 minutes) versus ENT (104 minutes; $P < .0001$). When evaluating the most common cases separately (thyroid lobectomy [CPT 60220], total thyroidectomy [CPT 60240[, and parathyroid exploration [CPT 60500]), this disparity between GS and ENT remained with mean operative times of 92 vs 102 minutes, 125 vs 136 minutes, and 91 vs 103 minutes, respectively ($P < .005$; Fig 3). On assessing the effect of residents on these index procedures, this trend continued across all years for attendings alone, senior residents, and fellows with the exception of a lack of significance for fellows in parathyroid exploration. For GS, operative time decreased with increasing PGY for all 3 index procedures (Fig 4, *A–C*). The converse was true for ENT, although the trend was not significant.

No differences were seen with the rates of morbidity, mortality and return to the operating room for both specialties in thyroid surgery and parathyroid surgery (Fig 5). Although trends were similar between specialties, ENT had a greater duration of stay for the most common thyroid procedures with 8% staying after postoperative day 1 vs 5% for GS in thyroid lobectomies ($P < .05$; Fig 6, *A*), and 21% vs 12% ($P < .05$) for total thyroidectomies (Fig 6, *B*). When evaluating cases performed by house staff, the trend was more pronounced, with 10% vs 26% staying >24 hours for GS and ENT, respectively ($P < .0001$).

DISCUSSION

As the rates of endocrine surgery increase, improved training is paramount. Our study looked at potential disparities between the 2 most common specialties performing thyroid and parathyroid operations with regard to practice patterns, outcomes, and educational opportunities.

Table. Demographics

	General surgery	*ENT*	P *value*
Thyroid operation			
Age (y)	51 ± 0.08	52 ± 0.25	.02
Female gender (%)	81	79	.021
Race (%)			
Caucasian	75	74	<.0001
Black	12	10	.0323
Other	13	16	.006
Type of thyroidectomy			
Unilateral	58	50	<.0001
Bilateral	42	50	<.001
Parathyroid operation			
Age (y)	59 ± 0.11	60 ± 0.59	.021
Female gender (%)	75	72	.097
Race (%)			
Caucasian	77	79	.264
Black	13	8	.002
Other	10	13	.072
Type of operation			
Parathyroid exploration	95	97	.037
Parathyroid reexploration	4	2	.0072
Parathyroidectomy, thoracic approach	0.6	0.6	*
Parathyroidectomy, autotransplantation	0.3	0.7	*

*Because of the small sample size, the *P* value cannot be calculated.

Unfortunately, it was not possible to directly compare absolute case numbers performed by GS and ENT because of the differential proportion of cases sampled depending on whether an institution participates in the general or multispecialty NSQIP program. Within a specialty, however, it is valid to compare the relative numbers of thyroid and parathyroid operations as well as the specific procedures performed on these 2 organs.

Regardless, Harness et al,[3] Le et al,[4] and Zarebzcan et al[7] have documented a continued lack of operative experience by graduating residents, with more than one third of residents stating they did not feel competent in performing endocrine operations by graduation. Because ENT residents perform significantly more thyroid and parathyroid operations than their GS counterparts,[4] the question exists as to what differences might occur in practice patterns and educational training between the specialties.

Although NSQIP does not provide physician-level data according to whether the surgeon has specialty interest in endocrine surgery, a large percent of NSQIP hospitals are academic institutions with >500 beds, which suggests that the majority of these cases are performed at larger institutions that likely have surgical specialties and residency training programs.

In concordance with previous literature, parathyroid operations comprise a greater proportion of GS practice than in ENT. It is interesting that parathyroid operations are performed to a much greater percentage by junior residents in GS (34% vs 14%), indicating that these procedures may not be a dominant focus of ENT practice compared with the more common thyroid operations. In fact, the caseload of senior residents in ENT is almost completely composed of thyroid operations with only 10% parathyroid operations, whereas chief residents in GS have a slightly more varied mix of 75%/25%. It is likely that this is the result of the greater proportion of parathyroid cases in GS overall as opposed to ENT but nonetheless represents earlier and more frequent exposure to these operations.

The proportion of thyroid and parathyroid operations performed without resident assistance in ENT is striking, especially when compared with GS (65% vs 28%; $P < .0001$). Although the use of physician assistants or surgeon preference may explain this finding, it is more likely that a greater proportion of ENT cases are done at community hospitals, where no resident involvement is possible. Regardless of the exact reason, this finding represents a loss of opportunity for ENT residents, and implies that ENT specialists may be unable to meet future increased demand, owing to the high proportion of ENT cases occurring outside of an educational milieu, as opposed to GS programs. GS cases being performed in community hospitals only 28% of the time is less than historical averages, and we speculate that this may indicate that these cases are being referred to tertiary care centers more frequently now than before, at least when GS is involved. As noted, the 1% of surgeons whose practice is composed primarily of endocrine operations account for 24% of all operations, and several studies have shown improvement in patient outcomes with a greater number of cases performed by these more specialized surgeons.[1,8,9] As such, one would hope that this trend will continue and result in greater operative exposure for residents of both specialties.

When comparing case distribution by year of training, GS junior residents seem to be performing a somewhat greater proportion of cases than their ENT counterparts (41.8% vs 35.2%, respectively; $P < .005$). The distribution of operations performed by senior residents is essentially the same between specialties, whereas ENT fellows perform almost 10% more of all cases (Fig 2), suggesting fellowship training at the expense of junior residents. Given the rarity of endocrine surgery fellowship programs

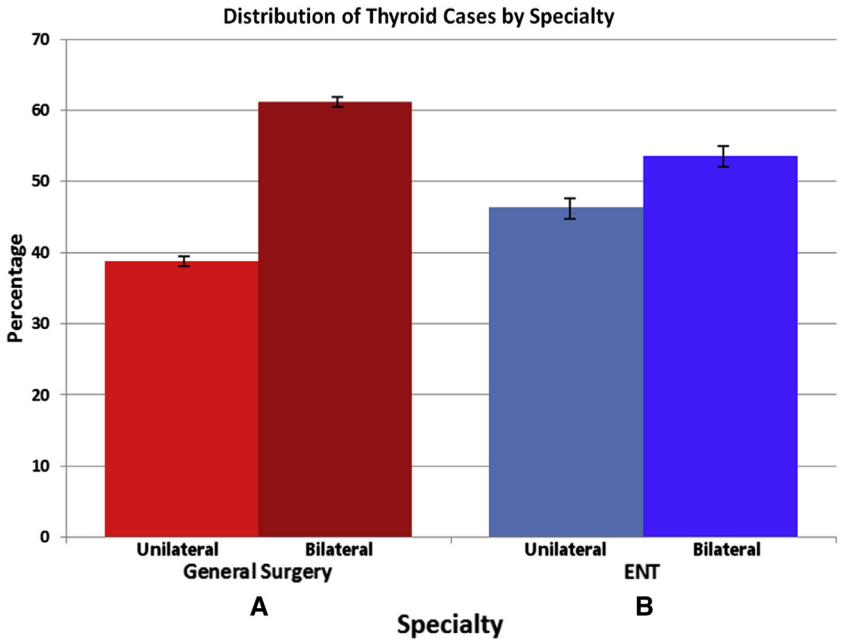

Fig 2. *A*, Attendings alone performed the majority of operations in otolaryngology (ENT), whereas this was not true in general surgery (GS) for thyroid operations ($P < .0001$). GS residents performed a statistically greater proportion of thyroid cases at all levels owing to the disparity between operations without resident involvement. *B*, Attendings alone performed the majority of operations in ENT, whereas this was not true in GS for parathyroid operations ($P < .0001$). GS residents performed a statistically greater proportion of thyroid cases at all levels, except fellows. (Color version of figure is available online.)

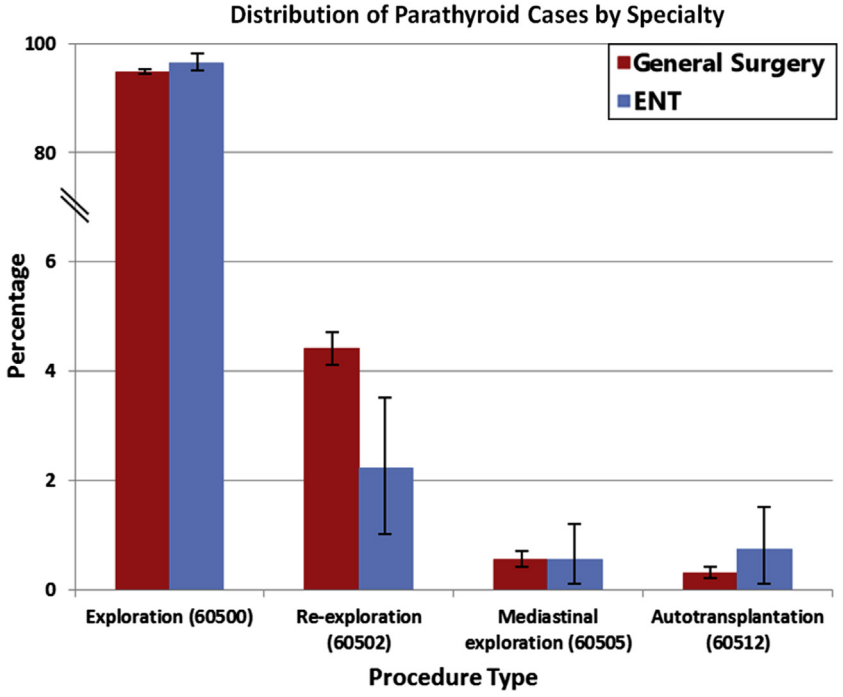

Fig 3. When evaluating the most common cases separately (thyroid lobectomy [Current Procedural Terminology code (CPT), 60220; total thyroidectomy [CPT 60240], and parathyroid exploration [CPT 60500]) disparity in operative times occurred between GS and ENT, with mean operative times significantly shorter for GS operations ($P < .005$ for each). (Color version of figure is available online.)

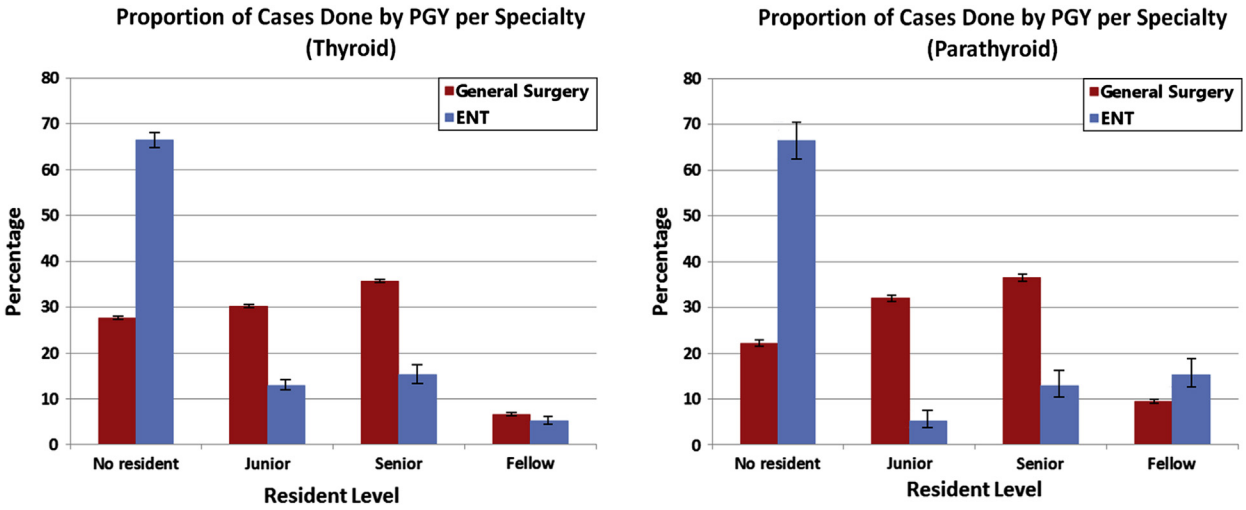

Fig 4. Operative times remained significantly shorter in general surgery (GS) than otolaryngology (ENT) for all 3 index cases (thyroid lobectomy, total thyroidectomy, and parathyroid exploration). The differences were significant for attendings operating alone, seniors, and fellows with the exception of a lack of significance for fellows in parathyroid exploration. (Color version of figure is available online.)

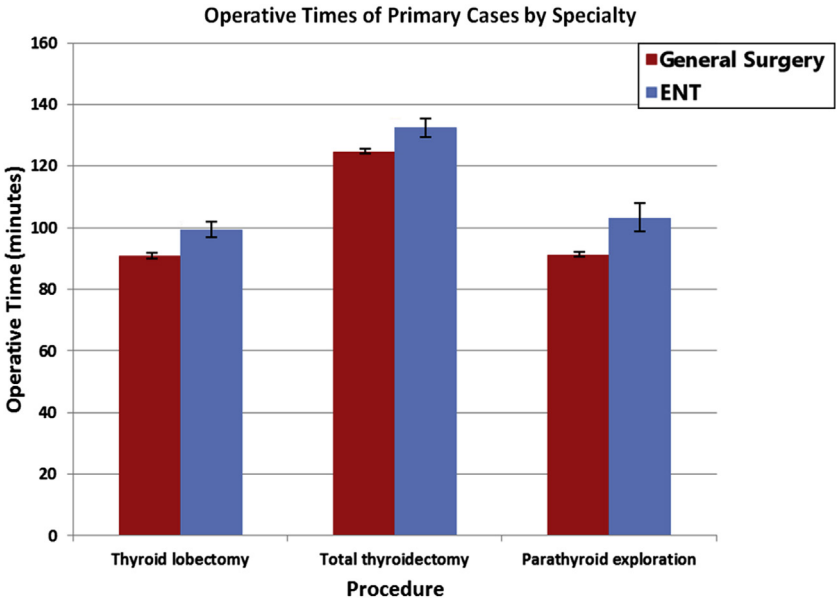

Fig 5. Although trends were similar between specialties, otolaryngology (ENT) patients had a longer duration of stay for the most common thyroid procedures. There were no differences in parathyroid exploration durations of stay. (Color version of figure is available online.)

in GS, fellows perform relatively fewer cases than their ENT counterparts, thus having less of an impact.

Although current RRC case logs note that more thyroid and parathyroid operations are performed by GS residents than ENT residents overall,[4] and, on an individual basis, ENT residents perform more of both types of surgery because there are approximately 4 times as many GS residents as ENT residents per year (1,146 vs 285 in 2012).[10] Previous literature has shown low case volume and a lack of readiness in graduating GS residents to perform these type of operations independently.[3,7,11,12] Although ENT residents individually perform more cases than GS residents, the fact that the ENT fellows seem to be performing endocrine cases at the expense of juniors implies that, despite the high numbers performed during residency, their ENT residents may still not feel

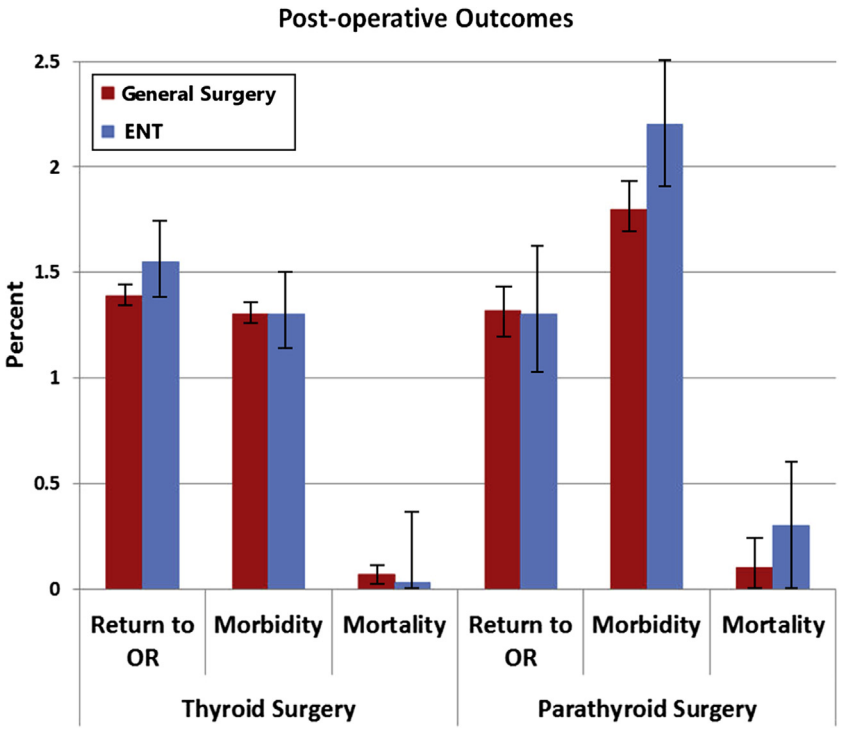

Fig 6. No differences were noted in duration of stay, morbidity, or return to operating room for both specialties. (Color version of figure is available online.)

competent in these cases at graduation. Nonetheless, ENT residents perform the majority of thyroidectomies and parathyroidectomies in their senior years, an inference supported by the current literature.[4]

Operative times were less for all GS operations when stratified by CPT code. This observation also held true when a subset analysis was performed looking at attendings operating alone, senior resident, and fellow involvement, although for junior residents, this did not attain significance. The explanation for this is not straightforward. Inequalities in case complexity could have accounted for this finding, but these were not found to be significantly different between specialties. Interestingly, there was a trend toward greater operating times as years of training increased in ENT for thyroid lobectomy. In contrast, operating times decreased as resident level increased in all GS operations. Literature on colorectal operations and analysis of NSQIP data regarding other GS operations note that operating times tend to increase in direct proportion to year of training, likely as a result of case complexity or greater resident autonomy.[13] Endocrine surgery seems to behave differently. Again, it is difficult to draw conclusions regarding this finding, although it is possible that residents are allowed less autonomy on a national scale than with most other procedures. This possibility is plausible considering that potential complications, such as recurrent laryngeal nerve injury and hypoparathyroidism, can be difficult or impossible to correct if mistakes are made and have profound impact on long-term quality of life. Additionally, GS residents who are well-trained in other operative procedures find commonality between many surgical approaches (eg, entrance of the abdominal cavity for multiple operations), but the approach to thyroid and parathyroid surgery is unique to this specialty. Combined with the intricate nature of these operations and the relatively low case numbers performed by individual residents,[3,4] this observation may lead to less autonomy at the level of trainees than is possible with other more commonly performed procedures.

Duration of stay was also significantly greater in ENT versus GS. This observation is puzzling; case complexity and patient factors were not found to be different. Previous studies have noted that patients undergoing operations by attendings operating alone tended to have greater durations of stay.[14] One hypothesis was that without resident assistance, busy private attendings might be hard-pressed to discharge their patients during peak hours owing to competing workload and lack of ancillary support. Given the greater proportion of ENT cases

operated on by attendings alone, we assumed this was the likely reason for the difference between specialties; however, when excluding this group and looking only at cases with house staff involvement, the difference in duration of stay between specialties persisted. We surmise that this may be owing to differing practice patterns.

Limitations to this study exist. As noted, differential sampling methods between GS and ENT prevent comparison of absolute numbers, making an estimate of the proportion of endocrine cases performed by the 2 specialties on a national level impossible. Although this differential sampling may raise a concern regarding selection bias, it should be noted that the NSQIP random sampling process is designed to minimize the possibility of selection bias specifically with regard to specialty programs. Sampling is obtained as a random 20% of the hospital's multispecialty cases. Although the difference in numbers is striking, one should recognize that the ENT arm of the study is still composed of approximately 2,500 patients, which should be great enough to make statistically significant inferences and minimize the likelihood of bias.

Additionally, it is difficult to draw conclusions regarding different numbers of fellows in these 2 specialties, because residents who spend time in research may be categorized as PGY≥6, in addition to fellows in endocrine, ENT, surgical oncology, and head/neck specialties. Further limitations include lack of specific information regarding hospital bed size, and residency or fellowship program participation, and thus we are unable to extrapolate data on a per-resident basis. Indeed, there may be ENT fellowship programs not affiliated with an ENT residency program. Last, although no differences in outcomes were found between specialties or between resident levels, the most common complications of these operations (recurrent laryngeal nerve injury, hypoparathyroidism, and acute postoperative hemorrhage) are not recorded in this database, limiting the relevance of any statements regarding outcome measurements.

Although thyroid and parathyroid operations are performed by both GS and ENT, differences in practice and resident involvement exist. There does not seem to be a difference in case complexity between specialties. Overall, a greater percentage of cases are being performed with resident involvement in GS, but this is true in only one third of cases in ENT. This may imply that, although thyroid operations are being directed to tertiary hospitals in GS, this trend may not hold true for ENT. Additionally, junior residents perform a substantial (4%) proportion of cases in GS indicating early exposure to endocrine surgery and that there is balanced operative exposure between junior and senior residents with minimal effect of fellows. In contrast, whereas juniors in ENT also receive substantial (35%) exposure, this is diminished by an increased proportion performed by fellows, and this trend is more pronounced with advanced-level cases. ENT residents perform the majority of their endocrine cases as senior residents rather than evenly over all years of training. Neither specialty had a difference in outcomes based on resident level except operative time and duration of stay, which were greater for ENT at all PGY levels. Reasons for this cannot be discerned by NSQIP, but do not seem to be related to case complexity. Ultimately, endocrine procedures remain primarily in the hands of GS with equal outcomes and lesser operating times and LOS than their ENT counterparts.

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DISCUSSION

Dr Samuel Snyder (Temple, TX): Drs Monteiro, Mino, and Siperstein have completed an elegant study on thyroidectomy and parathyroidectomy practice patterns, outcomes, and educational trends for general surgeons (GS) and otolaryngologists (ENT) between 2005 and 2010. They made use of the large database from the American College of Surgeons National Surgical Quality Improvement Program, which included involvement of residents and fellows in training. This type of data is no longer being recorded, making the study an important glimpse into endocrine surgery training. Dr Siperstein and the Cleveland Clinic have been leaders in promoting endocrine surgery fellowship training, so it is fitting that this study should be spearheaded by them.

I have 3 comments and questions for the authors. First, the key to this study is the large data pool that NSQIP provides. The numbers are robust for GS but meager for ENT. Of the general surgery case volumes, the ENT experience is only about 10% for thyroidectomy and 5% for parathyroidectomy. About two thirds of the ENT cases were done by attending staff alone, compared with about one quarter of general surgery cases, leaving ENT resident and fellow cases for comparison at only about 198 thyroidectomies per year and 28 parathyroidectomies per year over the 6 years of the study. How do you account for the very low case numbers by ENT residents and fellows? And how does this affect the validity of your assessment?

Second, the overall training of general surgery residents and ENT residents is vastly different, and this may account for why general surgery cases had significantly shorter operating times and hospital durations of stay, while having equal outcomes with respect to mortality and morbidity.

Interestingly, the general surgery experience comprised a greater proportion of parathyroidectomies, and the ENT experience a preference for unilateral thyroidectomy. Historically, general surgery and ENT residency/fellow training programs have functioned independently. With an eye toward improving patient care and equalizing some of the outcomes, should there be more cooperative training between general surgery and ENT programs at the resident and fellow levels?

Third, the recent trend is fellowship training for about 80% of graduating general surgery residents. It has been my experience that senior residents planning a fellowship in trauma, minimally invasive surgery, colon and rectal surgery, and so on, naturally become less interested in thyroidectomy and parathyroidectomy case experience. This may account for the relatively greater case experience of general surgery junior residents.

Conversely, upper-level ENT trainees and general surgery residents who see endocrine surgery as part of their future practice should be more likely to seek additional thyroidectomy and parathyroidectomy case experience. Do you advocate any specific modifications in general surgery training for senior residents to selectively improve their endocrine surgery training?

As a committed educator, I appreciated the opportunity to review this excellent, thought-provoking, and timely manuscript.

Dr Rosebel Monteiro (Cleveland, OH): Regarding the first question, what we tried to explain in the manuscript, and can be misleading when looking at the figures, is that the overall number of general surgery versus ENT operations are sampled differently. Given the different NSQIP program types - general, multispecialty, and targeted - it turns out that there are more general surgery operations trapped compared with ENT cases.

Therefore, it is not accurate to compare the raw number of general surgery cases with ENT cases. Within a specialty, it is valid to compare the relative number of case types performed and whether a resident was involved or not.

Additionally, of the >500 hospitals that participate in the NSQIP database, there is a trend toward having more tertiary centers participate in the program than community hospitals. Therefore, the graphs as percentages rather than stating the absolute case number.

Second, I agree with the fact that the training of residents differs between specialties and can vary vastly. Sometimes, political issues can inhibit ideal collaboration between specialties. But as US healthcare is moving more toward managing patients with evidence-based care pathways, it would be in the interest of good patient care to share best practices.

Third, a senior resident's operative experience in endocrine surgery is an interesting fact to speculate about. At our institution, endocrine surgery is a required rotation, where senior residents gain significant exposure to thyroid and parathyroid surgery over 5 weeks. I know that this is not the case at most institutions. I would agree that on a service with multiple different case types, a resident would be inclined to gravitate toward cases they are most interested in.

A previous paper by Dr Harness documented the wide discrepancy in operative experience between residents. Obviously the NSQIP does not represent individual resident experience, only the aggregate. Therefore, we can conclude that resident exposure is present at the junior and senior resident levels, and that we have shown that there is tremendous opportunity for senior residents to perform these cases. This is in contrast with ENT operations, where senior residents inevitably make thyroid operations a part of their practice.

Dr Victor Velanovich (Tampa, FL): Congratulations on an excellent study. Two or 3 years ago, we presented, at the American College of Surgeons a similar study looking just at general surgery, using NSQIP data for resident experience. And what we found is that, over that time, the number of cases that are done by attendings alone overall in general surgery has increased even in the teaching hospitals.

So my 2 questions have to do with, if you just looked at teaching hospitals, would you still see the same distribution of cases not having resident participation?

And, second, do you think this is something that is unique to thyroid and parathyroid surgery, or an overall trend in general surgery training?

Dr Rosebel Monteiro: The NSQIP database is set up using deindentified data. Therefore, it is not possible to tell which hospitals are teaching hospitals and which are not. Therefore, I'm not sure that we could answer that question appropriately.

With regard to whether this is unique to general surgery, there is a trend at tertiary institutions towards having more residents and fellows assist attendings in a vast majority of cases. There have been previous papers, one from our colorectal department at the Cleveland Clinic, that have shown that as trainee level increases, operative times increase, and trainee participation increases, likely because of case complexity, as well as the independence at advanced trainee levels. That's all I can say about that.

Dr Richard A. Prinz (Evanston, IL): Very nice work, Dr Monteiro. I compliment you on your efforts. I think you've pointed out to us that NSQIP was not a database that was intended to look at these educational things that you are probing it for.

I would say that at the university centers that I've worked at, ENT has had to farm out their residents to get the endocrine experience. That's typically at hospitals, community and elsewhere, that aren't captured by your database. So that's my first comment, and I would like you to respond to that.

Second, you're alluding to a greater duration of stay, or some factors in outcome that seem to be less good for ENT. Have you considered that very often they are doing, perhaps, tracheal resections, node dissections, other adjuncts to their thyroidectomy that may be responsible for that?

And finally, one of my former fellows, Dr Cherenfant, who is presenting at this meeting, has looked at thyroid surgery in the state of Illinois, and divided it into 2 periods, from 1998 to 2003, and then from 2005 to 2009. And in that period, there's been a dramatic increase, a significant increase, in thyroid surgery. But who is doing the thyroid surgery has changed.

Most of the thyroid surgery is done in community hospitals in our state because there's such a disparity. There's 180-some community hospitals in Illinois, with only 15 university-affiliated and 5 university hospitals. So it's not surprising that the bulk is done outside. And most of these community hospitals, again, would not be captured by NSQIP.

Dr Rosebel Monteiro: I think that it is correct that ENT surgeons perform, on a raw number basis, more cases than are performed by general surgeons. Again, this database tends to oversample general surgery operations. Initially, when the program began in 2005, only general and vascular surgery operations were trapped. This may account for some of the discrepancy in the numbers.

When looking at the increased duration of stay in ENT, we eliminated patients with concurrent CPT codes to account for this. We analyzed patients who mainly underwent thyroid and parathyroid operations only.

Dr Jose Velazquez (Skokie, IL): A nice presentation. I would like for you to comment on the incidence of lobectomy versus total thyroidectomy, the discrepancy between both specialties. You alluded in your presentation, perhaps it's the complexity of the disease. Would it be possible also that maybe a different approach to multinodular goiter, in which general surgeons tend to do more total thyroidectomies because of incidence of recurrence because of the possible incidence of occult thyroid cancer or it's maybe an approach based on training?

Do you have any data or any thoughts as to this applied to cancer, minimal cancer based on size, benign disease?

Dr Rosebel Monteiro: We did not extend our analysis to look at a subset of patients based on a diagnosis of thyroid cancer or benign disease.