

Sustained Growth of a University-Based Endocrine Surgery Program Over 10 Years

Shonan Sho, MD¹, Emily S. Singer, BA¹, Eric Kwok, BA², Randi Hissom, MBA³, Avital Harari, MD¹, Masha J. Livhits, MD¹, and Michael W. Yeh, MD¹

¹Section of Endocrine Surgery, UCLA David Geffen School of Medicine, Los Angeles, CA; ²ValU Care Redesign, UCLA Health System, Los Angeles, CA; ³Hospital Finance and Strategy, UCLA Health System, Los Angeles, CA

ABSTRACT

Background. Endocrine surgery continues to mature as a subspecialty field. We describe the clinical performance of an academic endocrine surgery program (ESP) over its first 10 years.

Methods. We examined all endocrine procedures performed during the 10-year period (2006–2015) following the inception of the ESP. Institutional and state-level data on case volume, patient geographic origin, and hospital-side costs were obtained.

Results. Endocrine case volume increased by approximately ninefold over the study period (from 102 cases in 2006 to 919 cases in 2015). The rate of growth remained approximately linear, and was driven by geographic expansion of referral regions coupled with transitioning low- to moderate-acuity operations to venues outside of the main tertiary care hospital. Market share across the eight-county Southern California region grew by more than twofold over the study period. Increased utilization of outpatient surgery led to cost reductions, averaging 11.1% per case by 2015.

Conclusions. Establishment of an academic ESP can lead to sustained clinical growth and a fundamental shift in regional referral patterns. The nation's continued need for skilled high-volume endocrine surgeons represents

opportunities for medical centers to institute their own dedicated endocrine surgery programs.

Endocrine surgery has matured as a field, particularly since 2007 when the American Association of Endocrine Surgeons (AAES) formalized the fellowship match process.^{1,2} Ample studies address the continued need for new endocrine surgeons, citing increased incidence of endocrine disorders and malignancies.^{2–5} An established association between surgeon volume and clinical outcomes for complex procedures further emphasizes the need for specialized surgical practitioners.^{6–10} Despite this, low-volume surgeons without subspecialty training perform the majority of endocrine cases in the USA.^{11–13} Furthermore, concerns over job availability and satisfaction for young endocrine surgeons are ongoing.^{14–16}

Most medical centers across the nation do not have a dedicated endocrine surgery program (ESP). The multidisciplinary ESP at University of California Los Angeles (UCLA) was established in 2006 to bring together physicians with focused clinical interest and expertise in diseases of the thyroid, parathyroid, and adrenal glands. Since its inception, we have prospectively quantified clinical, educational, and financial outcomes. In 2011, at the 5-year mark, we described the initial impact of the ESP on the widening of geographical referral patterns, growth in case volumes, expansion in institutional market share, and cost reduction.¹²

Because a five-year period of initial development does not prove durability, we undertook the current study to evaluate the sustained growth of UCLA's ESP over the 10 years since its inception. We aimed to illustrate the evolution in surgical volumes, regional referral patterns, market share, and cost of care, as well as to describe

Electronic supplementary material The online version of this article (doi:10.1245/s10434-017-6012-2) contains supplementary material, which is available to authorized users.

© Society of Surgical Oncology 2017

First Received: 5 May 2017;
Published Online: 26 July 2017

S. Sho, MD
e-mail: ssho@mednet.ucla.edu

strategies central to the growth of an ESP within an academic medical center.

METHODS

Institutional Case Finding

With approval from the institutional review board, case volume and cost data were obtained from the UCLA Health financial services department. Electronic records from the UCLA Ronald Reagan Hospital, UCLA Santa Monica Hospital, and UCLA Westwood Ambulatory Surgery Center were queried for endocrine-specific procedures between January 2006 and December 2015. Patients undergoing endocrine surgery procedures were identified using Current Procedural Terminology (CPT) codes. All patients undergoing unilateral or total thyroidectomy (60200, 60210, 60212, 60220, 60225, 60260, 60240, 60252, 60254, 60270, 60271), parathyroidectomy (60500, 60502, 60505), adrenalectomy (60540, 60545, 60650), and cervical lymphadenectomy for thyroid cancer [CPT 38720, 38724, 21557 and International Classification of Diseases (ICD)-9 diagnosis code 193 (thyroid cancer)] were selected from the master file. Operative cases in which both thyroidectomy and parathyroidectomy were performed were categorized as “combined thyroid/parathyroid.” Outpatient cases were defined as discharge within 23 h. Demographic data collected included age, gender, race, ethnicity, health insurance, and five-digit zip code for primary residence. Medical information collected included diagnoses, procedures, treatment dates, and total costs.

Regional Market Share Data

Data on regional market share were obtained from the California Office of Statewide Health Planning and Development (OSHPD) spanning the years 2005 to 2014 (1 year prior to the establishment of the ESP at UCLA until the most recent year OSHPD data were available). Hospitals from the eight-county region in Southern California were selected for analysis (Los Angeles, Orange, Riverside, San Bernardino, Ventura, Santa Barbara, Kern, and San Luis Obispo). The top eight hospitals within the region in terms of endocrine surgery case volume were determined, and their market share trends were followed over the 10-year study period.

Cost Analysis

A subset of commonly performed procedures, including appendectomy, laparoscopic cholecystectomy, colectomy, and hysterectomy, were identified using appropriate CPT

codes. These “control” operations were used to generate a cost index for common operations performed contemporaneously and involving similar nursing and ancillary staff as endocrine surgical procedures. Cost trends for endocrine procedures were compared against the cost index of control operations to take into account global institutional trends in surgical financial endpoints.

RESULTS

Ten-Year Trends in Case Volumes

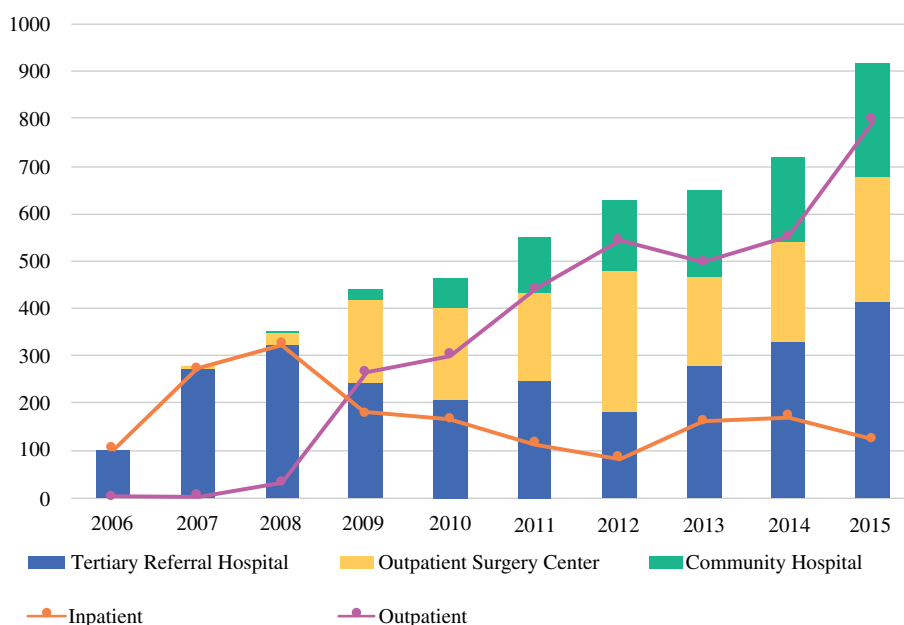
Table 1 illustrates the number of endocrine cases performed by the ESP over the study period. The total annual endocrine case volume increased by approximately nine-fold (from 102 cases in 2006 to 919 cases in 2015; 801% increase). No change in UCLA network affiliations occurred during the study period. Significant increase in case volumes was observed for all types of endocrine procedure, including thyroid (from 54 cases to 371 cases; 587% increase), parathyroid (from 33 cases to 380 cases; 1050% increase), and adrenal (from 9 cases to 57 cases; 533% increase). The annual rate of growth remained consistent throughout the 10-year period (Fig. 1). The increase in case volumes was observed for all types of endocrine procedure (Supplementary Fig. 1). Over the course of the same 10-year period (2006–2015), clinical volume of head and neck (H&N) surgery for endocrine-related cases remained overall stable (from 212 H&N endocrine-related cases in 2006 to 148 cases in 2015).

Transitioning Cases to Lower-Acuity Care Environments

Thyroid and parathyroid operations in low-perioperative-risk patients were transitioned to outpatient surgery with same-day discharge beginning in 2008.^{17,18} Since then, the proportion of outpatient cases has increased steadily, reaching 86.7% of all endocrine procedures in 2015 (Fig. 1). Similarly, cases considered low to moderate in acuity based on both medical and technical complexity were transitioned away from the tertiary care hospital and into the affiliated outpatient surgery center and community hospital. In fact, endocrine case volume in the tertiary care hospital remained stable between 2008 and 2015. Cases performed in the outpatient surgery center and the community hospital accounted for the majority of the growth observed during this period (Fig. 1). In 2008, 323 cases were performed within the tertiary care hospital, accounting for 91.5% (323 of 353 cases) of all cases performed that year. Outpatient surgery center and community hospital cases accounted for only 7.6% (27 cases) and 0.8% (3

TABLE 1 UCLA endocrine surgery program case volumes over 10 years

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Thyroid	54	97	153	167	167	226	262	284	318	371
Parathyroid	33	119	132	191	211	206	250	273	270	380
Adrenal	9	32	24	30	33	29	23	31	35	57
Cervical lymphadenectomy	4	9	20	31	30	41	41	39	57	65
Combined thyroid/parathyroid	2	16	24	20	23	50	50	30	39	46
Total	102	273	353	439	464	552	626	657	719	919

FIG. 1 UCLA endocrine surgery program case volume by hospital type and inpatient versus outpatient setting

cases), respectively. By 2015, more than half of all cases were performed in either the outpatient surgery center (265 of 919 cases, 28.8%) or the community hospital (240 of 919 cases, 26.1%).

Regional Market Share and Geographic Referral Patterns

Following inception of the ESP in 2006, UCLA's market share for endocrine procedures within Southern California increased by more than twofold, from 5.2 to 12.0% (Fig. 2). This growth occurred while the total number of endocrine surgery cases performed within the region remained relatively stable (7062 cases in 2005, 7223 cases in 2014). Notably, the total market share of the top eight hospitals was approximately 30%, indicating that most endocrine cases were performed in low-volume hospitals. When the zip codes of patient origin were assessed, the total number of zip codes represented increased from 180 in 2005 (prior to the ESP's inception), to 277 in 2010, then to 430 in 2015. Heat mapping revealed increased

market penetration into local zip codes as well as broadening of the geographical referral basis over time (Fig. 3). This geographical reach extended internationally, including 34 patients from 18 different countries in the regions of Asia, Latin America, Europe, and the Middle East.

Cost Associated with Endocrine Procedures

Trends for costs associated with endocrine procedures were determined between 2009 and 2015. We previously reported a 13% cost reduction in endocrine procedures between 2005 and 2009 compared with an index of common procedures. We noted a continued reduction in cost over the subsequent 5 years, peaking at a cost reduction of 27.2% from baseline in fiscal year 2012. This trend in cost reduction coincided with the maximal transition of cases to the outpatient surgery center and community hospital. Thereafter, from 2012 to 2015, growth in high-complexity cases best suited for the tertiary care hospital drove unit costs upwards, resulting in a net cost reduction of 11.1% from baseline for endocrine cases performed in 2015.

FIG. 2 Distribution of market share for endocrine operations in eight county regions (Los Angeles, Orange, Riverside, San Bernardino, Ventura, Santa Barbara, Kern, and San Luis Obispo), fiscal year 2003–2014. Letters B–H refer to the seven highest-volume hospitals in the region

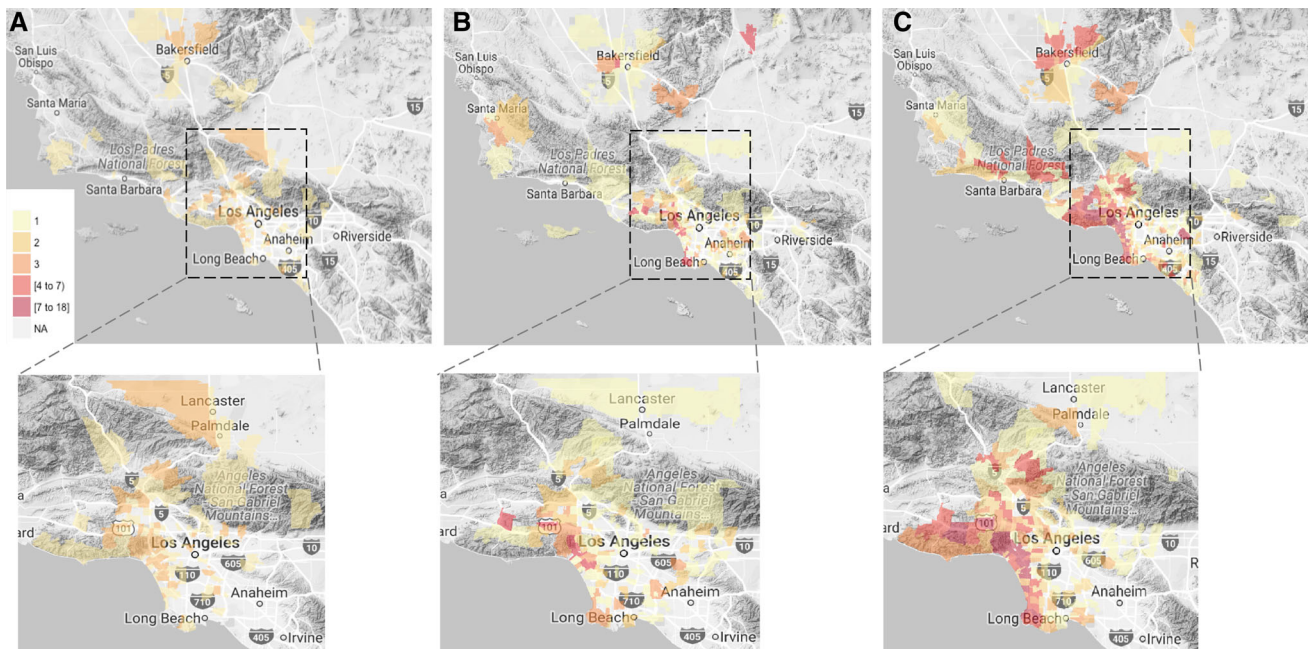
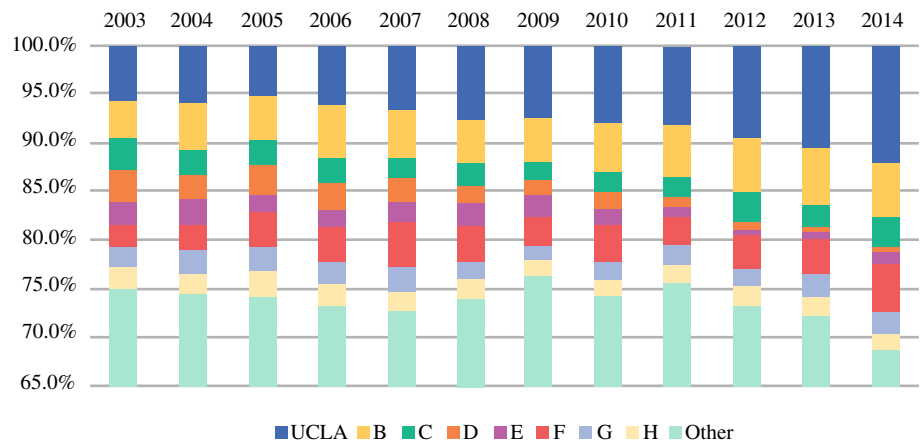


FIG. 3 Choropleth maps demonstrating the evolution of regional referral basis for surgical treatment of endocrine disorders at UCLA in **a** 2005, **b** 2010, and **c** 2015. Dotted black boxes encompass Los Angeles county

DISCUSSION

The present study shows that a dedicated ESP can be successfully instituted and sustained within an academic medical center. Endocrine case volumes of all types have continued to rise throughout the 10-year period; this coincided with geographical widening of the referral base and increase in regional market share. The annual growth rate of case volume has been sustained over the past 10 years, indicating a steady momentum and the possibility for even further expansion in the coming years. This growth was facilitated by the transition of most endocrine procedures to the outpatient surgery setting and expansion of services into the university-affiliated community hospital and ambulatory surgery center. The volume of outpatient

procedures rose considerably starting in 2009, after a systematic effort to reduce the inpatient census was initiated.^{17,18} While outpatient procedures accounted for only 59% of all endocrine cases in 2009, this number had grown to 87% by 2015. The growth in outpatient procedures occurred while the volume for inpatient cases stabilized, as we reserved the inpatient setting for patients with truly complex problems. Efficient allocation of available resources in this manner generated capacity for further expansion.

As the clinical volume grew over the years, costs associated with endocrine procedures declined. This trend was most notable over the years when an increasing number of cases were transitioned away from tertiary care centers into lower-acuity hospital settings. Additionally,

several other factors may also have contributed to the change in cost. First, the proportion of outpatient surgery continued to rise each year, reaching approximately 87% by the year 2015. This transition significantly reduced the overall hospital length of stay, helping to drive down the cost associated with endocrine procedures. Secondly, improvement in hospital resource utilization and reduced use of consumables were also key contributors. The ESP has implemented clinical pathways for thyroidectomy and parathyroidectomy since 2006 in an effort to reduce variability in care and to improve resource utilization. We previously reported on this effort, showing significant cost savings following implementation of clinical pathways in our endocrine surgery practice.¹⁸ The routine use of thyroidectomy/parathyroidectomy clinical pathways led to a significant reduction in laboratory use, nonroutine medication administration, and intensive care unit (ICU) admissions, all translating into measurable cost reductions.

Over the course of 10 years between 2006 and 2015, additional surgeons were recruited into the ESP to support the continued clinical growth. At the time of its inception in 2006, the ESP comprised a single surgeon. A second and third surgeon were recruited into the program in 2010 and 2015, respectively. Notably, all three surgeons joined the ESP immediately following completion of their respective endocrine surgery fellowship programs without prior outside practice. Therefore, all three surgeons started and grew their clinical practice within the ESP, without bringing an already existing outside patient base into the program.

While the addition of new surgical faculties was important for continued growth, close collaborations with medical endocrinologists were also indispensable. Our collaborative efforts have led to the establishment of the UCLA endocrine center, where endocrine surgeons and medical endocrinologists work and see patients side-by-side in a single location. We have also implemented systematic integrations with our medical endocrinologist colleagues, forming a single patient navigator/care coordination, single route of referral, single web and social media presence, as well as financial integration. Through these changes, the endocrine center functions to provide coordinated and comprehensive care centered on the patient's endocrine-related disorder. Accordingly, all patients considered for endocrine surgery are initially seen and evaluated through the endocrine center, allowing for the same multidisciplinary care to be delivered regardless of the hospital type where surgical procedures are ultimately performed (tertiary hospital versus university-affiliated community hospital versus ambulatory center).

Given the recent emergence of molecular testing for indeterminate thyroid nodules, it is important to discuss its potential impact on clinical volume. In 2012, UCLA began utilizing the Afirma gene expression classifier in all

patients with indeterminate thyroid nodules.¹⁹ All thyroid nodule fine-needle aspiration (FNA) biopsies resulting in indeterminate cytology were subjected to Afirma testing. Patients with benign gene-expression profiles were recommended observation instead of diagnostic thyroid lobectomy. This transition reduced the volume of diagnostic thyroid lobectomies by approximately half. However, as shown in “Results” section, our overall endocrine case volume as well as thyroid-related volumes continued to increase. The application of a more selective surgical approach to indeterminate thyroid nodules did not impede our clinical growth.

Lastly, we have often been asked what the fundamental drivers and strategies underlying our growth are. This is not an easy question to answer, as any claims of this nature are difficult to substantiate quantitatively in a manner that elucidates cause and effect. However, we are able to identify several factors which, we believe, have contributed to our steady progress over the years:

1. The backing of a major academic medical center
2. Disease-specific outcome metrics quantified in real time using an automated, electronic dashboard
3. Prompt and effective communication with internal and external referring physicians
4. Organization into a multidisciplinary, integrated practice unit for endocrine diseases
5. Digital marketing strategy, including website, social media, and interactive webinars
6. Entrepreneurial mindset
7. Collaboration with hospital enterprise to secure both initial investment to launch program as well as several phases of reinvestment to achieve sequential expansion goals

We have observed that, though academic medical centers do many things well, they are often characterized by an endemic scarcity mindset. In other words, the concept of capital investment to support a growth-oriented value proposition (such as establishing a new service line or expanding an existing service line into new markets) may be foreign when an organization's general mentality is that of holding onto its share of a perpetually shrinking pie.

In keeping with prior literature demonstrating that the majority of endocrine operations in the USA are performed by very low-volume surgeons without a specific interest in the field,¹³ our data indicate that the top eight hospitals in Southern California captured less than 30% of the market share of endocrine procedures. The market for dedicated endocrine surgeons in this country is far from saturated. The perceived lack of job opportunities for young endocrine surgeons^{4,14,20,21} is therefore factitious and reflects inadequate understanding of how endocrine surgery is currently practiced within the USA. We hope that our data

will convince department chairs and hospital chief executive officers (CEOs) to invest in creating new ESPs in markets where none currently exist. With the right talent, leadership, and resources, these programs have the potential to grow sustainably, enhance the profile of departments and medical centers, and durably raise the quality of care in a given region.

DISCLOSURE The authors have no conflicts of interest to disclose. No financial support was obtained for the current study.

REFERENCES

1. Pasiaka JL. Kindred spirits of the endocrines: the training of the future endocrine surgeons. *J Surg Oncol* 2005;89(3):202–5.
2. Sosa JA, Wang TS, Yeo HL, et al. The maturation of a specialty: workforce projections for endocrine surgery. *Surgery* 2007;142(6):876–83.
3. Wang TS. Endocrine surgery. *Am J Surg* 2011;202(3):369–371.
4. Krishnamurthy VD, Jin J, Siperstein A, Shin JJ. Mapping endocrine surgery: workforce analysis from the last six decades. *Surgery* 2016;159(1):102–12.
5. Chen AY, Jemal A, Ward EM. Increasing incidence of differentiated thyroid cancer in the United States, 1988–2005. *Cancer* 2009;115(16):3801–7.
6. Stavrakis AI, Ituarte PHG, Ko CY, Yeh MW. Surgeon volume as a predictor of outcomes in inpatient and outpatient endocrine surgery. *Surgery* 2007;142(6):887–99.
7. Birkmeyer JD, Stukel TA, Siewers AE, Goodney PP, Wennberg DE, Lucas FL. Surgeon volume and operative mortality in the United States. *N Engl J Med* 2003;349(22):2117–27.
8. Reames BN, Ghaferi AA, Birkmeyer JD, Dimick JB. Hospital volume and operative mortality in the modern era. *Ann Surg* 2014;260(2):244–51.
9. Finlayson EA, Goodney PP, Birkmeyer JD. Hospital volume and operative mortality in cancer surgery: a national study. *Arch Surg* 2003;138(7):721–5.
10. Boudourakis LD, Wang TS, Roman SA, Desai R, Sosa JA. Evolution of the surgeon-volume, patient-outcome relationship. *Ann Surg* 2009;250(1):159–65.
11. Kuo JH, Pasiaka JL, Parrack KM, Chabot JA, Lee JA. Endocrine surgery in present-day academia. *Surgery* 2014;156(6):1461–70.
12. Wiseman JE, Ituarte PHG, Hwang RS, et al. Strategic impact of a new academic endocrine surgery program. *Ann Surg Oncol* 2011;18(8):2260–4.
13. Saunders BD, Wainess RM, Dimick JB, Doherty GM, Upchurch GR, Gauger PG. Who performs endocrine operations in the United States? *Surgery* 2003;134(6):924–31.
14. Shin JJ, Milas M, Mitchell J, Berber E, Gutnick J, Siperstein A. The endocrine surgery job market: a survey of fellows, department chairs, and surgery recruiters. *J Surg Educ* 2013;70(3):377–83.
15. Tsinberg M, Duh Q-Y, Cisco RM, et al. Practice patterns and job satisfaction in fellowship-trained endocrine surgeons. *Surgery* 2012;152(6):953–56.
16. Libutti SK. Endocrine surgery specialty training: opportunities for growth. *Surgery* 2010;148(6):1073–4.
17. Abdulla AG, Ituarte PHG, Wiggins R, Teisberg EO, Harari A, Yeh MW. Endocrine surgery as a model for value-based health care delivery. *Surg Neurol Int* 2012;3:163.
18. Kulkarni RP, Ituarte PHG, Gunderson D, Yeh MW (2011) Clinical pathways improve hospital resource use in endocrine surgery. *J Am Coll Surg* 212(1):35–41.
19. Wu JX, Lam R, Levin M, Rao J, Sullivan PS, Yeh MW. Effect of malignancy rates on cost-effectiveness of routine gene expression classifier testing for indeterminate thyroid nodules. *Surgery* 2016;159(1):118–29.
20. Wang TS, Sippel RS. Expansion of endocrine surgery fellowships: if we increase the supply is there demand? *Surgery* 2013;154(6):1470–2.
21. Krishnamurthy VD, Gutnick J, Slotcavage R, et al. Endocrine surgery fellowship graduates past, present, and future: 8 years of early job market experiences and what program directors and trainees can expect. *Surgery* 2017;161(1):289–96.