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Ambulatory Thyroidectomy: A Multistate Study of Revisits and Complications

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Abstract

Objective. Determine rates and reasons for revisits after ambulatory adult thyroidectomy.

Study Design. Cross-sectional analysis of multistate ambulatory surgery and hospital databases.

Setting. Ambulatory surgery data from the State Ambulatory Surgery Databases of California, Florida, Iowa, and New York for calendar years 2010 and 2011.

Subjects and Methods. Ambulatory thyroidectomy cases were linked to state ambulatory, emergency, and inpatient databases for revisit encounters occurring within 30 days. The numbers of revisits, mortality, and associated diagnoses were analyzed.

Results. A total of 25,634 cases of ambulatory thyroid surgery were identified: 44.2% total thyroidectomy (TT) and 55.8% partial thyroidectomy (PT). Common indications for surgery included goiter/cyst (39.5%), benign/uncertain neoplasm (24.2%), and malignant neoplasm (24.0%). The 30-day revisit rate was 7.2% (n = 1858; 61.8% emergency department, 22.4% inpatient admission, and 15.8% ambulatory surgery center). The most common diagnosis at revisit was hypocalcemia (20.8% of revisits), followed by wound hematoma/seroma/bleeding (7.1%). Higher rates of revisit, hypocalcemia, and hematoma/seroma/bleeding were seen in patients undergoing TT ($P < .016$ for all). Sixteen patients had bleeding less than 24 hours after the index procedure (0.1% overall, 0.9% of revisits). Most hypocalcemia and hematoma/bleeding occurred over the first postoperative week. Three deaths occurred within 30 days of the index procedure.

Conclusion. In carefully selected patients, ambulatory thyroidectomy demonstrates a good postoperative morbidity and mortality profile. Common reasons for revisits included hypocalcemia and bleeding/seroma/hematoma, which occurred with relatively high frequencies as late as a week after surgery. Quality improvement measures should be targeted at lowering revisit rates and safely managing complications.

Keywords

thyroidectomy, thyroid surgery, outpatient, ambulatory surgical procedures, surgery, outpatient, perioperative complications, revisits

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Introduction

Thyroidectomy is commonly performed for the diagnosis and treatment of benign and malignant neoplasms but is also indicated in cases of goiter and inflammatory disease processes. Complications from thyroid surgery can be catastrophic, and accordingly, thyroid surgery was historically performed as an inpatient procedure. For example, postoperative vocal cord paralysis and neck hematoma can cause acute airway compromise requiring emergent intervention, while hypocalcemia necessitates supplementation and close monitoring.

Over recent decades, outpatient surgery has gained increasing acceptance and serves as the standard protocol for many procedures that were traditionally performed in the inpatient setting. This trend is driven in part by economic and patient factors and is bolstered by improved anesthetic techniques and lower surgical complication rates. Within otolaryngology, many rhinologic, otologic, and facial plastics cases that are performed under general anesthesia are routinely managed in the ambulatory setting.[1,2] For such procedures, the decision for same-day surgery depends on a host of patient, system, medical, and surgical factors, not the least of which is risk of serious postoperative complications.

In head and neck endocrine surgery, parathyroidectomy traditionally necessitated inpatient admission but is now accepted as an ambulatory procedure.[3,4] Ambulatory thyroid surgery was first described in 1986[5] but was slow to gain widespread acceptance. Today, there is a growing body of evidence that same-day thyroid surgery is a reasonable, cost-effective option[6] in healthy patients as long as they are

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Table 1. *Current Procedural Terminology (CPT)* Codes Used to Identify Adult Ambulatory Thyroidectomy Procedures.

CPT Code	Procedure Description
Partial thyroidectomy	
60210	Partial thyroid lobectomy, unilateral; with or without isthmusectomy
60212	Partial thyroid lobectomy, unilateral; with contralateral subtotal lobectomy, including isthmusectomy
Total thyroidectomy	
60220	Total thyroid lobectomy, unilateral; with or without isthmusectomy
60225	Total thyroid lobectomy, unilateral; with contralateral subtotal lobectomy, including isthmusectomy
60240	Thyroidectomy, total or complete
60252	Thyroidectomy, total or subtotal for malignancy; with limited neck dissection
60254	Thyroidectomy, total or subtotal for malignancy; with radical neck dissection
60260	Thyroidectomy, removal of all remaining thyroid tissue following previous removal of a portion of thyroid
60270	Thyroidectomy, including substernal thyroid; sternal split or transthoracic approach
60271	Thyroidectomy, including substernal thyroid; cervical approach

responsible and motivated and there are reliable support systems in place.[7-9] Since 2006, positive outcomes in more than 4500 outpatient thyroid surgery patients have been reported in the peer-reviewed literature.[7] Supported by the low complication rate of modern thyroid surgery, ambulatory thyroidectomy has become commonplace at many institutions.

As outpatient surgical practices such as thyroidectomy gain popularity, state and national outcome data merit critical review. Due to potentially serious nature of complications, revisit rates after ambulatory thyroidectomy serve as valuable metrics on the appropriateness of patient selection and surgical practices. In addition to helping to improve patient health and safety, revisit and complication data are increasingly targeted as quality performance measures.[10,11]

Population-based resources like state ambulatory surgery databases (SASDs) are useful tools in understanding ambulatory surgery outcomes across hospitals and healthcare systems.[9,12] We have previously used these databases to characterize complications and revisits for several otolaryngologic procedures.[13] We sought to study the revisit and complication rates of ambulatory thyroidectomy using a large, multistate cohort.

Methods

Cases of ambulatory thyroidectomy were obtained from the SASDs of California, Florida, Iowa, and New York for calendar years 2010 and 2011. These databases are part of the Healthcare Cost and Utilization Project and are maintained by the Agency for Healthcare Research and Quality.[14] This study was exempt from review by our Partners Healthcare Committee on Clinical Investigations due to the retrospective design using a deidentified, public database without protected health information. The databases were queried for patients 18 years of age or older who underwent thyroidectomy procedures according to *Current Procedural Terminology (CPT)* codes (**Table 1**). Patients were grouped by the extent of surgery as partial thyroidectomy (PT) or total thyroidectomy (TT) according to *CPT* code. Patients undergoing completion thyroidectomy as the index procedure were grouped with TT patients for analyses. Standard demographic information and primary diagnosis were extracted for the index procedure encounter. All index cases were ambulatory surgery, without overnight stay or 23-hour observation.

Revisits occur when a patient who has had ambulatory thyroidectomy surgery returns to the ambulatory surgery center, inpatient, or emergency department setting within 30 days after the index procedure. Revisits were linked to the index procedure and identified in SASDs, state inpatient databases (SIDs), and state emergency department databases (SEDDs) from each of the 4 states. The timing (days after the index procedure) and diagnoses coded at the revisits were included for analysis. Revisits for radioactive iodine treatment and revisits specifically for performance of completion thyroidectomy were excluded from further analysis. Several revisit diagnosis categories were specifically examined: hypocalcemia, wound infection, wound hematoma/seroma/bleeding, acute pain, fever/nausea/vomiting/dehydration, and urinary retention/urinary tract infection.

Rates of revisit and key revisit diagnosis categories were compared between patients who underwent PT and TT procedures. Proportions were compared using Pearson exact chi-square tests (2-sided). Comparisons achieving a P value less than .05 were considered statistically significant.

Results

In total, 25,634 total cases of outpatient thyroidectomy were identified, including 6932 cases from California (27.0%), 11,112 from Florida (43.3%), 1049 from Iowa (4.1%), and 6541 from New York (25.5%). Patients were predominately female (78.7%). The mean age was 52.9 years (95% CI, 38.4-67.4). TT was performed in 44.2% of cases (n = 11,321), and a PT was performed in 55.8% (n = 14,313). Surgery was most frequently performed for goiter or thyroid cysts (39.5%) (**Table 2**). Benign/uncertain and malignant

Table 2. Diagnosis at Time of Adult Ambulatory Thyroidectomy Procedure.

Diagnosis	n	%
Goiter or cyst	10,121	39.5
Benign or uncertain neoplasm	6191	24.2
Malignant neoplasm	6164	24.0
Graves' disease, thyroiditis, or thyrotoxicosis without goiter	1552	6.1
Hyperparathyroidism or hypercalcemia	1045	4.1
Other	561	2.2

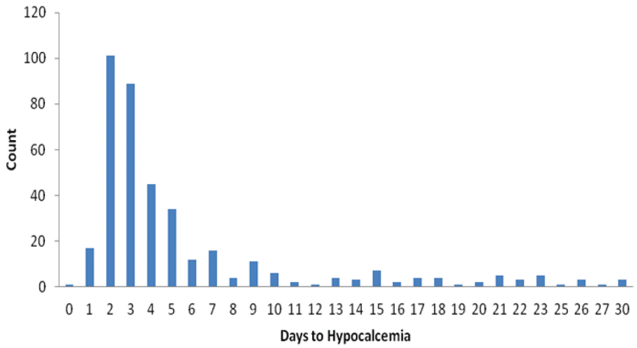

Figure 2. Histogram of days to hypocalcemia diagnosis at revisit following adult ambulatory thyroidectomy.

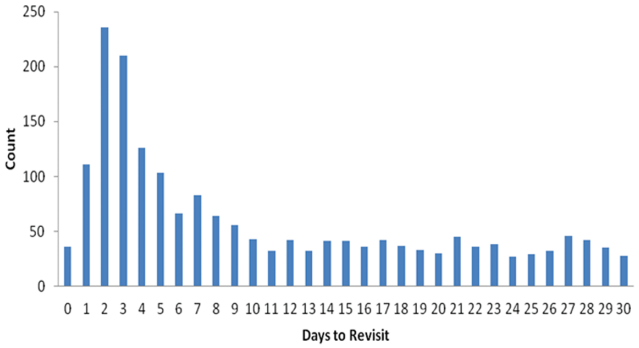

Figure 1. Histogram of days to first revisit after adult ambulatory thyroidectomy.

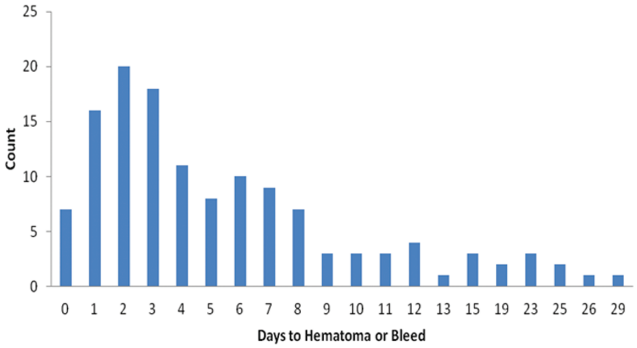

Figure 3. Histogram of days to hematoma or bleeding diagnosis at revisit following adult ambulatory thyroidectomy.

neoplasms each accounted for about a quarter of cases (24.2% and 24.0%, respectively).

Overall, we identified 1858 revisits (7.2% of index procedures; 95% CI, 6.9%-7.6%) within 30 days of the index procedure. The majority of revisits were to the emergency department (n = 1148, 61.8% of revisits, 4.5% overall), but 22.4% of revisits led to an inpatient stay (n = 416, 1.6% overall). The remaining patients had revisits to the ambulatory surgery site (n = 294, 15.8% of revisits, 1.1% overall). The median number of days to revisit was 7, with a range of 0 to 30 days. **Figure 1** presents the histogram distribution of days from index procedure for the first revisit. There was a peak of revisits around the second and third postoperative days followed by a relatively stable rate until postoperative day 30. One patient died during the index procedure encounter, and there were 2 mortalities at the revisit. Due to restrictions on confidentiality, we are unable to report specific factors associated with these deaths.

Examination of the predefined revisit diagnostic groups identified 387 patients with hypocalcemia (20.8% of revisits, 1.5% of overall thyroidectomy cases). **Figure 2** presents the histogram distribution of days from index procedure until the revisit diagnosis of hypocalcemia. The median time to hypocalcemia diagnosis was 3 days. A peak in hypocalcemia revisits occurred at postoperative days 2 and 3, and 81% of postoperative hypocalcemic complications manifested within the first week.

Wound hematoma, seroma, or bleeding accounted for the second most frequent revisit diagnosis group (7.1% of revisits, 0.5% overall). Only 16 patients had bleeding less than 24 hours after the index procedure (0.9% of revisits, 0.1% overall). The histogram of days to diagnosis of hematoma or bleed is provided in **Figure 3**. The median time to hematoma or bleeding diagnosis was 4 days. The figure shows a peak at postoperative day 2 and a gradual decline that appears to stabilize after day 8.

Table 3 presents the rates of several other key complication diagnoses at the time of revisit. Fever/nausea/vomiting/dehydration, urinary retention or urinary tract infection, acute pain, and wound infection each occurred in less than 0.5% of all ambulatory thyroidectomy cases. The most common primary diagnoses reported that were not categorized in the predefined complication groups were chest pain, syncope, headache, dizziness, fatigue/malaise, palpitations, constipation, anxiety, atrial fibrillation, lumbago, shortness of breath, and abdominal pain (n = 63, 22, 22, 19, 18, 18, 14, 12, 12, 11, 11, and 11, respectively). Vocal cord paralysis was diagnosed in 11 patients, and 2 patients were diagnosed with stridor (0.6% and 0.1% of revisits, respectively).

When data were analyzed by extent of surgery, there was a higher revisit rate in patients who underwent TT compared with those who had PT (8.8% vs 6.0% respectively, $P < .005$). **Table 4** presents the frequencies of revisit and

Table 3. Distributions of Event/Diagnosis on Revisit 1 after Adult Ambulatory Thyroidectomy Procedures.

		Among Revisits		Among All Cases	
Diagnosis/Event	n	%	95% CI	%	95% CI
Within 24 hours					
Any bleeding	16	0.9	0.5-1.4	0.06	0.04-0.1
Revisit 1					
Hypocalcemia	387	20.8	19.1-22.7	1.5	1.4-1.7
Wound hematoma, seroma, or bleeding	132	7.1	6.0-8.4	0.5	0.4-0.6
Fever/nausea/vomiting/dehydration	109	5.9	4.9-7.0	0.4	0.3-0.5
Urinary retention or urinary tract infection	109	5.9	4.9-7.0	0.4	0.3-0.5
Acute pain	86	4.6	3.8-5.7	0.3	0.3-0.4
Wound infection	58	3.1	2.4-4.0	0.2	0.2-0.3

Table 4. Events after Adult Ambulatory Thyroidectomy: Total versus Partial Thyroidectomy Procedures.

	Partial Thyroidectomy[a]		Total Thyroidectomy[b]		
Diagnosis/Event	n	%	n	%	Chi-Square[c]
Revisit	863	6.0	995	8.8	<0.0005
Hypocalcemia	77	0.5	310	2.7	<0.0005
Wound hematoma, seroma, or bleeding	60	0.4	72	0.6	0.016
Fever/nausea/vomiting/dehydration	47	0.3	62	0.5	0.007
Urinary retention or urinary tract infection	47	0.3	62	0.5	0.007
Acute pain	46	0.3	40	0.4	0.661
Wound infection	28	0.2	30	0.3	0.246
Bleeding <24 hours after surgery	8	0.1	8	0.1	0.638

[a]Partial thyroidectomy defined by *CPT* codes 60210 and 60212.
[b]Total thyroidectomy defined by *CPT* codes 60220, 60225, 60240, 60252, 60254, 50260, 60270, and 60261.
[c]Pearson exact chi-squared test (2-sided).

complications by surgical type. Hypocalcemia occurred in 2.7% of TT cases compared with 0.5% of PT ($P < .005$). Wound hematoma/seroma/bleeding, fever/nausea/vomiting/dehydration, and urinary retention or urinary tract infection occurred at low frequencies and achieved statistical significance for higher rates in total thyroidectomy procedures ($P = .016$, .007, and .007, respectively). There were no statistical differences in the rates of acute pain, wound infection, and acute bleeding between surgical groups.

Discussion

This cross-sectional, multistate analysis builds upon prior single-institution and single-state studies to reinforce, with population-based evidence, the consensus that outpatient thyroidectomy is a safe option in selected cases. The critical caveat is that not every patient undergoing thyroid surgery is a good candidate for ambulatory surgery. Prior work with the New York SASD[15] and University Health System Consortium (UHC)[16] found that patients undergoing inpatient versus ambulatory thyroid surgery had different demographic and clinical characteristics. Accordingly, patients in our dataset likely have different characteristics than patients selected to undergo inpatient or 23-hour observation thyroidectomy procedures because they were screened by their surgeon and deemed an acceptable risk for ambulatory surgery.

As emphasized by the American Thyroid Association consensus statement on outpatient thyroidectomy, ambulatory thyroidectomy can be safely performed in carefully selected situations.[7] The eligibility criteria that the authors of the statement proposed included preoperative education, absence of major comorbidities, team approach to care, available primary care support, social setting conducive to safe postoperative management, and proximity to skilled facility. Relative contraindications to outpatient thyroidectomy included clinical factors such as advanced renal or cardiopulmonary disease, anticoagulant/antiplatelet therapy, obstructive sleep apnea, factors that might prohibit communication and early presentation to a skilled facility, and high-risk procedures such as massive goiter, advanced cancer, and difficult thyroidectomy with Hashimoto's thyroiditis or Graves' disease.[7] Other tools for risk-stratification in thyroid surgery have also been reported.[17]

Of 25,634 ambulatory thyroidectomy cases in this study, most of the revisits within 30 days were to the emergency department (4.5% of all index cases). This is slightly lower than other published experience from a single institution that reported a 7.8% emergency department revisit rate following outpatient thyroidectomy.[18] Rehospitalization rates after outpatient thyroidectomy have been reported to range from 0% to 2.6%.[15,18-22] The readmission rate in our study was 1.6%. A baseline rate of emergency department revisits is likely unavoidable but may be minimized by strengthening communication and cooperative efforts between the surgeon, primary care provider, and patient.

Temporary hypocalcemia can occur in up to 25% of patients and usually manifests within 2 to 3 days after surgery.[7] The risk factors for postoperative hypocalcemia after both same-day and inpatient thyroidectomy have been reported to include bilateral resection, a large gland or tumor, central lymph node dissection, reoperation, and young age.[23,24] In our study, hypocalcemia accounted for 1 in 5 revisits and was seen in 1.5% of all patients who underwent ambulatory thyroidectomy. Our data showed that patients undergoing TT were at about 5 times the risk of developing hypocalcemia compared with patients undergoing PT.

It is well-established that even after hemi-thyroidectomy, there is a nonnegligible incidence of hypocalcemia. One group found that as many as 1.4% of patients undergoing hemi-thyroidectomy had permanent hypocalcemia compared with 3.5% of patients in their total thyroidectomy group.[25] Another group reported the risk of temporary hypocalcemia to be more than 10 times higher in cases of TT compared with hemi-thyroidectomy, with permanent hypocalcemia being about 3 times more likely.[26] Recent work from a single institution found a similar relationship, with TT posing a much larger risk for hypocalcemia (12.5%) than completion thyroidectomy procedures (1.5%).[27] The rates of hypocalcemia in this study should be interpreted with discretion due to the granularity of data provided in our dataset. Patients were discharged postoperatively and there are no data for parathyroid hormone or calcium levels at the time of surgery or for any of the revisits. Suspicious symptoms for hypocalcemia may have passed undetected because of the ambulatory nature of these procedures. Furthermore, data regarding therapeutic intervention (oral vs intravenous calcium replacement) and duration of hypocalcemia are not available in this dataset.

More than 95% of patients with hypocalcemia presented on postoperative day 2 or later, with most presenting in the first week. It is possible that patients who presented later would be clinically detected if they were inpatients or had 23-hour observation status. For this reason, one might expect revisit rates for hypocalcemia to be higher in ambulatory procedures than in cases with overnight observation. Additional studies to examine methods to better identify thyroidectomy patients who are most at risk for hypocalcemia might provide added insight into more effective patient disposition algorithms and could further reduce revisit rates.

Although uncommon, postoperative cervical hematomas that cause airway compression and venous congestion can require surgical decompression and evacuation and are associated with poor outcomes.[28-32] Rates of cervical hematoma following thyroidectomy have been reported to range from 0.3% to 4%,[20,28-30,32-40] with an overall incidence of about 1.2%.[7] Although the timing of presentation of hematoma varies by study, the risk is believed to be highest within the first 24 hours after surgery. We found the overall rate of wound hematoma, seroma, or bleeding complications to be 0.5%, and the rate of bleeding within 24 hours was 0.06%. These figures suggest an acceptably low risk profile for carefully selected outpatient thyroid surgery cases. Notably, complications presented across a broad range of postoperative days. Data from a high-volume thyroidectomy center demonstrated that even in patients carefully selected for ambulatory thyroid surgery, nearly 2 out of 5 may require overnight observation or admission.[41]

Compared with PT procedures, undertaking TT in the ambulatory setting appears to increase the risk for revisit and several key complications, including hypocalcemia. These findings are not surprising, as TT includes bilateral paratracheal dissection that results in a larger surgical bed and puts bilateral parathyroid glands at risk. With more extensive dissection also comes added operative and anesthetic time, which may contribute to the higher rates of indwelling catheter use and associated urinary complications and of postoperative nausea and dehydration issues. Notably, based on surgical procedure coding used in the dataset, the TT group contains some patients who also underwent neck dissection. The inclusion of thyroidectomy with neck dissection may inflate the differences in complication rates between the 2 surgical groups, and conclusions based solely on these statistics are cautioned. Further studies with more statistical power are needed to identify predictors of complications in the current thyroidectomy practice environment.

Additional limitations of this study stem from the nature of population-wide databases such as SASD, SID, and SEDD. This study relies upon the accuracy of the information contained in these datasets. Furthermore, although these datasets provide a large sample size, they do so at the sacrifice of medical, clinical, and surgical detail. For example, use of aspirin or blood-thinning medications and surgical details about thyroid gland size, hemostatic agent and drain usage, and surgical blood loss are unknown. Although patients with serious complications would be expected to present to emergency departments or to have inpatient stays, and would be available for analysis, outpatient visits are not captured, so minor complication and revisit rates are likely underestimated. Finally, this study cannot comment on the circumstances related to the 3 mortalities because of confidentiality restrictions.

Conclusion

In carefully selected patients, ambulatory thyroid surgery has an acceptable safety profile with regard to 30-day revisits and

complications. Revisit rates are higher among patients who undergo total thyroidectomy, and these patients appear to have a less favorable complication profile. Hypocalcemia is the most common reason for revisit and warrants quality improvement measures. Although wound hematoma, seroma, bleeding, and other complications are infrequent, safeguards should also be implemented against them. Hypocalcemia and hematoma/bleeding occurred with relatively high frequencies as late as a week after surgery. The decision to embark upon ambulatory thyroid surgery should be carefully considered on a case-by-case basis while accounting for medical, surgical, social, and system-based factors.

Author Contributions

Ryan K. Orosco, substantial contributions to the conception or design of the work, interpretation of data, drafting the work and revising it critically, final approval of the version to be published, agreement to be accountable for all aspects of the work; **Harrison W. Lin**, interpretation of data, drafting the work and revising it critically, final approval of the version to be published, agreement to be accountable for all aspects of the work; **Neil Bhattacharyya**, substantial contributions to the conception or design of the work, data acquisition and analysis, critical revisions of work, final approval of the version to be published, agreement to be accountable for all aspects of the work.

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Corrigendum

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In Table 4 of the above-referenced article, the number of patients who experienced bleeding <24 hours after partial and total thyroidectomy was incorrectly stated as n = 8 for both procedures; in fact, n ≤ 10 for both procedures. The corrected Table 4 is printed below.

Table 4. Events after Adult Ambulatory Thyroidectomy: Total versus Partial Thyroidectomy Procedures.

	Partial Thyroidectomy[a]		Total Thyroidectomy[b]		
Diagnosis/Event	n	%	n	%	Chi-Square[c]
Revisit	863	6.0	995	8.8	<0.0005
Hypocalcemia	77	0.5	310	2.7	<0.0005
Wound hematoma, seroma, or bleeding	60	0.4	72	0.6	0.016
Fever/nausea/vomiting/dehydration	47	0.3	62	0.5	0.007
Urinary retention or urinary tract infection	47	0.3	62	0.5	0.007
Acute pain	46	0.3	40	0.4	0.661
Wound infection	28	0.2	30	0.3	0.246
Bleeding <24 hours after surgery	≤10	0.1	≤10	0.1	0.638

[a]Partial thyroidectomy defined by *CPT* codes 60210 and 60212.
[b]Total thyroidectomy defined by *CPT* codes 60220, 60225, 60240, 60252, 60254, 50260, 60270, and 60261.
[c]Pearson exact chi-squared test (2-sided).