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Out of Pocket Costs for Patients Undergoing Thyroid Surgery

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Abstract

Objective: To determine out of pocket costs (OOPC) in patients undergoing thyroidectomy for benign and malignant conditions in a commercially insured US population.

Summary Background Data: Little is known about OOPC for thyroid surgery in the United States.

Methods: Retrospective cohort study using claims of patients undergoing thyroidectomy from the IBM Watson Marketscan database from 2008 to 2017. Out of pocket costs accrued from 90 days prior to surgery to 360 days after thyroid surgery were quantified. Costs were divided into expenditures for inpatient care, outpatient care and outpatient drug costs and over three time periods: from 90 days preoperatively to 30 days post operatively, from 30 days post operatively to 90 days postoperatively, and from 90 days to 1 year after surgery.

Results: A total of 45,971 commercially insured patients aged 18-95 who underwent thyroidectomy were identified after excluding patients who changed coverage and patients on capitated plans. The median OOPC per patient in the study period of 90 days prior to surgery to 360 days after surgery was $2,434 (IQR $1,273 - $4,226), the median insurance reimbursement was $15,520 (IQR $7,653 - $29,149). Patients undergoing thyroidectomy for malignant conditions had a median OOPC of $3,019 (IQR $1,596 to $5,021) compared to $2,271 (IQR $1,201 to 3,954) for benign conditions (P<0.0001).

Patients with PPO coverage had a median OOPC of $2,624 (IQR $1,458 to $4,358) compared to HMO patients with a median OOPC of $1,529 (IQR $739 to 3,058), and high deductible health plans with a median OOPC of $4,265 (IQR $2,788 to $6,210) (P<0.0001).

Conclusion: Despite commercial insurance coverage, patients face substantial out of pocket costs in the surgical management of thyroid disease in the United States.

Introduction

Healthcare costs in the US continue to increase at an alarming rate. Bankruptcies related to medical conditions are one of the leading causes of financial catastrophe in the United States. [1] Although there have been some limited studies about the cost of surgical management from the payor and provider perspective, little is known about the out of pocket burden of patients undergoing thyroidectomy in the US. [2 3 4 5] We hypothesize that spending on thyroidectomy parallels overall healthcare spending in the United States which continues to grow, with increasing cost shifting from insurers and employers to patients and employees.

In the subset of patients undergoing thyroidectomy for malignant conditions, recent work has sought to evaluate financial burden and its effects on quality of life. One study evaluated financial burden using a new financial distress questionnaire, coupled with the Patient

Reported Outcomes Measurement Information System 29 item (PROMIS -29) tool by surveying members of ThyCa, a patient advocacy and survivorship group. They found that 43% of thyroid cancer survivors reported financial difficulties and these were associated with anxiety and depression. Three percent of these patients had filed for bankruptcy compared to 0.6% of the overall US population. [3]

The objective of our study was to quantify out of pocket spending for commercially insured patients undergoing thyroidectomy. Specifically, we examined variation in costs associated with insurance type, indication for surgery, and trends over time.

Methods

This was a retrospective cohort study performed using IBM® MarketScan® Research Databases. [6] The MarketScan claims databases include nearly 240 million unique insured patients dating back to 1995. The databases capture information on patient level clinical services and expenditures across inpatient and outpatient settings and prescription drug spending. The annual commercial insurance medical databases include health data from approximately 350 payers in all 50 states, and captures claims from around 50 million patients prior to 2015, and around 30 million patients annually since 2015. This study uses de-identified aggregated data, and was determined to be non-human subjects research by the Columbia University Institutional Review Board.

Study population

Cohort selection was performed by identifying patients with Current Procedural Terminology (CPT) and International Classification of Disease, version 9 and 10 (ICD9/10) codes for thyroidectomy between 2008 and 2017. Patients with a concurrent malignancy other than thyroid cancer were excluded. Patients without continuous insurance and drug coverage from 6 months prior to surgery to 1 year after were also excluded. Finally, patients who were under 18 years of age, or covered with a fully capitated plan were excluded. The remaining cohort of 50,744 patients were sorted by primary insurance type for a final analytic cohort of 45,971 commercially insured patients after excluding Medicaid patients. (Figure 1)

Variables

We extracted patient demographic variables including age at surgery (<40, 40-49, 50-59, 60-64, ≥ 65), gender (male, female) and Elixhauser comorbidity index (0, 1, 2, ≥ 2), and procedural variables such as year of surgery, indication for surgery (malignant vs benign condition), extent of surgery (substernal, complete, or partial thyroidectomy), and neck dissection (yes or no). The Elixhauser comorbidity index was calculated using ICD-9/ICD-10 codes using a validated coding algorithm. [7]

Patient's health insurance sub-types included comprehensive, exclusive provider organization (EPO), health maintenance organization (HMO), point of service (POS), preferred provider organization (PPO), consumer-directed healthcare plan (CDHP), and high deductible health

plan (HDHP). A HDHP shifts risk to the patient with a deductible of at least $1300 for an individual and $2600 for a family. Generally, the tradeoff is a lower upfront premium. CDHPs combine a HDHP with a tax advantaged health care spending account. Patients' geographic information included metropolitan statistical area (MSA, no, yes, unknown), and region (northeast, north central, south, west, and unknown). Metropolitan statistical areas are concordant with the 2013 US Census Bureau definition of an area containing at least one urban area with a population of 50,000 or more inhabitants. This variable is used as a rough marker of urban vs. rural setting.[6]

Cost Analysis

Medical expenditures were defined as all reimbursed costs. This included all reimbursed costs from the primary insurance providers (insurance), out of pocket costs incurred by the patient, and benefits received from other insurance carriers. Out-of-pocket (OOP) payment was calculated as the sum of deductibles, copayments, and coinsurance. Coordination of benefits and other savings (COB) was estimated as third party payment from a source other than the patient or the submitting plan, such as the Medicare payments for Medicare beneficiaries with a commercial plan as their primary insurance. Insurance liability was the payment received by the provider from the primary insurer excluding OOP and COB. [8]

Total costs were derived from the summation of claims from three time periods. The peri-operative period was defined as 90 days prior to the date of the surgery to 30 days after the index surgery. The adjuvant period was defined as 30 days post-operatively to 90 days post operatively. The monitoring/surveillance period was defined from 91 days to 1 year after surgery. Out of pocket costs were estimated as the sum of the co-insurance, co-pay, and deductible amounts for the three time periods specified. Costs were further characterized as inpatient, outpatient, and prescription drug costs. Both facility fees and professional fees were included. All costs were adjusted for inflation and reported in 2016 dollars. To mitigate the effect of outliers, all cost data were winsorized. Patients with costs <3rd percentile were set at the 3rd percentile, and patients with costs 97th percentile set at the 97th percentile. [9 10]

Statistical Analysis

Demographic and clinical characteristics are reported descriptively as counts and percentages. The total, OOP, and insurance expenditures are reported as medians with interquartile ranges among the patients who had inpatient, outpatient services and outpatient drugs in each period. The median expenditures were compared by year of diagnosis, malignant disease status, health insurance type, and region using Kruskal-Wallis tests. A multivariable quantile regression model with median regression and resampling method for 95% confidence interval was developed to evaluate the difference of median OOP cost across patient demographic and clinical factor. [11] All analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, North Carolina). All tests were two-sided. A P-value of <0.05 was considered statistically significant.

Results

We identified 45,971 patients who underwent thyroidectomy. Seventy five percent of patients underwent thyroidectomy for benign conditions, 24% for malignancy and 1% were unknown. Eleven percent of patients were 65 years of age or older. Eighty four percent of patients were female. Sixty one percent of patients had a preferred provider organization (PPO plan). Fifty nine percent of patients had a thyroid lobectomy, 37 percent had a total thyroidectomy and 4 percent had a substernal goiter resection. (Supplemental Table 1, http://links.lww.com/SLA/D264)

Nearly all patients had outpatient and prescription drug claims during the study period. Twenty four percent of patients had inpatient claims during the study period. The median total cost of claims for all services from 90 days prior to surgery to 360 days after surgery was $20,050 (IQR $11,575 to $35,464). The median OOPC was $2,434 (IQR $1,273 to $4,226) or, 12.1% of total costs. The total costs and median OOPC were $12,349 (IQR $6,130 to $21,011) and $1,213 (IQR $487 to $2,516) during the perioperative period, $1,984 (IQR $732 to $6,068) and $306 (IQR $123 to $681) during the adjuvant period and $2,048 (IQR $816 to $5,291) and $402 (IQR $173 to $857) during the surveillance period. (Table 1)

Total OOPC increased by 51.7% during the study period from a median of $1,953 in 2008 to $2,964 in 2016. Out of pocket costs as a percentage of total costs also increased from 11.4% to 12.8% over the course of the study (Figure 2). Total OOPC costs increases were mostly driven by outpatient OOPC increases from $1,164 to $2,433 during the study period.

A comparison of indications for surgery showed that patients undergoing thyroidectomy for malignant conditions had a greater median total cost of $29,171 (IQR 19,200 to $46,092) and OOPC of $3,019 (IQR $1,596 to $5,021) compared to total cost $17,335 (IQR $9,981 to $30,814) and OOPC $2,271 (IQR $1,201 to 3,954) for patients with benign conditions ($P<0.0001$)

Differences were also noted when the analysis was stratified for type of insurance coverage. Patients with a PPO had a median OOPC of $2,624 (IQR $1,458 to $4,358) compared to HMO patients with a median OOPC of $1,529 (IQR $739 to 3,058), and high deductible health plans (HDHP) had the highest median OOPC of $4,265 (IQR $2,788 to $6,210) ($P<0.0001$).

Similarly, geographical differences in cost were also noted. The median of total medical expenditures was highest in the Southern region $20,226 (IQR $12,126 to $39,403) and lowest in the Northeast region $18,711 (IQR $10,452 to $32,460). The out-of-pocket expenditures followed a similar pattern with median OOPC of $2,977 (IQR $1,676 to $5016) in the South and $1,567 (IQR 793 to $2976) in the Northeast.

Table 2 summarizes the multivariable quantile regression analysis. Malignant disease, age 40-59, HDHP, a later year of surgery, and a higher Elixhuaser comorbidity score were all associated with higher out of pocket costs. After adjusting for covariates, compared to patients with benign disease, patients with malignant disease paid $528 more. Compared to patients with PPO plans, patients with CDHP paid $1,034 more and patients with HDHP paid $1,553 more. Patients undergoing surgery in 2016 paid $420 more than patients undergoing surgery in 2008 (costs were adjusted for inflation). Surveillance costs for patients after surgery were similar regardless of the extent of surgery. (Table 3)

Discussion

Using a large national claims database, we comprehensively evaluated the financial burden faced by patients undergoing surgery for management of thyroid disease. We determined that the overall total cost for this cohort has increased 35% from 2008-2016, with the largest increase in costs in outpatient care: 62%. We also demonstrate that the median OOPC for patients increased during this time frame with the median OOPC from $1,953 to $2,964 (an increase of 51.7%) during the study period. The bulk of the OOPC was accrued predictably around the peri-operative period: $1,213. Interestingly, outpatient medication costs have decreased. Patients undergoing treatment for malignant conditions have higher OOPC than patients undergoing surgery for benign conditions. Middle aged patients face the highest OOPC, and OOPC became a greater percentage of overall costs over the study period. Additionally, patients with HDHP plans and those who lived in the South had overall higher OOPC.

The trends demonstrated in this study are consistent with the changes that have occurred in the surgical management of thyroid diseases during this time. In the past decade, surgical advances have facilitated the movement of thyroid operations from the inpatient setting to the outpatient setting, with most patients staying less than 23 hours in the hospital, regardless of benign or malignant disease. However, malignant disease can be associated with a more extensive operation, especially in the setting of lymph node metastases, and potentially a greater risk for surgical complications that may contribute to increased costs during the perioperative period, as well as additional treatment such as radioactive iodine that would increase costs in the adjuvant period. Additionally, in response to heightened awareness of the opioid epidemic and over prescription of perioperative opioids for low risk operations such as thyroidectomy and neck dissections, many surgeons have decreased or stopped prescribing perioperative opioids routinely for these operations.[12,13] There has also been increasing availability of $4 generic thyroid hormone replacement prescriptions at many national pharmacies. [14] This may contribute to some of the decrease in costs for outpatient medications seen the latter years of this study. Finally, thyroid diseases disproportionately affect young, working adults who otherwise have few comorbidities. Many in this patient cohort may opt for the lower upfront premiums of a HDHP plan, weighing those benefits against a perceived low risk for medical coverage.

Using the same database and a similar population of commercially insured patients, those with ovarian cancer have a median out of pocket cost of $2988 in the year after surgery, which represents about 3% of total expenditures. [8] Patients with lung cancer, colorectal cancer, and breast cancer have cumulative average out of pocket costs of $4,299, $3273, and $3,588 respectively in the first 17 months after diagnosis. [15] Though total spending for other cancers may exceed thyroidectomy, it appears that out of pocket spending for most cancer diagnoses in the first year or so is relatively fixed. This may be a function of out of pocket maximums/stop-loss coverage which are a critical feature of nearly all commercial insurance plans.

One of the most surprising facts that has emerged in the last decade, is that thyroid cancer is one of the leading cancer diagnoses associated with bankruptcy, second only to lung cancer. [16,17] Initially it was hypothesized that this financial toxicity afflicted younger patients who were less insured, but subsequent studies have shown that financial toxicity is shared by all thyroid patients, those with malignant disease, and those with benign disease, and in fact, this cohort has a relatively higher percentage of commercially insured patients. [18] The results of our study provide some explanation for this worrisome finding. Though modern thyroidectomy is considered a safe, straightforward procedure, thyroid conditions requiring thyroidectomy afflict patients in their prime working years. Commercially insured patients with employer sponsored plans are typically regarded as patients with "good insurance." Despite this, our study shows that patients undergoing thyroidectomy face substantial and increasing OOPC. This may be a result of thyroidectomy slowly moving out of the inpatient setting to the outpatient setting over the last decade. Though this is a cost-saving strategy for hospital systems, it suggests some of that financial burden is placed on the patient instead. Unfortunately, most Americans are unprepared to carry this extra financial burden. The median weekly earnings for a fully employed American is $908. [19] The Federal Reserve estimates 40% of American households are ill-equipped to pay an unexpected $400 bill. [20] This study demonstrates that the median OOPC of $2,434 would likely constitute a substantial, and unexpected, financial burden for many patients. A recent study presented at the Academic Surgical Congress suggests that the psychological financial burden of thyroid cancer survivors was exacerbated by a lack of counseling or preparation for the out of pocket spending that these patients ultimately experienced. [21]

There has been increased focus on the rising incidence of thyroid cancer in the United States and worldwide, as well as possible over-treatment of low risk thyroid cancer. [22] The findings from this study suggest that over-treatment has significant implications for financial toxicity as well. [3]

As much as the financial burden of thyroidectomy is surprising for treatment of malignant disease, it is perhaps even more surprising, that this burden (though relatively less) is shared by those patients who undergo thyroidectomy for treatment of benign disease. Although the advent of molecular profiling for indeterminate nodules has decreased the number of patients referred for thyroidectomy, benign disease still accounts for ~75% of patients in this study. [23] This large proportion of patients with benign disease may be explained by the fact that

thyroidectomy remains the gold standard treatment for growing, symptomatic goiters and is the more cost-effective definitive treatment for Graves' Disease.[24-26]Though the overall cost of thyroidectomy is less for benign disease, a median OOPC $2,271 would constitute a financial burden for many patients, perhaps even more unexpected in the absence of a cancer diagnosis.

One emerging strategy to deal with unexpected medical costs has been crowdfunding. In one study, the average amount raised for patients undergoing thyroid surgery was $2514 with malignant conditions raising more money than benign conditions. [27] This is concordant with our study in that patients undergoing surgery for malignant conditions have higher OOPC. This is perhaps intuitive as patients undergoing surgery for benign conditions will need less extensive surgery, less surveillance imaging, and have no need for adjuvant treatment. For example, Medicare costs for radioactive iodine treatment ranged from $5430 and $9106 in 2014 and rates for commercially insured patients are likely much higher. [28]

Average premium costs for large employers have increased 65% since 2008. Employee contributions to premium costs have risen from 16% to 18% during the same time period. This creates a double bind. Not only are patients paying more upfront for insurance premiums but they also face higher OOPC as demonstrated by the cost shifting in this study. [29]

Limitations:

This study has several limitations. First, rather than adjudicating individual claims, this study summed all costs from claims surrounding the anchor date of surgical claims. Though we excluded patients who had another cancer diagnosis, the vast majority of patients in this study had other co-morbid conditions. This may over-estimate the OOPC attributable to thyroid related conditions. However, this is a pragmatic approach as thyroid conditions do not exist in a vacuum and these costs are representative of total out of pocket medical spending a patient requiring thyroidectomy would face. Second, this analysis is limited to commercially insured patients and does not reflect the experience of patients with Medicaid, military insurance or Medicare only patients. Third, this analysis underestimates total financial burden on patients as it does not include costs incurred for lost productivity, job loss, travel expense, over the counter medication or the cost of premiums. Lastly, the IBM Watson MarketScan databases do not include race as a variable in their claims data. This is a missed opportunity to explore disparities in access to thyroidectomy, total spending and out of pocket spending.

Conclusion:

Patients undergoing thyroidectomy face substantial and increasing out of pocket costs. These estimates provide context for shared decision making in the management of thyroid conditions where non-operative management may be an option or where surgical treatment should be delayed until the patient can enroll in a more favorable insurance plan. This study demonstrates that even for a relatively low risk, mostly outpatient procedure, patients face potentially daunting and crippling out of pocket costs.

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Figure1. Cohort selection flow chart

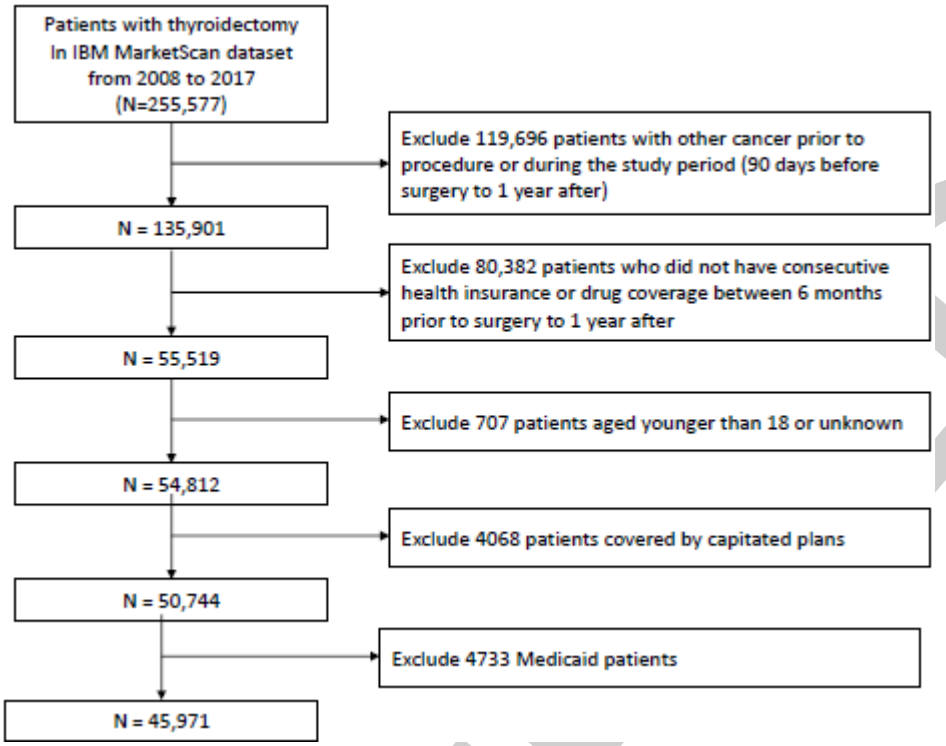

Figure 2. Median OOPC medical expenditures in U.S. dollars from 90 days prior to 1-year postoperative stratified by year. Medians of OOPC were significantly different by year of diagnosis (P<0.0001)

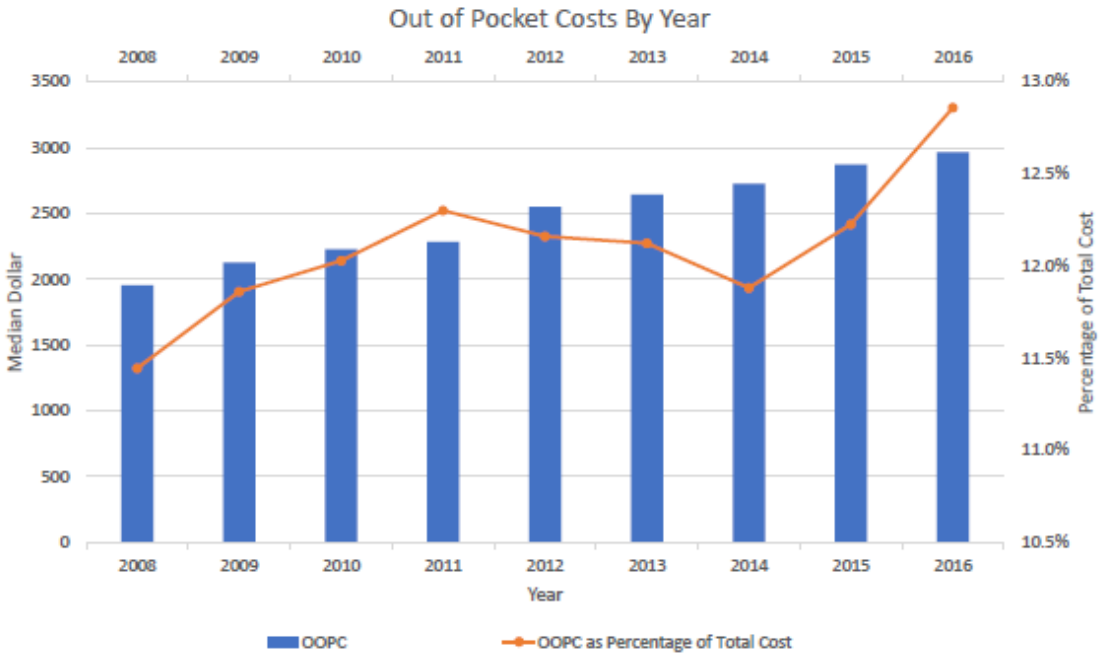

Table 1. Medical expenditure during from 90 days prior to surgery to within 360 days after surgery for commercially insured patients with thyroidectomy

	No. of patients	Total $	OOP $	Insurance $	COB $
	N (%)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)
Overall study period					
Total cost	4,5971 (100)	20,050 (11,575 – 35,464)	2,434 (1,273 – 4,226)	15,520 (7,653 – 29,149)	0 (0 - 0)
Inpatient services	11,207 (24.4)	11,834 (7,628 – 19,984)	485 (10 – 1,405)	9,571 (5,004 – 16,723)	0 (0 - 0)
Outpatient services	45,942 (99.9)	14,683 (7,564 – 26,492)	1,681 (759 – 3,281)	11,281 (4,527 – 22,041)	0 (0 - 0)
Outpatient medications	44,356 (96.5)	958 (312 – 2,944)	311 (126 - 661)	590 (122 – 2,197)	0 (0 - 0)
Stratify by study period					
Perioperative period					
Total cost	45,971 (100)	12,349 (6,130 – 21,011)	1,213 (487 – 2,516)	9,641 (3,597 – 17,748)	0 (0 - 0)
Inpatient services	8,308 (18.1)	10,870 (7,371 – 16,796)	468 (11 – 1,347)	8,991 (5,018 – 14,464)	0 (0 - 0)
Outpatient services	45,911 (99.9)	8,694 (3,763 – 17,193)	884 (298 – 2,115)	6,560 (2,252 – 14,409)	0 (0 - 0)
Outpatient medications	42,604 (92.7)	249 (71 - 781)	80 (30 - 180)	147 (21 - 581)	0 (0 - 0)
Adjuvant period					
Total cost	45,061 (98.0)	1,984 (732 – 6,068)	306 (123 - 681)	1,365 (452 – 4,527)	0 (0 - 0)
Inpatient services	2,308 (5.0)	10,896 (6,472 – 20,245)	228 (0 - 933)	8,156 (3,607 – 16,593)	0 (0 - 0)
Outpatient services	43,723 (95.1)	1,214 (462 – 4,095)	145 (46 - 418)	783 (259 – 2,999)	0 (0 - 0)
Outpatient	41,863	321 (100 – 1,015)	105 (39 - 230)	191 (31 - 757)	0 (0 - 0)

medications	(91.1)				
Surveillance period					
Total cost	45,055 (98.0)	2,048 (816 – 5,291)	402 (173 - 857)	1341 (454 – 3,825)	0 (0 - 0)
Inpatient services	1,921 (4.2)	13,825 (7,812 – 26,379)	314 (0 – 1,285)	9,683 (2,825 – 21,196)	0 (0 - 0)
Outpatient services	43,605 (94.9)	1,273 (521 – 3,511)	212 (75 - 548)	769 (258 – 2,420)	0 (0 - 0)
Outpatient medications	42,163 (91.7)	373 (116 – 1,215)	127 (48 - 278)	212 (33 - 896)	0 (0 - 0)

US. Dollars. All costs were adjusted for inflation and reported in 2016 dollar,,s

Over all study period: from 90 days prior to surgery to within 360 days

Perioperative period: from 90 days prior to surgery to within 30 days after surgery

Adjuvant period: from 31 to 180 days after surgery

Surveillance period: from 181 to 360 days after surgery

Table 2. Multivariable median regression model for out-of-pocket cost

	Median (IQR)	Adjusted estimate for extra median OOP cost
Surgery type		
Substernal thyroidectomy	2,592 (1,380-4,338)	Referent
Complete thyroidectomy	2,893 (1,596-4,805)	111 (7,215)*
Partial thyroidectomy	2,150 (1,122-3,832)	-310 (-405,-214)**
Malignant disease		
No	2,271 (1,201-3,954)	Referent
Yes	3,019 (1,596-5,021)	528 (475,581)**
Unknown	1,854 (974-3,330)	-78 (-281,125)
Surgery year		
2008	1,953 (1,009-3,317)	Referent
2009	2,126 (1,083-3,593)	98 (19,178)*
2010	2,229 (1,199-3,801)	244 (162,326)**
2011	2,285 (1,242-3,889)	266 (183,349)**
2012	2,549 (1,351-4,385)	429 (342,516)**
2013	2,643 (1,369-4,608)	427 (331,524)**
2014	2,724 (1,416-5,000)	413 (315,512)**
2015	2,871 (1,472-5,118)	443 (349,537)**
2016	2,964 (1,524-5,142)	420 (314,526)**
Age at surgery		
<40	2,577 (1,296-4,458)	Referent
40-49	2,647 (1,369-4,459)	35 (-25,96)
50-59	2,643 (1,402-4,484)	101 (44,157)*
60-64	2,501 (1,391-4,296)	20 (-53,93)
≥65	1,497 (914-2,322)	-693 (-756,-629)**
Gender		
Male	2,390 (1,245-4,244)	Referent
Female	2,441 (1,280-4,223)	17 (-37,72)

Health insurance type		
Comprehensive	1,571 (973-2,419)	-519 (-585,-454)**
EPO	1,606 (834-2,680)	-854 (-1007,-702)**
HMO	1,529 (738-3,058)	-930 (-991,-868)**
POS	2,059 (1,021-3,750)	-549 (-621,-477)**
PPO	2,624 (1,458-4,358)	Referent
Unknown	1,484 (716-2,980)	-632 (-713,-551)**
CDHP	3,877 (2,357-6,366)	1,034 (910,1158)**
HDHP	4,265 (2,788-6,210)	1,553 (1383,1723)**
Metropolitan Statistical Area (MSA)		
Non-MSA	2,724 (1,496-4,561)	Referent
MSA	2,373 (1,234-4,162)	-159 (-210,-107)**
Unknown	2,434 (1,397-3,754)	1,473 (1110,1837)**
Region		
Northeast	1,567 (793-2,976)	Referent
North Central	2,179 (1,222-3,682)	537 (485,588)**
South	2,977 (1,676-5,016)	1,115 (1060,1170)**
West	2,336 (1,116-4,074)	514 (444,584)**
Unknown	2,219 (1,239-3,604)	-868 (-1203,-534)**
Elixhauser comorbidity score		
0	2,282 (1,146-4,033)	Referent
1	2,533 (1,381-4,283)	300 (253,347)**
2	2,808 (1,579-4,801)	561 (488,633)**
≥2	3,057 (1,764-5,225)	939 (854,1023)**
Neck dissection		
No	2,428 (1,270-4,219)	Referent
Yes	3,219 (1,901-5,418)	27 (-186,239)

*P<0.05, **P<0.0001

Table 3. Medical expenditure during surveillance period by surgery type

	No. of patients	Total $	OOP $	Insurance $	COB $
	N (%)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)
Substernal thyroidectomy (N = 2,036)					
Total cost	2,009 (98.7)	2,019 (769 - 5,246)	413 (171 - 845)	1,235 (380 – 3,607)	0 (0 - 0)
Inpatient services	95 (4.7)	19,322 (7,804 – 34,687)	239 (0 – 1,051)	105,81 (1,710 – 26,764)	0 (0 - 4576)
Outpatient services	1,927 (94.6)	1,216 (519 – 3,305)	208 (76 - 523)	659 (212 – 2,148)	0 (0 - 0)
Outpatient medications	1,910 (93.8)	369 (121 – 1,253)	137 (53 - 291)	201 (33 - 904)	0 (0 - 0)
Complete thyroidectomy (N = 16,860)					
Total cost	16,774 (99.5)	2,085 (872 – 5,322)	426 (197 - 887)	1,389 (490 – 3,962)	0 (0 - 0)
Inpatient services	629 (3.7)	15,348 (8,154 – 26,712)	320 (0 – 1,395)	11,081 (4,459 – 23,658)	0 (0 - 0)
Outpatient services	16,329 (96.9)	1,312 (549 – 3,584)	217 (81 - 559)	833 (292 – 2,556)	0 (0 - 0)
Outpatient medications	16,170 (95.9)	373 (133 – 1,159)	142 (60 - 291)	202 (36 - 841)	0 (0 - 0)
Partial thyroidectomy (N =27,075)					
Total cost	26,272 (97)	2,025 (780 – 5,273)	384 (158 - 838)	1,319 (438 – 3,759)	0 (0 - 0)
Inpatient services	1,197 (4.4)	12,972 (7,647 – 25,516)	310 (0 – 1,269)	9,097 (2,289 – 19,314)	0 (0 - 0)
Outpatient services	25,349 (93.6)	1,251 (504 – 3,484)	209 (70 - 542)	736 (242 – 2,349)	0 (0 - 0)
Outpatient medications	24,083 (88.9)	373 (103 – 1,246)	116 (40 - 269)	220 (30 - 933)	0 (0 - 0)

US. Dollars. All costs were adjusted for inflation and reported in 2016 dollar

Surveillance period: from 181 to 360 days after surgery