Published in final edited form as:

Surgery. 2020 January ; 167(1): 102–109. doi:10.1016/j.surg.2019.04.068.

Energy level and fatigue after surgery for thyroid cancer: A population-based study of patient-reported outcomes

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Abstract

Introduction: The relationship between treatment for differentiated thyroid cancer (DTC) and patient-report of decreased energy and fatigue remains unclear.

Methods: Patients diagnosed with DTC from 2014–2015 included in the Georgia and Los Angeles cancer registries of the Surveillance, Epidemiology, and End Results (SEER) program were surveyed 2–4 years after diagnosis, and responses were linked to data from the SEER registry. Multivariable logistic regression analysis determined characteristics associated with report of worse energy level at 2–4 years compared to before treatment and current fatigue severity using adjusted odds ratios (OR) with 95% confidence intervals (CI).

Results: Of the 2584 respondents, 988 (38.2%) reported much worse or somewhat worse energy and 1310 (50.7%) reported moderate to very severe fatigue. The majority of patients were treated with total thyroidectomy with or without nodal dissection (total thyroidectomy with lymph node removal (49.3%) or total thyroidectomy (38.3%)). Only 12.3% had a thyroid lobectomy. Just over half were treated with radioactive iodine therapy (56.7%) and thyroid hormone suppression (50.2%) after the thyroidectomy. Younger age, history of depression, thyroid hormone suppression (OR 1.48 [CI 1.21–1.82]), and receipt of radioiodine (OR 1.31 [CI 1.10–1.56]) correlated with

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Society paper: This study will be presented the 40th Annual Meeting of the American Association of Endocrine Surgeons in Los Angeles, California from April 7–9, 2019 as an oral podium presentation.

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COI/Disclosures:

All authors have no financial, direct or indirect personal relationships that could potentially and inappropriately influence (bias) the work and conclusions of this study.

worse energy. Similarly, correlates of substantial fatigue included younger age, more comorbidities, history of depression, and thyroid hormone suppression (OR 1.63 [CI 1.34–1.99]). The presence of a low serum calcium levels for >3 months after thyroidectomy was associated with worse energy (OR 1.26 [CI 1.02–1.54]) and substantial fatigue (OR 1.49 [CI 1.21–1.84]).

Conclusion: In addition to accepted risk factors such as depression and comorbidities, receiving radioactive iodine and reporting low calcium after thyroidectomy for DTC were associated with reports of worse energy compared to preoperative levels; thyroid hormone suppression was associated with reports of both worse energy and substantial post-treatment fatigue.

Introduction:

The incidence of newly diagnosed thyroid cancer has increased 3% annually over the past 30 years.^{1–3} Most patients with differentiated thyroid cancer (DTC) will be treated with thyroidectomy, and selected patients will be treated with radioactive iodine ablation (RIA) therapy and thyroid hormone suppression. Studies using a variety of quality of life questionnaires report greater rates of fatigue in patients treated for thyroid cancer (28–62%) compared to patients in a general oncology cohort (19–38%).^{4–9} Additionally, survivors of thyroid cancer report greater levels of fatigue compared to healthy controls in multiple studies.^{10–15}

It is clear that post-treatment fatigue is one of the most frequent complaints of thyroid cancer survivors; however, prior studies have not previously analyzed the effect of the extent of the thyroidectomy (total thyroidectomy versus lobectomy), its complications (hypoparathyroidism and laryngeal nerve dysfunction), or adjuvant treatments (thyroid hormone suppression and/or) on the rates of patient-reported fatigue or decreased energy levels in this patient population. The aim of this study was to determine the incidence of post-thyroidectomy fatigue and decreased energy levels in patients treated for thyroid cancer using data of patient-reported outcomes. Additionally, we sought to determine if patient factors, the extent and complications of thyroid surgery, and utilization of post-operative treatments, including RAI therapy and thyroid hormone suppression, were associated with fatigue and decreased energy levels in this patient population.

Methods:

Study Population and Collection of Data

This study was approved by the institutional Review Boards of the University of Michigan, the University of Southern California, the Committee for the Protection of Human Subjects (California State Institutional Review Board), and Emory University, as well as the Georgia Department of Public Health, and received approval by the California Cancer Registry. Patients diagnosed with DTC between January 2014 and December 2015 while residents of Los Angeles county or the state of Georgia and ascertained by the SEER registries in these areas were selected initially for participation in this study. ICD-O-3 morphology codes used to identify DTC included: Papillary thyroid cancer: 8050, 8260, 8340, 8341, 8342, 8343, 8344, 8350, 8450; Follicular thyroid cancer: 8330, 8331, 8332, 8335, 8337 and Hürthle cell cancer: 8290. Additional eligibility criteria required patients to be between the ages of 18 to

79 at the time of diagnosis and to be alive currently per registry records (not known to be deceased).

Eligible patients were mailed a survey with a \$20 cash incentive using a modified Dillman approach to encourage response.¹⁶ The survey was written at no more than an 8th grade reading level and included both English and Spanish translations when appropriate. Questions in the survey included queries about treatment experiences, communication, and decision-making and were developed based on a conceptual framework directed at answering our research questions. Standard techniques were used to assess content validity including review by content and design experts. The study was also piloted in a diverse cohort of patients with thyroid cancer treated at the University of Michigan. The goal of this pilot was to identify any survey questions that were difficult to follow or understand, to assess patient ability to complete the survey in a timely fashion, and to determine whether the survey addressed concerns relevant to patients. There were small modifications in the survey as a result of the pilot.

The survey response rate and cooperation rate was calculated using the Research Calculator of the American Association for Public Opinion available at: <https://www.aapor.org/Education-Resources/For-Researchers/Poll-Survey-FAQ/Response-Rates-An-Overview.aspx>. The inclusion criteria identified 4317 patients of whom 133 were ineligible, because they were deceased, incarcerated, reported they did not have a cancer diagnosis, or did not meet other eligibility criteria prior to contact. From the 4184 eligible patients, 2632 patient responses were received for a 63% response rate and a 77% cooperation rate. After review of the survey responses, an additional 48 patients were excluded for not undergoing a thyroidectomy or having an unknown operation in the SEER database leaving a final study patient cohort of 2584.

The patient-reported survey data were linked to SEER demographic and clinical data, and personal identifiers were removed from the analytic research file. Specifically, variables from the SEER registry included age in years at diagnosis, stage of disease, tumor subtype, primary tumor size, and extent of the thyroidectomy. Lymph node dissection was defined as any lymph nodes removed at the time of operation. Patient-reported variables collected in the survey included sex, race/ethnicity, treatment with RAI and /or with thyroid hormone suppression, having depression as a comorbidity (determined by a diagnosis of depression prior to their thyroid cancer diagnosis), complications or side effects resulting from treatment, and the number of comorbid conditions.

Complications as a result of treatment were assessed as follows “*Many people experience complications or side effects as a result of treatment. Please select all of the complications or side effects you have experienced as a result of your thyroid cancer treatment.*” These complications included such conditions as low calcium, voice changes, pain, weight loss, osteoporosis, dry mouth or eyes, early menopause, high blood pressure, heart issues, diarrhea, and pregnancy issues among others.

Outcome variables

Two outcome variables were assessed: energy level and fatigue. Patients were asked how their energy level was now compared to their energy level before their thyroid surgery using a five-point, Likert scale in a pre-post format, and therefore, this question had a retrospective component. Specifically, they were asked if their energy level now was ‘Much worse’, ‘Somewhat worse’, ‘About the same’, ‘Somewhat better’, or ‘Much better’ now compared to before their thyroid surgery. Fatigue was assessed at the time the questionnaire was completed (two to four years after the treatment of their thyroid cancer). Patients were asked to rate their fatigue on average on a five-point, Likert scale from None, Mild, Moderate, Severe, or Very Severe. The fatigue survey item is from the validated PROMIS scale (available at <http://www.healthmeasures.net/explore-measurement-systems/promis>). The energy level item from the survey was inspired by patients, created by clinical experts, modified by survey design experts, and piloted in patients with a history of thyroid cancer.

Statistical analysis

The percentage distribution of the sample by demographic and clinical variables was provided. Two, multivariable logistic regression analyses were performed to determine variables independently related to the two outcome variables of energy level and fatigue. Common demographic characteristics, treatment factors, and known correlates of fatigue, e.g., depression and comorbidities, were selected as independent variables. The energy level outcome variable was dichotomized by combining the categories of ‘*Somewhat worse* or ‘*Much worse*’ vs. ‘*About the same*, ‘*Somewhat better*, and ‘*Much better*’. Independent variables included patient age at the time of diagnosis grouped by years (44, 45–54, 55–64, 65), sex, race/ethnicity, extent of the thyroid surgery, receipt of RAI therapy, use of thyroid hormone suppression, number of comorbid conditions, and presence of depression. The second multivariable logistic regression analysis was also performed with the dependent outcome variable being a rating of average fatigue ‘*Very severe*, ‘*Severe*, or ‘*Moderate*’ vs. ‘*None* or ‘*Mild*’. The independent variables included were the same as in the first analysis.

Additional multivariable models were created that examined the independent effects of the multiple complications related to the thyroid operation on worse energy and fatigue also controlling for age, sex, and comorbidity. In an attempt to understand the relationship between complications of treatment and patient-reported changes in energy and fatigue, we selected common complications and side effects that are attributed to treatment with thyroidectomy, RAI, or thyroid hormone suppression and determined their correlation with change in energy level and severity of fatigue. The specific complications included in these models were low serum calcium concentrations for over three months, voice changes for over three months, pain for over three months, weight gain, and racing heart. Analyses were performed using R version 3.5.2.¹⁷ Adjusted odds ratios (OR) are reported in the multivariable analyses. Statistical significance was determined using 95% confidence intervals (95% CI).

Results:

The final patient cohort analyzed included 2584 patients; the demographics of these study patients are presented in Table 1 with data derived from both patient-completed surveys and from patient-specific associated SEER data as noted. A total of 1326 (51.3%) of the patients surveyed were from the state of Georgia and 1258 (48.7%) from Los Angeles county. The majority of patients were female (77.6%), and the ethnic mix of the patient cohort represents the diverse population in the Los Angeles and Georgia SEER database. The majority of patients had Derived-AJCC stage (7th edition) stage 1 disease (68.9%), papillary histology (93.2%), and were treated mostly commonly with total thyroidectomy with or without nodal dissection (total thyroidectomy with lymph node removal (49.3%) or total thyroidectomy (38.3%)). Only 12.3% had a thyroid lobectomy. Just over half were treated with RAI therapy (56.7%) and thyroid hormone suppression (50.2%) after their operation. When queried about comorbid conditions, patients reported zero (57.5%), one (27.3%), and two or more (15.1%) comorbidities. When specifically asked about depression as a comorbid condition prior to treatment of their thyroid cancer, 17.6% reported depression.

Patients were asked how their energy level was now compared to their energy level before their thyroid surgery, and they responded as follows: *much worse* 310/2584 (12.0%), *somewhat worse* 678/2584 (26.2%), *about the same* 1010/2584 (39.1%), *somewhat better* 279/2584 (10.8%), *much better* 230/2584 (8.9%), and 77/2584 (3.0%) did not answer. When asked to rate their fatigue on average, patients responded: *none* 298/2584 (11.5%), *mild* 939/2584 (36.3%), *moderate* 931/2584 (36.0%), *severe* 282/2584 (10.9%), *very severe* 97/2584 (3.8%); and 37/2584 (1.4%) did not answer.

Thyroid-related complications after treatment are shown in Figure 1. Weighted percentages based on available data are reported (missing data were not included in these percentages). Of the 344/2584 (13.3%) patients that selected “None, I didn’t have any complications or side effects” there were 325/2584 (12.6%) who selected it exclusively, and there were 114/2584 (4.4%) patients who did not select any of the provided options. The most commonly reported side effects included lack of energy in 1447/2584 (56.0%), weight gain in 934/2584 (36.1%), and low mood in 860/2584 (33.3%). The most common postoperative complications reported included voice changes over three months in 718/2584 (27.8%) and low serum calcium concentrations for over three months in 598/2584 (23.1%).

In the multivariable logistic regression model to determine demographic and clinical factors associated with worse energy levels (Figure 2), we found statistically significant associations with receiving RAI (OR 1.31 [95%CI 1.10–1.56]), treatment with thyroid hormone suppression (OR 1.48 [95%CI 1.21–1.82]), and having depression before the operation (OR 1.34 [95%CI 1.07–1.67]). Age >45 years was associated with a lesser risk for worse energy and was more protective with increasing age: age 45–54 (OR 0.79 [95%CI 0.63–0.98]), age 55–64 (OR 0.58 [95%CI 0.45–0.74]), and age 65 (OR 0.47 [95%CI 0.36–0.63]). The extent of the thyroidectomy correlated with reports of somewhat worse or much worse energy in the univariate analysis (Thyroid lobectomy-32% versus Total thyroidectomy with or without lymph node dissection-40% [p=0.007]), but not on the multivariable analysis. There was no correlation between sex, race/ethnicity, the presence of comorbidities, and

reports of worse energy after the thyroidectomy. When the region (LA county versus Georgia) was added to the analyses, there were no changes in the findings.

In the multivariable logistic regression model that examined the factors associated with greater fatigue (Figure 3), we found statistically significant, positive associations with thyroid hormone suppression (OR 1.63 [95%CI 1.34–1.99]), one (OR 1.43 [95%CI 1.17–1.75]) or two (OR [95%CI 1.71–2.97]) comorbidities, and depression prior to the thyroidectomy (OR 2.34 [95%CI 1.85–2.95]). Older age was negatively correlated with reports of fatigue: age 45–54 (OR 0.75 [95%CI 0.60–0.94]), age 55–64 (OR 0.52 [95%CI 0.41–0.67]), and age 65 (OR 0.54 [95%CI 0.41–0.71]). There were no correlations between sex, race/ethnicity, receiving RI, the extent of thyroidectomy, and patient reports of substantial fatigue. When the region (LA county versus Georgia) was added to the analyses, there were no changes in the findings.

Finally, we examined the association of selected thyroid complications with the two outcome variables in two additional multivariable logistic regression models. (Figure 4); age, sex, and comorbidities were controlled for in both of these statistical models. Complications and side effects of the treatment of thyroid cancer that correlated with worse energy included: low serum calcium concentrations for more than three months (OR 1.26 [95%CI 1.02–1.54]), pain for more than three months (OR 1.39 [95%CI 1.05–1.84]), weight gain (OR 3.03 [95%CI 2.53–3.63]), and racing heart (OR 1.55 [95%CI 1.26–1.92]). Voice changes for more than three months did not correlate with reports of worse energy. The complications and side effects of the treatment of thyroid cancer which correlated with patient reports of significant fatigue included: low calcium for more than three months (OR 1.49 [95%CI 1.21–1.84]), pain for more than three months (OR 1.83 [95%CI 1.35–2.48]), weight gain (OR 2.45 [95%CI 2.04–2.94]), and racing heart (OR 1.35 [95%CI 1.09–1.68]). Voice changes for more than three months did not correlate with reports of worse energy.

Discussion:

In this large study of patient-reported outcomes of patients treated for DTC by either total thyroidectomy (87.7%) or thyroid lobectomy (12.3%), more than half of the patients reported moderate, severe, or very severe levels of fatigue at 2–4 years after diagnosis and a third reported somewhat or much worse energy levels at the time of the survey compared to before treatment. Receiving RAI and reporting low serum calcium concentrations after thyroidectomy were associated with reports of worse energy compared to preoperative levels; thyroid hormone suppression was associated with reports of both worse energy and substantial post-treatment fatigue. Despite the overall excellent prognosis in the majority of patients with DTC, the deleterious effects caused by substantial fatigue cannot be understated.

The etiology of worse fatigue after thyroidectomy is likely multifactorial. Indeed, several prior studies attempting to determine correlates of fatigue after treatment of thyroid diseases have had mixed results.^{8,11–14,18,19} Patient factors including older age, comorbidities, presence of psychologic problems, and time period closer to diagnosis correlated with greater fatigue in some studies^{8,12,18} but not all.¹³ One prior, randomized control trial

evaluating treatment with thyroid hormone suppression (to maintain TSH levels less than 0.4 mIU/L) and rates of patient-reported fatigue showed no correlation; however, this was a small study of 25 patients which did not control for other treatment factors.¹¹ Finally, one cross-sectional, single-center study of 316 patients found that RAI treatment did not affect rates of fatigue based on patient-reported quality of life questionnaires.¹⁴ In our study, although RAI treatment was not associated with patient reports of moderate to severe fatigue, RAI was associated with patient reports of worse energy level two to four years after treatment compared to before. Our study also shows that treatment with thyroid hormone suppression increases reports of both substantial fatigue and decreased energy levels two to four years after compared to before thyroidectomy. The etiology of the difference between our study and some of the prior studies may lie in the difference in study design with our study having a very large, population-based patient cohort, its use of the data of patient-reported outcomes, and its unique incorporation of patient perception of how thyroidectomy specifically impacted their energy level. It was also interesting/alarming that 20% of patients did not recall if they were treated with thyroid hormone suppression which suggests that improvement in the communication and patient education about thyroid hormone suppression may improve patient understanding of their treatment of thyroid cancer.

An interesting finding of this study is the lack of direct correlation of the extent of thyroidectomy (total thyroidectomy with or without lymph node dissection versus thyroid lobectomy) with the presence of post-treatment fatigue or worse energy levels after controlling for additional treatments in the multivariate analysis; however, there was a correlation of worse energy levels with the complication of low serum calcium concentrations related to hypoparathyroidism (which is should only be relevant to total thyroidectomy). Additionally, treatment with RAI correlated with increased reports of worse energy, and the use of thyroid hormone suppression correlated with increased reports of worse energy and fatigue. Both of these adjuvant treatments are used much more commonly after total thyroidectomy compared to thyroid lobectomy. Although there is a need for an adequately powered study designed to compare total thyroidectomy versus thyroid lobectomy, this study suggests that the downstream effects of total thyroidectomy, including hypoparathyroidism, use of RAI, and thyroid hormone suppression appears to have deleterious effects on patients' energy and/or fatigue levels after treatment for thyroid cancer. The effects of recent clinical guidelines for the treatment of DTC may lead to a shift of the extensiveness of the thyroidectomy toward more thyroid lobectomies and away from total thyroidectomy for localized disease.²⁰ If so, then the rates of both RAI therapy and thyroid hormone suppression, and potentially the rates of operative complications (laryngeal nerve injury and hypoparathyroidism), will decrease. Although it is unclear if a shift in treatment intensity would impact post-treatment fatigue, our study findings suggest it is possible that reports of post-treatment fatigue and decreased energy after the treatment of thyroid cancer will decrease as a result of less patients receiving thyroid hormone suppression, a decreased use of RAI therapy, and lesser rates of post-operative hypoparathyroidism.

The stepwise, reverse correlation of patient age and decreased energy levels and fatigue is also an interesting finding of this analysis. The youngest patients (< 44 years) reported the greatest levels of fatigue at 57%, while 48% of older patients (>65 years) reported fatigue. Similarly, younger patients (< 44 years) had the greatest rates of decreased energy compared

to before the thyroidectomy, while patients older than 65 years reported the least rates. The reasons behind these differences are unknown and open to conjecture. It may represent a recall bias, whereby younger patients may remember greater than actual energy levels prior to treatment compared to older patients. Alternatively, younger patients may have a greater baseline energy level prior to the treatment of thyroid cancer and thus be more likely to feel a decrease in energy. Additionally, younger patients may have different expectations for their energy levels after treatment for their thyroid cancer compared to older patients. Alternatively, this could represent a real, age-related differential response to negative effects of thyroid hormone suppression and RAI therapy on energy levels and fatigue, where younger patients are more severely affected than older patients.

A strength of our study design is the survey of patients two to four years after diagnosis and treatment, because the transient fatigue or decreased energy that would be anticipated immediately after treatment for thyroid cancer (including the period of hypothyroidism related to thyroid hormone withdrawal for RAI therapy) should have resolved by the time of the survey. At two to four years after diagnosis, patients should be at a stable baseline with regard to sustained post-treatment effects. Additional strengths of our study include its population-based design, the ability to link SEER data on tumor and treatment to patient reports of fatigue from the surveys, and the generalizability of the findings to diverse patient groups with thyroid cancer, including patients of minority race and ethnicity. Inherently, this study has some limitations due to the retrospective nature of surveying patients two to four years after their initial treatment of thyroid cancer and its reliance on the accuracy of patient recall of receiving RAI treatment, whether they underwent thyroid hormone suppression, and their serum calcium levels greater than 3 months after their thyroidectomy. To minimize recall bias, the survey included exhaustive descriptive details about both RAI treatment and thyroid hormone suppression preceding the questions about receiving these treatments. In addition, patient self-report has been shown to be reliable for care of prostate cancer when recalling procedure or details of radiation treatment, and therefore, it is likely that self-report in thyroid cancer patients is similarly reliable.²¹ It is possible that patients may be biased in their current experience and may have recall bias assuming they felt much better prior to treatment in comparison to how they felt at the time of survey. A measure of the study variables prior to treatment and then again after treatment would be ideal, but neither is practical nor feasible at a population level. An additional limitation is the fact that fatigue and energy level are subjective outcome variables. In an attempt to decrease the impact of subjective differences in severity of fatigue or perception of energy level, however, the outcome variables were dichotomized with worse energy including *somewhat* and *much worse* energy and fatigue including *moderate*, *severe*, and *very severe* fatigue. Validity to all of the findings is suggested by the fact that characteristics well known to correlate with fatigue, such as depression and comorbidities, also correlated in this study. Finally, since SEER data only includes patients with thyroid malignancy; a benign comparative cohort was not included in this study and limits its application to patients with benign thyroid diseases treated operatively.

Patients are concerned commonly about the requirements of thyroid hormone supplementation after total thyroidectomy and the potential effects of this on energy level, fatigue, weight gain, and overall feelings of well-being. In addition, patients often inquire

about the risks of treatment with RAI. Often surgeons are the provider discussing these concerns with patients preoperatively. It is evident from this study that the increased fatigue and decreased energy that is common after treatment for thyroid cancer should be discussed thoroughly with patients prior to thyroidectomy. The etiology of this fatigue seems multifactorial, and discussions with patients about their personal risk factors and the treatment factors which are associated with greater rates of fatigue should be included in the informed consent process prior to thyroidectomy. Considerations about the relative benefits of treatment with thyroid hormone suppression and RAI on decreasing recurrence rates should be weighed against their negative effects on patient energy and/or level of fatigue.

Acknowledgments

Funding/Support

This work is supported by R01 CA201198 from the National Cancer Institute (NCI) to Dr. Haymart. The collection of cancer incidence data used in this study was supported by the California Department of Public Health pursuant to California Health and Safety Code Section 103885; Centers for Disease Control and Prevention's (CDC) National Program of Cancer Registries, under cooperative agreement 5NU58DP006344 and the NCI's SEER Program under contract HHSN261201800015I awarded to the University of Southern California (USC). The collection of cancer incidence data in Georgia was supported by contract HHSN261201800003I, Task Order HHSN26100001 from the NCI and cooperative agreement 5NU58DP003875-04 from the CDC. The ideas and opinions expressed herein are those of the authors and endorsement by the State of California and State of Georgia Departments of Public Health, the NCI and the CDC or their Contractors and Subcontractors is not intended nor should be inferred.

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Figure 1.
Patient reported complications or side effects experienced as a result of thyroid cancer treatment (n=2584).

Figure 2.

Factors associated with patient report of worse energy 2–4 years after surgery compared to before surgery.

* Weighted percentages are shown.

† Adjusted odds ratio.

‡ Tot Thy; total thyroidectomy; LNR: lymph node removal; RAI: radioactive iodine; TSH: thyroid stimulating hormone

Figure 3.

Factors associated with patient reports of moderate to very severe fatigue 2–4 years after thyroid surgery

* Weighted percentages are shown.

† Adjusted odds ratio.

‡ Tot Thy; total thyroidectomy; LNR: lymph node removal; RAI: radioactive iodine; TSH: thyroid stimulating hormone

Figure 4. Thyroid cancer treatment side effects and complications associated with worse energy and significant fatigue.

* Controlled for age, sex, and comorbidity.

[†] Weighted percentages are shown.

[‡] Adjusted odds ratio.

Table 1:**Patient Demographic and Clinical Characteristics**

Characteristic	Data Source	N (%) (n = 2584)
Age at diagnosis (years ; mean±SD)	SEER	
Categories		50 (±14)
44 years		
45 – 54 years		888 (34.4)
55 – 64 years		622 (24.1)
65 years		604 (23.4)
Unknown		470 (18.2)
		0 (0)
Sex	Survey	
Female		2005 (77.6)
Male		579 (22.4)
Not answered		0 (0)
Combined Race/Ethnicity	Survey	
White		1480 (57.3)
Hispanic		511 (19.8)
Black		287 (11.1)
Asian		236 (9.1)
Other		49 (1.9)
Not answered		21 (0.8)
Derived AJCC-7 Stage	SEER	
Stage I		1780 (68.9)
Stage II		216 (8.4)
Stage III		398 (15.4)
Stage IV		164 (6.3)
Unknown		26 (1.0)
Histologic type ICD-O-3	SEER	
Papillary		2407 (93.2)
Follicular		125 (4.8)
Hürthle cell		52 (2.0)
Unknown		0 (0)
Tumor size	SEER	
1 cm		977 (37.8)
>1 cm to 2 cm		756 (29.3)
>2 cm to 4 cm		589 (22.8)
> 4 cm		243 (9.4)
Unknown		19 (0.7)

Characteristic	Data Source	N (%) (n = 2584)
Type of thyroidectomy	SEER	
Total thyroidectomy with lymph node removal		1275 (49.3)
Total thyroidectomy		990 (38.3)
Thyroid lobectomy		319 (12.3)
Unknown		0
Radioiodine treatment	Survey	
Yes		1465 (56.7)
No		1079 (41.8)
Not answered		40 (1.5)
Treated with thyroid hormone suppression	Survey	
Yes		1296 (50.2)
No		711 (27.5)
I don't know		510 (19.7)
Not answered		67 (2.6)
Prior diagnosis of depression	Survey	
Yes		456 (17.6)
No		2128 (82.4)
Not answered		0
Number of comorbid conditions	Survey	
Zero		1487 (57.5)
One		706 (27.3)
More than 2		391 (15.1)
Not answered		0
How is your energy level now, compared to your energy level before your thyroid surgery?	Survey	
Much worse		310 (12.0)
Somewhat worse		678 (26.2)
About the same		1010 (39.1)
Somewhat better		279 (10.8)
Much better		230 (8.9)
Not answered		77 (3.0)
Rate your fatigue on average:	Survey	
None		298 (11.5)
Mild		939 (36.3)
Moderate		931 (36.0)
Severe		282 (10.9)
Very severe		97 (3.8)
Not answered		37 (1.4)