

Supplementary Online Content

Meltzer C, Hull M, Sundang A, Adams JL. Association between annual surgeon total thyroidectomy volume and transient and permanent complications. *JAMA Otolaryngol Head Neck Surg*. Published online July 25, 2019. doi:10.1001/jamaoto.2019.1752.

eTable 1. ICD-9 Codes for Comorbidities

eTable 2. Exploratory Analysis of Covariates

eTable 3. Characteristics of 10 546 Patients Receiving Total Thyroidectomies

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. ICD-9 Codes for Comorbidities

Dyspnea	786.0
Chronic obstructive pulmonary disease	416.8,416.9, 490.*, 492.*, 494.*, 495.*, 496.*, 500.*, 502.*, 503.*, 504.*, 505.*, 506.4, 508.1, 508.8
Asthma	493.*
Congestive heart failure	428.0
Hypertension	401.*, 997.91, 459.3*
Disseminated cancer	199.*
Steroid use	v87.45
Bleeding disorders	286.9, 287.9, 455.*
Chemotherapy in past 30 days	v58.1, v07.39, v67.2, 999.81, v66.2, v07.39, v58.11, v87.41
Radiotherapy in past 90 days	v58.0, v66.1, v67.1, E879.2
Acute myocardial infarction	410.*
Stroke	436.*,997.02, 431, 433.*, 434.3.*, 436, 438.*
Dialysis	586.*, 639.3, v45.11, v56.0, v45.11, v45.12
Anticoagulant therapy	V58.61, E934.5, 964.5
Seizures	345.*, 649.4, v17.2
Anxiety	313, 300.*, 309.28, 309.21, 309.24, 293.84
Obstructive sleep apnea	372.2*, 780.5*
Hearing loss	389.*, 388.12, 388.2
Vision impairment	369.*
Dementia	290.*, 291.2, 294.1, 331.19, 331.82
Hashimoto's disease	245.2
Graves' disease	242.0*, 378.9*
Thyroid cancer	193.*, 197.0, 194.1, 198.5, v10.87
Non-toxic goiter	241.0, 241.1
Primary hyperparathyroidism	252.01
Pregnancy	V23.86, 646.7, V23.2, V22, 646.8, 643, 761.5, 633.9, 633.91

Note: Comorbid diabetes and depression were identified using an enterprise data repository of members with chronic conditions.

eTable 2. Exploratory Analysis of Covariates

Covariate	Odds ratio*	P value
S (total thyroidectomy volume)	NA	0.00
(Intercept)	1.00	NA
Acute myocardial infarction	0.53	0.54
Age	0.74	0.00
Anticoagulant therapy	2.73	0.00
Asthma	1.34	0.41
Bleeding disorders	1.10	0.82
BMI	0.98	0.70
Charlson comorbidity Index score	1.01	0.91
Chemotherapy in past 30 days	1.04	0.87
Congestive heart failure	1.06	0.91
COPD	0.98	0.84
Dementia	0.00	1.00
Depression	0.82	0.34
Diabetes	1.01	0.95
Dialysis	0.98	0.98
Disseminated cancer	0.84	0.82
Distance from nearest medical office	1.01	0.89
DxCG score	1.04	0.68
Dyspnea	1.35	0.02
Emergency room visits (prior year)	1.17	0.00
Gender	0.86	0.17
Graves' disease	1.20	0.24
Hashimoto's disease	1.24	0.22
Hearing loss	0.94	0.79
Heart failure	1.18	0.69
Hyperlipidemia	0.92	0.82
Hypertension	1.03	0.78
Inpatient encounters (prior year)	0.97	0.71
Missing Charlson comorbidity score	0.70	0.30
Missing race/ethnicity	0.00	0.00
Missing variable group	2.00	0.03
Multiple race/ethnicity	0.00	0.00
Obstructive sleep apnea	1.02	0.92
Office visits (prior year)	1.01	0.02
Pregnancy	1.18	0.71
Radiotherapy in past 90 days	1.20	0.74

Covariate	Odds ratio*	P value
Race/ethnicity		
American Indian/Alaskan Native	0.00	0.00
Asian/Pacific Islander	0.00	0.00
Black	0.00	0.00
Hispanic	0.00	0.00
White	0.00	0.00
Seizures	1.38	0.45
Steroid use	1.26	0.71
Stroke	0.56	0.16
Surgery in Southern California	0.50	0.00
Thyroid cancer	1.59	0.00
Visual impairment	1.41	0.58
Year	1.08	0.00

** for a one-unit change in the outcome

eTable 3. Characteristics of 10 546 Patients Receiving Total Thyroidectomies

Age in years, no. (%)	
<18	97 (1)
18-44	3432 (33)
45-64	4877 (46)
≥65	2140 (20)
Males, no. (%)	
8500 (81)	
Ethnicity, no. (%)	
American Indian/Alaskan Native	25 (0)
Asian/Pacific Islander	1694 (16)
Black	1534 (15)
Hispanic	2564 (24)
Multiple	107 (1)
White	4593 (44)
Distance to nearest medical office building in miles, no. (%)	
< 5	7053 (67)
5 - 19.9	3241 (31)
≥ 20	252 (2)
Region, no. (%)	
Northern California	3939 (37)
Southern California	6607 (63)
Charlson comorbidity index, no. (%)	
0	4452 (42)
1-4	4556 (44)
5-9	952 (9)
≥ 10	270 (3)
Missing	316 (3)
DxCG score, no. (%)	
<1	1603 (15)
1-4.99	6867 (65)
≥ 5	1930 (18)
Missing	146 (1)
Surgery year, no. (%)	
2008	700 (7)
2009	1179 (11)
2010	1388 (13)
2011	1479 (14)
2012	1476 (14)
2013	1404 (13)
2014	1481 (14)
2015	1439 (14)
BMI, no. (%)	
< 18.5	345 (3)
18.6 – 24.9	2740 (26)
25.0 – 29.9	3302 (31)
≥ 30.0	4159 (39)
Comorbid disease, no. (%)	
Hashimoto's disease	483 (5)
Graves disease	771 (7)
Thyroid cancer	3032 (29)
Obstructive sleep apnea	470 (5)
Visual impairment	33 (0)

Hearing loss	407 (4)
Disseminated cancer	24 (0)
Hypertension	3965 (38)
Chronic obstructive pulmonary disease	1697 (16)
Bleeding disorders	85 (1)
Diabetes	1266 (12)
Depression	475 (5)
Asthma	98 (1)
Dementia	8 (0)
Pregnancy	57 (1)
Radiotherapy within 90 days	53 (1)
Chemotherapy within 30 days	383 (4)
Dyspnea	1170 (11)
Steroid medication use	39 (0)
Anticoagulant/antiplatelet therapy	95 (1)
Dialysis	33 (0)
History of AMI	28 (0)
Cerebrovascular disease	168 (2)
Seizure disorder	62 (1)
Prior year hospitalizations	
0	9422 (90)
1-3	1088 (10)
>3	36 (<1)
Prior year office visits	
0-10	7025 (67)
11-20	2456 (23)
21-30	674 (6)
31-40	215 (2)
≥41	176 (2)

Abbreviations: AMI, acute myocardial infarction; BMI, body mass index