

Online Supplementary Material

Multiple Comorbidities, Psychiatric Disorders, Healthcare Resource Utilization, and Costs Among Adults With Essential Tremor: A Retrospective Observational Study in a Large US Commercially Insured and Medicare Advantage Population. *JHEOR*. 2022;9(2):37-46. [doi:10.36469/jheor.2022.37307](https://doi.org/10.36469/jheor.2022.37307)

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



Table S1. ICD-10-CM Codes for Comorbid Conditions

Comorbidity	Abbreviation	ICD-10-CM Code(s)
Atrial fibrillation	AFF	I48.0–I48.2, I48.4, I48.91
AIDS/HIV	AID	B20.x–B22.x, B24.x
Anxiety	ANX	F40.x F41.x
Bipolar disorder	BIP	F31.x
Cancer (malignant)	CAN	C00.x–C97.x
Cerebrovascular disease	CBD	G45.x, G46.x, I60.x–I69.x, H34.0
Congenital heart disease	CHD	Q20.x–Q28.x
Congestive heart failure	CHF	I09.9, I11.0, I13.0, I13.2, I25.5, I42.0, I42.5–I42.9, I43.x, I50.x, P29.0
Cholelithiasis/cholecystitis	CHO	K80.x
Chronic kidney disease	CKD	N18.1–N18.6, N18.9
Chronic pulmonary disease	COP	J40.x–J47.x, J60.x–J67.x, I27.8, I27.9, J68.4, J70.1, J70.3
Inflammatory bowel disease	CRO	K50.x–K52.x
Chronic thyroid disorders	CTD	E00.x–E03.x, E06.5, E07.9, E89.0
Dementia	DEM	F00.x–F03.x, F05.1, G30.x, G31.1
Depression	DEP	F32.x, F33.x
Diabetes mellitus	DM	E10.x–E14.x
Diverticular disease	DTD	K57.x
Epilepsy	EPL	G40.x
Fatigue and sleep-related disorders	FSR	R53.1, R53.8x, F48.8, F51.02, F51.09, F51.01, F51.03–F51.05, F51.19, F51.11–F51.13, F51.8, G47.0x, G47.1x, G47.2x, G47.4x–G47.6x, G47.8, G47.9, G93.3
Glaucoma	GLC	H40.x, H42.x
Hypercoagulable syndrome	HCG	D68.59, D68.69
Hemiplegia or paraplegia	HEM	G04.1, G11.4, G80.1, G80.2, G81.x, G82.x, G83.0–G83.4, G83.9
Hyperlipidemia	HLD	E78.0–E78.5
Hypertension	HTN	I10.x–I13.x, I15.x
Iron deficiency anemia	IDA	D50.8, D50.9
Ischemic heart disease	IHD	I20.x–I25.x
Kidney stones	KST	N20.x
Liver disease	MSL	B18.x, I85.0, I85.9, I86.4, I98.2, K70.0–K70.4, K70.9, K71.1, K71.3–K71.5, K71.7, K72.1, K72.9, K73.x, K74.x, K76.0, K76.2–K76.9, Z94.4
Multiple sclerosis	MSS	G35.x
Metabolic syndrome	MSX	E88.81
Nonspecific gastritis/dyspepsia	NGD	K29.70, K30.x
Obesity	OBE	E66.x, Z68.3x, Z68.4x
Osteoporosis	OSP	M80.x, M81.x
Osteoarthritis	OST	M15.x–M19.x
Pain disorders	PAI	E08.42, E09.42, E11.42, E13.42, G04.xx, G05.xx, G35, G36.xx, G37.xx, G43.xx, G44.xx, G50.xx, G51.xx, G54.xx, G56.xx, G57.xx, G58.7, G60.xx, G89.xx, G90.xx, G95.xx, G99.xx, M05.xx, M06.xx, M12.xx, M26.6xx, M43.xx, M45.xx, M46.xx, M47.xx, M48.xx, M50.xx, M51.xx, M53.xx, M54.xx, M60.xx, M79.xx, M96.1, R07.xx, R10.xx, R16.xx, R19.xx, R51, R52, F45.4x, B02.2x, S04.1x, S14.1x, S24.1x, S34.1x, S34.3x, S44.xx, S54.xx, S64.xx, or S74.xx
Pancreatitis	PAN	K85.x
Parkinson's disease	PAR	G20.x
Psychoses	PSY	F20.x, F22.x–F25.x, F28.x, F29.x, F30.2, F31.2, F31.5

Table S1. ICD-10-CM Codes for Comorbid Conditions, *cont'd*

Peptic ulcer disease	PUD	K25.x- K28.x
Peripheral vascular disease	PVD	I70.x, I71.x, I73.1, I73.8, I73.9, I77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, Z95.9
Rheumatoid arthritis/collagen vascular disease	RHA	L94.0, L94.1, L94.3, M05.x, M06.x, M08.x, M12.0, M12.3, M30.x, M31.0–M31.3, M32.x–M35.x, M45.x, M46.1, M46.8, M46.9
Sickle cell anemia	SCA	D57.x
Substance use disorders	SDO	F10.x-F19.x
Systemic lupus erythematosus	SLE	M32.x

Abbreviation: ICD-10-CM, *International Classification of Diseases, Tenth Revision, Clinical Modification*.

Table S2. ICD-10-CM Codes for Comorbid Psychiatric Disorders

Psychiatric Disorder	Abbreviation	ICD-10-CM Code	Description
Depression	DEP	F32.x	Major depressive disorder, single episode
		F33.x	Major depressive disorder, recurrent
Anxiety	ANX	F40.x	Phobic anxiety disorders
		F41.x	Other anxiety disorders
Stress and adjustment disorders	SAD	F43.x	Reaction to severe stress, and adjustment disorders
Substance use disorders	SDO	F10.x-F19.x	Substance use disorders
Dissociative and conversion disorders	DCD	F44.x	Dissociative and conversion disorders
Somatoform disorders	SOM	F45.x	Somatoform disorders

Abbreviation: ICD-10-CM, *International Classification of Diseases, Tenth Revision, Clinical Modification*.

Table S3. Prevalence of the 30 Most Common Comorbid Conditions Among Patients With ET at Baseline by Age Group

Comorbidity	Overall (n = 5286)	Age Group (Years)			P Value ^a
		22-44 (n = 197)	45-64 (n = 890)	≥65 (n = 4199)	
Hypertension	3587 (67.86)	38 (19.29)	484 (54.38)	3065 (72.99)	<.0001
Pain disorders	3269 (61.84)	121 (61.42)	591 (66.4)	2557 (60.9)	.01
Hyperlipidemia	2928 (55.39)	26 (13.2)	408 (45.84)	2494 (59.4)	<.0001
Fatigue and sleep-related disorders	1485 (28.09)	58 (29.44)	260 (29.21)	1167 (27.79)	.63
Diabetes mellitus	1444 (27.32)	5 (2.54)	222 (24.94)	1217 (28.98)	<.0001
Obesity	1366 (25.84)	28 (14.21)	255 (28.65)	1083 (25.79)	<.0001
Osteoarthritis	1334 (25.24)	5 (2.54)	170 (19.1)	1159 (27.6)	<.0001
Anxiety	1174 (22.21)	66 (33.5)	264 (29.66)	844 (20.1)	<.0001
Chronic pulmonary disease	1076 (20.36)	24 (12.18)	184 (20.67)	868 (20.67)	.01
Depression	1065 (20.15)	43 (21.83)	238 (26.74)	784 (18.67)	<.0001
Ischemic heart disease	1020 (19.3)	1 (0.51)	99 (11.12)	920 (21.91)	<.0001
Cancer (malignant)	674 (12.75)	2 (1.02)	52 (5.84)	620 (14.77)	<.0001
Cerebrovascular disease	649 (12.28)	5 (2.54)	65 (7.3)	579 (13.79)	<.0001
Chronic kidney disease	630 (11.92)	1 (0.51)	57 (6.4)	572 (13.62)	<.0001
Peripheral vascular disease	596 (11.28)	0 (0)	63 (7.08)	533 (12.69)	<.0001
Atrial fibrillation	591 (11.18)	2 (1.02)	27 (3.03)	562 (13.38)	<.0001
Substance use disorders	570 (10.78)	27 (13.71)	157 (17.64)	386 (9.19)	<.0001
Glaucoma	474 (8.97)	2 (1.02)	41 (4.61)	431 (10.26)	<.0001
Congestive heart failure	471 (8.91)	2 (1.02)	46 (5.17)	423 (10.07)	<.0001
Osteoporosis	461 (8.72)	1 (0.51)	45 (5.06)	319 (7.6)	<.0001
Diverticular disease	365 (6.91)	1 (0.51)	45 (5.06)	319 (7.6)	<.0001
Rheumatoid arthritis	268 (5.07)	8 (4.06)	53 (5.96)	207 (4.93)	.3601
Chronic thyroid disorders	264 (4.99)	9 (4.57)	49 (5.51)	206 (4.91)	.7281
Dementia	249 (4.71)	0 (0.00)	11 (1.24)	238 (5.67)	<.0001
Iron deficiency anemia	216 (4.09)	5 (2.54)	32 (3.60)	179 (4.26)	.3524
Epilepsy	184 (3.48)	21 (10.66)	45 (5.06)	118 (2.81)	<.0001
Inflammatory bowel disease	167 (3.16)	10 (5.08)	37 (4.16)	120 (2.86)	.00386
Liver disease	165 (3.12)	9 (4.57)	45 (5.06)	111 (2.64)	.0004
Bipolar disorder	163 (3.08)	24 (12.18)	65 (7.30)	74 (1.76)	<.0001
Kidney stones	159 (3.01)	2 (1.02)	34 (3.82)	123 (2.93)	.0915

Unless otherwise noted, all data are reported as number (%) of patients.

Abbreviation: ET, essential tremor.

^aP value for comparison among treatment groups.

Table S4. Prevalence and Incidence of Comorbid Psychiatric Conditions Among Patients With ET During Follow-up Period by Age Group

Comorbidities	Overall (n=5286)	Age Group (Years)			P Value ^a
		22-44 (n=197)	45-64 (n=890)	≥65 (n=4199)	
Depression	1354 (25.61)	50 (25.38)	270 (30.34)	1034 (24.62)	.0019
Anxiety	1466 (27.73)	82 (41.62)	319 (35.84)	1065 (25.36)	<.0001
Stress and adjustment disorders	278 (5.26)	27 (13.71)	83 (9.33)	168 (4.0)	<.0001
Dissociative and conversion disorders	31 (0.59)	6 (3.05)	10 (1.12)	15 (0.36)	<.0001
Somatoform disorders	41 (0.78)	4 (2.03)	13 (1.46)	24 (0.57)	.0028
Substance use disorders	729 (13.79)	34 (17.26)	201 (22.58)	494 (11.76)	<.0001
Any comorbid psychiatric conditions	2425 (45.88)	108 (54.82)	508 (57.08)	1809 (43.08)	<.0001

Unless otherwise noted, all data are reported as number (%) of patients.

Abbreviations: ET, essential tremor.

^aP value for comparison among age groups.

Table S5. Multivariate Regression Results of All-Cause and ET-Related HCCs in Patients With ET

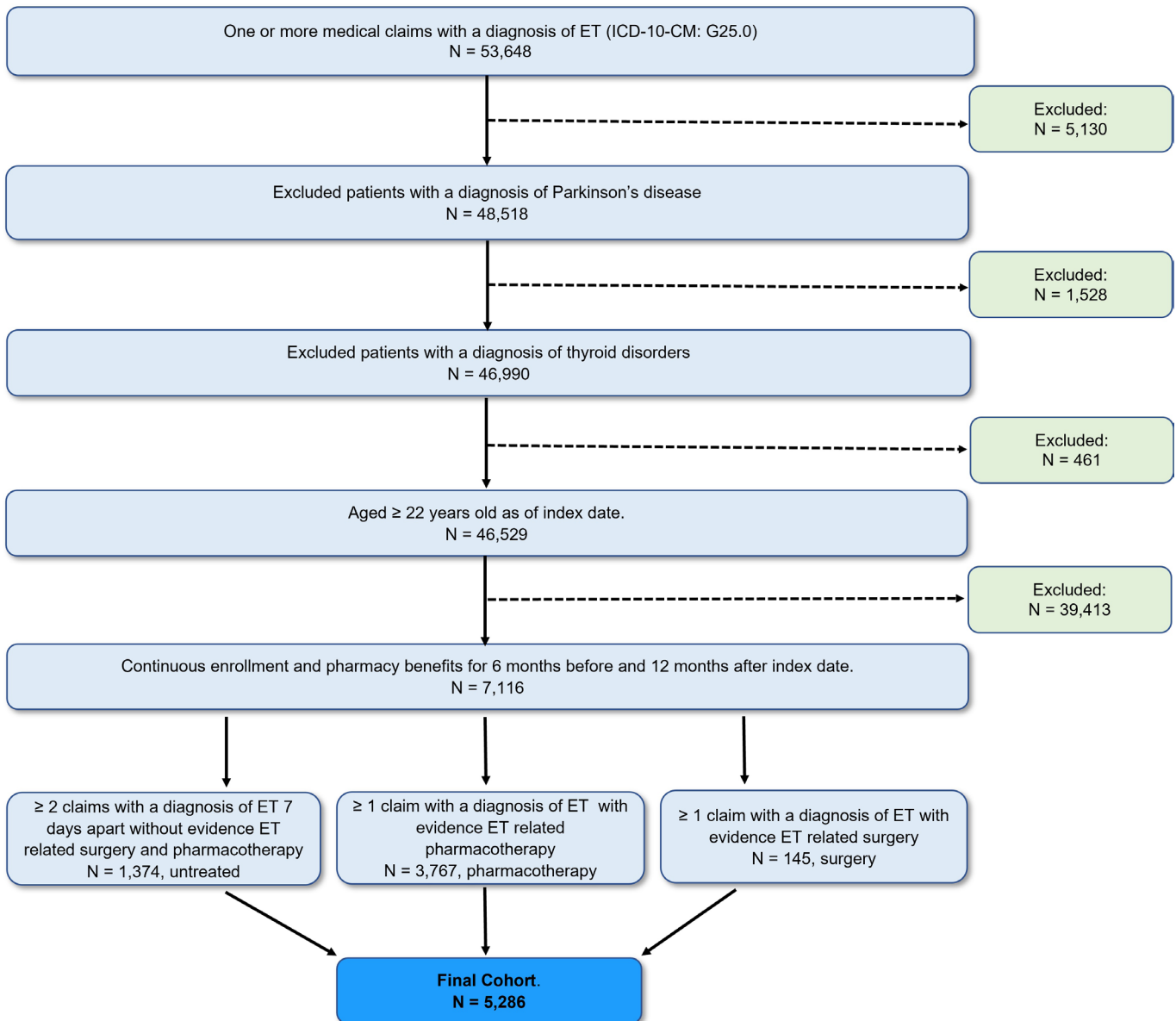
	Healthcare Costs		
	\$, Mean (SD), PPPY	Adjusted Cost Ratio (95% CI)	P Value
All-cause HCCs model			
Age (years)			
22-44	15 716 (29 457)	1 [reference]	
45-64	23 742 (73 216)	1.29(1.09-1.54)	.0032
≥65	16 336 (28 739)	0.99 (0.83-1.19)	.9864
Gender			
Male	17 789 (47 414)	1 [reference]	
Female	17 322 (30 400)	1.01 (0.95-1.07)	.7715
Geographic region			
Midwest	15 292 (24 144)	1 [reference]	
Northeast	19 075 (58 588)	1.12 (1.03-1.21)	.0086
South	17 753 (33 154)	1.02 (0.94-1.10)	.6364
West	20 646 (40 068)	1.22 (1.06-1.39)	.0042
Urban-rural			
Rural	16 264 (26 319)	1 [reference]	
Suburban	17 620 (37 804)	1.05 (0.98-1.13)	.1856
Urban	20 626 (63 418)	1.10 (1.02-1.19)	.0202
Median household income			
Quartile 1, <\$45 725	16 474 (27 702)	1 [reference]	
Quartile 2, \$45 726-\$56 659	18 265 (56 443)	1.01 (0.92-1.09)	.8925
Quartile 3, \$56 660-\$71 948	17 165 (35 998)	0.99 (0.91-1.08)	.8642
Quartile 4, >\$71 948	18 337 (33 816)	1.05 (0.97-1.16)	.1564
Payer			
Commercial	21 656 (73 057)	1 [reference]	
Medicare	16 717 (28 725)	0.78 (0.71-0.87)	<.0001
No. of comorbidities			
<5	9 756 (19 841)	1 [reference]	
5-7	17 802 (31 754)	1.96 (1.83-2.10)	<.0001
>7	31 655 (66 113)	3.44 (3.18-3.72)	<.0001

Table S5. Multivariate Regression Results of All-Cause and ET-Related HCCs in Patients With ET, *cont'd*

Any psychiatric disorders			
No	12 185 (22 120)	1 [reference]	
Yes	23 901 (53 215)	1.60 (1.50-1.70)	<.0001
ET treatment group			
Untreated	13 255 (51 527)	1 [reference]	
Pharmacotherapy	18 646 (34 625)	1.34 (1.25-1.44)	<.0001
Invasive therapy	30 129 (40 010)	2.48 (2.04-2.99)	<.0001
ET-related HCCs model			
Age (years)			
22-44	2312 (13 333)	1 [reference]	
45-64	3038 (21 252)	1.97 (1.56-2.48)	<.0001
≥65	2058 (5987)	1.46 (1.15-1.84)	.0019
Gender			
Male	2267 (10 892)	1 [reference]	
Female	2198 (10 172)	1.03 (0.96-1.12)	.3968
Geographic region			
Midwest	2175 (7 321)	1 [reference]	
Northeast	2503 (13 235)	1.06 (0.95-1.17)	.3257
South	2058 (10 930)	0.85 (0.77-0.93)	.0006
West	2412 (8 049)	0.98 (0.82-1.16)	.8104
Urban-rural			
Rural	2057 (5973)	1 [reference]	
Suburban	2662 (17 180)	1.14 (1.04-1.25)	.0043
Urban	2064 (6249)	1.00 (0.90-1.12)	.9353
Median household income			
Quartile 1, <\$45 725	1 955 (5950)	1 [reference]	
Quartile 2, \$45 726-\$56 659	2156 (5823)	1.09 (0.98-1.22)	.0954
Quartile 3, \$56 660-\$71 948	2382 (13 992)	1.13 (1.01-1.25)	.0378
Quartile 4, >\$71 948	2438 (13 403)	1.18 (1.05-1.32)	.0050
Payer			
Commercial	2510 (16 754)	1 [reference]	
Medicare	2176 (8736)	0.99 (0.87-1.14)	.9458
No. of comorbidities			
<5	1741 (6773)	1 [reference]	
5-7	2219 (5745)	1.54 (1.41-1.69)	<.0001
>7	3163 (18 547)	1.96 (1.76-2.17)	<.0001
Any psychiatric disorder			
No	1571 (5248)	1 [reference]	
Yes	3014 (14 448)	1.77 (1.63-1.92)	<.0001
ET treatment group			
Untreated	1686 (5614)	1 [reference]	
Pharmacotherapy	2175 (11 279)	1.19 (1.09-1.30)	.0002
Invasive therapy	8910 (20 119)	6.59 (5.12-8.47)	<.0001

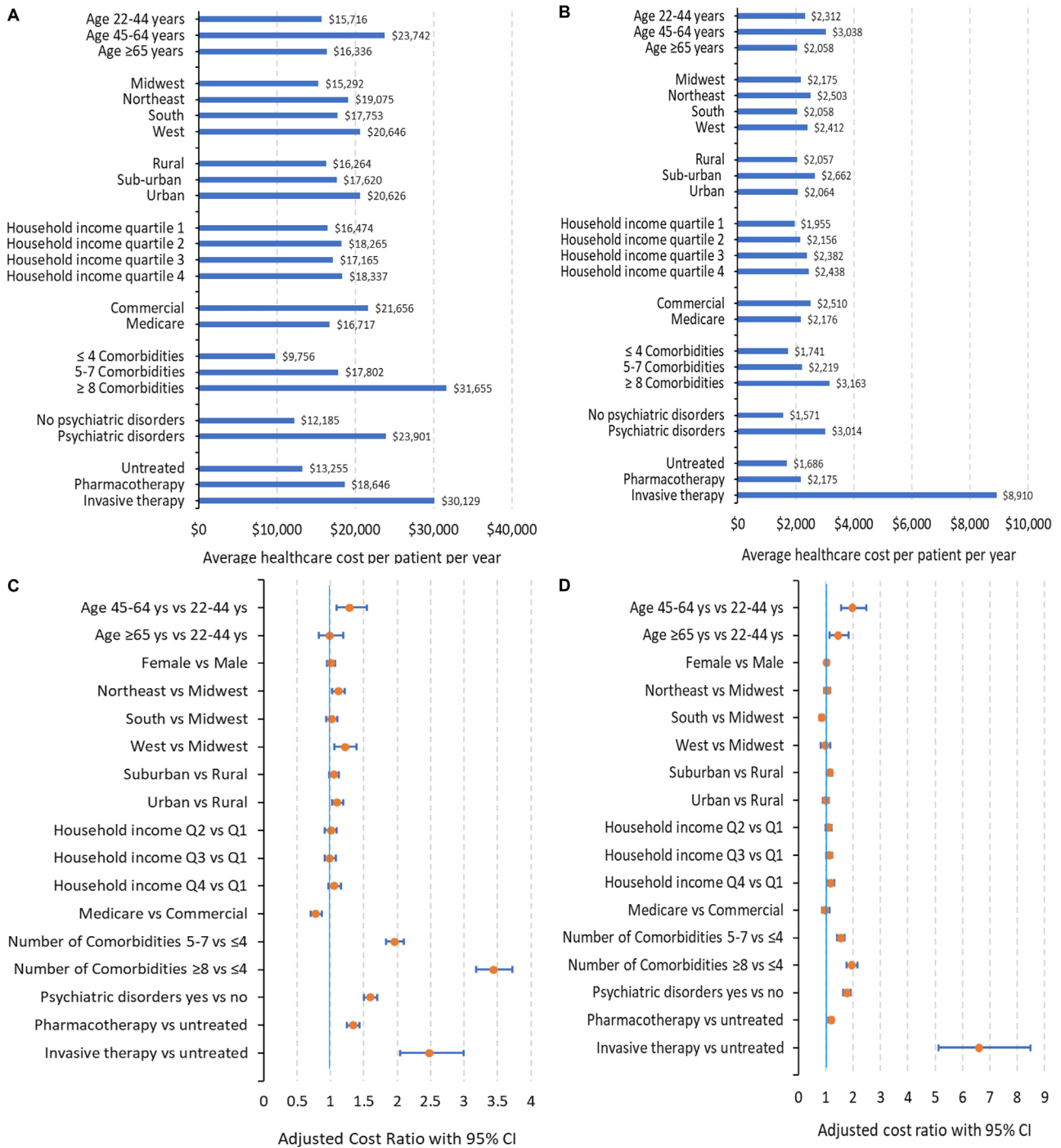
Unless otherwise noted, all data are reported as number (%) of patients.

Abbreviations: CI, confidence interval; ET, essential tremor; HCCs, healthcare costs; PPPY, per patient per year.

Figure S1. Patient Attrition

Abbreviations: ET, essential tremor; ICD-10-CM, *International Classification of Diseases, Tenth Revision, Clinical Modification*.

Figure S2. Average All-Cause (A) and ET-Related (B) Healthcare Costs Among Patients With ET by Characteristics, (C) Adjusted Cost Ratios for All-Cause, and (D) ET-Related Healthcare Costs



Abbreviations: CI, confidence interval; ET, essential tremor.

Average all-cause (A) and ET-related (B) healthcare costs among patients with ET by characteristics. Forest plot of total all cause costs (C) and ET-related costs (D) accrued during the 12-months follow-up period, displayed as cost ratio. The vertical blue line represents a cost ratio of 1, which is associated with equal costs for both groups. For each cost ratio displayed, the orange dot symbol depicts the mean, and the horizontal blue line represents the 95% CI. Lines that do not cross the dashed vertical line are statistically significant.