

eTable 1: CPT Codes for Active and Passive Physical Therapy Interventions

CPT Codes	Physical Therapy
Active	
97110	THERAPEUTIC EXERCISES
97112	NEUROMUSCULAR REEDUCATION
97113	AQUATIC THERAPY/EXERCISES
97116	GAIT TRAINING THERAPY
97530	THERAPEUTIC ACTIVITIES
97535	SELF CARE MANAGEMENT TRAINING
Passive	
97010	HOT OR COLD PACKS THERAPY
97012	MECHANICAL TRACTION THERAPY
97014	ELECTRIC STIMULATION THERAPY
97016	VASOPNEUMATIC DEVICE THERAPY
97018	PARAFFIN BATH THERAPY
97022	WHIRLPOOL THERAPY
97024	DIATHERMY EG, MICROWAVE
97026	INFRARED THERAPY
97028	ULTRAVIOLET THERAPY
97032	ELECTRICAL STIMULATION
97033	ELECTRIC CURRENT THERAPY
97034	CONTRAST BATH THERAPY
97035	ULTRASOUND THERAPY
97036	HYDROTHERAPY
97124	MASSAGE THERAPY
97140	MANUAL THERAPY 1/> REGIONS
G0283	ELECTRICAL STIMULATION, OTHER THAN WOUND CARE, AS PART OF A THERAPY PLAN OF CARE
Evaluation	
97001	PT EVALUATION
97161	PHYSICAL THERAPY EVALUATION LOW COMPLEX 20 MINS
97162	PHYSICAL THERAPY EVALUATION MODERATE COMPLEX 30 MINS
97163	PHYSICAL THERAPY EVALUATION HIGH COMPLEX 45 MINS

eTable 2: A list of Included and Excluded Opioids

Included opioids: opioid prescriptions of oral/enteral formulations of the following:
fentanyl, codeine, hydrocodone, oxycodone, meperidine, hydromorphone, morphine, methadone, oxymorphone, propoxyphene, levorphanol, levomethadyl, pentazocine, butorphanol, tapentadol, and tramadol.
Excluded opioids
Combinations of opioids with medications commonly used for cough, nasal congestion, and headache; those containing pseudoephedrine, guaifenesin, phenylephrine, brompheniramine, pyrilamine, bulbital or caffeine.

eTable 3. Sensitivity Analysis: Relation of timing of PT initiation to any opioid use and chronic opioid use in people with knee OA who were opioid naïve (TOP SECTION) and opioid experienced (BOTTOM SECTION) *while additionally adjusting for prior NSAIDs use*. Adjusted risk ratios (RR), 95% confidence intervals, and E-values are reported.

		Subjects, n (%)	Any Opioid Use, n (%)	Adjusted RR	Chronic Opioid Use, n (%)	Adjusted RR
OPIOID NAÏVE						
Timing (months)	<1	15,940 (44.4%)	1523 (9.6%)	1.0	205 (1.3%)	1.0
	1-<3	8,816 (24.6%)	1025 (11.6%)	1.18 (1.10, 1.27)	147 (1.7%)	1.24 (1.01, 1.53)
	3-<6	5,461 (15.2%)	821 (15.0%)	1.48 (1.37, 1.60)	144 (2.6%)	1.82 (1.47, 2.24)
	6-<9	3,249 (9.1%)	576 (17.7%)	1.72 (1.57, 1.87)	112 (3.4%)	2.28 (1.81, 2.87)
	9-12	2,433 (6.8%)	478 (19.6%)	1.90 (1.73, 2.09)	91 (3.7%)	2.45 (1.91, 3.13)
OPIOID EXPERIENCED						
Timing (months)	<1	12694 (40.5%)	3,642 (28.7%)	1.0	1,418 (11.2%)	1.0
	1-<3	7,941 (25.3%)	2,753 (34.7%)	1.18 (1.14, 1.23)	1,161 (14.6%)	1.24 (1.16, 1.33)
	3-<6	5,126 (16.4%)	2,051 (40.0%)	1.31 (1.26, 1.37)	940 (18.3%)	1.42 (1.32, 1.53)
	6-<9	3,185 (10.2%)	1,365 (42.9%)	1.38 (1.32, 1.45)	654 (20.5%)	1.52 (1.40, 1.65)
	9-12	2,400 (7.7%)	1,149 (47.9%)	1.53 (1.45, 1.61)	532 (22.2%)	1.63 (1.49, 1.78)

eTable 4. Cohort Characteristics of the opioid experienced group when defined as individuals with 2 or more previously filled opioid prescriptions

Characteristics	Opioid Experienced (n=17,839)
Age (years), mean (SD)	61.1 (10.9)
Female, n (%)	11305 (63.4%)
Obesity, n (%)	3942 (22.1%)
Race/ethnicity, n (%)	
Asian	213 (1.2%)
Black	2325 (13.0%)
Hispanic	1069 (6.0%)
White	13867 (77.7%)
Missing	365 (2.0%)
US Region, n (%)	
Midwest	5648 (31.7%)
Northeast	1546 (8.7%)
South	8155 (45.7%)
West	2490 (14.0%)
Insurance Type, n (%)	
Commercial	12615 (70.7%)
Medicare Advantage	5224 (29.3%)
NSAID use, n (%)	10857 (60.9%)
Neck Pain, n (%)	4264 (23.9%)
Shoulder Pain	1552 (8.7%)
Low Back Pain, n (%)	8774 (49.2%)
Elixhauser Physical (counts), mean (SD)	2.9 (2.4)
Fibromyalgia/Chronic Pain/Fatigue, n (%)	2463 (13.8%)
ADHD, n (%)	168 (0.9%)
Depression, n (%)	4042 (22.7%)
Substance Use Disorder, n (%)	271 (1.5%)
Alcohol Use Disorder, n (%)	262 (1.5%)
Anxiety, n (%)	2062 (11.6%)
Bipolar Disorder/Schizophrenia/PTSD, n (%)	530 (3.0%)
Dementia, n (%)	116 (0.7%)
Sleep Disorder, n (%)	3256 (18.3%)
Healthcare Utilization, n (%)	
0-3	1753 (9.8%)
4-6	3568 (20.0%)
7-10	5508 (30.9%)
11+	7010 (39.3%)
NSAID: Nonsteroidal anti-inflammatory drugs (including celecoxib, diclofenac, diflunisal, fenoprofen, flurbiprofen, ibuprofen, indomethacin, ketoprofen, ketorolac, meloxicam, naproxen, nabumetone, oxaprozin, phenylbutazone, rofecoxib, salsalate, sulindac, tolmetin, and valdecoxib)	
ADHD: attention deficit hyperactivity disorder	
PTSD: post-traumatic stress disorder	

eTable 5. Sensitivity Analysis: Relation of timing of PT initiation to any opioid use and chronic opioid use in people with knee OA who were opioid experienced (*defined as 2 or more previously filled opioid prescriptions*). Adjusted risk ratios (RR) and 95% confidence intervals are reported.

		Subjects, n (%)	Any Opioid Use, n (%)	Adjusted RR	Chronic Opioid Use, n (%)	Adjusted OR
Timing (months)	<1	6,795 (38.1%)	2,752 (40.5%)	1.0	1,283 (18.9%)	1.0
	1-<3	4,584 (25.7%)	2,147 (46.8%)	1.14 (1.09, 1.19)	1,067 (23.3%)	1.18 (1.10, 1.27)
	3-<6	2,998 (16.8%)	1,576 (52.6%)	1.24 (1.19, 1.30)	844 (28.2%)	1.34 (1.24, 1.44)
	6-<9	1,986 (11.1%)	1,088 (54.8%)	1.28 (1.22, 1.34)	596 (30.0%)	1.38 (1.27, 1.50)
	9-12	1,476 (8.3%)	888 (60.2%)	1.40 (1.33, 1.47)	488 (33.1%)	1.52 (1.40, 1.66)

eTable 6. Sensitivity Analysis: Relation of timing of PT initiation to chronic opioid use *defined as at least 90 days filled prescriptions without a ≥ 30 day break in supply* in people with knee OA who were opioid naïve (TOP SECTION) and opioid experienced (BOTTOM SECTION). Adjusted risk ratios (RR) and 95% confidence intervals are reported.

		Subjects, n (%)	Chronic Opioid Use, n (%)	Adjusted RR
OPIOID NAÏVE*				
Timing (months)	<1	15,940 (44.4%)	147 (0.9%)	1.0
	1-<3	8,816 (24.6%)	114 (1.3%)	1.34 (1.05, 1.71)
	3-<6	5,461 (15.2%)	109 (2.0%)	1.90 (1.49, 2.44)
	6-<9	3,249 (9.1%)	86 (2.6%)	2.41 (1.84, 3.15)
	9-12	2,433 (6.8%)	66 (2.7%)	2.49 (1.86, 3.32)
OPIOID EXPERIENCED				
Timing (months)	<1	12,694 (40.5%)	1,131 (8.9%)	1.0
	1-<3	7,941 (25.3%)	975 (12.3%)	1.31 (1.22, 1.42)
	3-<6	5,126 (16.4%)	789 (15.4%)	1.50 (1.38, 1.63)
	6-<9	3,185 (10.2%)	534 (16.8%)	1.56 (1.42, 1.71)
	9-12	2,400 (7.7%)	446 (18.6%)	1.72 (1.56, 1.90)

*ADHD was not included as a covariate for this analysis as there were no individuals with ADHD diagnosis who had the outcome

eTable 7. Relation of dose of PT interventions with any opioid use and chronic opioid use in people with knee OA who were opioid naïve (TOP SECTION) and those who were opioid experienced (BOTTOM SECTION). Adjusted risk ratios (RR) and 95% confidence intervals are reported.

		Subjects, n (%)	Any Opioid Use, n (%)	Adjusted RR	Chronic Opioid Use, n (%)	Adjusted RR
<i>OPIOID NAÏVE</i>						
Dose (# sessions)	1-5	16,089 (44.8%)	1,961 (12.2%)	1.0	323 (2.0%)	1.0
	6-12	11,690 (32.6%)	1,381 (11.8%)	0.96 (0.90, 1.02)	198 (1.7%)	0.81 (0.68, 0.97)
	>12	8,120 (22.6%)	1,081 (13.3%)	1.10 (1.02, 1.18)	178 (2.2%)	1.07 (0.89, 1.28)
<i>OPIOID EXPERIENCED</i>						
Dose (# sessions)	1-5	14,479 (46.2%)	5,191 (35.9%)	1.0	2,300 (15.9%)	1.0
	6-12	9,686 (30.9%)	3,204 (33.1%)	0.93 (0.90, 0.97)	1,333 (13.8%)	0.88 (0.83, 0.94)
	>12	7,181 (22.9%)	2,565 (35.7%)	1.01 (0.98, 1.05)	1,072 (14.9%)	0.97 (0.91, 1.03)

eTable 8. Relation type of PT interventions with any opioid use and chronic opioid use in people with knee OA who were opioid naïve (TOP SECTION) and those who were opioid experienced (BOTTOM SECTION). Adjusted risk ratios (RR and 95% confidence intervals are reported).

		Subjects, n (%)	Any Opioid Use, n (%)	Adjusted RR	Chronic Opioid Use, n (%)	Adjusted RR
<i>OPIOID NAÏVE</i>						
Type	Active	28,048 (78.1%)	3,407 (12.1%)	0.92 (0.86, 0.98)	535 (1.9%)	0.86 (0.72, 1.02)
	Passive	7,851 (21.9%)	1,016 (12.9%)	1.0	164 (2.1%)	1.0
<i>OPIOID EXPERIENCED</i>						
Type	Active	24,120 (77.0%)	8,323 (34.5%)	0.94 (0.90, 0.97)	3,605 (14.9%)	0.94 (0.89, 1.00)
	Passive	7,226 (23.0%)	2,637 (36.5%)	1.0	1,100 (15.2%)	1.0

eTable 9. Sensitivity analysis: Relation of type of PT interventions with any opioid use and chronic opioid use in people with knee OA who were opioid naïve (TOP SECTION) and opioid experienced (BOTTOM SECTION. *Active PT was defined as every PT visit having at least one active CPT code.* Adjusted risk ratios (RR and 95% confidence intervals are reported).

		Subjects, n (%)	Any Opioid Use, n (%)	Adjusted RR	Chronic Opioid Use, n (%)	Adjusted RR
<i>OPIOID NAÏVE</i>						
Type	Active	31,982 (89.1%)	3,886 (12.2%)	0.91 (0.84, 0.99)	600 (1.9%)	0.77 (0.62, 0.95)
	Passive	3,917 (10.9%)	537 (13.7%)	1.0	99 (2.5%)	1.0
<i>OPIOID EXPERIENCED</i>						
Type	Active	27,562 (87.9%)	9,464 (34.3%)	0.91 (0.88, 0.95)	4,045 (14.7%)	0.91 (0.85, 0.98)
	Passive	3,784 (12.1%)	1,496 (39.5%)	1.0	660 (17.4%)	1.0