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Appendix A. CPT codes for primary and secondary outcomes

CPT code	Description
CPT codes for the initial procedures	
25215 (PRC)	Carpectomy; all bones of proximal row
25820 (FCA)	Intercarpal fusion; without bone graft
25825 (FCA)	Intercarpal fusion; with autograft (includes obtaining graft)
CPT codes for the primary outcome	
25800	Arthrodesis, wrist joint (including radiocarpal and/or ulnocarpal fusion); without bone graft
25805	Arthrodesis, wrist joint (including radiocarpal and/or ulnocarpal fusion); with sliding graft
25810	Arthrodesis, wrist joint (including radiocarpal and/or ulnocarpal fusion); with iliac or other autograft (includes obtaining graft)
CPT codes for the secondary outcomes: I. Revision FCA	
25820	Intercarpal fusion; without bone graft
25825	Intercarpal fusion; with autograft (includes obtaining graft)
CPT codes for the secondary outcomes: II. Arthroscopy	
29844	Arthroscopy, wrist, surgical; synovectomy, partial
29845	Arthroscopy, wrist, surgical; synovectomy, complete
29846	Arthroscopy, wrist, surgical; excision of triangular fibrocartilage and/or joint debridement
29847	Arthroscopy, wrist, surgical; internal fixation for fracture or instability
29843	Arthroscopy, wrist, surgical; for infection, lavage and drainage
CPT codes for the secondary outcomes: III. Removal of implant	
20680	Removal of implant; deep, (e.g. buried wire, pin, screw, metal band, nail, rod or plate) removal of hardware
CPT codes for the secondary outcomes: IV. Debridement	
11040	Debridement; skin, partial thickness
11041	Debridement; skin, full thickness
11042	Debridement; skin, and subcutaneous tissue
11043	Debridement; skin, subcutaneous tissue, and muscle
11044	Debridement; skin, subcutaneous tissue, muscle, and bone
CPT codes for the secondary outcomes: V. Incision	

10180	Incision and drainage, complex, postoperative wound infection
26034	Incision, deep, with opening of bone cortex (eg for osteomyelitis or bone abscess), hand or finger
CPT codes for the secondary outcomes: VI. Treatment for dislocation	
25660	Closed treatment of radiocarpal or intercarpal dislocation, one or more bones, with manipulation
25670	Open treatment of radiocarpal or intercarpal dislocation, one or more bones

Appendix A: This table includes CPT codes used for initial screening the medical record to identify patients undergoing a PRC or FCA and those undergoing secondary operations. Chart review then allowed for verification to ensure correct association of CPT code for procedure performed. Chart reviewed also allowed for verification that the CPT code for secondary operations were associated with the index procedure (FCA/PRC), and to identify any 'missed' outcomes of interest not identified by CPT code search.

Appendix B.

Description and Measurement of 22 Covariates

Covariate	Description	Measurement
Patient Demographics		
Age at exposure		Continuous variable
Male	If patients are male	Yes/No
BMI	Body mass index	Continuous variable
Married	Married Status	Yes/No
Smoking	Smoking Status: ever smoked	Yes/No
Dominant	FCA/PRC on dominant hand	Yes/No
Pre-operative Employment Status	Employed	Yes/No
Number of active VA prescriptions		Continuous variable
Comorbidity Diagnoses		
Distinct CCS count		Continuous variable
Infection		Yes/No
Musculoskeletal system and connective tissue		Yes/No
Cancer		Yes/No
Diabetes		Yes/No
Gout and other crystal arthropathies		Yes/No
Immunity		Yes/No
Mental health		Yes/No
Alcohol related disorders		Yes/No
Substance abuse		Yes/No
Blood disorders		Yes/No
Nervous system		Yes/No
Number of visits		
Inpatient Admissions		Continuous variable
ED visits		Continuous variable

Patient characteristics for full population and propensity score matching weight adjusted cohort*

	Unadjusted				Matching weights adjusted cohorts			
Variable Names	**FCA (N=257)**	**PRC (N=933)**	**Standardized difference**	**p-value**	**FCA (N=251)**	**PRC (N=251)**	**Standardized difference**	**p-value**
Patient Demographics								
Age at exposure, mean ±std**	54.8 ± 12.1	58 ± 10.6	0.283	<0.001	55.1 ± 11.8	55.2 ± 11.6	0.003	0.966
Gender								
Male	253 (98.4)	911 (97.6)	0.058	0.436	246.5 (98.4)	246.8 (98.5)	0.009	0.921
Female	4 (1.6)	22 (2.4)	0.058	0.436	4 (1.6)	3.7 (1.5)	0.009	0.921
BMI, mean ±std**	29.6 ± 5.3	30.1 ± 5.5	0.080	0.261	29.6 ± 5.3	29.6 ± 5.3	0.014	0.842
Married	143 (55.6)	471 (50.5)	0.104	0.143	137 (54.7)	136.8 (54.6)	0.001	0.987
Race								
White	186 (72.4)	667 (71.5)	0.020	0.781	180.7 (72.1)	181.3 (72.4)	0.005	0.953
Black	53 (20.6)	208 (22.3)	0.041	0.567	53 (21.2)	52.1 (20.8)	0.009	0.921
Other	10 (3.9)	21 (2.3)	0.095	0.144	8.8 (3.5)	8.6 (3.4)	0.005	0.956
Unknown	8 (3.1)	37 (4)	0.046	0.526	8 (3.2)	8.5 (3.4)	0.012	0.892
Smoking	77 (30)	368 (39.4)	0.200	0.005	76 (30.3)	75.9 (30.3)	0.001	0.994
Surgery on dominant hand	6 (2.3)	12 (1.3)	0.079	0.247	6 (2.4)	6.3 (2.5)	0.008	0.928
Employment status								
Pre-operative Employment Status	70 (27.2)	230 (24.7)	0.059	0.398	67 (26.7)	66.5 (26.5)	0.005	0.956
Number of distinct VA drug	8.8 ± 7.6	10.6 ± 9	0.213	0.001	9 ± 7.6	8.9 ± 8.3	0.013	0.857

class codes, mean ±std**								
CCS Comorbidity								
Distinct count, mean ±std**	8.7 ± 4.5	9 ± 4.6	0.071	0.317	8.9 ± 4.4	8.8 ± 4.3	0.011	0.884
Infection	135 (52.5)	530 (56.8)	0.086	0.222	134.5 (53.7)	133 (53.1)	0.012	0.892
Musculoskeletal system and connective tissue	255 (99.2)	925 (99.1)	0.009	1.000	250.5 (100)	250.5 (100)	0.000	0.998
Cancer	159 (61.9)	588 (63)	0.024	0.735	157.7 (63)	157.4 (62.8)	0.003	0.977
Diabetes	102 (39.7)	388 (41.6)	0.039	0.584	101.7 (40.6)	101.8 (40.6)	0.001	0.992
Gout and other crystal arthropathies	37 (14.4)	146 (15.6)	0.035	0.622	36.7 (14.6)	36 (14.4)	0.008	0.933
Immunity	3 (1.2)	4 (0.4)	0.083	0.176	2.7 (1.1)	2.8 (1.1)	0.003	0.975
Mental health	162 (63)	596 (63.9)	0.018	0.803	161.7 (64.5)	160.7 (64.2)	0.008	0.927
Alcohol related disorders	82 (31.9)	307 (32.9)	0.021	0.763	81.5 (32.5)	80.5 (32.1)	0.009	0.922
Substance abuse	84 (32.7)	331 (35.5)	0.059	0.406	83.7 (33.4)	84.8 (33.8)	0.009	0.918
Blood disorders	46 (17.9)	178 (19.1)	0.030	0.668	46 (18.4)	45.2 (18)	0.009	0.922
Nervous system	200 (77.8)	726 (77.8)	0.000	0.998	199.5 (79.6)	198.5 (79.2)	0.010	0.910
Number of visits								
Inpatient Admissions, mean±std**	0.2 ± 0.6	0.2 ± 0.6	0.045	0.542	0.2 ± 0.6	0.2 ± 0.6	0.006	0.933
ED visits, mean±std**	1.1 ± 1.9	1.2 ± 3.9	0.052	0.246	1.1 ± 1.9	1.1 ± 2.7	0.005	0.936

* Values are the number (%) unless indicated otherwise.

**std: standard deviation

*** We included race to present patients' race distribution, but this variable was not included in the statistical analyses.

Appendix B: First table shows the 22 covariates identified which were used to match the FCA and PRC patient cohorts. The second table shows these covariates in the unmatched and matched FCA and PRC cohorts. After propensity matching the weight adjusted cohorts have no statistically significant difference in the 22 covariates included in this study as demonstrated by p values greater than .05.

Appendix C. Clinical Classifications Software Category by groups collapsed in this study

Number*	CCS Category	Group
1	Tuberculosis	Infection
2	Septicemia (except in labor)	
3	Bacterial infection; unspecified site	
4	Mycoses	
5	HIV infection	
6	Hepatitis	
7	Viral infection	
8	Other infections; including parasitic	
9	Sexually transmitted infections (not HIV or hepatitis)	
201	Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease)	
11	Cancer of head and neck	Cancer
12	Cancer of esophagus	
14	Cancer of colon	
15	Cancer of rectum and anus	
16	Cancer of liver and intrahepatic bile duct	
18	Cancer of other GI organs; peritoneum	
19	Cancer of bronchus; lung	
21	Cancer of bone and connective tissue	
22	Melanomas of skin	
23	Other non-epithelial cancer of skin	
24	Cancer of breast	
26	Cancer of cervix	
29	Cancer of prostate	
30	Cancer of testis	
31	Cancer of other male genital organs	
32	Cancer of bladder	
33	Cancer of kidney and renal pelvis	
35	Cancer of brain and nervous system	
36	Cancer of thyroid	
38	Non-Hodgkin`s lymphoma	
39	Leukemias	
40	Multiple myeloma	
41	Cancer; other and unspecified primary	

42	Secondary malignancies	
43	Malignant neoplasm without specification of site	
44	Neoplasms of unspecified nature or uncertain behavior	
45	Maintenance chemotherapy; radiotherapy	
47	Other and unspecified benign neoplasm	
49	Diabetes mellitus without complication	Diabetes
50	Diabetes mellitus with complications	

Number*	**CCS Category**	**Group**
54	Gout and other crystal arthropathies	Gout and other crystal arthropathies
57	Immunity disorders	Immunity disorder
62	Coagulation and hemorrhagic disorders	Blood disorder
63	Diseases of white blood cells	
64	Other hematologic conditions	
95	Other nervous system disorders	Nervous system
202	Rheumatoid arthritis and related disease	Musculoskeletal system and connective tissue
203	Osteoarthritis	
204	Other non-traumatic joint disorders	
205	Spondylosis; intervertebral disc disorders; other back problems	
651	Anxiety disorders	Mental health disorder
653	Delirium, dementia, and amnestic and other cognitive disorders	
657	Mood disorders	
658	Personality disorders	
659	Schizophrenia and other psychotic disorders	
662	Suicide and intentional self-inflicted injury	
660	Alcohol-related disorders	Alcohol related disorder
661	Substance-related disorders	Substance abuse

*: CCS Category Number

Appendix C: This is a table of the 58 comorbidity diagnoses that were selected as clinically relevant to balance the PRC and FCA patient populations for this study. The 58 diagnoses were then collapsed into 11 groups. The matching weight adjusted FCA and PRC cohorts were balanced based on these comorbidity diagnoses to create similar populations with respect to comorbidity burden.

Appendix D: Statistical Equations Utilized to Determine Propensity Scores, Matching Weights, and Standardized Difference

Propensity score (e_i) for each initial procedure was generated using potential confounders (X) to model treatment decisions (Z) with a logistic regression:

$$e_i = e(X_i) = \Pr(Z_i = 1|X_i)$$

Matching Weight for each initial procedure (W_i) was defined as:

$$W_i = \frac{\min(1 - e_i\,,\ e_i\,)}{Z_i e_i + (1 - Z_i)(1 - e_i)}$$

Standardized differences: using weighted means and variances. Based on previous literature, if the standardized differences are less than 10% (< 0.1) in the matching weight adjusted cohort, then the differences of covariates were considered as balanced between the two surgery groups in the adjusted cohort.

$$Standardized\ difference = \frac{100\ \times (\bar{x}_{(1)} - \bar{x}_{(0)})}{\sqrt{(s^2_{(1)} + s^2_{(0)})/2}}$$

Appendix D: These are the statistical equations used to determine propensity scores, standardized differences, and matching weights for each the PRC and FCA matched cohorts.