http://dx.doi.org/10.2106/JBJS.22.01193

Appendix

Data Sources

Table A.1 Data sources for study variables.

Database Name	Database Description	Variables
Continuing Care Reporting System (CCRS)	CCRS contains clinical and demographic information on residents receiving facility-based continuing care services, including in-hospital based continuing care and residential care providing 24-hour nursing services.	Long-term care residence
Discharge Abstract Database (DAD)	DAD is compiled by CIHI and contains clinical, demographic, and administrative data on all hospital admissions and discharges.	Hip fracture diagnosis, hip dislocation, revision hip surgery, 30-day hospital readmission, age, dementia, frailty, hospital hip fracture volume
Ontario Dementia Dataset (DEMENTIA)	This ICES-derived database utilizes validated case-finding algorithms to identify individuals between the ages of 40 and 110 years with a diagnosis of Alzheimer's and related dementias.	Dementia
Home Care Database (HCD)	This database receives home care data from the Ontario Association of Community Care Access Centres.	Home care services
Institution Information System (INST)	INST contains information about Ontario health care institutions funded by the MOHLTC. It contains data on number and types of beds available at each institution.	Hospital bed volume
National Ambulatory Care Reporting System (NACRS)	This database contains information on patient visits to hospital and community-based ambulatory care, day surgery, outpatient clinics, and emergency departments.	Dementia, frailty, hip dislocation, revision hip surgery
Ontario Drug Benefit Claims (ODB)	ODB contains claims for prescription drugs received under the Ontario Drug Benefit Program. Data is collected for patients who have a valid OHIP card and meet at least one of the following criteria: 65+ years old, residents of LTC facilities, receiving services under the Home Care Program, Trillium Drug Program recipients,	Dementia, long-term care residence

	on social assistance, and eligible for Special Drugs Programs.	
Ontario Health Insurance Plan Claims Database (OHIP)	This database contains claims paid by the Ontario Health Insurance Plan to all health care providers. All physicians are required to submit billings for income (fee-for-service) or submit shadow billing for alternative funding plans.	Treatment group, outcomes, American Society of Anesthesiologists score, dementia, frailty, year
Ontario Home Care Administrative System (OHCAS)	This database collects information on patients when they apply for home care. Details of actual home care visits are collected. This database was replaced by HCD in 2005.	Home care services
Ontario Marginalization Index (ONMARG)	This index quantifies the degree of marginalization occurring across Ontario, thus providing a geographic-based index of SES.	Marginalization
Ontario Mental Health Reporting System (OMHRS)	OMHRS collects data on patients in adult inpatient mental health beds. It contains information on admissions/discharges, patient demographics, and psychiatric and non-psychiatric diagnoses.	Congestive heart failure, frailty
Ontario Rheumatoid Arthritis Dataset (ORAD)	This ICES-derived database utilizes validated case-finding algorithms to identify individuals with a diagnosis of rheumatoid arthritis since 1991.	Rheumatoid arthritis
Postal Code Conversion File (PCCF)	This database allows the linkage of six-character postal codes to 2011 Canadian census areas.	Rurality, Marginalization
Registered Persons Database (RPDB)	RPDB provides basic demographic information on all individuals who have ever received an Ontario health card number.	Sex, death
Same Day Surgery Database (SDS)	This database contains data for day surgeries across Ontario. Since April 2003, same day surgery is captured in the NACRS dataset.	Dementia, frailty, hip dislocation, revision hip surgery

Variable Definitions and Validation Studies

Table A.2 Variable definitions, coding algorithms, and validation studies (where applicable).

Variable	Source	Coding Algorithm/Definition	Validation Information
Exposure			
Femoral Neck Fracture	DAD	ICD-10-CA codes: S72.010, S72.011, S72.080, S72.081, S72.090, S72.091 ICD-9 codes: 8200, 8201, 8208, 8209	Sensitivity and positive predictive value (PPV) of ICD-10-CA codes for hip fracture diagnoses are 95% (95% CI 93-97%) and 95% (95% CI 92-97%), respectively (1).
Total Hip Arthroplasty	OHIP	OHIP fee code: R440	OHIP captures claims for inpatient and outpatient physician services with high accuracy (96%) (2).
Hemiarthroplasty	OHIP	OHIP fee codes: R439, F101	OHIP captures claims for inpatient and outpatient physician services with high accuracy (96%) (2).
Outcome			
Hip Dislocation	OHIP, DAD, NACRS, SDS	OHIP fee codes: D042, D043, R628 ICD-10-CA codes: S73000, S73001, S73010, S73011, S73080, S73081, S73090, S73091 CCI codes: 1VA73JA, 1VA73LA	OHIP captures claims for inpatient and outpatient physician services with high accuracy (96%) (2).
Hip Revision Surgery	OHIP, DAD, NACRS, SDS	OHIP fee code R241 CCI codes: 1VA53LA-PN, 1VA53LA-PM with Status = revision	OHIP captures claims for inpatient and outpatient physician services with high accuracy (96%) (2). For CCI codes with status = revision, appropriate designation of procedure had 81.8% (95% CI 60-95%) sensitivity and 99.4% (95% CI 97-100%) specificity (2).
Death	RPDB	DTHDATE	N/A
30-Day All-Cause Hospital Readmission	DAD	ADMDATE + DX10CODE1 variables within 30 days of discharge from hip-fracture associated hospital stay	N/A
Patient Characteristics			
Marginalization Summary Score	ONMARG	See reference	(3)

Frailty	DAD, NACRS, OHIP, OMHRS, SDS	See Appendix A	(4, 5)
Long-Term Care Residence	ODB (primary), OHIP, CCRS	Variable definition: patient defined as residing in long-term care residence prior to admission if any of the following applies: - ODB: any prescription flagged as LTC in the two years prior to patient's hip fracture admission - CCRS: hip fracture admission date falls between admission and discharge dates to LTC for patient or if hip fracture admission falls after admission date and there is no discharge date	(6)
Pre-admission home care services	OHCAS, HCD	Variable definition: any home care services in the 6 months prior to hip fracture admission	N/A
ASA Score	OHIP	I. A normal healthy patient II. A patient with mild systemic disease III. A patient with severe systemic disease IV. A patient with severe systemic disease that is a constant threat to life V. A moribund patient who is not expected to survive without the operation (7)	N/A
ADG	DAD, NACRS, OHIP, OMHRS, SDS	See reference	(4)
RUB	DAD, NACRS, OHIP, OMHRS, SDS	See reference	(4)
Dementia	ICES-Derived Cohort	Variable definition: a person aged 40 to 110 years old is identified with dementia if s/he meets one of the following criteria: - The person had at least 3 OHIP claims with a dementia diagnosis	Sensitivity 79.3% Specificity 99.1% (8)

		recorded which were each at least 30 days apart in a 2-year period, or - The person had atleast one hospitalization or same day surgery with a dementia diagnosis recorded, or - The person had at least one ODB claim with a dementia medication (SUBCLNAM= CHOLINESTERASE INHIBITORS) dispensed The dataset was created by combining these data sources with demographic information for persons eligible for health care coverage in Ontario (from RPDB)	
Institution Characteristics			
Institution Teaching Status	INST	Variable definition: Institutions designated as teaching hospital by Ministry of Healthy and Long-Term Care	N/A
Institution Hip Fracture Volume	DAD, INST	Variable definition: number of admitting hip fractures at treating institution in the 365 days prior to patient's hip fracture admission	N/A
Institution Surgical Bed Volume	INST	Variable definition: number of surgical beds in treating institution during index year	N/A
Note: ASA Score = American Society of Anesthesiologists physical status classification system score; ADG = Johns Hopkins Aggregated Diagnosis Groups; RUB = Resource Utilization Bands			

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Propensity Score – Balance Diagnostics

Propensity Score Distribution

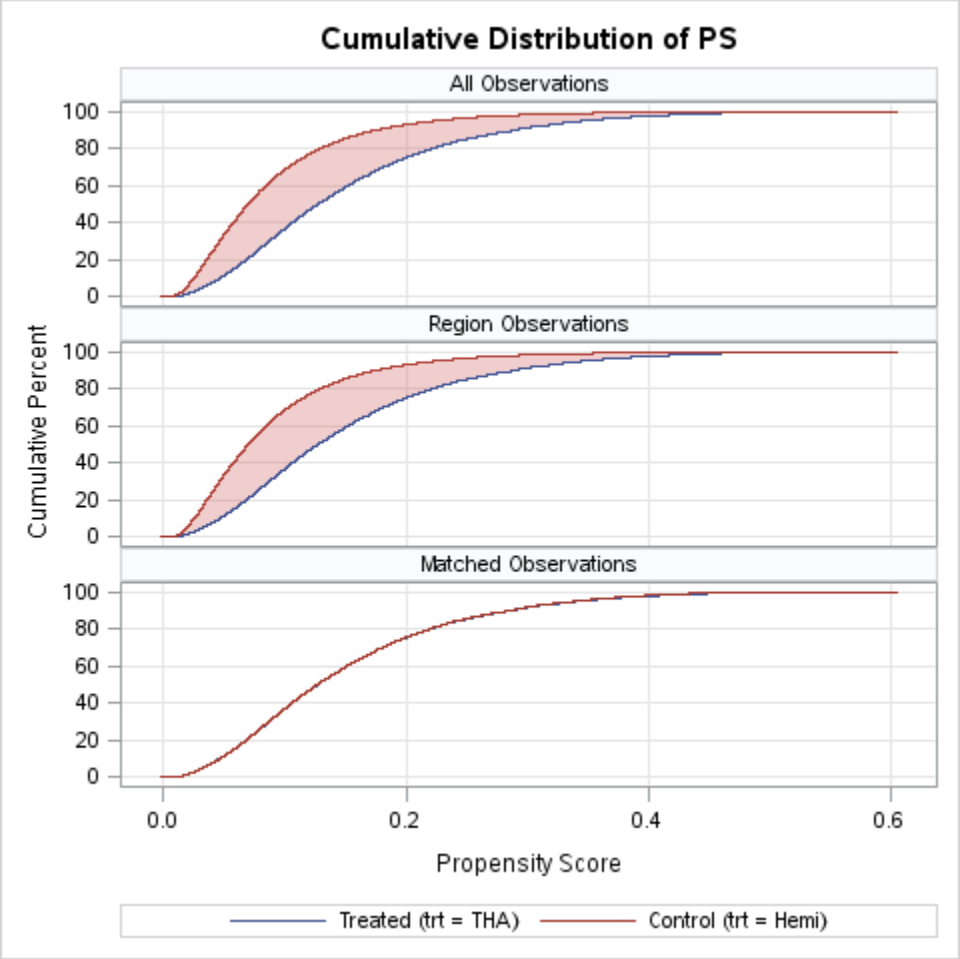

Figure A.1 Cumulative distribution of propensity scores for THA for overall cohort (top) and matched cohort (bottom).

Note: THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

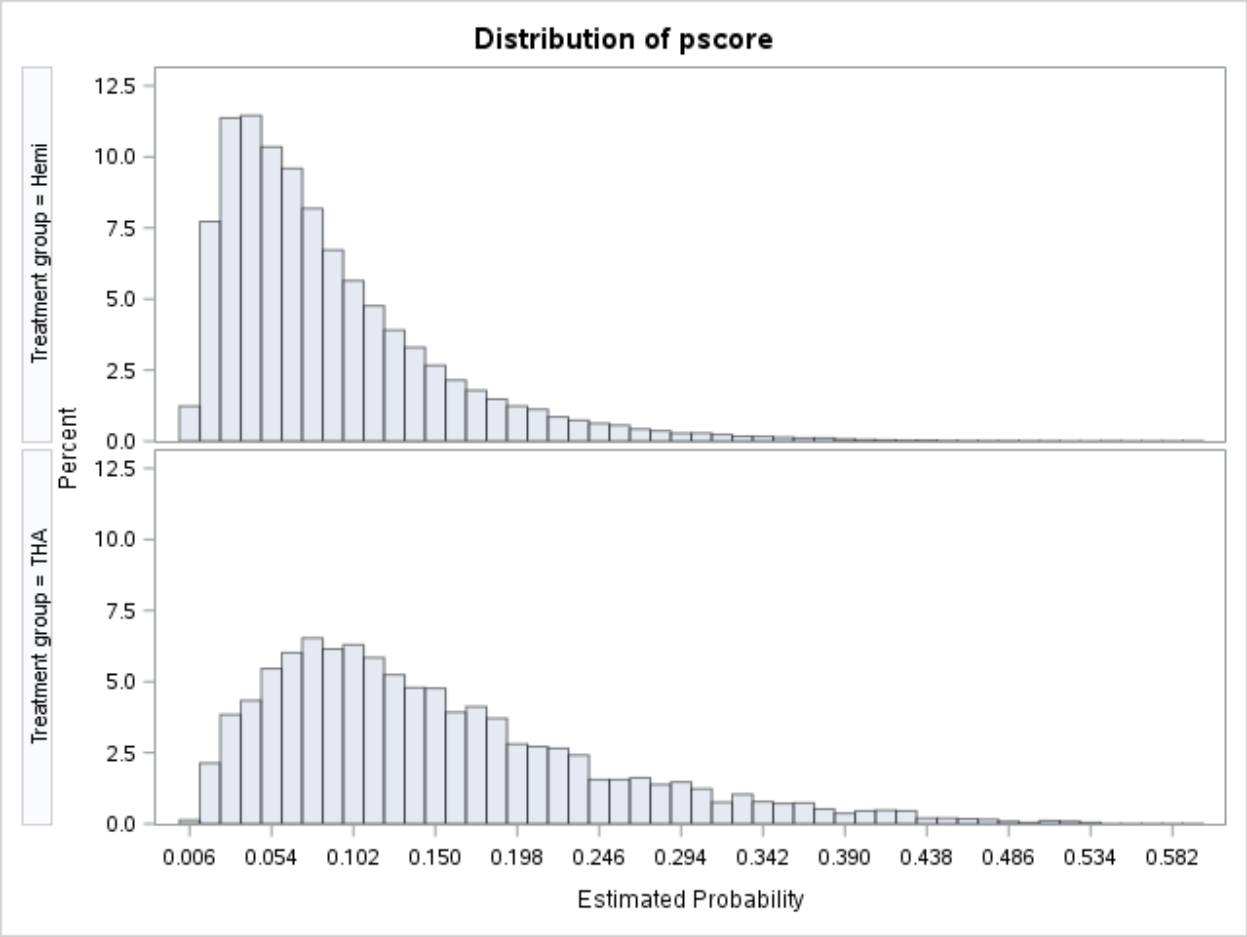

Figure A.2 Histograms demonstrating distribution of propensity scores for treatment with THA in full cohort, stratified by actual treatment received.

Note: THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

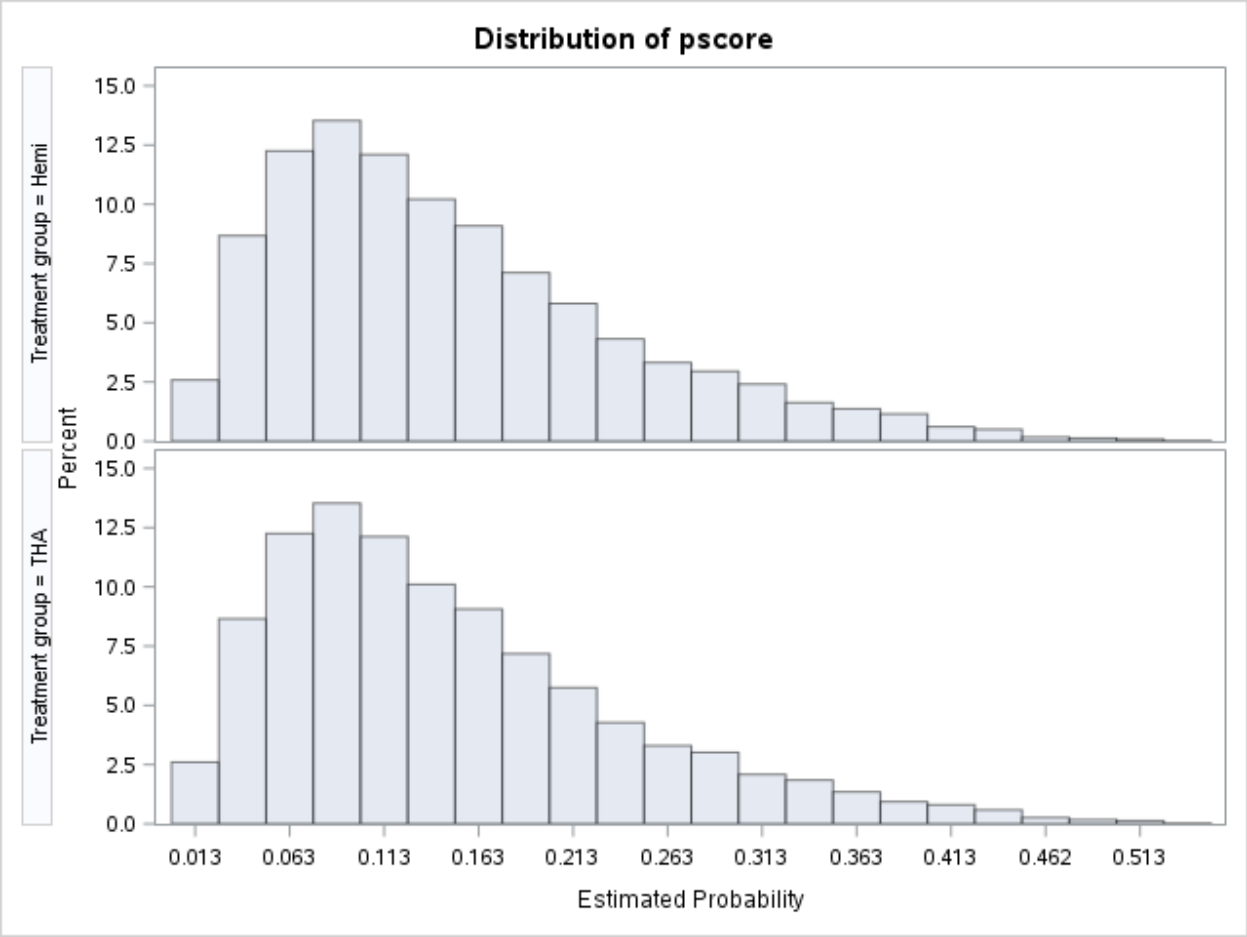

Figure A.3 Histograms demonstrating distribution of propensity scores for treatment with THA in matched cohort, stratified by actual treatment received.

Note: THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

Comparison of Summary Statistics

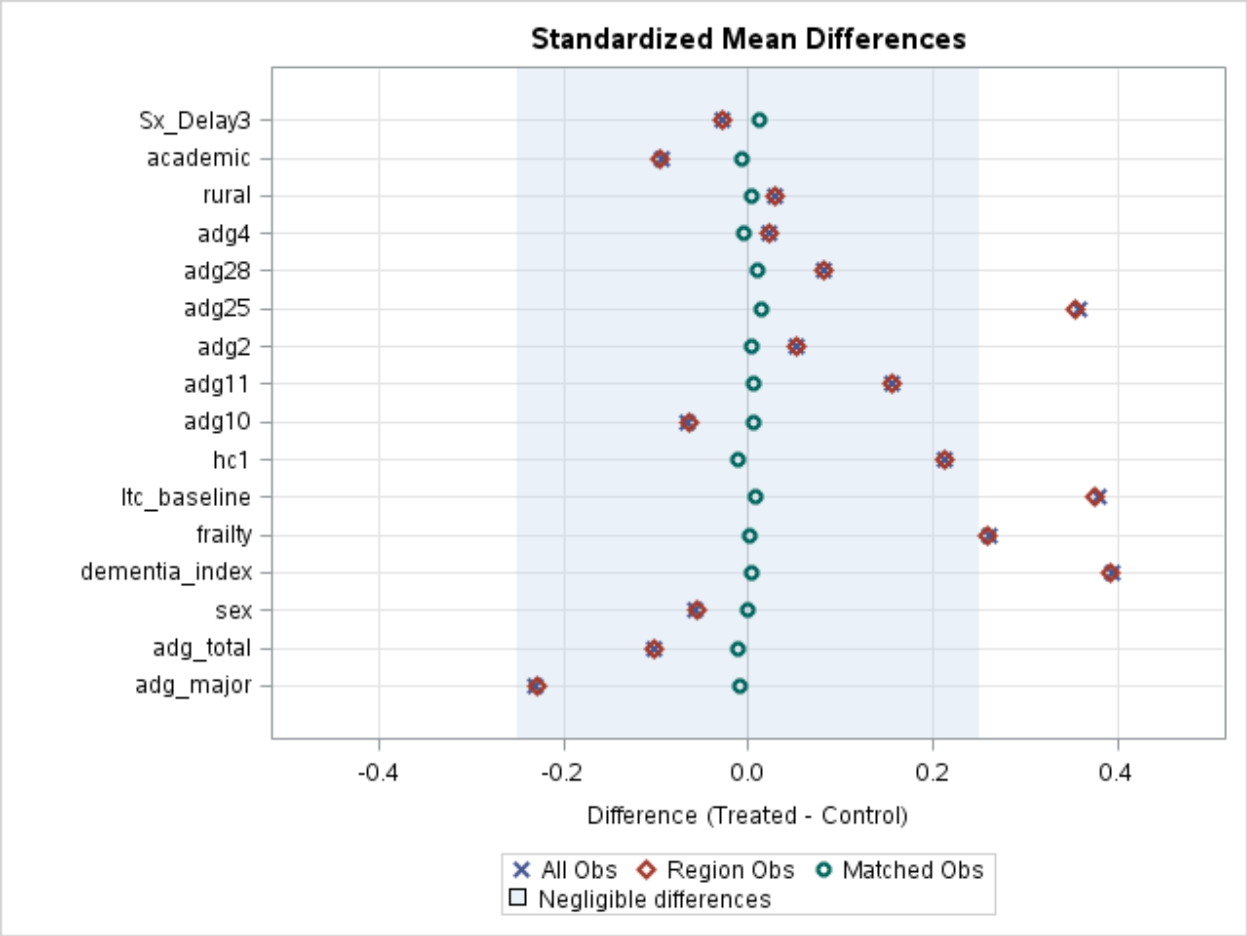

Figure A.4 Standardized differences for categorical variables.

Standardized differences for the matched observations (marked green circle) are within the recommended limits of -0.25 and 0.25 (reference lines). Many authors use limits of -0.10 and 0.10 (9).

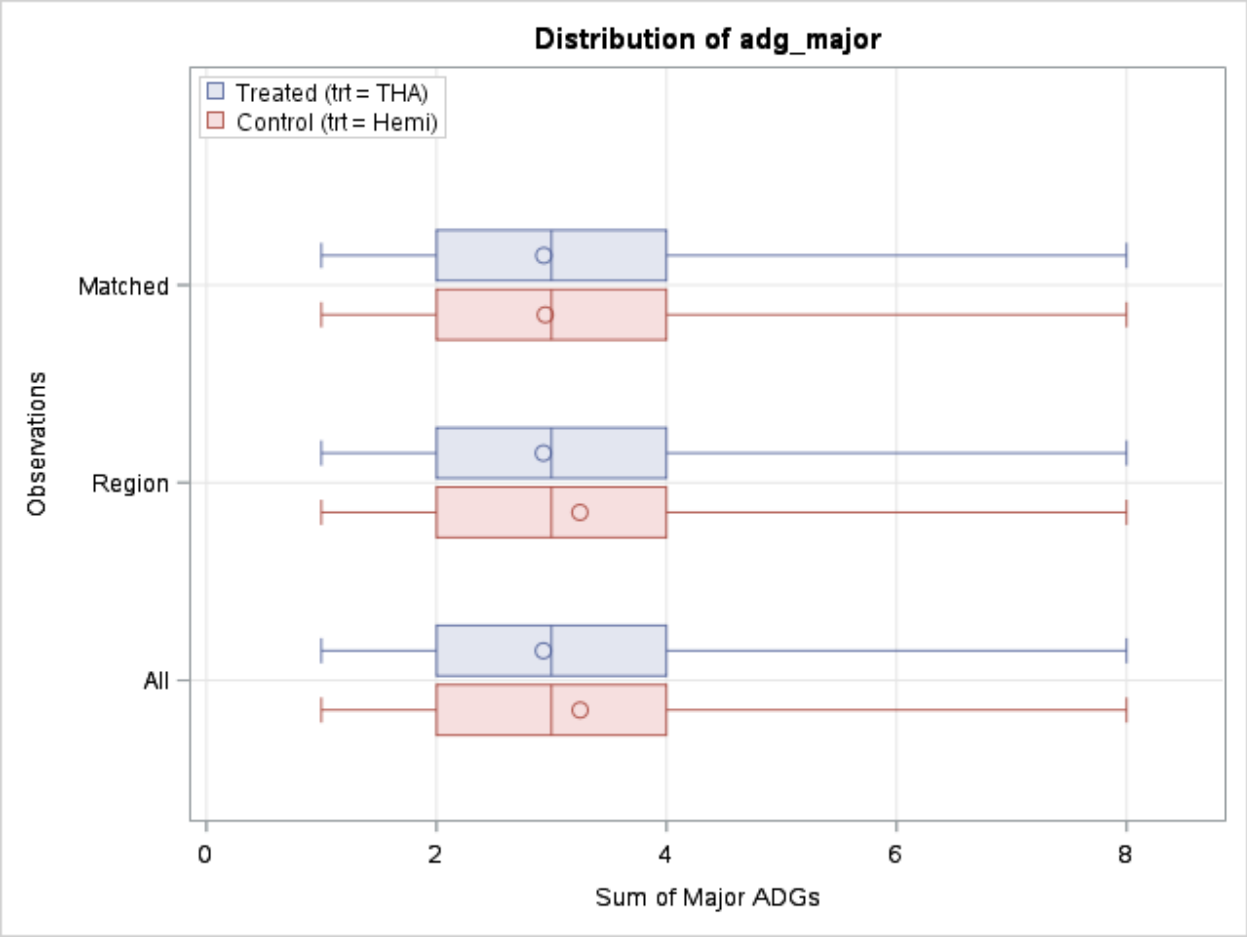

Figure A.5 Distribution of sum of major Johns Hopkins Aggregated Diagnosis Groups (ADGs) in full cohort and matched cohort.

Note: THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

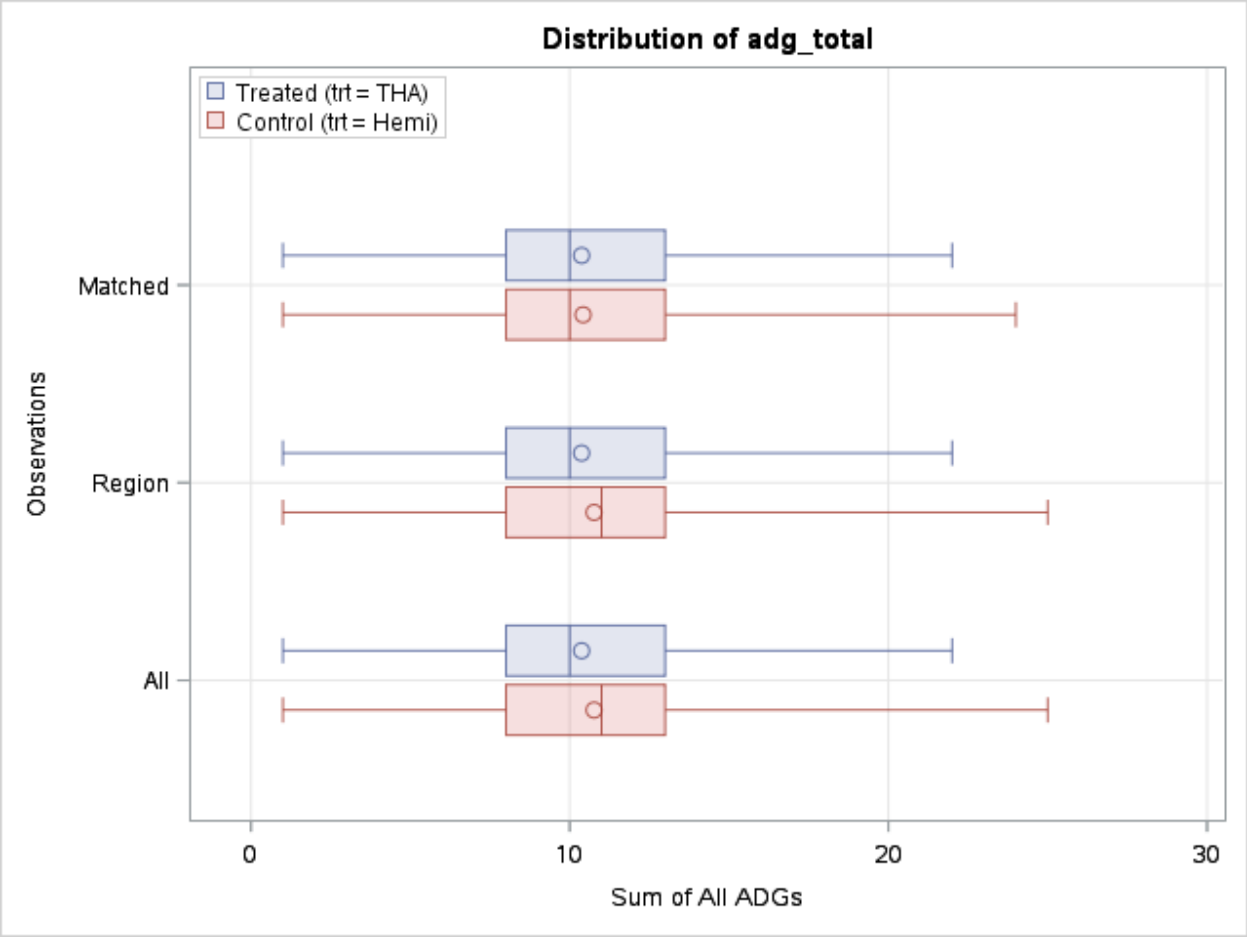

Figure A.6 Distribution of sum of all Johns Hopkins Aggregated Diagnosis Groups (ADGs) in full cohort and matched cohort.

Note: THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

http://dx.doi.org/10.2106/JBJS.22.01193

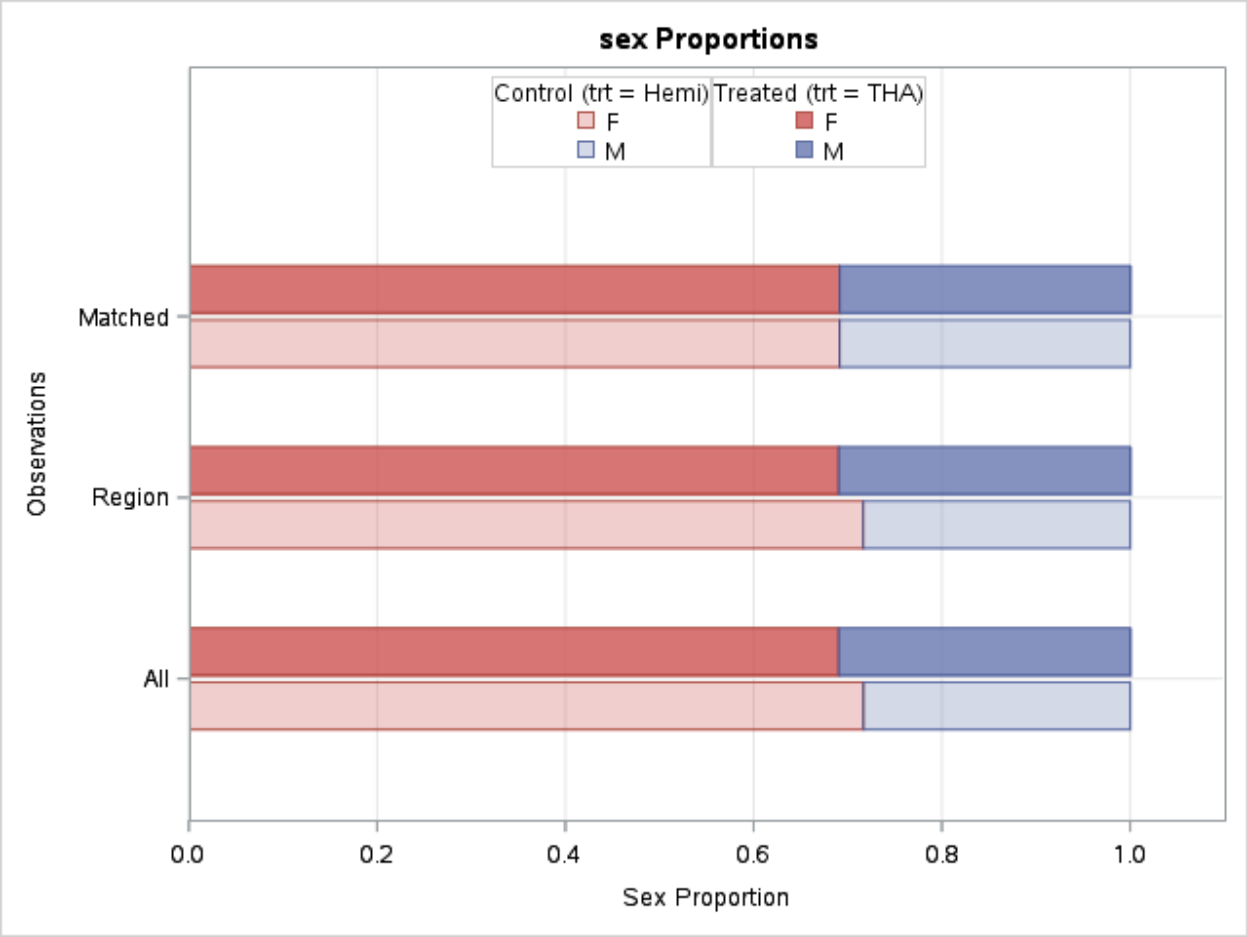

Figure A.7 Distribution by sex in full cohort and matched cohort.

Note: F = female; M = Male; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

Bar charts display identical distribution for sex in matched observation because exact matching for this variable was specified in our model.

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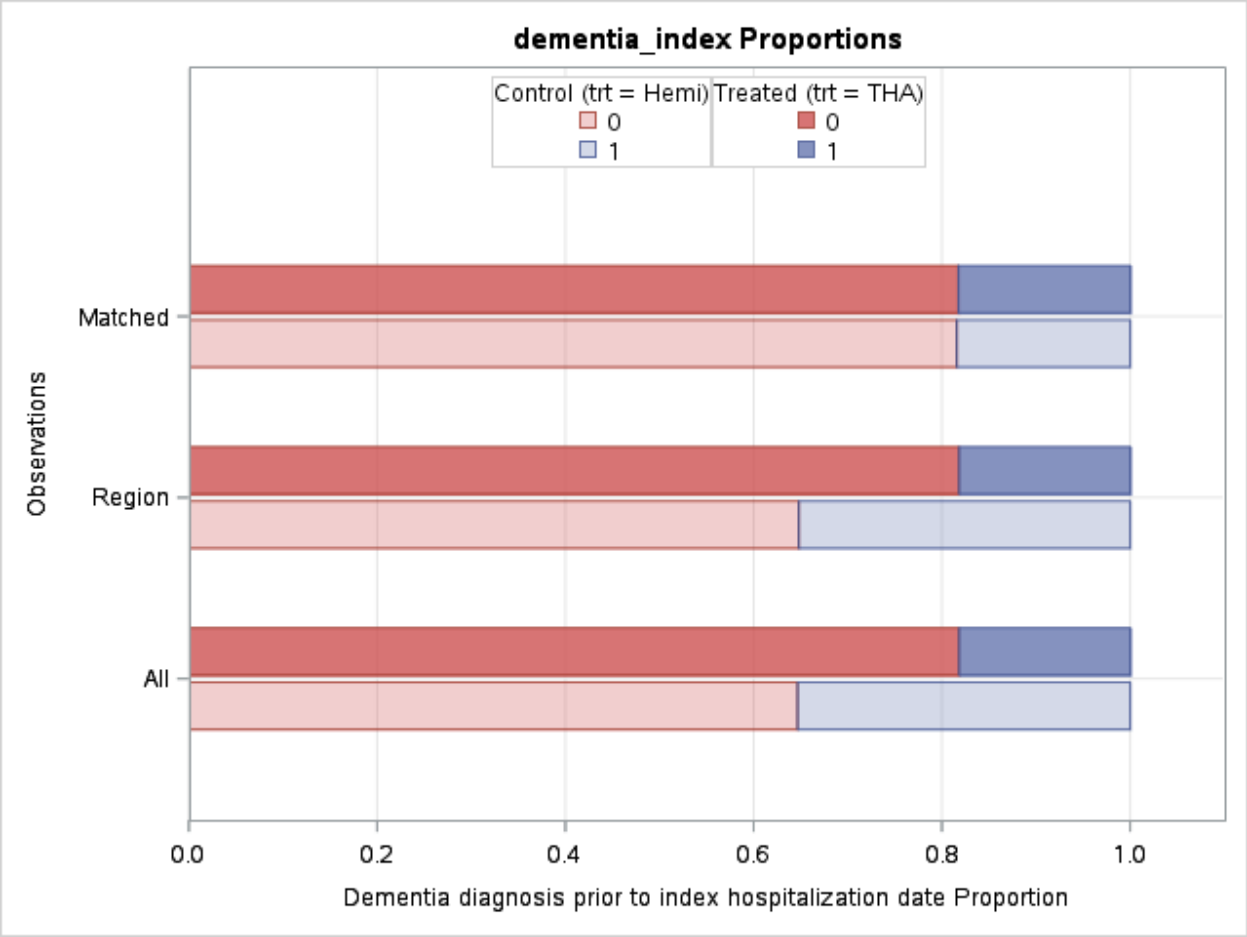

Figure A.8 Distribution of patients with dementia in full cohort and matched cohort.

Note: 0 = No dementia at baseline; 1 = Baseline dementia; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

http://dx.doi.org/10.2106/JBJS.22.01193

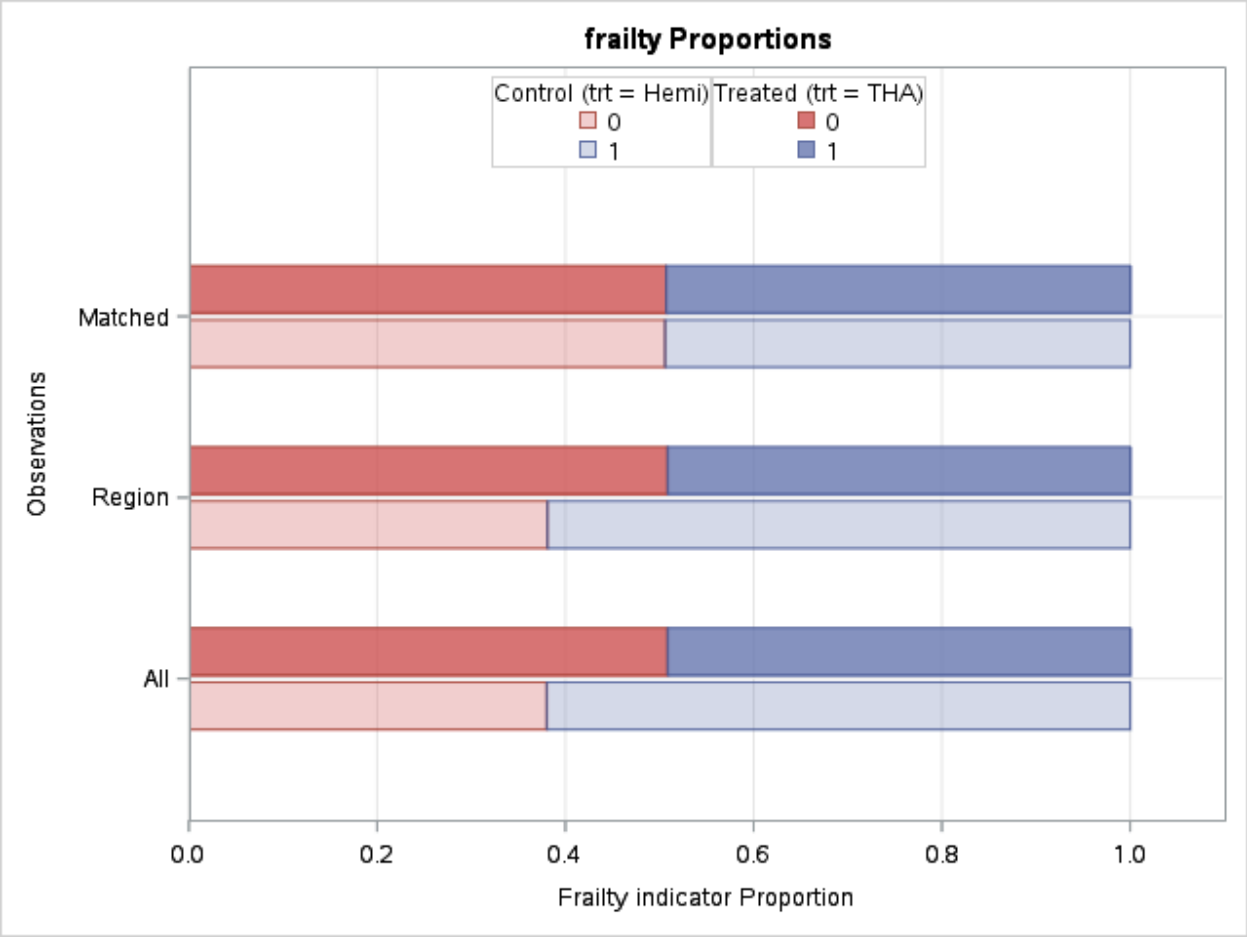

Figure A.9 Distribution of frail patients in full cohort and matched cohort.

Note: 0 = No baseline frailty; 1 = Baseline frailty; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

http://dx.doi.org/10.2106/JBJS.22.01193

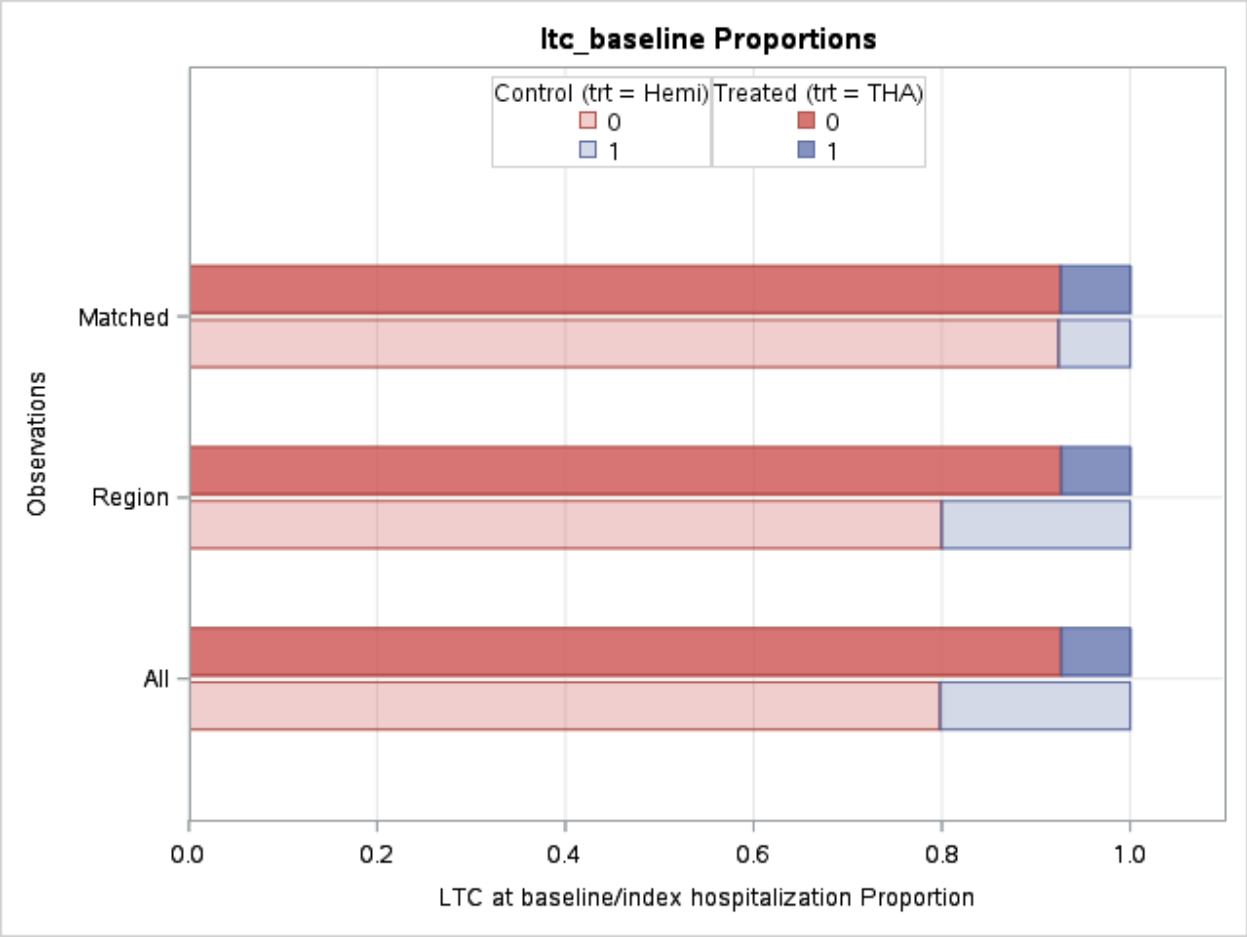

Figure A.10 Distribution of patients residing in long-term care at baseline in full cohort and matched cohort.

Note: 0 = No baseline long-term care residence; 1 = Baseline long-term care residence; LTC = long-term care; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

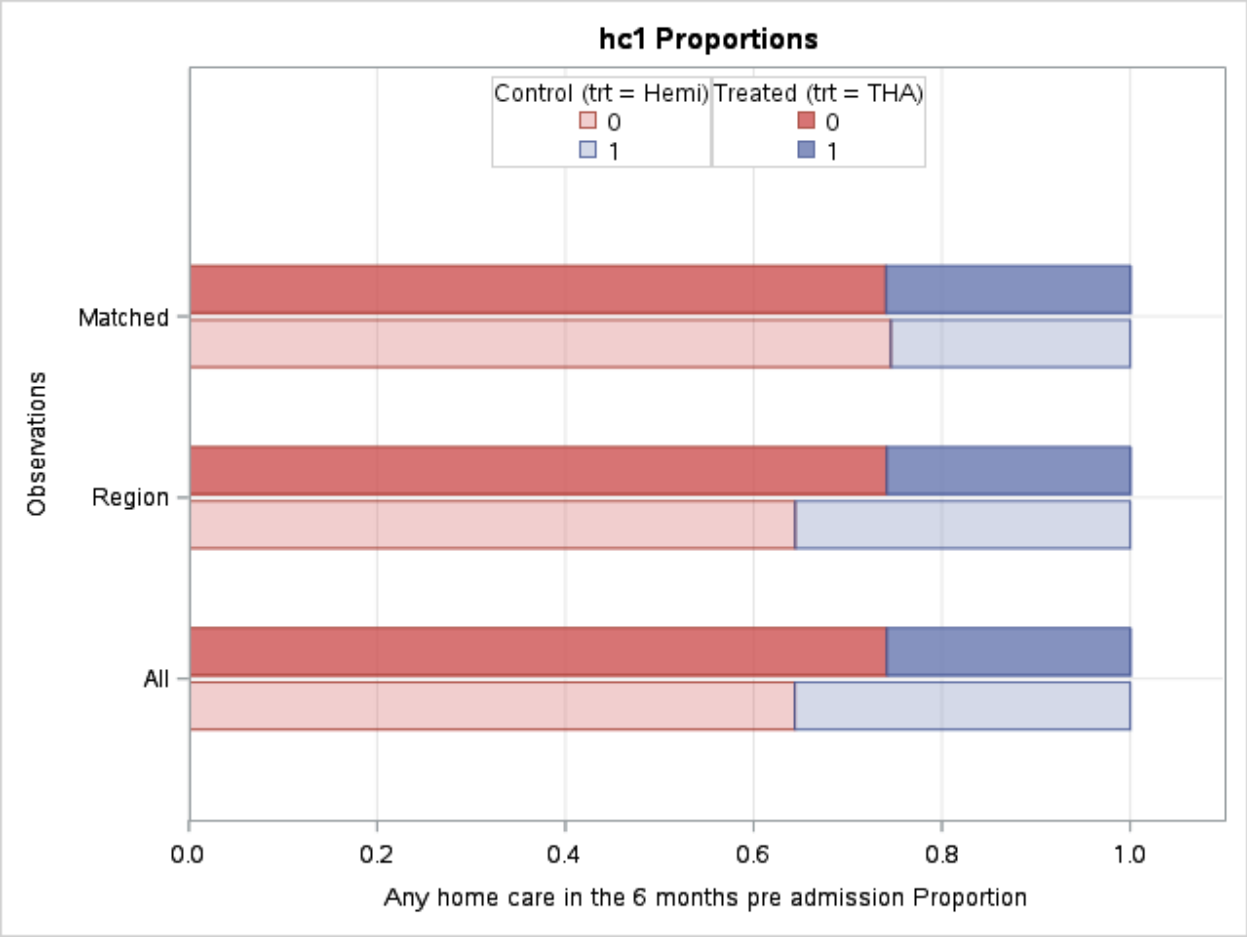

Figure A.11 Distribution of patients receiving home care services as baseline in full cohort and matched cohort.

Note: 0 = no baseline home care services; 1 = Baseline home care services; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

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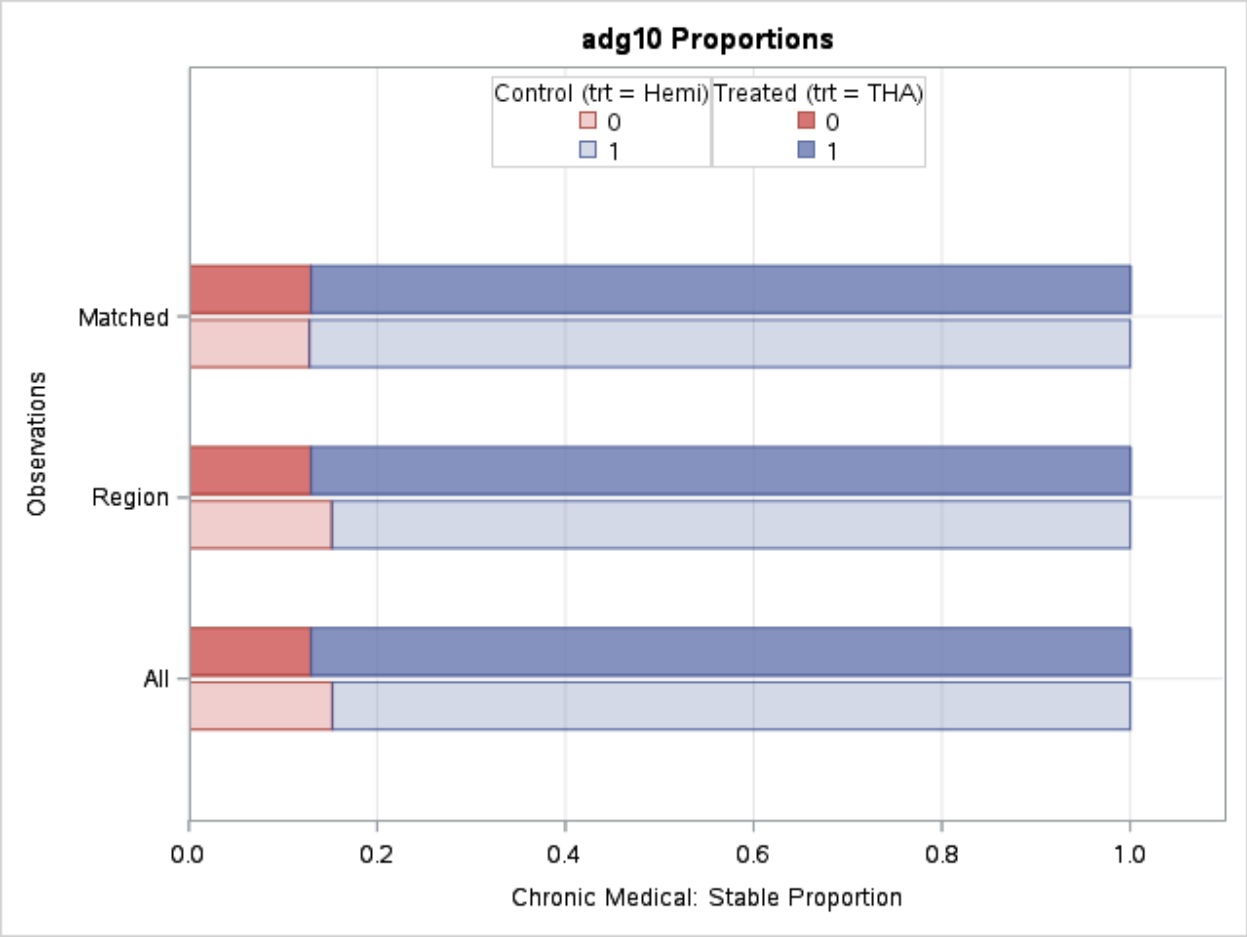

Figure A.12 Distribution of patients with Johns Hopkins Aggregated Diagnosis Groups 10 (ADG10) diagnosis in full cohort and matched cohort.

Note: 0 = No ADG10; 1 = ADG10; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

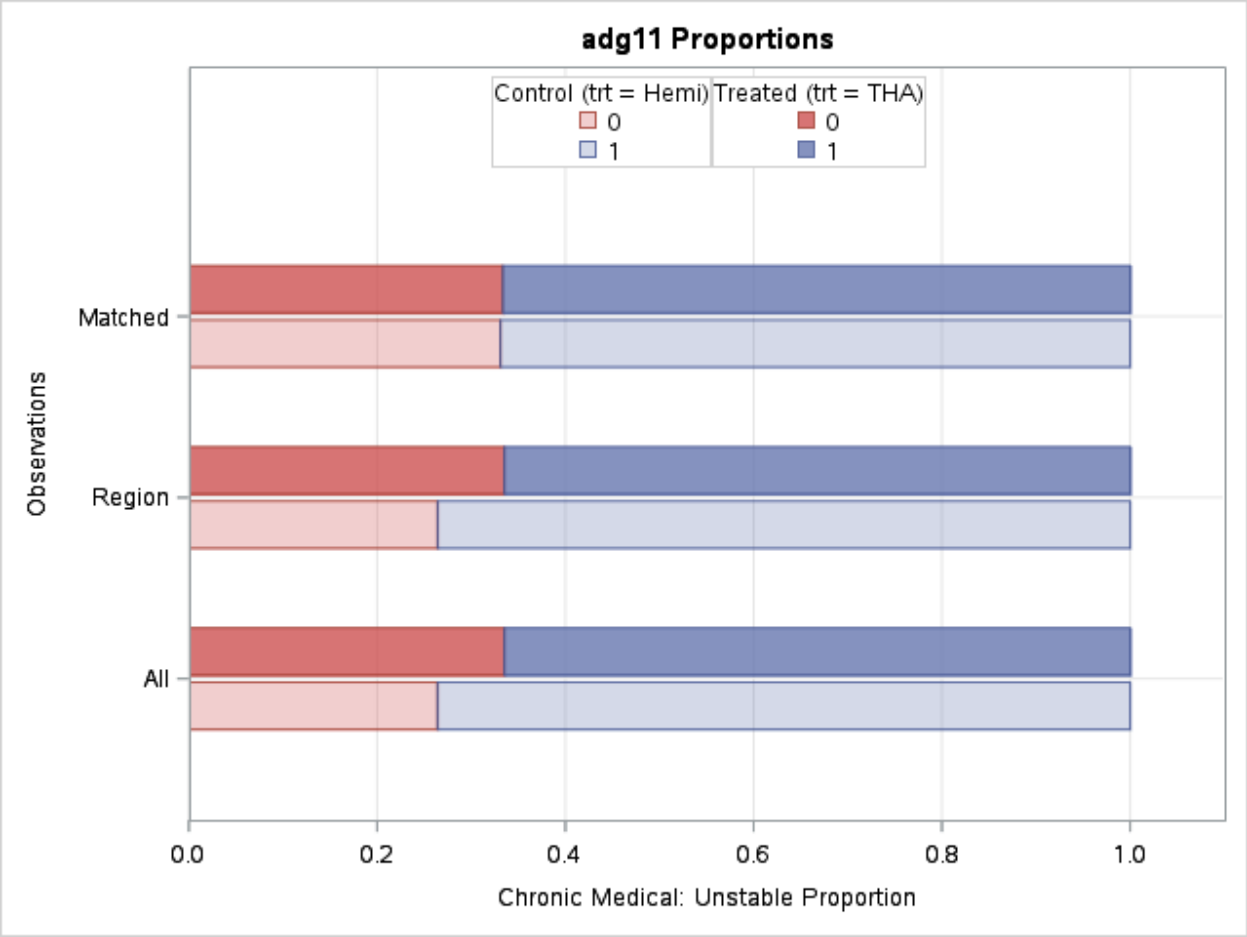

Figure A.13 Distribution of patients with Johns Hopkins Aggregated Diagnosis Groups 11 (ADG11) diagnosis in full cohort and matched cohort.

Note: 0 = No ADG11 diagnosis; 1 = ADG11 diagnosis; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

http://dx.doi.org/10.2106/JBJS.22.01193

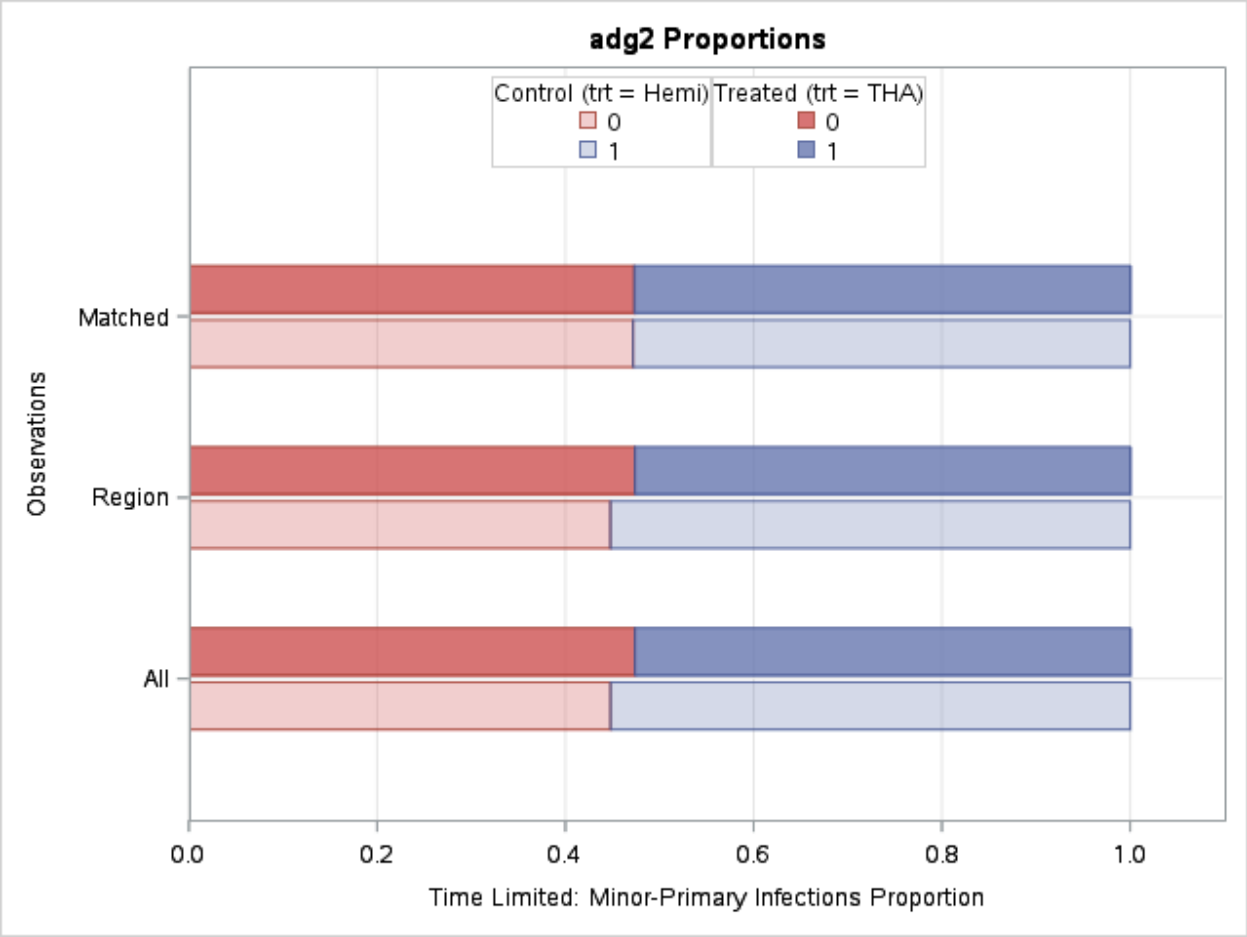

Figure A.14 Distribution of patients with Johns Hopkins Aggregated Diagnosis Groups 2 (ADG2) diagnosis in full cohort and matched cohort.

Note: 0 = No ADG2 diagnosis; 1 = ADG2 diagnosis; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

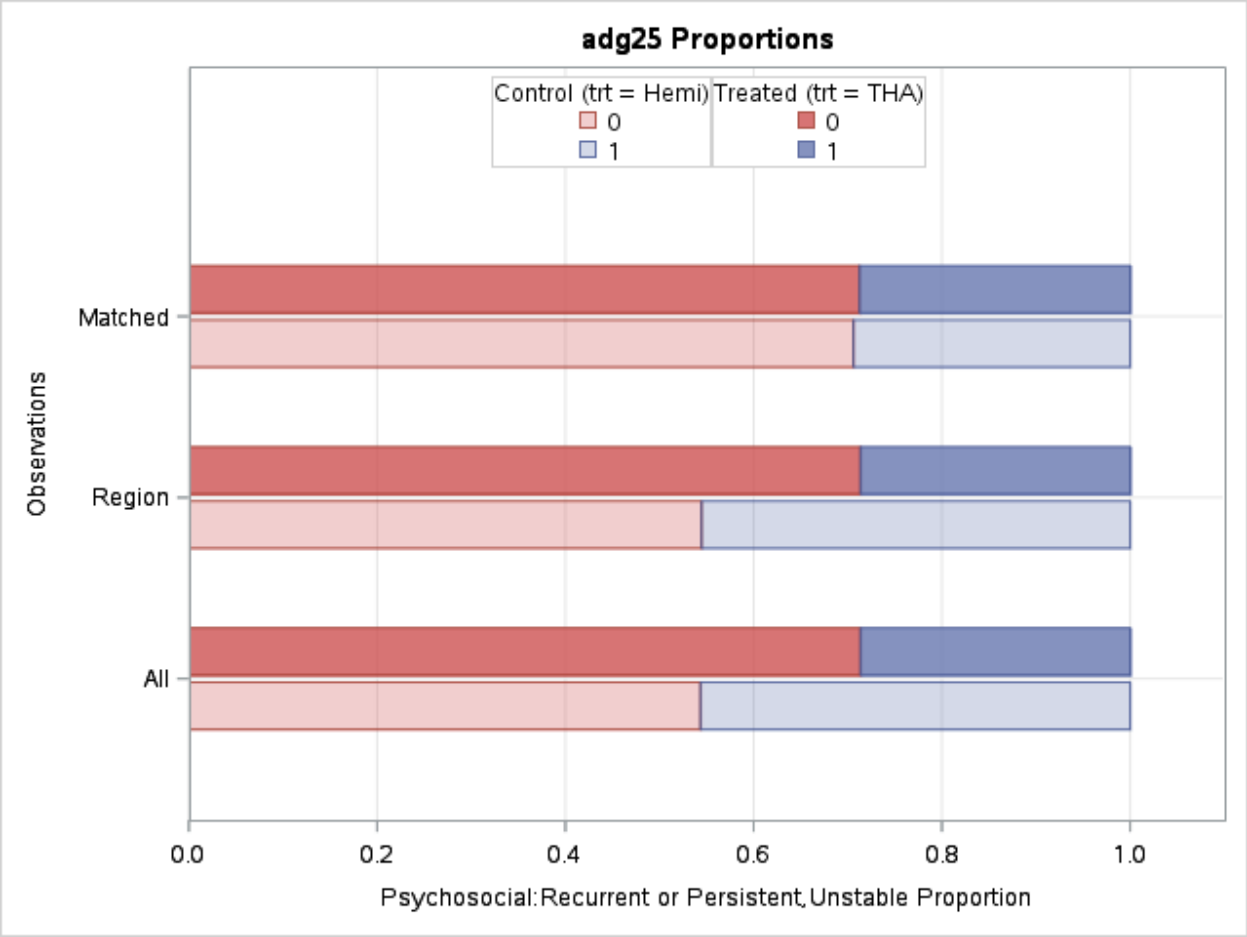

Figure A.15 Distribution of patients with Johns Hopkins Aggregated Diagnosis Groups 25 (ADG25) diagnosis in full cohort and matched cohort.

Note: 0 = No ADG25 diagnosis; 1 = ADG25 diagnosis; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

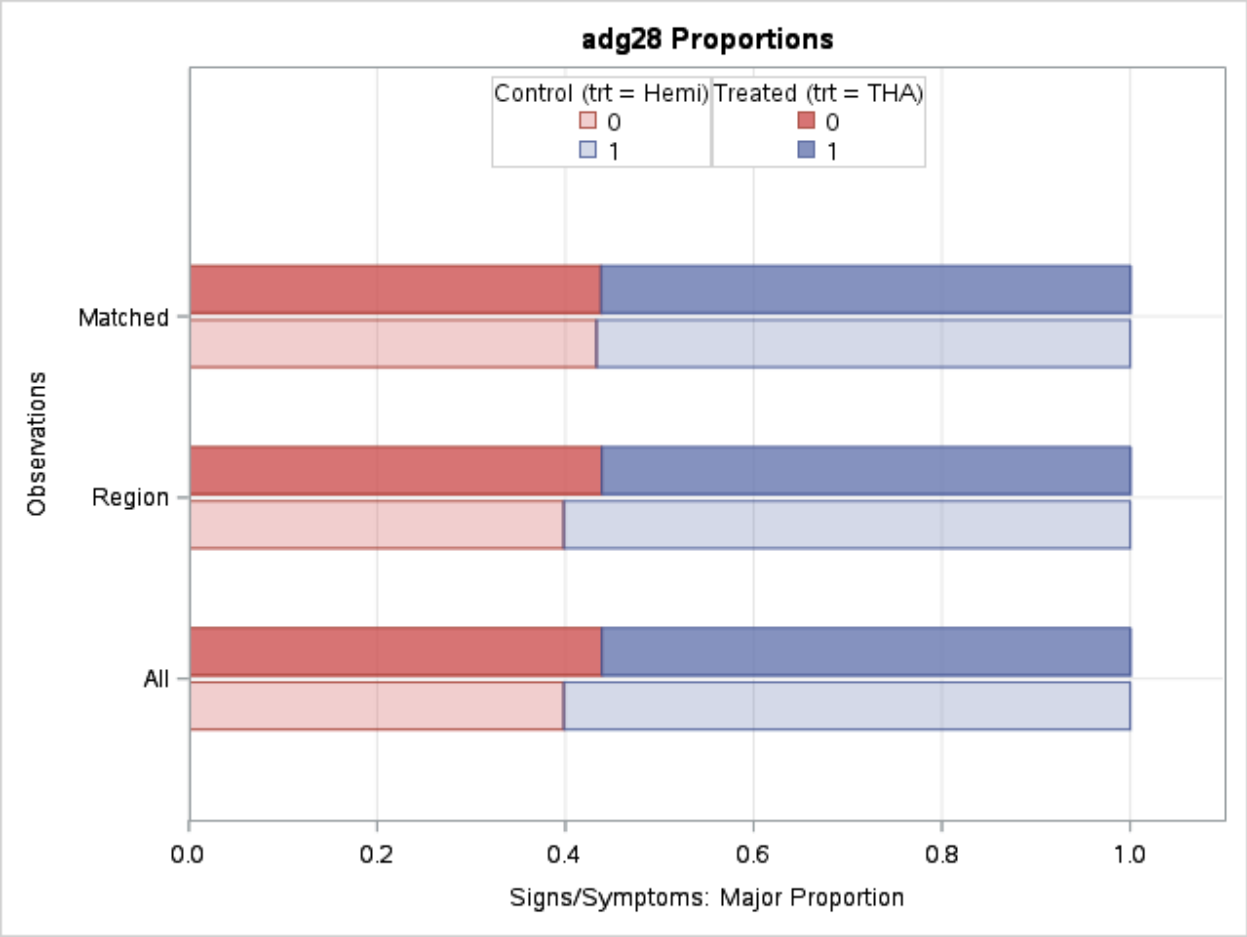

Figure A.16 Distribution of patients with Johns Hopkins Aggregated Diagnosis Groups 28 (ADG28) diagnosis in full cohort and matched cohort.

Note: 0 = No ADG28 diagnosis; 1 = ADG28 diagnosis; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

http://dx.doi.org/10.2106/JBJS.22.01193

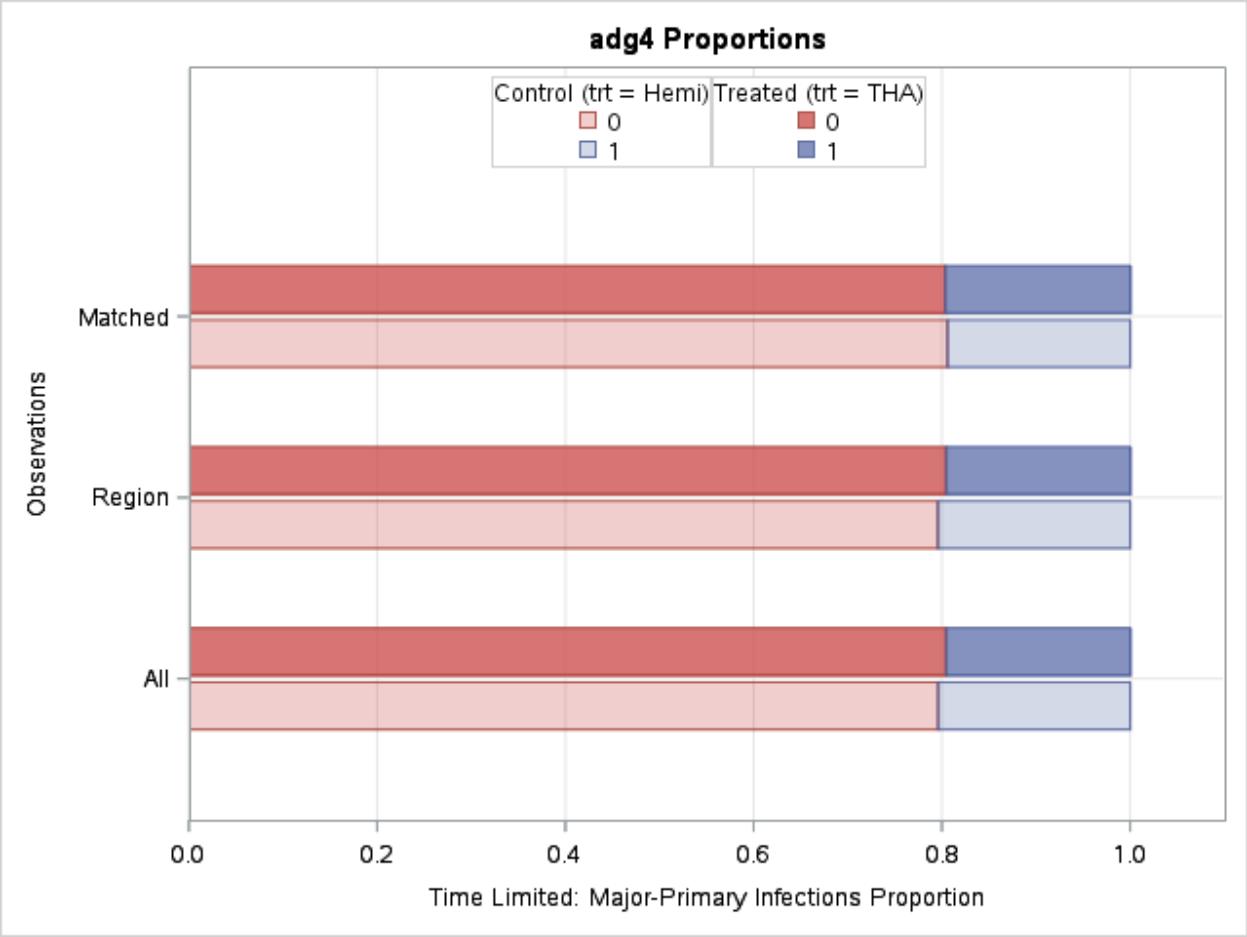

Figure A.17 Distribution of patients with Johns Hopkins Aggregated Diagnosis Groups 4 (ADG4) diagnosis in full cohort and matched cohort.

Note: 0 = No ADG4 diagnosis; 1 = ADG4 diagnosis; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

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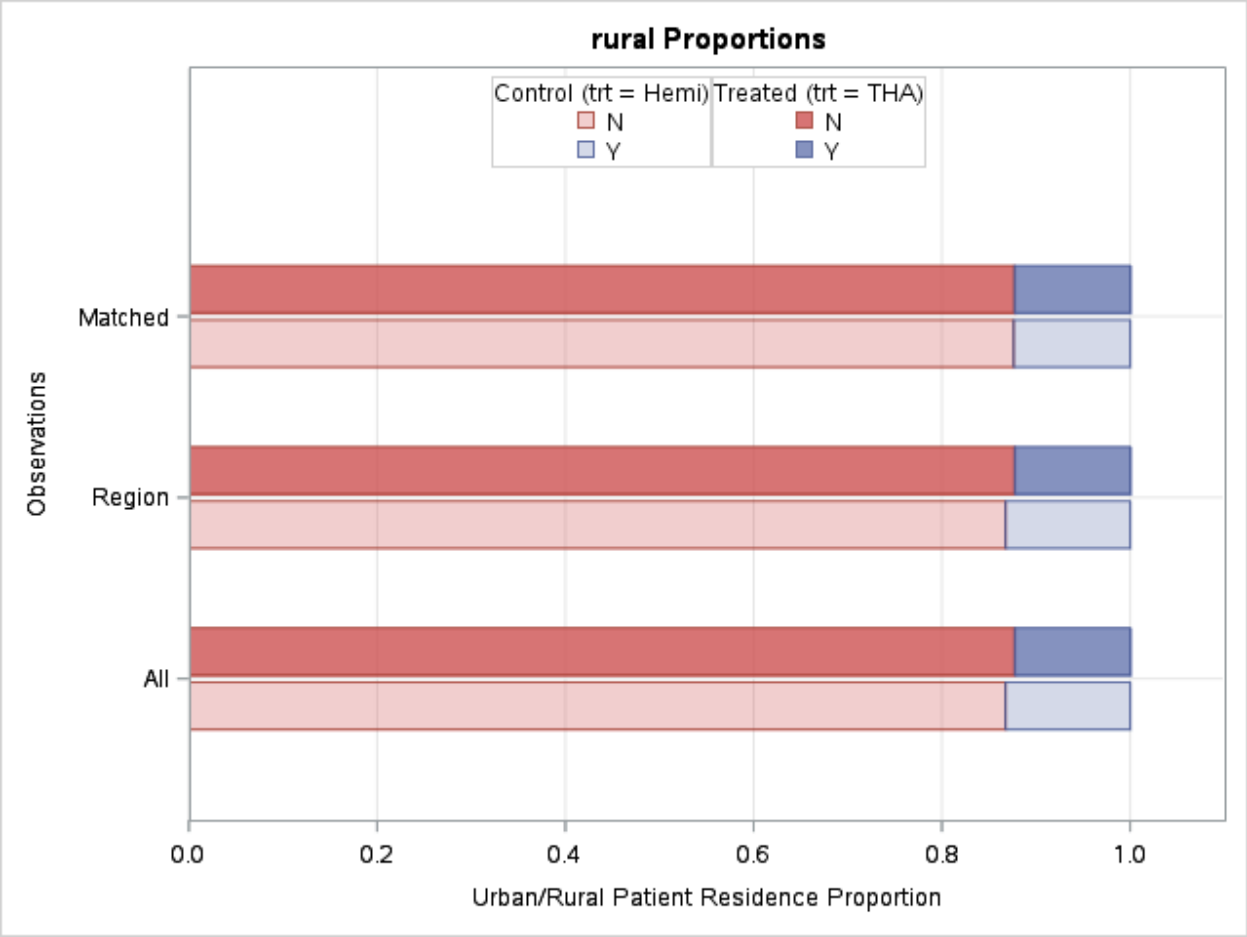

Figure A.18 Distribution of patients' residence in full cohort and matched cohort.

Note: N = Urban; Y = Rural; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

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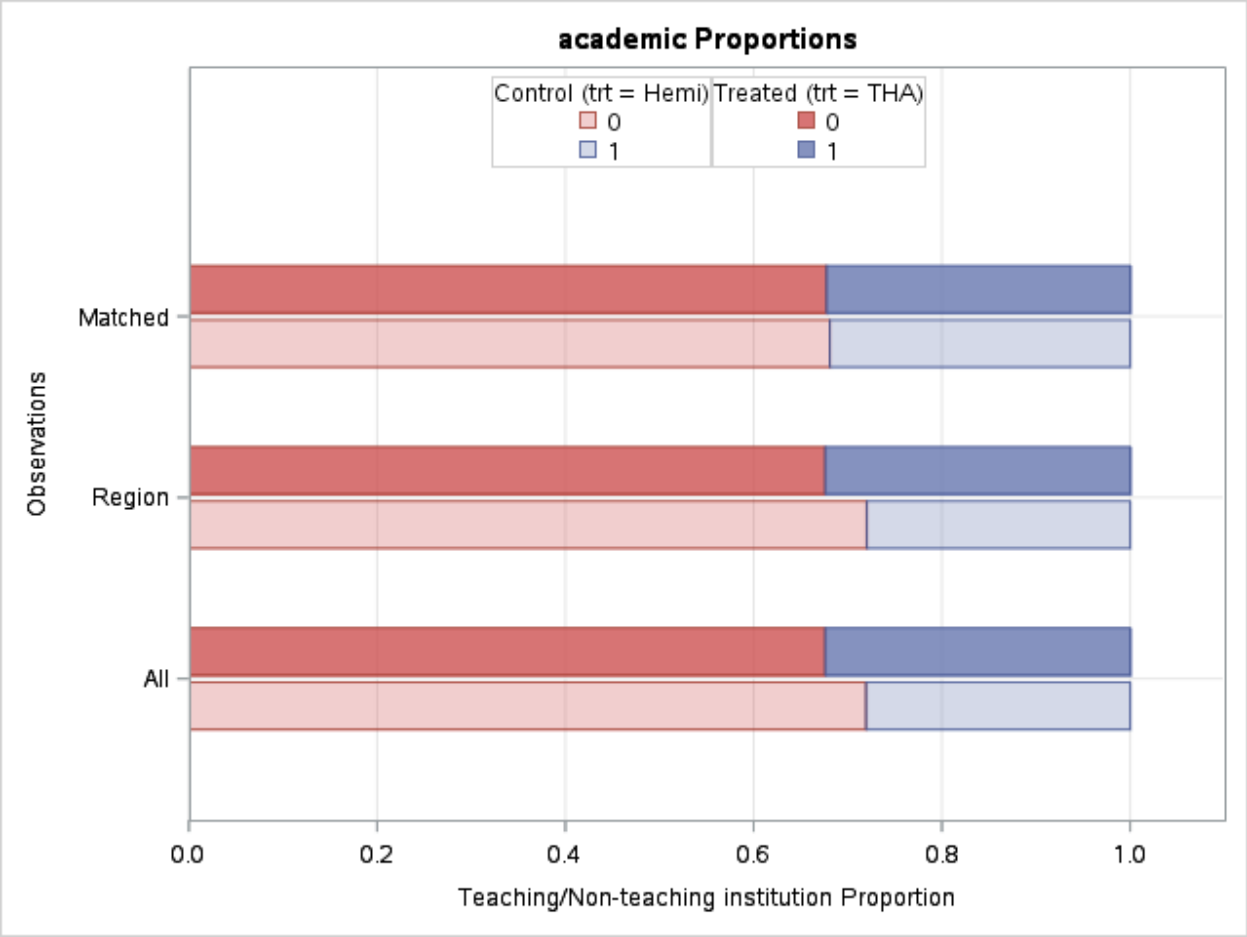

Figure A.19 Distribution of institution teaching status in full cohort and matched cohort.

Note: 0 = Non-teaching institution; 1 = Teaching institution; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

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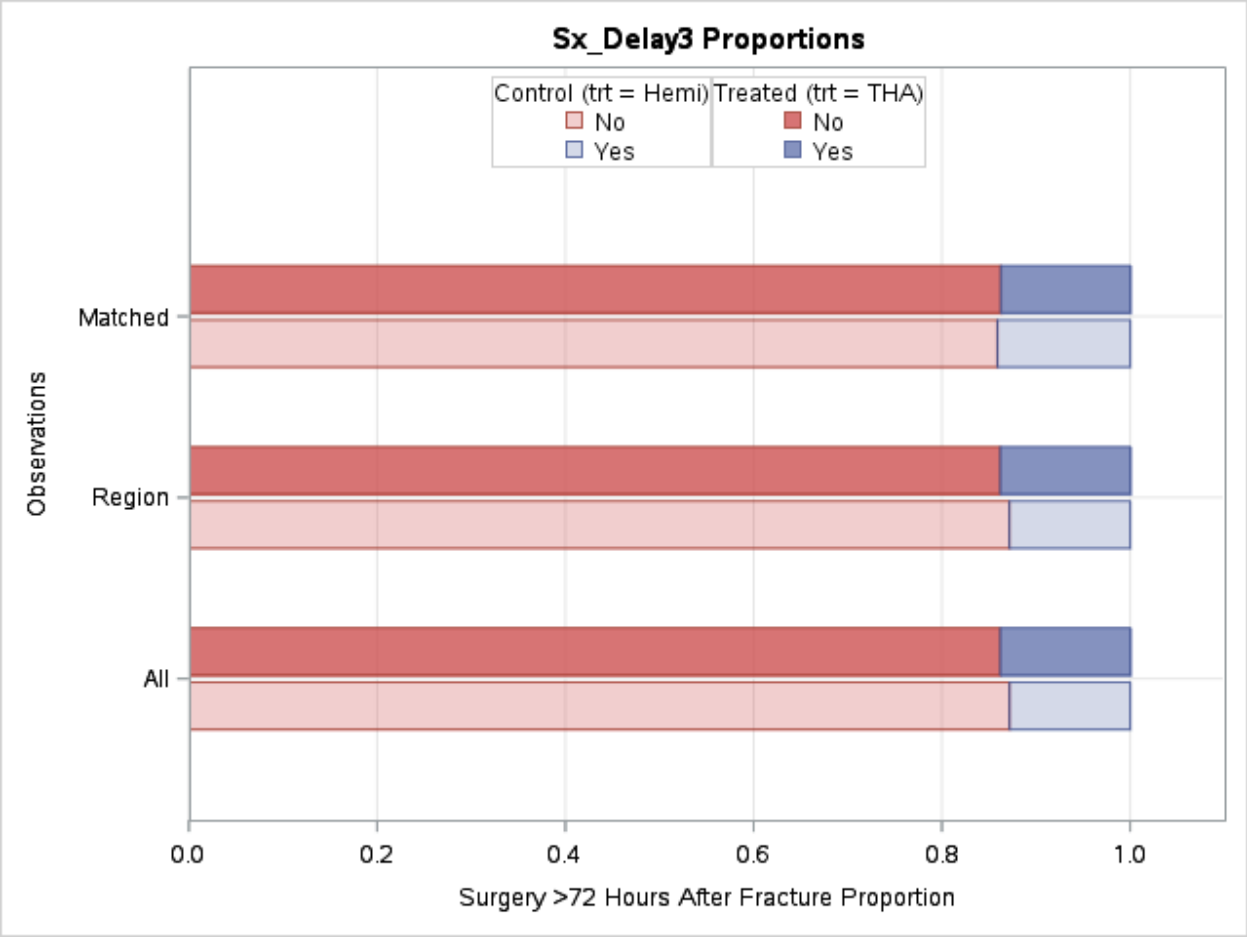

Figure A.20 Distribution of surgical timing in full cohort and matched cohort.

Note: No = Surgery <2 days after fracture; Yes = Surgery ≥3 days after fracture; THA = Total hip arthroplasty; Hemi = Hemiarthroplasty

Variance Ratio

Table A.3 Standardized differences and variance ratios for variables used in propensity score match.

Variable	Observations	Mean Difference	Standard Deviation	Standardized Difference	Percent Reduction	Variance Ratio
ADG Major	All	-0.32	1.39	-0.23		1.05
	Region	-0.32		-0.23	0.39	1.05
	Matched	-0.01		-0.01	95.86	1.03
Total ADG	All	-0.39	3.80	-0.10		1.02
	Region	-0.39		-0.10	0.00	1.02
	Matched	-0.04		-0.01	89.43	1.02
Sex	All	-0.03	0.46	-0.06		1.05
	Region	-0.03		-0.06	1.04	1.05
	Matched	0.00		0.00	100.00	1.00
Dementia	All	0.17	0.43	0.40		0.65
	Region	0.17		0.39	0.76	0.65
	Matched	0.00		0.00	98.99	0.99
Frailty	All	0.13	0.49	0.26		1.06
	Region	0.13		0.26	0.65	1.06
	Matched	0.00		0.00	99.16	1.00
Long-term Care	All	0.13	0.34	0.38		0.42
	Region	0.13		0.38	1.32	0.42
	Matched	0.00		0.01	98.15	0.97
Home care	All	0.10	0.46	0.21		0.84
	Region	0.10		0.21	0.49	0.84
	Matched	-0.01		-0.01	94.67	1.01
ADG10	All	-0.02	0.35	-0.07		0.87
	Region	-0.02		-0.06	1.90	0.88
	Matched	0.00		0.00	92.36	1.01
ADG11	All	0.07	0.46	0.16		1.15
	Region	0.07		0.16	0.16	1.15
	Matched	0.00		0.01	96.33	1.00
ADG2	All	0.03	0.50	0.05		1.01
	Region	0.03		0.05	0.00	1.01
	Matched	0.00		0.00	94.95	1.00
ADG25	All	0.17	0.48	0.36		0.82
	Region	0.17		0.35	0.69	0.82

	Matched	0.01		0.01	96.17	0.99
ADG28	All	0.04	0.49	0.08		1.03
	Region	0.04		0.08	0.00	1.03
	Matched	0.00		0.01	88.20	1.00
ADG4	All	0.01	0.40	0.02		0.97
	Region	0.01		0.02	0.00	0.97
	Matched	0.00		-0.01	72.14	1.01
Rural residence	All	0.01	0.33	0.03		0.94
	Region	0.01		0.03	0.76	0.94
	Matched	0.00		0.00	91.20	0.99
Academic institution	All	-0.04	0.46	-0.09		1.09
	Region	-0.04		-0.10	0.00	1.09
	Matched	0.00		-0.01	92.01	1.01
Surgery >72 hours after fracture	All	-0.01	0.34	-0.03		1.06
	Region	-0.01		-0.03	1.43	1.06
	Matched	0.00		0.01	62.07	0.98

Note: ADG = Johns Hopkins Aggregated Diagnosis Groups
Standard deviation of all observations used to compute standardized differences

Standardized mean differences for included variables are significantly reduced in the matched cohort. All standardized differences are lower than the upper limit of 0.10 used by several authors (9, 10). The variance ratios are between 0.97 and 1.03 for all included variables in the matched cohort, which is within the recommended range of 0.5 and 2 (10). Because exact matching was used for age and sex, the standardized difference for these variables is zero.

http://dx.doi.org/10.2106/JBJS.22.01193

Five-Number Summaries

Table A.4 Five-number summaries of continuous variables comparing patients treated with hemiarthroplasty and total hip arthroplasty in both overall cohort and matched cohort.

Note: exact matching was implemented for age.

	Hemiarthroplasty					Total Hip Arthroplasty				
Variable	**Min**	**25 %**	**Median**	**75 %**	**Max**	**Min**	**25 %**	**Median**	**75 %**	**Max**
Unmatched sample										
Age	60	78	84	88	107	60	71	79	84	103
ADG Major	1	2	3	4	8	1	2	3	4	8
ADG Total	1	8	11	13	25	1	8	10	13	22
Matched sample										
Age	60	71	79	84	103	60	71	79	84	103
ADG Major	1	2	3	4	8	1	2	3	4	8
ADG Total	1	8	10	13	24	1	8	10	13	22

Note: Min = Minimum; 25% = 25th Percentile; 75% = 75th Percentile; Max = Maximum; ADG = Johns Hopkins Aggregated Diagnosis Groups

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Competing Risk Analysis Using Cumulative Incidence Functions (Sensitivity Analysis)

The purpose of this sensitivity analysis was to compare differences in Kaplan-Meier failure curves and cumulative incidence functions (CIFs). Kaplan-Meier curves represent risk of outcome in a hypothetical world with no competing risks, while CIFs represent risk of outcome in a world where competing risks are possible. In our study, similar estimates from both analyses suggest that the observed treatment-related risk differences in hip dislocation, revision surgery, and hospital readmission are not grossly driven by differences in the competing risk of death between treatment groups (Table A.5). CIF curves for outcomes with competing risks are included (Figures A.21-A.24).

As described in the literature, Kaplan-Meier curves tend to overestimate probability of events by assuming absence of competing risks (11). This can be seen by slightly higher failure estimates using Kaplan-Meier compared to incidence estimates using CIFs for outcomes with competing risks (hip dislocation, revision surgery, and hospital readmission).

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Table A.5 Cumulative incidence estimates and Kaplan-Meier failure function estimates for outcomes in matched cohort.

	Cumulative Incidence Estimates					Kaplan-Meier Failure Function Estimates†				
Clinical Outcome	**Hemi**	**95% CI**	**THA**	**95% CI**	**P-Value**	**Hemi**	**95% CI††**	**THA**	**95% CI**	**P-Value**
Hip dislocation (30-day)	0.5%	0.3%, 0.7%	1.0%	0.7%, 1.3%	0.004	0.5%	0.3%, 0.7%	1.0%	0.7%, 1.3%	0.007
Hip dislocation (1-year)	0.7%	0.5%, 1.0%	1.9%	1.3%, 2.1%	<0.001	0.7%	0.5%, 1.0%	1.7%	1.3%, 2.1%	<0.001
Hip dislocation (2-year)	0.7%	0.5%, 1.0%	1.9%	1.3%, 2.1%	<0.001	0.8%	0.5%, 1.0%	1.8%	1.4%, 2.1%	<0.001
Revision surgery (30-day)	1.1%	0.9%, 1.5%	1.6%	1.2%, 2.0%	0.09	1.2%	0.9%, 1.5%	1.6%	1.2%, 2.0%	0.12
Revision surgery (1-year)	2.9%	2.4%, 3.4%	3.4%	2.9%, 3.9%	0.16	3.1%	2.6%, 3.6%	3.5%	3.0%, 4.1%	0.20
Revision surgery (2-year)	4.0%	3.4%, 4.5%	3.9%	3.4%, 4.5%	0.91	4.5%	3.8%, 5.1%	4.1%	3.5%, 4.7%	0.91
Revision surgery (10-year)	5.9%	5.2%, 6.6%	6.2%	5.4%, 7.0%	0.88	8.1%	6.8%, 9.3%	8.4%	7.1%, 9.7%	0.61
Hospital readmission (30-day)	8.5%	7.7%, 9.3%	7.9%	7.2%, 8.8%	0.42	8.5%	7.7%, 9.3%	7.9%	7.1%, 8.7%	0.16

† Failure rates reported
Note: Hemi = Hemiarthroplasty; THA = Total hip arthroplasty; CI = Confidence interval

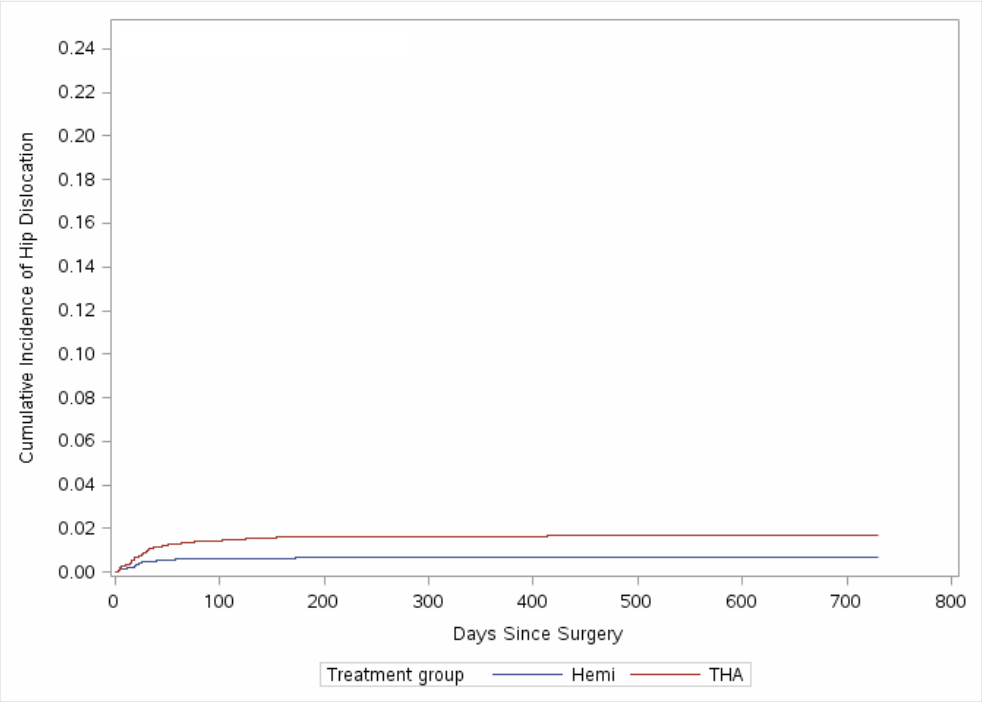

Figure A.21 Cumulative incidence function curves for hip dislocation up to two years following treatment with hemiarthroplasty or THA in the matched cohort (CIF equality test p-value <0.001).

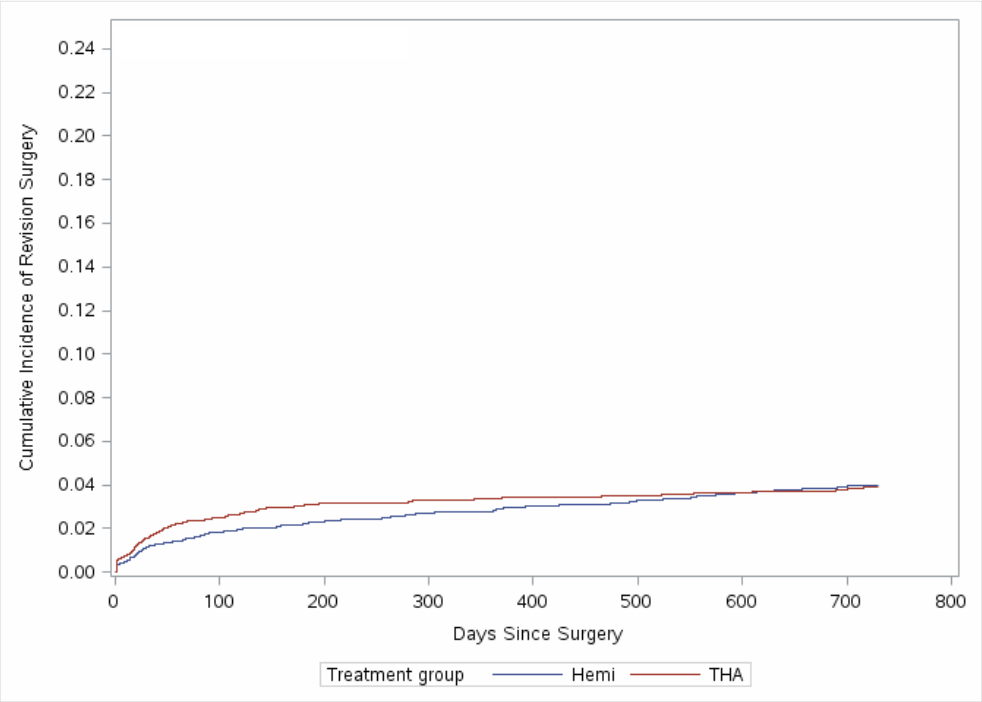

Figure A.22 Cumulative incidence function curves for revision hip surgery up to two years following treatment with hemiarthroplasty or THA in the matched cohort (CIF equality test p-value = 0.96).

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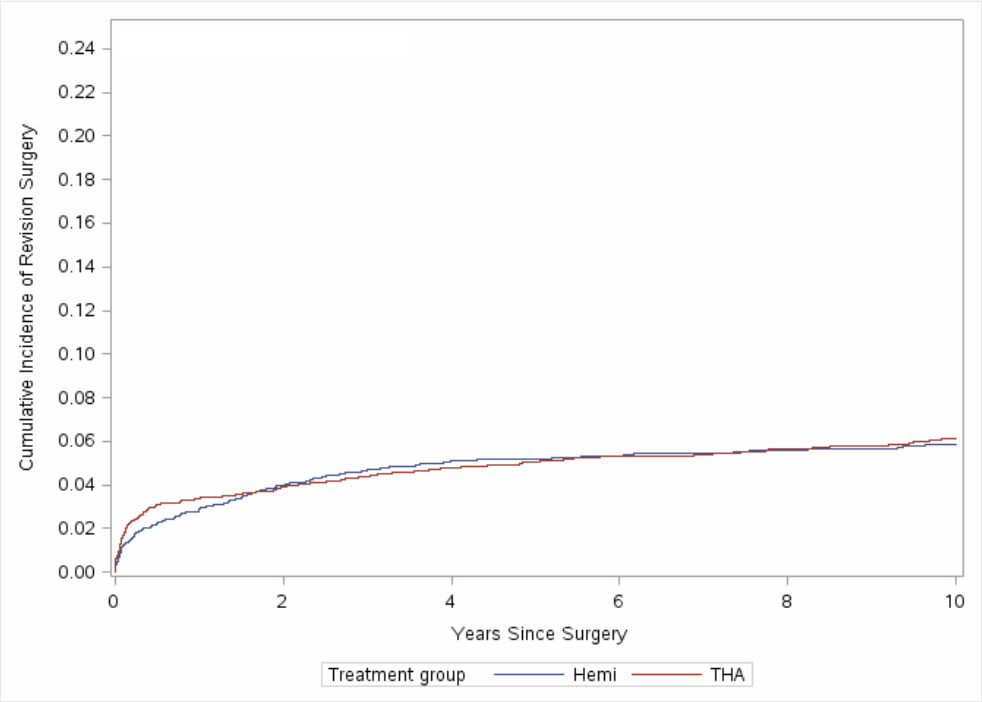

Figure A.23 Cumulative incidence function curves for revision surgery up to ten years following treatment with hemiarthroplasty or THA in the matched cohort (CIF equality test p-value = 0.60).

http://dx.doi.org/10.2106/JBJS.22.01193

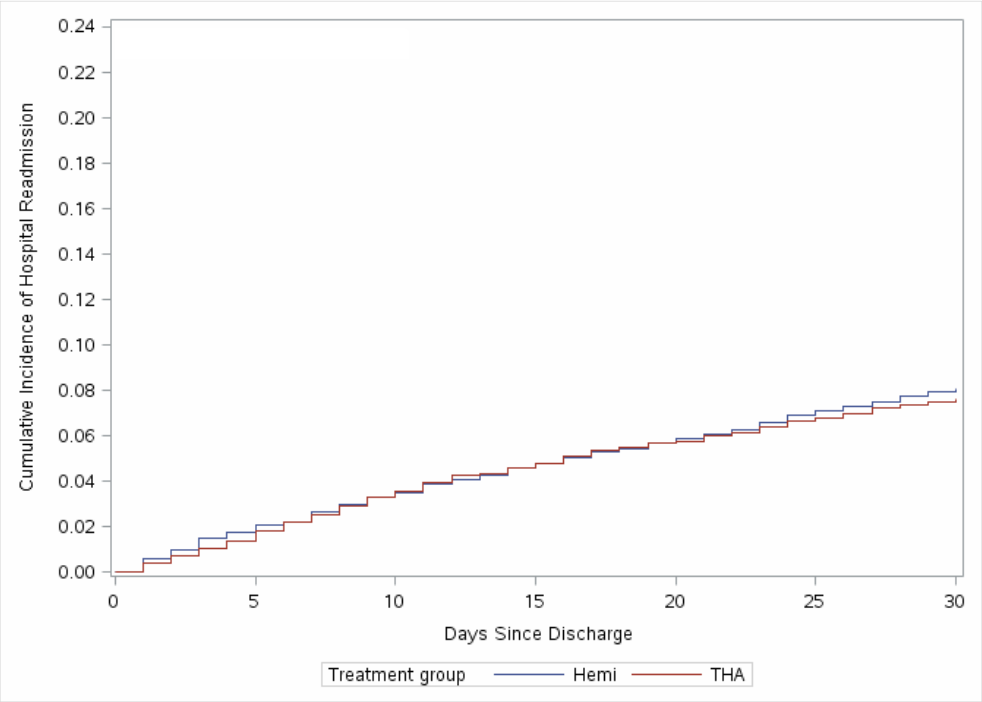

Figure A.24 Cumulative incidence function curves for all-cause hospital readmission (up to 30 days from discharge) following treatment with hemiarthroplasty or THA in the matched cohort (CIF equality test p-value = 0.59).

http://dx.doi.org/10.2106/JBJS.22.01193

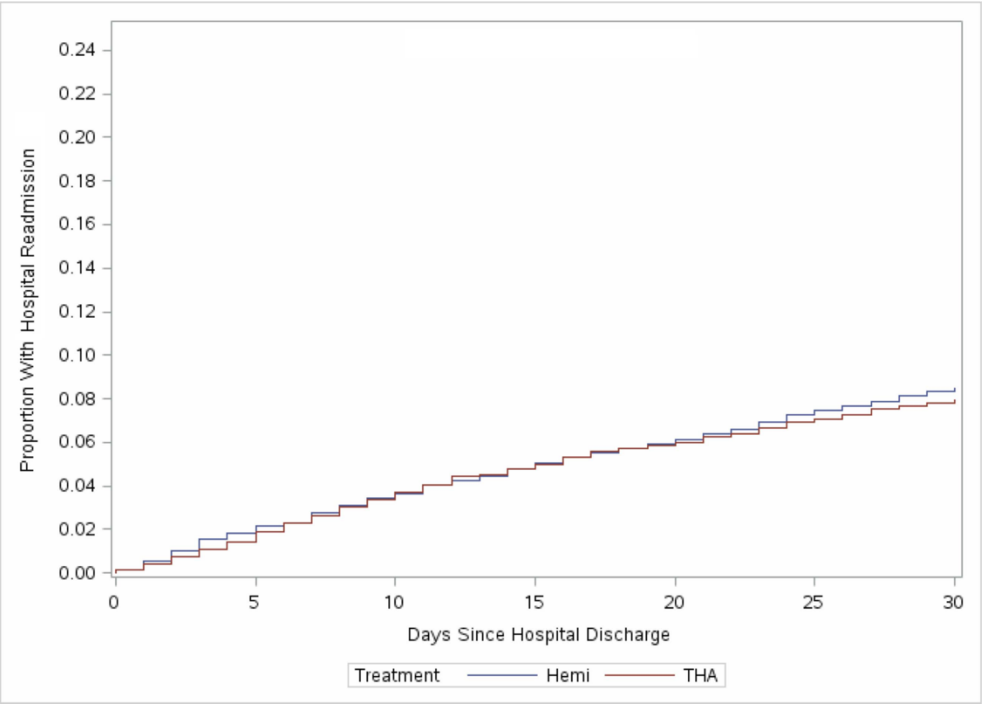

Figure A.25 Kaplan-Meier failure function for all-cause hospital readmission up to 30 days following discharge after treatment with hemiarthroplasty or THA in the matched cohort (p = 0.16, stratified log-rank test).

http://dx.doi.org/10.2106/JBJS.22.01193

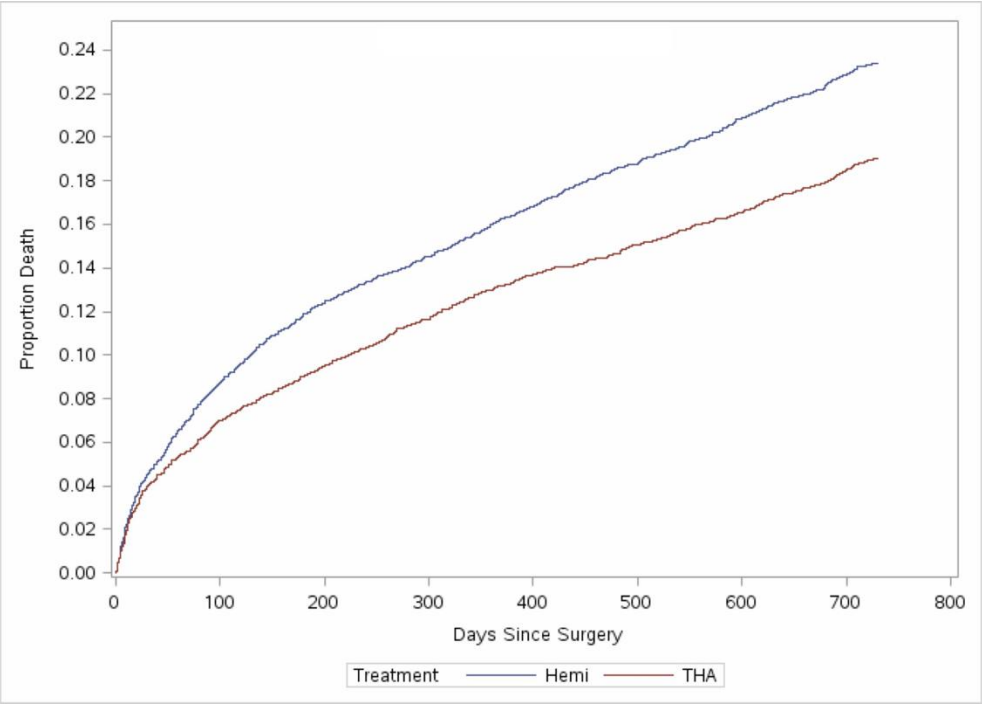

Figure A.26 Kaplan-Meier failure function for death up to 2 years following treatment with hemiarthroplasty or THA in the matched cohort ($p < 0.001$, stratified log-rank test).

http://dx.doi.org/10.2106/JBJS.22.01193

TABLE A.I Complete Baseline Characteristics in the Full (Descriptive) and Matched Cohorts*

	Descriptive Cohort					Matched Cohort				
Characteristic	Hemiarthroplasty (N = 44,959)	THA (N = 4,638)	Total (N = 49,597)	SD	P Value	Hemiarthroplasty (N = 4,612)	THA (N = 4,612)	Total (N = 9,224)	SD	P Value
Age† *(yr)*	84 (78-88)	79 (71-84)	83 (77-88)	0.56	<0.001	79 (71-84)	79 (71-84)	79 (71-84)	0	1.00
Female sex‡	32,213 (71.6%)	3,202 (69.0%)	35,415 (71.4%)	0.06	<0.001	3,188 (69.1%)	3,188 (69.1%)	6,376 (69.1%)	0	1.00
Rural residence‡	5,959 (13.3%)	569 (12.3%)	6,528 (13.2%)	0.03	0.06	571 (12.4%)	567 (12.3%)	1,138 (12.3%)	0	0.90
Marginalization‡										
Least	9,418 (20.9%)	1,092 (23.5%)	10,510 (21.2%)	0.06	<0.001	1,068 (23.2%)	1,081 (23.4%)	2,149 (23.3%)	0.01	0.86
2	9,062 (20.2%)	958 (20.7%)	10,020 (20.2%)	0.01		970 (21.0%)	953 (20.7%)	1,923 (20.8%)	0.01	
3	9,775 (21.7%)	953 (20.5%)	10,728 (21.6%)	0.03		928 (20.1%)	951 (20.6%)	1,879 (20.4%)	0.01	
4	9,098 (20.2%)	933 (20.1%)	10,031 (20.2%)	0		913 (19.8%)	926 (20.1%)	1,839 (19.9%)	0.01	
Most	7,606 (16.9%)	702 (15.1%)	8,308 (16.8%)	0.05		733 (15.9%)	701 (15.2%)	1,434 (15.5%)	0.02	
Frailty‡	27,872 (62.0%)	2,280 (49.2%)	30,152 (60.8%)	0.26	<0.001	2,279 (49.4%)	2,274 (49.3%)	4,553 (49.4%)	0.00	0.92
Long-term-care residence‡	9,087 (20.2%)	340 (7.3%)	9,427 (19.0%)	0.38	<0.001	351 (7.6%)	340 (7.4%)	691 (7.5%)	0.01	0.66
Home care services in prior 6 months‡	16,023 (35.6%)	1,200 (25.9%)	17,223 (34.7%)	0.21	<0.001	1,173 (25.4%)	1,197 (26.0%)	2,370 (25.7%)	0.01	0.57
Dementia‡	15,887 (35.3%)	843 (18.2%)	16,730 (33.7%)	0.4	<0.001	850 (18.4%)	842 (18.3%)	1,692 (18.3%)	0	0.83
ASA class‡										
I or II	7,392 (16.4%)	1,030 (22.2%)	8,422 (17.0%)	0.15	<0.001	1,045 (22.7%)	1,017 (22.1%)	2,062 (22.4%)	0.01	0.77
III	19,605 (43.6%)	2,260 (48.7%)	21,865 (44.1%)	0.1		2,240 (48.6%)	2,251 (48.8%)	4,491 (48.7%)	0	
IV	17,724 (39.4%)	1,334 (28.8%)	19,058 (38.4%)	0.23		1,317 (28.6%)	1,330 (28.8%)	2,647 (28.7%)	0.01	
V	238 (0.5%)	14 (0.3%)	252 (0.5%)	0.04		10 (0.2%)	14 (0.3%)	24 (0.3%)	0.02	
Sum of all ADGs†	11 (8-13)	10 (8-13)	11 (8-13)	0.1	<0.001	10 (8-13)	10 (8-13)	10 (8-13)	0.01	0.67
Sum of major ADGs†										

1	4,153 (9.2%)	732 (15.8%)	4,885 (9.8%)	0.2	<0.001	697 (15.1%)	724 (15.7%)	1,421 (15.4%)	0.02	0.82
2	10,149 (22.6%)	1,269 (27.4%)	11,418 (23.0%)	0.11		1,246 (27.0%)	1,261 (27.3%)	2,507 (27.2%)	0.01	
3	12,603 (28.0%)	1,182 (25.5%)	13,785 (27.8%)	0.06		1,200 (26.0%)	1,177 (25.5%)	2,377 (25.8%)	0.01	
4	9,754 (21.7%)	783 (16.9%)	10,537 (21.2%)	0.12		803 (17.4%)	778 (16.9%)	1,581 (17.1%)	0.01	
5	5,529 (12.3%)	447 (9.6%)	5,976 (12.0%)	0.09		449 (9.7%)	447 (9.7%)	896 (9.7%)	0	
6	2,279 (5.1%)	176 (3.8%)	2,455 (4.9%)	0.06		178 (3.9%)	176 (3.8%)	354 (3.8%)	0	
7	474 (1.1%)	45 (1.0%)	519 (1.0%)	0.01		38 (0.8%)	45 (1.0%)	83 (0.9%)	0.02	
8	18 (0.0%)	≤5 (≤0.1%)	22 (0.0%)	0.02		≤5 (≤0.1%)	≤5 (0.1%)	≤5 (≤0.1%)	0.03	
Specific ADGs‡										
Chronic medical: stable	38,112 (84.8%)	4,037 (87.0%)	42,149 (85.0%)	0.07	<0.001	4,022 (87.2%)	4,014 (87.0%)	8,036 (87.1%)	0.01	0.80
Chronic medical: unstable	33,086 (73.6%)	3,084 (66.5%)	36,170 (72.9%)	0.16	<0.001	3,086 (66.9%)	3,074 (66.7%)	6,160 (66.8%)	0.01	0.79
Chronic specialty: stable-orthopaedic	2,296 (5.1%)	343 (7.4%)	2,639 (5.3%)	0.09	<0.001	326 (7.1%)	333 (7.2%)	659 (7.1%)	0.01	0.77
Chronic specialty: unstable-orthopaedic	1,873 (4.2%)	315 (6.8%)	2,188 (4.4%)	0.12	<0.001	297 (6.4%)	304 (6.6%)	601 (6.5%)	0.01	0.77
Psychosocial: recurrent or persistent, unstable	20,526 (45.7%)	1,329 (28.7%)	21,855 (44.1%)	0.36	<0.001	1,356 (29.4%)	1,326 (28.8%)	2,682 (29.1%)	0.01	0.49
Signs/symptoms: major	27,059 (60.2%)	2,604 (56.1%)	29,663 (59.8%)	0.08	<0.001	2,615 (56.7%)	2,593 (56.2%)	5,208 (56.5%)	0.01	0.64
Time limited: major-primary infections	9,177 (20.4%)	907 (19.6%)	10,084 (20.3%)	0.02	0.17	895 (19.4%)	906 (19.6%)	1,801 (19.5%)	0.01	0.77
Time limited: minor-primary infections	24,821 (55.2%)	2,441 (52.6%)	27,262 (55.0%)	0.05	<0.001	2,436 (52.8%)	2,430 (52.7%)	4,866 (52.8%)	0	0.90
Resource utilization bands										
2	433 (1.0%)	71 (1.5%)	504 (1.0%)	0.05	<0.001	74 (1.6%)	70 (1.5%)	144 (1.6%)	0.01	0.89
3	4,443 (9.9%)	707 (15.2%)	5,150 (10.4%)	0.16		693 (15.0%)	700 (15.2%)	1,393 (15.1%)	0	
4	10,294 (22.9%)	1,275 (27.5%)	11,569 (23.3%)	0.11		1,240 (26.9%)	1,267 (27.5%)	2,507 (27.2%)	0.01	
5	29,789 (66.3%)	2,585 (55.7%)	32,374 (65.3%)	0.22		2,605 (56.5%)	2,575 (55.8%)	5,180 (56.2%)	0.01	

Surgery >72 hours after fracture‡	5,767 (12.8%)	640 (13.8%)	6,407 (12.9%)	0.03	0.06	651 (14.1%)	634 (13.7%)	1,285 (13.9%)	0.01	0.61
Teaching institution‡	12,618 (28.1%)	1,503 (32.4%)	14,121 (28.5%)	0.09	<0.001	1,472 (31.9%)	1,488 (32.3%)	2,960 (32.1%)	0.01	0.72
Institution volume quartile‡										
Lowest	11,405 (25.4%)	963 (20.8%)	12,368 (24.9%)	0.11	<0.001	966 (20.9%)	961 (20.8%)	1,927 (20.9%)	0	0.82
2	11,362 (25.3%)	1,023 (22.1%)	12,385 (25.0%)	0.08		1,055 (22.9%)	1,020 (22.1%)	2,075 (22.5%)	0.02	
3	11,044 (24.6%)	1,308 (28.2%)	12,352 (24.9%)	0.08		1,287 (27.9%)	1,303 (28.3%)	2,590 (28.1%)	0.01	
Highest	11,148 (24.8%)	1,344 (29.0%)	12,492 (25.2%)	0.09		1,304 (28.3%)	1,328 (28.8%)	2,632 (28.5%)	0.01	
Surgical bed volume quartile‡										
Lowest	11,037 (24.5%)	862 (18.6%)	11,899 (24.0%)	0.15	<0.001	871 (18.9%)	861 (18.7%)	1,732 (18.8%)	0.01	0.86
2	11,759 (26.2%)	1,053 (22.7%)	12,812 (25.8%)	0.08		1,081 (23.4%)	1,052 (22.8%)	2,133 (23.1%)	0.01	
3	11,230 (25.0%)	1,412 (30.4%)	12,642 (25.5%)	0.12		1,374 (29.8%)	1,399 (30.3%)	2,773 (30.1%)	0.01	
Highest	10,933 (24.3%)	1,311 (28.3%)	12,244 (24.7%)	0.09		1,286 (27.9%)	1,300 (28.2%)	2,586(28.0 %)	0.01	

*THA = total hip arthroplasty, SD = standardized difference, ASA = American Society of Anesthesiologists physical status classification, ADG = Johns Hopkins Aggregated Diagnosis Groups. †The values are given as the median, with the interquartile range in parentheses. ‡The values are given as the number of patients, with the percentage in parentheses.

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