

**Appendix**

TABLE E-1 Full Descriptions of Study Concepts and Variables\*

Variable/Concept	Time Frame	Source	Qualifying Codes	Data Files
Emergency department and ambulance use near index shoulder complaint	Index date and day prior	Revenue center codes and Berenson-Eggers type of service codes	Revenue center codes 0450, 0451, 0452, 0456, 0459, 0981, 0540, 0541, 0542, 0543, 0544, 0545, 0546, 0547, 0548, or 0549; Berenson-Eggers type of service codes beginning with M3 or A01	Outpatient revenue center, carrier
MRI of the upper extremity or orbit, face, and neck	Within 90 days after index date	HCPCS codes	70540, 70542, 70543, 73218, 73219, 73220, 73221, 73222, or 73223	Carrier (part-B physician claims), outpatient revenue center
Diagnosis of RCT	Within 14 days of the earliest dated MRI	ICD-9 diagnosis code	727.61, 840.3, or 840.4	Carrier (part-B physician claims), outpatient base claims
Surgical RCT repair	Surgery claim within the 105-day treatment exposure period after the MRI and diagnosis of an ARCT and no earlier or concurrent claim for PT	ICD-9 procedure codes or HCPCS codes	ICD-9 procedure codes 80.81, 81.88, 81.82, 81.83, or 83.6; HCPCS codes 23410, 23412, 23420, 23472, 29827, 29820, 29822, 29823, 29824, 29826, 29828	Carrier, outpatient revenue center, outpatient base claims, MedPAR
Physical therapy	PT claim within 105-day treatment exposure period after the MRI and diagnosis of an ARCT and no earlier or claim for surgery	HCPCS codes	29240, 97014, 97032, 97016, 97110, 97112, 97124, 97140, or 97530	
Watchful waiting	No claims for either surgery or PT during the 105-day treatment exposure period after the MRI and	NA		

	diagnosis of an ARCT			
Cervical spine pain	1 year prior to index date through 104 days after index shoulder pain diagnosis	ICD-9 diagnosis code	722.40, 722.91, 723.1, 724.00, or 847.0	Carrier (part-B physician claims)
Scapular pain			811.01 or 811.09	
Glenohumeral arthritis			715.91 or 715.11	
Inflammatory arthritis			711.01 or 711.11	
Dementia			290.10, 290.11, 290.12, 290.13, 290.20, 290.40, 290.41, 290.42, 290.43, 294.10, 294.11, 294.20, 294.21, 331.11, 331.19, 290.0X, 290.3X, 294.0X, 294.8X, 331.0X, 331.2X, 331.7X, or 797.XX	
Humeral fracture			733.11 or 812.XX	
Adhesive capsulitis			726.0	
Patient-specific clinical covariables				
Patient age	On index date	Date of birth filed with Medicare		Medicare beneficiary A/B summary file
Charlson comorbidity index (CCI)	All claims over period 1 year prior to index date	Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40(5):373-83.		
Revised frailty index	All claims over period 1 year prior to index date	For algorithm, see:		
Cane		Chrischilles E, Schneider K, Wilwert J, Lessman G, O'Donnell B, Gryzlak B, Wright K, Wallace R. Beyond comorbidity: expanding the definition and measurement of complexity among older adults using administrative claims data. Med Care. 2014 Mar;52 Suppl 3:S75-84.		
Walker		Chrischilles EA, Schneider KM, Schroeder MC, Letuchy E, Wallace RB, Robinson JG, Brooks JM. Association between preadmission functional status and use and effectiveness of secondary prevention medications in elderly survivors of acute myocardial infarction. J Am Geriatr Soc. 2016 Mar;64(3):526-35.		
Wheelchair		Codes for cane, walker, and wheelchair were removed and independent variables were created for each. See citations and description for frailty index, above.		
Sum total payments made by Medicare and beneficiary to providers in 365 days prior to index	All claims over period 1 year prior to index date	Line payment amounts	NA	Inpatient, outpatient, durable medical equipment, home health, carrier (physician services), skilled nursing

Pre-index PT visits as number of days when a PT service was used	January 1, 2011, to index date	HCPCS codes	29240, 97014, 97032, 97016, 97110, 97112, 97124, 97140, or 97530	Carrier, outpatient revenue center, outpatient base claims, MedPAR
Patient-specific demographic covariables				
Sex	2011	Sex filed with Medicare in 2011	NA	Medicare beneficiary A/B summary file
Race	2011	Race filed with Medicare in 2011	NA	Medicare beneficiary A/B summary file
Medicaid dual eligible status	Index month	Dual-eligibility status in month of index. Indicates whether individual is either partially or fully dual-eligible, versus not dual eligible.	Dual-status code of 01 through 06, or 08	Medicare beneficiary part-D components file
County and HRR-level geographic characteristic covariables				
HRR total physician supply: physicians per 100,000 population	2011	The Dartmouth Atlas of Health Care† <a href="http://www.dartmouthatlas.org/tools/downloads.aspx">http://www.dartmouthatlas.org/tools/downloads.aspx</a>	NA	Table name: 2011_phys_hrr
HRR general surgeon supply: general surgeons per 100,000 population				
HRR orthopaedic surgeon supply: orthopaedic surgeons per 100,000 population				
HRR primary care physician supply: primary care physicians per 100,000 population				
HRR physical therapist supply: physical therapists per 100,000 population				
HRR specialist supply: physician specialists per 100,000 population				
HRR proportion of physicians who are general surgeons			Supply of physicians in specific category, divided by the supply of total physicians in an HRR	
HRR proportion of physicians who are orthopaedic surgeons				

HRR proportion of physicians who are primary care physicians				
HRR proportion of physicians who are physical therapists				
HRR proportion of physicians who are specialists				

\*MRI = magnetic resonance imaging, HCPCS = Healthcare Common Procedure Coding System, RCT = rotator cuff tear, ICD-9 = International Classification of Diseases, Ninth Revision, ARCT = atraumatic rotator cuff tear, PT = physical therapy, HRR = hospital referral region, NA = not applicable, MedPAR = Medicare Provider Analysis and Review. †The data in this section of the table were obtained from The Dartmouth Atlas of Health Care, which is funded by the Robert Wood Johnson Foundation and the Dartmouth Clinical and Translational Science Institute, under award number UL1TR001086 from the National Center for Advancing Translational Sciences (NCATS) of the National Institutes of Health (NIH).

### Map of HRR Quintile of PT ATRD

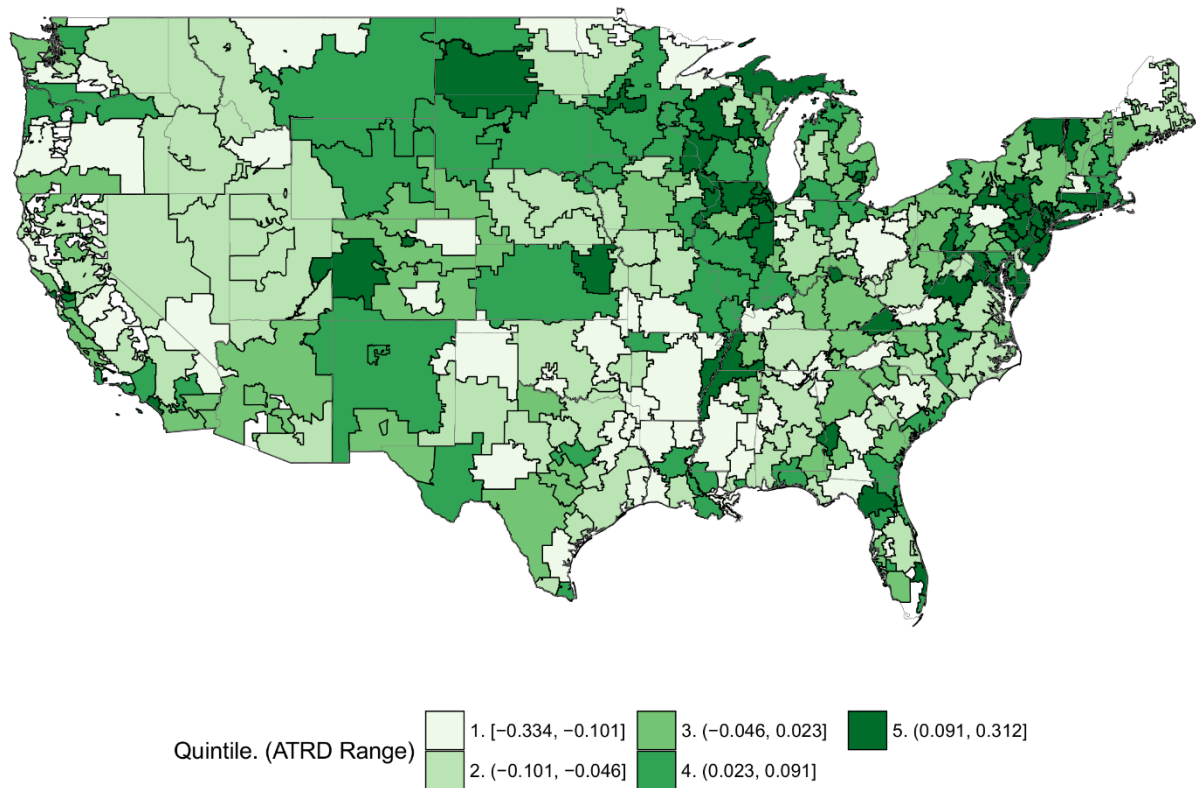


Fig. E-1A

Hospital referral regions (HRRs) across the United States, colored by quintile of area treatment rate differential (ATRD) for physical therapy (PT). A higher quintile reflects higher use of physical therapy in the HRR than expected on the basis of average treatment patterns across the entire sample as estimated with use of logistic regression models. The range of values across HRRs in each quintile is shown in the key at the bottom of the figure.

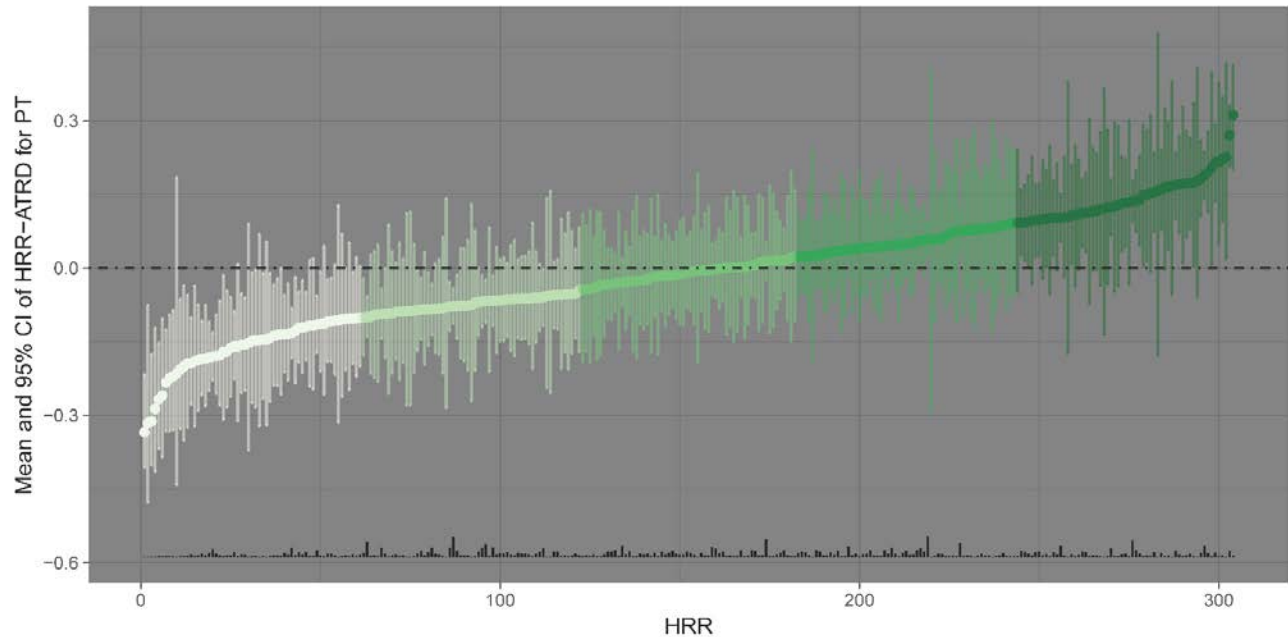


Fig. E-1B

Estimated area treatment rate differentials (ATRDs) for physical therapy (PT) across hospital referral regions (HRRs), in ascending order. The vertical span of each point represents the 95% CI as estimated using the bootstrap method with 4,500 iterations. The color indicates the quintile of the ATRD for PT. The rug plot along the x axis (vertical black bars) shows the relative proportion of the sample that resides in each HRR.

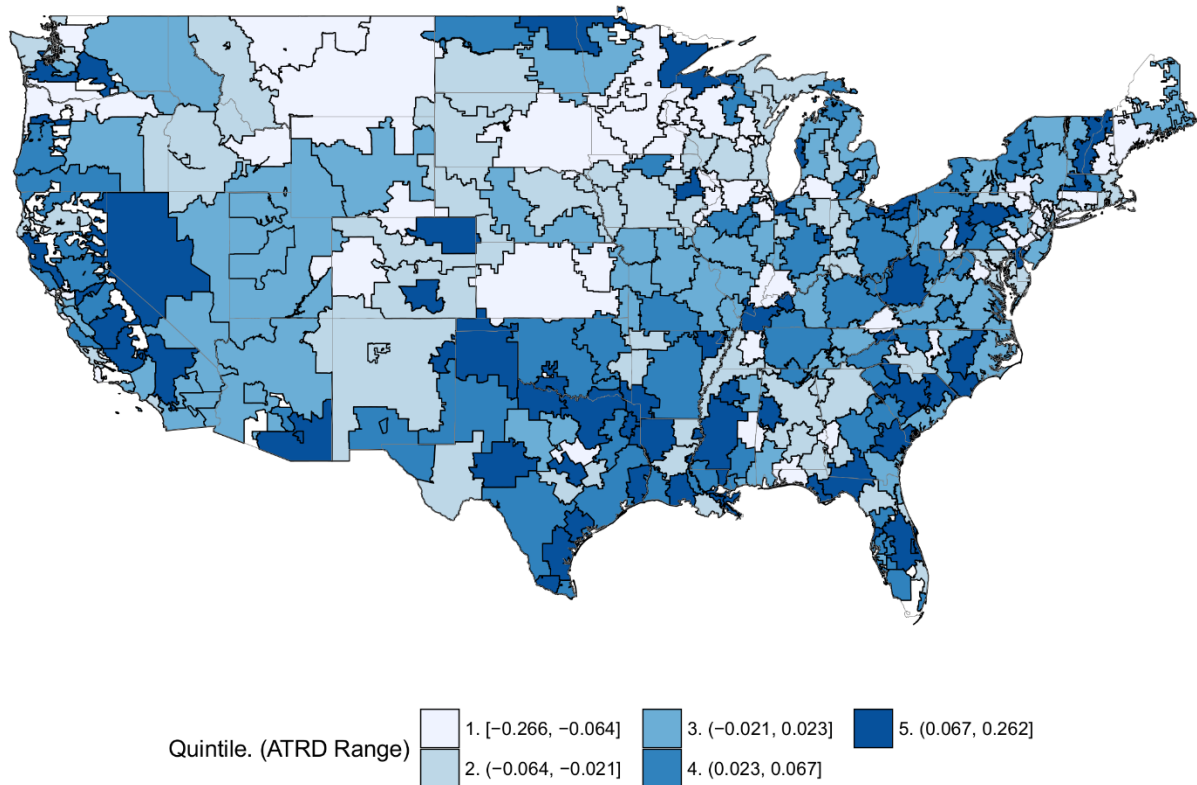


Fig. E-2A

Hospital referral regions (HRRs) across the United States, colored by the quintile of the area treatment rate differential (ATRD) for watchful waiting (WW). A higher quintile reflects higher use of WW in the HRR than expected on the basis of the average treatment patterns across the entire sample as estimated with use of logistic regression models. The range of the ATRD values across HRRs in each quintile is shown in the key at the bottom of the figure.

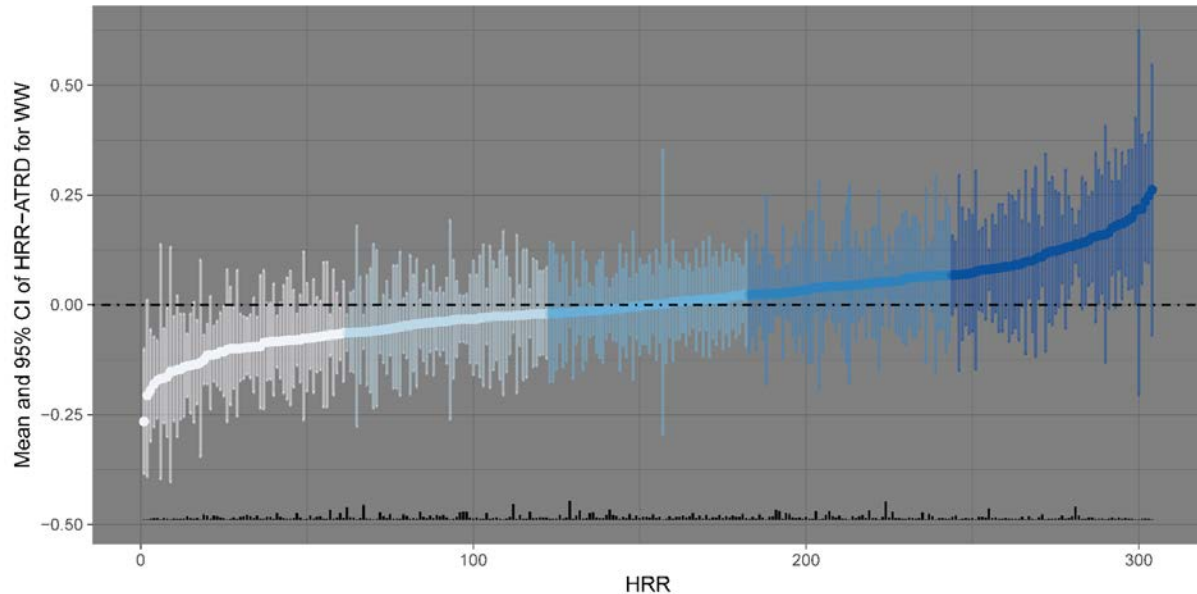


Fig. E-2B

Estimated area treatment rate differentials (ATRDs) for watchful waiting (WW) across hospital referral regions (HRRs), in ascending order. The vertical span of each point represents the 95% CIs as estimated using the bootstrap method with 4,500 iterations. The color indicates the quintile of the ATRD for WW. The rug plot along the x axis (vertical black bars) shows the relative proportion of the sample that resides in each HRR.