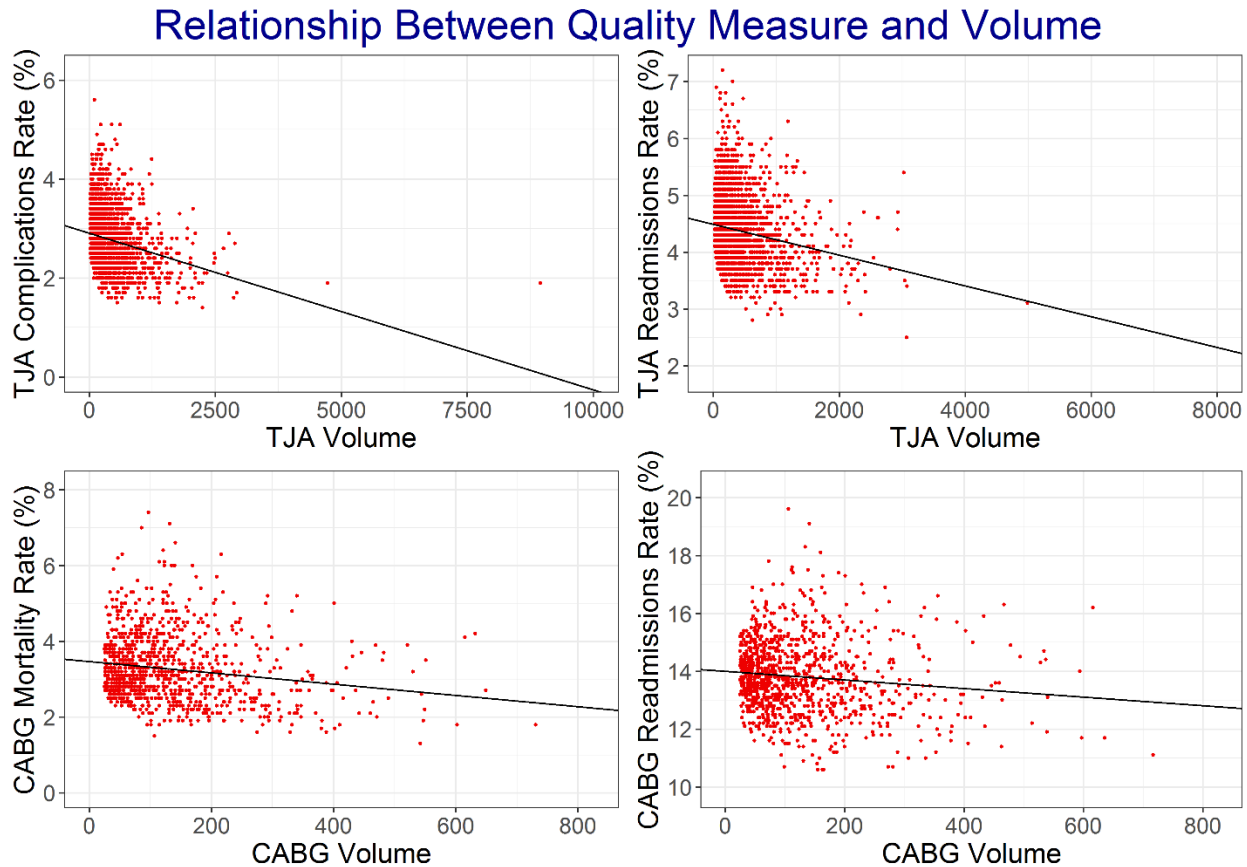


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Appendix



Appendix Figure E-1. Relationship Between Quality Measure and Volume.

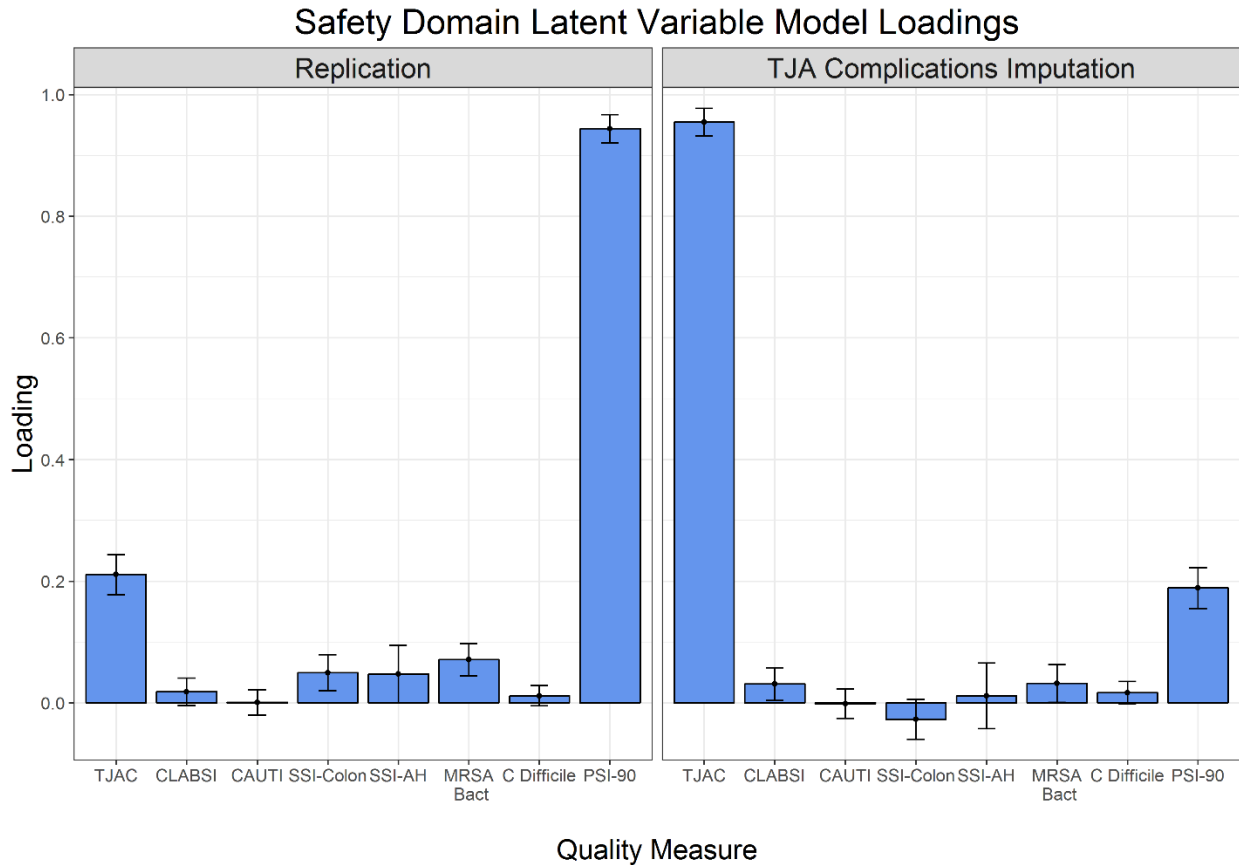
Top-left: Hospital-Level 30-Day All-Cause Risk-Standardized Complication Rate Following Elective Primary Total hip Arthroplasty and Total Knee Arthroplasty (TJA Complications Rate).

Top-right: Hospital-Level 30-Day All-Cause Risk-Standardized Readmission Rate following Elective Total hip Arthroplasty and Total Knee Arthroplasty (TJA Readmissions Rate).

Bottom-left: Coronary Artery Bypass Graft 30-Day Mortality Rate (CABG Mortality Rate).

Bottom-right: Coronary Artery Bypass Graft 30-Day Readmission Rate (CABG Readmissions Rate).

Best-fit univariate linear regression lines superimposed.



Appendix Figure E-2. Safety Domain Latent Variable Model Loadings.

Left: replication (without imputation). Right: regression-based imputation of total joint arthroplasty (TJA) complications. Quality measures in the safety domain: TJA Complications (TJAC), Central-Line Associated Bloodstream Infection (CLABSI), Catheter-Associated Urinary Tract Infection (CAUTI), Surgical Site Infection from Colon Surgery (SSI-Colon), Surgical Site Infection from Abdominal Hysterectomy (SSI-AH), MRSA Bacteremia (MRSA Bact), Clostridium Difficile (C Difficile), and Complication/Patient Safety for Selected Indicators (PSI-90). Error bars are 95% confidence intervals.

Appendix Table E-1. Star Comparison Matrices for Total Joint Arthroplasty Complications Imputation: All Hospitals, Non-Imputed Hospitals, and Imputed Hospitals

Panel A: Regression-Based Imputation Method										
All Hospitals										
	Imputation Stars							Total	%	
Replication Stars	1	2	3	4	5	Total	Same	2263	61.29%	
1	179	70	12	0	0	261	Better	477	12.92%	
2	149	440	139	24	0	752	Worse	952	25.79%	
3	25	269	745	140	10	1,189	TOTAL	3692	100.00%	
4	1	55	326	689	82	1,153				
5	0	0	20	107	210	337	Newly rated	7		
Total	354	834	1,242	960	302	3,692	Never rated	880		
Non-Imputed Hospitals										
	Imputation Stars							Total	%	
Replication Stars	1	2	3	4	5	Total	Same	1909	59.53%	
1	139	63	12	0	0	214	Better	462	14.41%	
2	135	354	132	24	0	645	Worse	836	26.07%	
3	25	238	612	139	10	1,024	TOTAL	3207	100.00%	
4	1	55	267	603	82	1,008				
5	0	0	20	95	201	316	Newly rated	0		
Total	300	710	1,043	861	293	3,207	Never rated	771		
Imputed Hospitals										
	Imputation Stars							Total	%	
Replication Stars	1	2	3	4	5	Total	Same	354	72.99%	
1	40	7	0	0	0	47	Better	15	3.09%	
2	14	86	7	0	0	107	Worse	116	23.92%	
3	0	31	133	1	0	165	TOTAL	485	100.00%	
4	0	0	59	86	0	145				
5	0	0	0	12	9	21	Newly rated	7		
Total	54	124	199	99	9	485	Never rated	109		

Panel B: Bottom-Performance Imputation Method										
All Hospitals										
	Imputation Stars							Total	%	
Replication Stars	1	2	3	4	5	Total	Same			
1	187	61	13	0	0	261	Better	462	12.51%	
2	189	403	137	23	0	752	Worse	1176	31.85%	
3	21	377	638	144	9	1,189	TOTAL	3692	100.00%	
4	1	53	392	632	75	1,153				
5	0	0	16	127	194	337	Newly rated	7		
Total	398	894	1,196	926	278	3,692	Never rated	880		
Non-Imputed Hospitals										
	Imputation Stars							Total	%	
Replication Stars	1	2	3	4	5	Total	Same			
1	140	61	13	0	0	214	Better	461	14.37%	
2	123	363	136	23	0	645	Worse	815	25.41%	
3	19	238	614	144	9	1,024	TOTAL	3207	100.00%	
4	1	43	269	620	75	1,008				
5	0	0	16	106	194	316	Newly rated	0		
Total	283	705	1,048	893	278	3,207	Never rated	771		
Imputed Hospitals										
	Imputation Stars							Total	%	
Replication Stars	1	2	3	4	5	Total	Same			
1	47	0	0	0	0	47	Better	1	0.21%	
2	66	40	1	0	0	107	Worse	361	74.43%	
3	2	139	24	0	0	165	TOTAL	485	100.00%	
4	0	10	123	12	0	145				
5	0	0	0	21	0	21	Newly rated	7		
Total	115	189	148	33	0	485	Never rated	109		

Panel C: Mean-Based Imputation Method									
All Hospitals									
	Imputation Stars							Total	%
Replication Stars	1	2	3	4	5	Total	Same		
1	178	71	12	0	0	261	Better	482	13.06%
2	148	441	138	25	0	752	Worse	940	25.46%
3	25	263	748	143	10	1,189	TOTAL	3692	100.00%
4	1	56	320	693	83	1,153			
5	0	0	20	107	210	337	Newly rated	7	
Total	352	831	1,238	968	303	3,692	Never rated	880	
Non-Imputed Hospitals									
	Imputation Stars							Total	%
Replication Stars	1	2	3	4	5	Total	Same		
1	138	64	12	0	0	214	Better	467	14.56%
2	135	353	132	25	0	645	Worse	833	25.97%
3	25	237	611	141	10	1,024	TOTAL	3207	100.00%
4	1	56	264	604	83	1,008			
5	0	0	20	95	201	316	Newly rated	0	
Total	299	710	1,039	865	294	3,207	Never rated	771	
Imputed Hospitals									
	Imputation Stars							Total	%
Replication Stars	1	2	3	4	5	Total	Same		
1	40	7	0	0	0	47	Better	15	3.09%
2	13	88	6	0	0	107	Worse	107	22.06%
3	0	26	137	2	0	165	TOTAL	485	100.00%
4	0	0	56	89	0	145			
5	0	0	0	12	9	21	Newly rated	7	
Total	53	121	199	103	9	485	Never rated	109	

Panels A, B, and C show star comparison matrices for the three imputation methods: regression-based, bottom-performance based, and mean-based. The top table in each panel shows results for all hospitals. The middle and bottom tables in each panel show results further broken down by hospitals without total joint arthroplasty (TJA) complications imputed and hospitals with TJA complications imputed, respectively. Entries highlighted in blue indicate the number of hospitals that have identical star ratings between replication (without imputation) and imputation. Other entries not highlighted indicate the number of hospitals that have different star ratings between replication and imputation. Total and % columns indicate the number and percentage of hospitals with the same, better, or worse star ratings after imputation. Newly rated indicates the number of hospitals that did not have a star rating before imputation, but do after imputation. Never rated indicates the number of hospitals that did not have a star rating before nor after imputation.