Cost of Readmission: Can the VHA Experience Inform National Payment Policy

Acknowledgement and Disclaimer

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The work presented here in no way reflects the position or opinion of the Veterans Health Administration. All errors and opinions expressed are that of the authors alone.

Background

Hospitalization is costly

Currently, readmission to the hospital is prevalent

There is concern that rates of readmission are ‘too high’ and could and should be reduced

Background

National policy is moving toward penalizing hospitals for higher than expected readmission rates for AMI, CAP and CHF

Bundled payment approaches for episodes of care as an option to reduce costs and incent better coordinated care are being explored

Motivation for our work

Targeting readmission to reduce healthcare cost raises questions:

Is readmission a consistent measure of quality care?

Do facility rates of readmission predict individual readmission or patient episode costs?

What are the actual costs of patients who are readmitted?

Our contribution

We examine AMI, CAP and CHF admissions to address:

1. Whether historic facility readmission rates predict patient readmission

2. Whether historic facility readmission rates affect individual patient costs in the contemporaneous period

3. The difference in hospital episode cost of care for patients readmitted within 30 days of discharge

Setting

Veterans Health Administration (VHA) acute care hospitals

We focus on those hospitals averaging $\geq$ 3 admissions per quarter for a given condition

Comparing readmissions rates

	30 day readmission rates	
	Medicare FFS*	VHA
AMI	19.8%	18.8%
CAP	18.4%	14.0%
CHF	24.8%	20.1%

*Rates taken from Medicare Hospital Compare

Data

Patient level health data on hospital admissions

Patient level socioeconomic and demographic characteristics

Cost data from VHA Decision Support System (DSS)

Summary characteristics

Index hospitalization admitting condition	AMI	CAP	CHF
No. of patients	15,603	63,679	64,391
No. of facilities[#]	35	101	90
	mean + sd	mean + sd	mean + sd
Episode Characteristics			
Total episode cost ($)[^]	21114 ± 7277	14307 ± 5553	13946 ± 4852
Index hospitalization cost ($)	18572 ± 6117	12293 ± 4918	11331 ± 3891
Readmission hospitalization cost ($)	2542 ± 3184	2014 ± 2071	2615 ± 2186
Readmission rate (%)	18.84 ± 10.21	13.97 ± 7.14	20.12 ± 8.10
Index visit LOS (days)	5.40 ± 1.51	5.86 ± 1.33	5.34 ± 1.13

Summary characteristics (cont'd)

Index hospitalization admitting condition	AMI	CAP	CHF
Demographic Characteristics	mean ± sd	mean ± sd	mean ± sd
Female (%)	1.96 ± 3.51	3.15 ± 3.60	1.65 ± 2.48
Age (years)	67.6 ± 3.8	69.4 ± 3.7	70.8 ± 3.3
Divorced (%)	32.61 ± 12.44	29.16 ± 10.02	30.27 ± 10.61
Never married (%)	8.07 ± 7.84	9.59 ± 8.09	9.32 ± 7.49
Widowed (%)	11.02 ± 7.83	14.43 ± 7.31	15.68 ± 7.68
Hispanic (%)	1.40 ± 4.53	0.94 ± 3.53	1.05 ± 3.66
Black (%)	8.93 ± 12.23	12.94 ± 15.98	18.32 ± 19.96
Asian (%)	1.00 ± 3.33	0.75 ± 2.11	0.70 ± 1.83
Native American (%)	0.47 ± 2.10	0.45 ± 1.51	0.36 ± 1.25
Missing (%)	44.0 ± 34.00	35.45 ± 35.16	35.91 ± 35.61

Model predicting readmission

$$R_{i,j,t} = \beta_0 + \beta_1 r_{j,t-1} + \beta_2 iLOS_i + \beta_3 X_i + \phi_j + \varepsilon_{i,j,t}$$

Where

R is readmission indicator

r is the condition-specific readmission rate in the previous quarter

iLOS is the patient's index admission length of stay

X is the patient's health, demographic and socioeconomic characteristics

ϕ are hospital fixed effects

Results

Index hospitalization admitting condition	AMI	CAP	CHF
Hospital readmission rate (t-1)	-0.0005	-0.0002	-0.0001
	(.0004)	(0.0002)	(0.0003)
Index hospitalization LOS (in days)	0.0028**	0.0027***	0.0023***
	(0.0009)	(0.0003)	(0.0004)
N	15603	63679	64391

These models are adjusted for comorbid conditions, race, gender, marital status and income.
Standard errors in parentheses are robust clustered at the facility level
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Episode cost modeling

We first addressed whether facility readmission rate impacts risk adjusted bundled hospital episode cost by estimating:

$$\ln(\text{Ep. Cost}_{i,j,t}) = \beta_0 + \beta_1 r_{j,t-1} + \beta_2 \text{eLOS}_i + \beta_3 X_i + \phi_j + \varepsilon_{i,j,t}$$

Where all covariates are defined the same as in the previous except **eLOS** which is the total episode length of stay

Results

	(1)	(2)	(3)
Index hospitalization admitting condition	AMI	CAP	CHF
Hospital readmission rate (t-1)	31.65	-12.36	11.79
	(20.65)	(16.50)	(11.95)
Index hospitalization LOS (in days)	2789***	2701***	2453***
	(148)	(294)	(146)
N	15603	63679	64391

These models are adjusted for comorbid conditions, race, gender, marital status and income.
Standard errors in parentheses are robust clustered at the facility level
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Episode cost modeling

We then address the difference in the average risk adjusted bundled hospital episode cost for readmitted patients :

$$\ln(\text{Ep. Cost}_{i,j,t}) = \beta_0 + \beta_1 r_{j,t-1} + \beta_2 \text{eLOS}_i + \beta_3 X_i + \beta_4 R_{i,j,t} + \phi_j + \varepsilon_{i,j,t}$$

Where all covariates are defined the same as in the previous and the readmission indicator R is included

Results

Index hospitalization admitting condition	AMI	CAP	CHF
Hospital readmission rate (t-1)	32.15	-10.55	11.52
	(19.07)	(16.52)	(11.33)
Readmission indicator	12,681***	13,326***	12,466***
	(679)	(425)	(398)
Ep. hospitalization LOS (in days)	2770***	2694***	2445***
	(147)	(295)	(146)
N	15603	63679	64391

Models are adjusted for total episode LOS, comorbid conditions, race, gender, marital status and income.
Standard errors in parentheses are robust clustered at the hospital level
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Episode cost modeling

Because linear models can obscure tail effects we then estimate episode costs via quantile regression:

$$Q_q(\text{Ep. cost}_{i,j,t}) = \beta_{q,0} + \beta_{q,1}\, r_{j,t-1} + \beta_{q,2}\, \text{eLOS}_i + \beta_{q,3}\, X_i + \beta_{q,4}\, R_{i,j,t}$$

And evaluate the model at q=.10, .25, .50, .75 and .90

Results

percentile:	10th	25th	50th	75th	90th
AMI					
Patient was readmitted	3369***	5368***	8505***	13699***	24559***
	(154)	(168)	(303)	(485)	(944)
Hospital readmission rate in (t-1)	-15.16**	-22.13***	-30.34***	-27.19*	0.62
	(5.20)	(6.79)	(6.66)	(15.04)	(20.7)
N=15,603					

Models are adjusted for total episode LOS, comorbid conditions, race, gender, marital status and income.
Bootstrapped standard errors (100 reps) in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results

percentile:	10th	25th	50th	75th	90th
CAP					
Patient was readmitted	3588***	5415***	8498***	14133***	24937***
	(113)	(113)	(142)	(303)	(534)
Hospital readmission rate in (t-1)	-4.45***	-12.28***	-20.91***	-19.94***	-16.94***
	(1.63)	(1.98)	(2.42)	(3.16)	(4.41)
N=63,679					

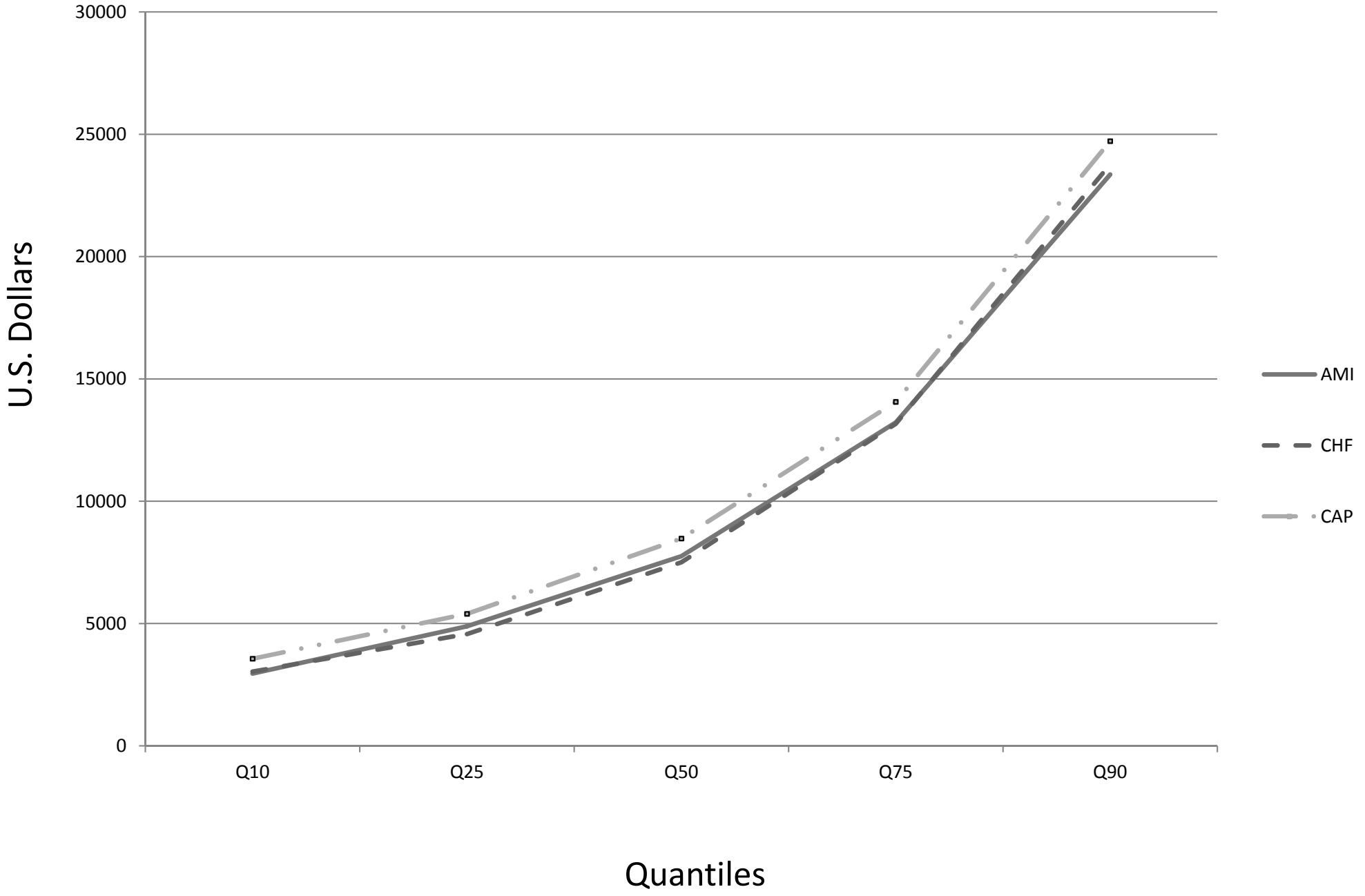
Models are adjusted for total episode LOS, comorbid conditions, race, gender, marital status and income.
Bootstrapped standard errors (100 reps) in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results

percentile:	10th	25th	50th	75th	90th
CHF					
Patient was readmitted	3079***	4589***	7572***	13446***	25238***
	(52)	(55)	(86)	(246)	(517)
Hospital readmission rate in (t-1)	-0.094	-7.29***	-6.97***	-8.82***	-4.54
	(2.71)	(1.88)	(2.16)	(2.75)	(3.85)
N=64,391					

Models are adjusted for total episode LOS, comorbid conditions, race, gender, marital status and income.
Bootstrapped standard errors (100 reps) in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Patients treated in facilities with ≥ 3 disease specific discharges per quarter



Findings

Recent hospital readmission rate does not appear to predict individual patient readmission

Risk adjusted episode costs are not impacted by hospitals' recent readmission rates

Hospital episode costs are higher for readmitted patients, and this increased cost can be substantial

Conclusion

Penalizing hospitals based on rates may be misguided

Recent interventions suggest the cost per patient to reduce readmission is greater than the cost of readmission itself

While reducing readmission may have value, the theory that it will reduce costs is in question