Technical Appendix

eTable 1. Hospital Quality Alliance Quality of Care Process Measures

Condition	Quality Measure
Acute Myocardial Infarction (AMI)	Aspirin within 24 hours of admission
	Aspirin at the time of discharge
	Angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) for left ventricular systolic dysfunction (LVSD)
	Beta-blockers at the time of discharge
	Fibrinolytic medication received within 30 minutes of hospital arrival
	Percutaneous coronary intervention (PCI) Received Within 90 Minutes of Hospital Arrival
	Smoking cessation advice or counseling among smokers
Congestive Heart Failure (CHF)	Evaluation of left ventricular systolic function
	ACE inhibitor or ARB for LVSD
	Discharge instructions that address activity level, diet, medications, follow-up appointment, weight and symptom monitoring
	Smoking cessation advice or counseling among smokers
Pneumonia	Initial antibiotic therapy begun within 6 hours of arrival
	Pneumococcal vaccination status
	Influenza vaccination status
	Blood cultures performed prior to antibiotics being started
	Appropriate initial antibiotic selection
	Smoking cessation advice or counseling among smokers

Summary scores for each condition were calculated as the total number of times a hospital performed the appropriate action for each measure divided by the total number of opportunities the hospital had to provide appropriate care for that condition.

eTable 2: Quality of Care

Quality Metrics	**Critical Access Hospitals**		**Non-Critical Access Hospitals**		**P value**
	N reporting	Score	N reporting	Score	
Acute myocardial infarction					
Aspirin at arrival	477	92.4	3015	98.4	<0.001
Aspirin at discharge	431	90.8	2978	98.4	<0.001
Beta-blocker at discharge	429	91.1	2985	98.3	<0.001
ACE/ARB for LV systolic dysfunction	206	87.9	2679	95.4	<0.001
Smoking cessation counseling	122	91.4	2595	99.4	<0.001
Lytic within 30 minutes of arrival	37	30.0	481	54.8	0.008
PCI within 90 minutes of arrival	2	96.9	1501	87.5	0.30
AMI Summary score	**497**	**91.0**	**3028**	**97.8**	**<0.001**
Congestive heart failure					
ACE/ARB for LV systolic dysfunction	725	84.8	3080	94.0	<0.001
Assessment of LV function	845	82.6	3119	97.9	<0.001
Discharge instructions	829	75.6	3115	86.8	<0.001
Smoking cessation counseling	658	85.7	3080	98.4	<0.001
CHF Summary score	**847**	**80.6**	**3119**	**93.5**	**<0.001**
Pneumonia					
Influenza vaccination	831	83.3	3104	90.0	<0.001
Pneumococcal vaccination	895	85.8	3121	92.6	<0.001
Initial antibiotic within 6 hours	879	95.0	3116	94.8	0.57
Smoking cessation counseling	849	86.2	3111	97.4	<0.001
Most appropriate initial antibiotic	888	87.4	3113	91.4	<0.001
Blood culture before first antibiotic	836	92.0	3088	95.0	0.34
Pneumonia Summary score	**898**	**89.3**	**3127**	**93.7**	**<0.001**

ACE-I = Angiotensin Converting Enzyme Inhibitor; ARB = Angiotensin Receptor Blocker; LV = left ventricular; PCI = percutaneous coronary intervention. N reporting indicates the number of hospitals submitting performance data for each measure.

eTable 3: Quality of Care, adjusted for case mix and hospital characteristics

Quality Metrics	Critical Access Hospitals		Non-Critical Access Hospitals		P value
	N reporting	Score	N reporting	Score	
AMI Summary score	497	91.0	3028	97.8	<0.001
Adjusted for case mix		91.4		97.6	<0.001
Adjusted for case mix and hospital characteristics		91.5		97.4	<0.001
CHF Summary score	847	80.6	3119	93.5	<0.001
Adjusted for case mix		81.0		93.5	<0.001
Adjusted for case mix and hospital characteristics		81.3		93.1	<0.001
Pneumonia Summary score	898	89.3	3127	93.7	<0.001
Adjusted for case mix		89.4		93.7	<0.001
Adjusted for case mix and hospital characteristics		89.4		93.6	<0.001

AMI=acute myocardial infarction; CHF=congestive heart failure. Hospital characteristics include teaching status, ownership, region, and membership in a hospital system.

eTable 4: 30-day Mortality, excluding transfers

	AMI			CHF			Pneumonia		
	CAH	Non-CAH	Odds Ratio	CAH	Non-CAH	Odds Ratio	CAH	Non-CAH	Odds Ratio
Proportion of patients transferred out	29.8%	11.1%	n/a	7.4%	2.5%	n/a	5.6%	1.5%	n/a
Risk-adjusted mortality	28.2%	18.0%	1.95 (1.83, 2.09)	12.9%	10.9%	1.23 (1.19, 1.27)	13.5%	12.0%	1.16 (1.10, 1.23)

p<0.001 for all comparisons. AMI=acute myocardial infarction; CHF=congestive heart failure; CAH=Critical Access Hospital.

eTable 5a: Hospital Characteristics, including only small, rural hospitals

Hospital Characteristics		**Critical Access Hospitals N=1022**	**Non-Critical Access Hospitals N=379**
Medical/surgical hospital bed capacity, median (IQR)		18 (14, 24)	33 (25, 41)
Ownership	Public	479 (47%)	127 (34%)
	For-profit	39 (4%)	78 (21%)
	Non-profit	504 (49%)	174 (46%)
Major teaching hospital†		0 (0%)	0 (0%)
Rural / urban category (RUCA)	Urban	0 (0%)	0 (0%)
	Large town	0 (0%)	0 (0%)
	Small town	586 (57%)	294 (78%)
	Rural	436 (43%)	85 (22%)
Region	Northeast	56 (5%)	24 (6%)
	Midwest	498 (49%)	56 (15%)
	South	270 (26%)	259 (68%)
	West	198 (19%)	40 (11%)
County income, median (IQR)		$29,002 (25,624, 32,674)	$26,537 (23,893, 29,509)
Percent county poverty, median, (IQR)†		13.6 (10.8, 17.5)	17.5 (13.9, 21.3)
Proportion Medicare patients		57.7% (50.8, 68.3)	52.2% (46.4, 57.3)
Proportion Medicaid patients		11.0% (5.8, 16.0)	15.9% (11.4, 21.9)
Volume of Medicare patients (median, IQR)*	AMI	6 (3, 11)	19 (9, 31)
	CHF	32 (17, 56)	92 (53, 135)
	Pneumonia	57 (33, 88)	122 (75, 170)

AMI = acute myocardial infarction; CHF = congestive heart failure; IQR = Interquartile Range; RUCA=Rural Urban Commuting Area (Urban = 50,000 or more, Large town = 10,000-49,999, Small town = 2,500-9,999, Rural = <2,500)

* Over the 23 month study period.

† p-value >0.05. Otherwise p-value for all comparisons <0.001.

eTable 5b: Clinical and Technological Resources, including only small, rural hospitals

Clinical Resources		**Critical Access Hospitals N=1022**	**Non-Critical Access Hospitals N=379**	**P value**
Member of hospital system		227 (27%)	112 (33%)	0.08
Medical intensive care unit		259 (25%)	200 (53%)	<0.001
Cardiac intensive care unit*		94 (11%)	51 (16%)	0.01
Cardiac catheterization		2 (0.2%)	19 (5%)	<0.001
PET scanner*		15 (2%)	14 (4%)	0.008
Surgical capability		875 (86%)	354 (93%)	<0.001
Nurse-to-census ratio, median (IQR)		7.0 (3.0, 11.1)	6.3 (4.6, 8.5)	0.18
Total physicians per 100,000 (mean, SD)†		86.2 (89.9)	86.2 (56.5)	0.05
Generalists per 100,000 (mean, SD)†		50.4 (37.3)	40.1 (25.2)	<0.001
Cardiologists per 100,000 (mean, SD)†		0.7 (3.1)	0.9 (2.0)	<0.001
Pulmonologists per 100,000 (mean, SD)†		0.3 (1.3)	0.5 (1.4)	0.002
Overall EHR adoption‡	Comprehensive	12 (1%)	13 (3%)	0.05
	Basic	47 (5%)	12 (3%)	
	None	933 (94%)	344 (93%)	

*=of 1192 hospitals reporting these measures. †=reported at the county level; means reported because medians were zero for CAH and therefore less interpretable. PET = positron emission tomography. ‡=based on responses from the hospitals that returned the HIT survey; all results are weighted for nonresponse bias to produce a representative sample.