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ABSTRACT: 249 words

Background: Whether American College of Cardiology (ACC) Chest Pain Center (CPC) accreditation alters guidelines adherence rates is unclear.

Methods: We analyzed patient-level, hospital-reported, quality metrics for myocardial infarction (MI) patients from 644 hospitals collected in the ACC's Chest Pain-MI Registry from 1/1/19 to 12/31/20, stratified by CPC accreditation for >1 year.

Results: Of 192,374 MI patients, 67,462 (35.1%) received care at an accredited hospital. In general, differences in guideline adherence rates between accredited and non-accredited hospitals were numerically small, though frequently significant. Patients at accredited hospitals were more likely to undergo coronary angiography (98.6% vs 97.9%, p<0.0001), percutaneous coronary intervention (PCI) for NSTEMI (55.4% vs 52.3%, p<0.0001), have overall revascularization for NSTEMI (63.5% vs 61.0%, p<0.0001), and receive P2Y12 inhibitor on arrival (63.5% vs. 60.2%, p<0.0001). Non-accredited hospitals more ECG within 10 minutes (62.3% vs. 60.4%, p<0.0001) and first medical contact to device activation ≤ 90 minutes (66.8% vs. 64.8%, p<0.0001). Accredited hospitals had uniformly higher discharge medication guideline adherence, with patients more likely receiving aspirin (97.8% vs. 97.4%, p<0.0001), angiotensin converting enzyme inhibitor (46.7% vs. 45.3%, p<0.0001), beta blocker (96.6% vs. 96.2%, p<0.0001), P2Y12 inhibitor (90.3% vs. 89.2%, p<0.0001), and statin (97.8% vs. 97.5%, p<0.0001). Interaction by accredited status was significant only for length of stay (LOS), which was slightly shorter at accredited facilities for specific subgroups.

Conclusions: ACC CPC accreditation was associated with small consistent improvement in adherence to guideline-based treatment recommendations of catheter-based care (catheterization and PCI) for NSTEMI and discharge medications, and shorter hospital stays.

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Introduction:

Cardiovascular disease is the number one cause of death in industrialized nations. In the US in 2018, it was estimated that there were 129,974,000 emergency department visits, 7 million (5.4%) of whom had chest pain and potential myocardial infarction (MI). (1) Though guidelines exist for patients with MI, great variability remains in the evaluation and management of these patients.

To address the quality improvement aspects of a suspected ACS presentation, and to leverage the collaborative potential of a multispecialty approach, the Society of Chest Pain Centers (SCPC) was formed in 1998 to define a set of optimal evaluation and management processes. Institutions that met the standards of quality improvement, as defined by the SCPC, were eligible for accreditation as a Chest Pain Center (CPC). By formalizing a process of accreditation, institutions were directed down a path of consistent improvement in the measurement, standardization, and delivery of high-quality MI care. Because of clearly defined improvements and outcomes in the delivery of care, (2,3,4,5,6,7) by 2018 nearly 1/3 of all US hospitals were accredited by the SCPC, prompting development of similar accreditation programs in Brazil, China, Germany, and the United Kingdom. (8,9,10,11)

Late in 2018, in an effort to expand their quality improvement mission, the SCPC and the American College of Cardiology (ACC) merged, resulting in the formation of ACC Accreditation Services (AS). ACC-AS provides accreditation for several service lines related to cardiovascular care that include cardiac catheterization laboratories, heart failure, etc, as well as CPC accreditation. To obtain ACC CPC accreditation requires achievement of specific structural and process related "essential" elements, implementation of continuous quality improvement

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efforts, standardized data collection and reporting, and regular evaluation of related outcomes.
(12)

In addition to CPC accreditation, the ACC also offers participation in the National Cardiovascular Data Registry (NCDR) which provides a means for hospitals to measure quality and performance for a range of cardiovascular care services, including the Chest Pain-MI (CP-MI) Registry. While these programs are independent, and interested facilities can opt to participate in one without the other, the NCDR CP-MI Registry facilitates standard data collection and aligns accreditation with ACC performance measures, CMS measures, and provides a streamlined mechanism for facility level analysis of processes and outcomes. In addition, the NCDR CP-MI Registry is considered a high-weight improvement activity under the Medicare Merit-Based Incentive Payment System (MIPS), provides institutional 30-day risk standardized AMI mortality reports, and post-discharge outcome data through a linkage to the National Death Index (NDI).

Because ACC CPC accreditation may alter the delivery of care for MI patients, we sought to evaluate differences in adherence to AHA/ACC guideline recommended 1A quality metrics for acute MI (13) between accredited and non-accredited institutions using the NCDR CP-MI registry.

Methods:

This was a retrospective observational analysis of the NCDR CP-MI registry. Included hospitals were ACC CPC accredited for at least 1 year. Definitions of registry data elements are available at: https://www.ncdr.com/webncdr/action/home/datacollection.   Performance measures of non-contraindicated points of interest include first door to first ECG within 10 min for direct arrival among patients who had an ECG, cardiac catheterization, any percutaneous coronary

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intervention (PCI) for NSTEMI, primary PCI for STEMI, rates of first medical contact to device activation $\leq$ 90 minutes, coronary artery bypass grafting (CABG) for overall patients, cardiac rehabilitation referral for overall patients alive and out of hospital, medications at arrival among non-contraindicated patients (aspirin, P2Y12 inhibitors (P2Y12i), and beta-blockers), and discharge medication (aspirin, angiotensin receptor blocker (ARB), angiotensin converting enzyme inhibitor (ACEi), beta blocker, P2Y12i), or statin) in those discharged alive and not to another acute hospital, against medical advice or hospice, or if there was a medical/patient reason for not prescribing a medication of interest. Outcomes of interest included hospital length of stay (LOS) and in-hospital mortality.

Data were stratified by accredited vs. non-accredited hospital status. Continuous variables are presented as mean (standard deviation; SD) and median (intra quartile rank; IQR). Categorical variables were described using frequencies and percentages. The non-parametric Wilcoxon rank sum test was used to compare median of continuous variables between two group, and Chi-Square test was used for comparison of categorical variables between patients in accredited and non-accredited hospitals. Generalized estimating equations (GEE) logistic regression models and generalized score tests were used to evaluate the interactions of stratification factors (age groups, gender, race and ethnicity, hospital bed size categories, hospital academic status, hospital in rural / urban) with main interested variable (accredited vs non-accredited) in respect to performance measures and in-hospital mortality (binary variables). A negative binomial regression model was used to test the interactions of stratification factors with main interested variable in respect to LOS among non-transfer out patients. For testing the interactions, a p-value of <0.002 (=0.05/25, which is number of outcomes) was considered

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significant to adjust for multiple comparisons. If the p-value for the interaction was statistically significant, we then describe the performance measures and outcomes by stratifications.

This registry was either approved by an institutional review board, or considered quality assurance data and not subject to institutional review board approval based on individual site determinations (14). All statistical analyses were performed using SAS version 9.4 software (SAS Institute, Cary, NC).

Results:

Overall, 434,506 patients at 784 institutions were included in the NCDR CP-MI registry during the enrollment period 2019 - 2020. Of these, 64,811 patients (at 139 hospitals) were excluded for missing facility accreditation status, 75,103 for transfer in status, 96,180 for not STEMI or NSTEMI, and 6,038 for non-index admission within a single site. This left the records of 192,374 MI patients, seen at 644 hospitals, of which 383 (59.5%) were CPC accredited facilities that cared for 67,462 (35.1%) of the cohort.

BASELINE CHARACTERISTICS: Table 1 displays the overall baseline characteristics of hospitals participating in the NCDR CP-MI registry, overall and stratified by accreditation status. Most NCDR CP-MI registry participating hospital are located in the Southern or Midwest areas (72.2%) of the United States, with the Northeast and West least represented (9.6, and 18%, respectively). Accredited and non-accredited hospitals are similarly represented in all regions, with rates of accreditation always within an absolute 10% of non-accredited status, regardless of region. Table 2 displays the overall baseline characteristics of patients cared for at hospitals participating in the NCDR CP-MI registry, and stratified by accredited and non-accredited hospital status. In general, these characteristics were similar regardless of accreditation status, although accredited facilities had higher STEMI rates (40.0 vs. 37.4%, p<0.0001).

GUIDELINE ADHERANCE: Table 3 shows guideline adherence to various metrics. Many small statistically significant differences exist, and were mixed when stratified by accreditation status. Differences > 1% in magnitude between accredited and non-accredited hospitals included greater use of PCI for NSTEMI (55.4 vs. 52.3%, p<0.0001), more revascularization for NSTEMI (63.5 vs. 61.0, p<0.0001), and more frequent P2Y12i on arrival (63.5 vs. 60.2%, p<0.0001) at accredited facilities. There were higher rates of ECG within 10 minutes of arrival (62.3 vs. 60.4%, p<0.0001) and higher rates of first medical contact to device activation ≤ 90 minutes (66.8 vs. 64.8%, p<0.0001) at non-accredited facilities. At hospital discharge, patients at accredited hospitals had consistent, but very small, uniformly higher rates of discharge medication 1A guideline compliance, with a greater likelihood of receiving aspirin (97.8 vs. 97.4%, p<0.0001, ACEi (46.7 vs. 45.3%, p<0.0001), beta blocker (96.6 vs.96.2%, p<0.0001), P2Y12i (90.3 vs.89.2%, p<0.0001), and statins (97.8 vs. 97.5%, p<0.0001). Interactions of accredited status and stratification factors in respect to performance metrics were not found significant at the modified significance level 0.002.

OUTCOMES: Interactions by accreditation status was found only for LOS. When specific stratification factors were evaluated (Table 4), accredited hospitals still had slightly shorter mean [SD] and median [IQR] LOS for men (mean 4.1[5.0] vs. 4.2 [4.9], median 3 [2,4] vs 3 [2,5] days, p=0.0003), non-Hispanic Asians (mean 4.5 [6.0] vs. 4.7 [5.4], median 3 [2, 5] vs 3 [2, 5], p<0.0001), and the middle age groups of ≥50 to ≤65 (mean 3.9 [4.8] vs 4.0 [4.9], median 2 [2,4] vs. 2 [2,4] days, p=0.0008) and >65 to ≤80 years old (mean 4.7 [5.7] vs. 4.8 [5.1], median 3 [2, 5] vs. 3 [2, 6] days, p<0.0001).

When stratified by hospital characteristics, LOS was shorter at accredited hospitals that were larger (>250 bed) (mean 4.47 [5.3] vs. 4.54 [5.1], median 3 [2,5] vs. 3 [2,5] days,

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p=0.0011), rural in location (mean 3.80 [5.1] vs. 3.83 [3.9], median 2 [2, 4] vs 3 [2, 4], p=0.0009), and with non-academic status (mean 4.0 [4.7] vs. 4.2 [4.6], median 3 [2,4] vs. 3 [2,5] days, p<0.0001). There were no differences with accreditation for LOS at smaller hospitals, those in suburban or urban locations, and if they were categorized as academic. There were no differences in the rates of in-hospital deaths (5.4 vs 5.2%, p=0.11, respectively).

Discussion:

While prior analyses of CPC accreditation showed favorable improvement in acute MI performance measures, our study adds to the literature by showing greater general adherence to guideline-based care, especially use of percutaneous intervention among NSTEMI patients, in accredited vs. non-accredited facilities that participate in the NCDR CP-MI registry. By using this larger group of patients receiving care at separate facilities concurrently, we were able to examine important steps in MI care. In this large dataset of MI patients, we found that patients who presented to ACC CPC accredited institutions were slightly more likely to undergo invasive diagnostic testing and PCI, while those at non-accredited facilities were slightly more likely to receive CABG, and cardiac rehabilitation. These differences are not explained by demographic population differences between the cohorts, and their impact is unclear.

We also found that accredited hospitals provided slightly higher rates consistently across all guideline compliant discharge medications, which may be related to components of the accreditation process that mandate the incorporation of standard order sets for various aspects of acute, in-hospital, and discharge care, including guidelines directed medical therapy. Although the actual numeric differences are small, the consistency of these post-discharge medication results suggests the potential for epidemiologic consequences of these findings.

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Post-MI ACEi have been evaluated in >100,000 patients, (15) and are clearly shown to reduce the relative risk of death and non-fatal cardiovascular events after MI by ~25%. (16,17) If the mortality reduction of ACEi's are applied to the non-accredited dataset, the 1.5% higher rate of ACEi discharge medications associated with accreditation could have resulted in an additional 1,849 patients receiving a discharge ACEi, and the potential avoidance of 462 subsequently preventable deaths in the non-accredited cohort. Similarly, post-MI beta-blocker use has also been studied in >100,000 patients, and is associated with ~25% relative mortality reduction. (18, 19, 20) If the 0.5% higher rate of beta blocker discharge prescription occurring at accredited hospitals is applied to the non-accredited cohort, a further 574 patients would have received beta-blocker prescriptions, with the potential avoidance of 144 preventable deaths. Even small increases in discharge prescription rates may have large and important effects on mortality.

Beyond ACEi and beta-blockers, there were also differences in the rates of antiplatelet discharge medication prescriptions. Post-MI P2Y12i therapy is associated with a ~25% post discharge relative mortality improvement. (21, 22) Applying the 1.2% higher P2Y12i discharge prescription rate at accredited hospitals to the non-accredited institution cohort results in an additional 1,462 prescriptions and 365 preventable deaths. Likewise, post-MI aspirin has been evaluated in >100,00 patients and also has a ~25% mortality reduction, (23, 24) occurring with as little as 1 month of use. (25) Applying the 0.4% higher accredited hospital rate of aspirin use to the non-accredited hospital patients would have resulted in another 475 discharges with an aspirin prescription, and a potential mortality reduction of 142 patients.

Finally, guidelines recommend the administration of statins at discharge in patients with coronary artery disease, including MI, regardless of lipid testing results. (26) In observational studies of > 40,00 patients, 1 year mortality reductions as high as ~30% were observed. (27, 28)

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Applying the higher accredited hospital discharge statin prescription rate to the non-accredited hospitals population would have resulted in an additional 387 patients receiving a statin, with a potential of 116 deaths avoided.

The consistency of the improvement associated with accreditation for discharge prescription rate should be noted. While not large in magnitude with any single drug, the fact that every 1A guideline recommended medication had higher prescription rates at accredited hospitals, as compared to non-accredited institutions, implies an operational effect that ultimately may result in an absolute lower long-term mortality rate for patients cared for at accredited institutions. Applying the totality of discharge prescriptions at accredited facilities to the non-accredited cohort would have resulted in an increase of 4,747 guideline recommend 1A discharge prescriptions, and the potential avoidance of 1,229 deaths at non-accredited facilities.

We also found very small LOS differences between accredited and non-accredited facilities. Although the magnitude is of such size as to question its clinical or financial relevance, its distribution occurred in large relevant subgroups (males, those age 50-85, and those of Asian race), and for specific hospital categories (large, non-suburban). While there may be patient level benefit to early discharge (i.e., a marked decrease in the rate of in-hospital acquired conditions), (29) and this may have beneficial economic implications for accredited institutions (shorter length of stay being associated with a greater financial advantage to the hospital), without the inclusion of long-term outcome data, it is difficult to determine a summary result of these potentially conflicting values.

Limitations:

This analysis has several important limitations. Methodologically, this was a retrospective analysis. Although the data set is large, and the findings robust, our results must be limited to hypothesis generating only, as no causality can be determined from our report. Further, the potential of spectrum bias must be considered, as all hospitals included herein are participating in the NCDR CP-MI registry and may not be representative of all U.S. practice. This results in limitations of comparisons outside this program. Further, institutions in this study are engaged in an existing quality improvement activity. It is very probable that all the facilities (accredited and non-accredited) represented by this data are "quality-motivated" institutions and differences in guideline adherence at hospitals not participating in these quality improvement activities may be greater than reported here.

Finally, the data reported here rely on site-reported data that is known by participating institutions to be potentially publicly available. This has the potential to result in over- or under-reporting of patient or hospital data. However, the NCDR program performs annual audits of site data collection, incorporates a validated automatic event adjudication process to ensure data quality, and includes data quality algorithms that require predetermined levels of completeness and consistency before submission. Lastly, sites are provided reports to spur iterative data quality improvement, and annual audits are conducted in randomly selected hospitals, which have demonstrated a high degree of agreement. (30)

Conclusions:

ACC CPC accreditation is associated with small but consistent improvements in performance rates of guideline directed medical care that contribute to important long term patient outcomes including prescription of key discharge medications, higher rates of guideline catheter-based care (catheterization and PCI) for MI, and shorter hospital stays.

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Table 1. Hospital Characteristics Stratified by Accreditation Status

Variable	Level	Overall n=644 (%)	Accredited n=261 (%)	Non-Accredited n=383 (%)	P value
Hospital Region	Missing	1 (0.2)	1(0.4)	0 (0)	0.0031
	West	116 (18.0)	40 (15.3)	76 (19.8)	
	Northeast	62 (9.6)	35 (13.4)	27 (7.0)	
	Midwest	147 (22.8)	70 (26.8)	77 (20.1)	
	South	318 (49.4)	115 (44.1)	203 (53.0)	
Hospital Community Description	Rural	109 (16.9)	57 (21.8)	52 (13.6)	0.0205
	Suburban	233 (36.2)	86 (32.9)	147 (38.4)	
	Urban	302 (46.9)	118 (45.2)	184 (48.0)	
Hospital Profit Type Description	Government	11 (1.7)	3 (1.1)	8 (2.1)	0.0347
	Private/Community	584 (90.7)	230 (88.1)	354 (92.4)	
	University	49 (7.6)	28 (10.7)	21 (5.4)	
Member of Council of Teaching Hospitals	Missing	27 (4.2)	11 (4.2)	16 (4.2)	0.0472
	No	536 (83.2)	209 (80.1)	327 (85.4)	
	Yes	81 (12.6	41 (15.7)	40 (10.4)	
Hospital Level of On-site Service	No Cath Lab services	3 (0.5)	1 (0.4)	2 (0.5)	0.1601
	Diagnostic caths (only)	6 (0.9)	2 (0.8)	4 (1.0)	
	Diagnostic caths & PCIs	181 (28.1)	86 (32.9)	95 (24.8)	
	Diagnostic caths, PCIs, cardiac surgeries	454 (70.5)	172 (65.9)	282 (73.6)	

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Hospital Total Beds	Median	282.5	269.0	288.0	0.2706
	25th, 75th IQR	175.5, 434.5	160.0, 445.0	187.0, 428.0	
	Mean (SD)	336.7, 216.9	335.2, 238.1	337.7, 201.6	

Caths = Catheterization, IQR = Interquartile Rank, PCI = Percutaneous Coronary Intervention,

SD = Standard Deviation

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Table 2. Population characteristics stratified by accreditation status

Categorial data presented as n (%), continuous presented as median (interquartile rank)

	Overall (N=192374)	Accredited (N=67462)	Non-accredited (N=124912)	P value
Patient Characteristics				
Median (IQR) Age	65 (56, 75)	65 (57, 75)	65 (56, 75)	0.5025
Male	127538 (66.3)	44855 (66.5)	82683 (66.2)	0.1896
Median (IQR) BMI	28.9 (25.3 – 33.2)	28.9 (25.4 – 33.2)	28.9 (23.5 – 33.2)	0.1146
Race/Ethnicity				
White	158862 (82.6)	55482 (82.2)	103380 (82.8%)	<0.0001
Black	23126 (12.0)	8155 (12.1)	14971 (12.0)	
Asian	4845 (2.5)	1777 (2.6)	3068 (2.5)	
Hispanic	16959 (8.8)	4402 (6.5)	12557 (10.1)	<0.0001
Past Medical History				
Hypertension	145777 (75.8)	51256 (76.0)	94521 (75.7)	0.1581
Dyslipidemia	105179 (54.7)	39041 (57.9)	66138 (53.0)	<0.0001
Diabetes	71144 (37.0)	24921 (36.9)	46223 (37.0)	0.7732
Prior MI	35036 (18.2)	13246 (19.6)	21790 (17.4)	0.0001
Prior PCI	43769 (22.7)	16187 (24.0)	27582 (22.1)	<0.0001
Prior CABG	19771 (10.3)	7122 (10.6)	12649 (10.1)	0.9209
Prior Stroke	15827 (8.2)	5906 (8.7)	9921 (7.9)	<0.0001

BMI = basal metabolic index, CABG = coronary artery bypass graft, IQR = interquartile rank,

MI = myocardial infarction, PCI = percutaneous coronary intervention,

Table 3. Interventions stratified by Accreditation Status

Data presented as frequency (percentage) for categorical variables.

	Overall (N=192374)	Accredited (N=67462)	Non-accredited (N=124912)	P value
Procedures				
ECG w/in 10 mins of arrival	61.6	60.4	62.3	<0.0001
Rate of 1st medical contact to 1st device activation	66.0	64.8	66.8	<0.0001
Coronary angiography	98.2	98.6	97.9	<0.0001
CABG among NSTEMI	9.0	8.6	9.2	0.0019
PCI for NSTEMI	53.3	55.4	52.3	<0.0001
Revascularization for NSTEMI	61.8	63.5	61.0	<0.0001
PCI for STEMI	94.4	94.6	94.3	0.1362
LV function assessed	96.2	96.2	96.2	0.7891
Arrival Medications				
Aspirin	96.8	96.8	96.8	0.8437
Beta blockers	71.3	71.2	71.3	0.5462
P2Y12i	61.3	63.5	60.2	0.0001
Discharge Medications/referral				
Aspirin	97.5	97.8	97.4	<0.0001
ACEi/ARB	81.7	82.5	81.2	<0.0128
Beta blocker	96.3	96.6	96.2	<0.0001

P2Y12i	89.6	90.3	89.2	<0.0001
Statin	97.6	97.8	97.5	<0.0001
Cardiac rehabilitation referral	130276 (80.2)	45996 (80.5)	84280 (80.0)	0.0305
In Hospital Mortality				
Death	9564 (5.3)	3435 (5.4)	6129 (5.2)	0.1055

ACEi/ARB = Angiotensin Converting Enzyme inhibitor/Angiotensin Receptor Blocker, CABG = Coronary Artery Bypass Graft, ECG = Electrocardiogram, LV = Left Ventricular, NSTEMI = Non-ST Segment Elevation Myocardial Infarction, P2Y12i = P2Y12 inhibitor, STEMI = ST Segment Elevation Myocardial Infarction,

Table 4. Hospital length of stay, stratified by accreditation status

Presented as Median (Interquartile Rank); Mean (SD)

	Overall N=192,374	Accredited N=67,462	Non-accredited N=124,912	P value
LOS	3 (2, 5); 4.26 (4.91)	3 (2, 5); 4.21 (5.06)	3 (2, 5); 4.29 (4.82)	<0.0001
Age in years				
< 50	2 (2, 3); 3.38 (4.20)	2 (2, 3); 3.38 (4.34)	2 (2, 3); 3.38 (4.12)	0.1057
>=50, <=65	2 (2, 4); 3.96 (4.84)	2 (2, 4); 3.89 (4.80)	2 (2, 4); 4.01 (4.86)	0.0008
>65, <=80	3 (2, 5); 4.73 (5.35)	3 (2, 5); 4.66 (5.73)	3 (2, 6); 4.77 (5.13)	0.0037
>80	3 (2, 6); 4.65 (4.26)	3 (2, 6); 4.67 (4.28)	3 (2, 6); 4.64 (4.24)	0.2972
Sex				
Male	3 (2, 4); 4.18 (4.90)	3 (2, 4); 4.11 (4.96)	3 (2, 5); 4.21 (4.87)	0.0003
Female	3 (2, 5); 4.43 (4.91)	3 (2, 5); 4.41 (5.26)	3 (2, 5); 4.45 (4.71)	0.1748
Race/Ethnicity				
Hispanic	3 (2, 5); 4.72 (5.40)	3 (2, 5); 4.59 (5.19)	3 (2, 5); 4.77 (5.47)	0.0837
NH-White	3 (2, 5); 4.14 (4.66)	3 (2, 4); 4.11 (4.80)	3 (2, 5); 4.15 (4.58)	0.1103
NH-Asian	3 (2, 5); 4.63 (5.60)	3 (2, 5); 4.50 (5.96)	3 (2, 5); 4.71 (5.39)	<0.0001
NH-Black	3 (2, 5); 4.66 (5.63)	3 (2, 5); 4.62 (5.71)	3 (2, 5); 4.68 (5.58)	0.8374
Hospital Bed Numbers				
< 100	2 (2, 4); 3.47 (3.52)	2 (2, 4); 3.50 (3.54)	2 (2, 4); 3.43 (3.48)	0.0281
100-250	2 (2, 4); 3.77 (4.26)	2 (2, 4); 3.75 (4.64)	2 (2, 4); 3.78 (4.04)	0.8514
>250	3 (2, 5); 4.52 (5.19)	3 (2, 5); 4.47 (5.31)	3 (2, 5); 4.54 (5.13)	0.0011

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Hospital Academic Status				
Non-academic	3 (2, 5); 4.14 (4.63)	3 (2, 4); 4.03 (4.71)	3 (2, 5); 4.19 (4.59)	<0.0001
Academic	3 (2, 6); 4.94 (6.20)	3 (2, 5); 4.98 (6.36)	3 (2, 6); 4.91 (6.08)	0.5197
Hospital Location				
Rural	2 (2, 4); 3.82 (4.50)	2 (2, 4); 3.80 (5.12)	3 (2, 4); 3.83 (3.91)	0.0009
Suburban	3 (2, 5); 4.15 (4.56)	3 (2, 5); 4.12 (4.54)	3 (2, 5); 4.17 (4.57)	0.5150
Urban	3 (2, 5); 4.45 (5.21)	3 (2, 5); 4.42 (5.35)	3 (2, 5); 4.47 (5.14)	0.0143

NH = non-hispanic