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Facility-Level Variation in Stress Test Utilization in Veterans with Ischemic Heart Disease

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Quantifying facility-level variation in cardiac stress test utilization is important for healthcare systems seeking to improve the efficiency and quality of cardiovascular care. Limited registry and payer data suggest such variation may be wide (1,2) but benchmark data from a single, large healthcare system are lacking. Therefore, our aim was to quantify variation in cardiac stress test utilization across the Veterans Health Administration (VA) in patients with established ischemic heart disease (IHD).

We used VA datasets to identify adults with IHD (myocardial infarction, percutaneous coronary intervention and/or coronary artery bypass grafting) with a primary care clinic visit

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at the VA in fiscal year 2014. Patients with metastatic cancer, receiving hospice care or with missing date of birth or gender information were excluded. VA datasets were used to obtain patient characteristics and medication use and to calculate the Diagnostic Cost Group Relative Risk Score (DCG RRS), a measure of overall illness burden. Facility-level cardiac stress test utilization was defined as the number of cardiac stress tests (exercise treadmill testing [ETT], stress echocardiography [SE], and stress myocardial perfusion imaging [MPI]) performed per 100 IHD patients per year at each of 130 VA medical centers. Utilization was mapped to patient county of residence to assess geographic variation and the influence of rurality. To quantify facility-level variation, we calculated median rate ratios (MRRs) with multivariable hierarchical regression models that adjusted for clustering of patients within facilities, treated patient-level characteristics as fixed effects and treated individual facilities as a random effect. Unadjusted and adjusted MRRs were calculated for: 1) overall cardiac stress test utilization and 2) non-imaging (i.e., ETT) versus imaging-based tests (i.e., SE, SPECT stress MPI and PET stress MPI). The Michael E. DeBakey VA Medical Center granted institutional review board approval.

The study cohort included 994,929 patients. Patients were predominantly non-Hispanic white males and the mean age was 72 years. Hypertension was highly prevalent (82%) and diabetes was present in 46%. 83% of patients were on statins and 58% on beta-blockers. The mean DCG RRS was 1.9. Unadjusted facility-level cardiac stress test utilization ranged from 2.1–31.7 studies/100 patients with a mean (standard deviation) of 15.4 (5.5). Figure 1 shows marked variation in unadjusted utilization at the county level between and often within states. The unadjusted MRR for overall cardiac stress test utilization was 1.69 (95% confidence interval [CI]: 1.58–1.79). Adjusting for patient-level characteristics (age, gender, race, hypertension, diabetes, and DCG RRS), the MRR decreased to 1.40 (95% CI: 1.34–1.46). Facility-level variation was similar between ETT (adjusted MRR 1.50, 95% CI 1.42–1.57) and imaging-based tests (adjusted MRR 1.44, 95% CI: 1.37–1.50). Additional adjustment for rurality did not alter the above MRRs.

Our data suggest that even after adjustment for patient mix, there is significant unexplained residual variation in cardiac stress test utilization in Veterans with IHD. These are the first benchmark data from a large, nationwide healthcare system. A number of provider- and facility-level variables could explain our findings. Providers in facilities with higher utilization rates may be overusing or misusing these tests. Given that self-referral and ‘defensive medicine’ motives are largely attenuated within the VA (3), overuse or misuse may reflect insufficient awareness about appropriate use criteria or perhaps ‘carryover’ from practice outside the VA. Limited data suggest the proportion of ‘rarely appropriate’ stress tests within and outside the VA are comparable (3,4), but a system-wide VA analysis remains undone. In addition, facility-level variables such as on-site availability of invasive cardiac catheterization (5) and cardiac CT angiography could have influenced referrals for cardiac stress tests. Future studies should include these variables, as well as patient-level symptom data, to better contextualize our findings.

In conclusion, we found 40% residual facility-level variation in cardiac stress test utilization within the VA. Further contextualization with relevant patient/provider/facility-level

variables, appropriateness, and patient outcomes could meaningfully improve efficiencies in and the quality of Veterans' cardiovascular care.

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Abbreviations List

DCG RRS	Diagnostic Cost Group Relative Risk Score
ETT	exercise treadmill testing
IHD	ischemic heart disease
MPI	myocardial perfusion imaging
MRR	median rate ratio
PET	positron emission tomography
SE	stress echocardiography
SPECT	single photon emission computed tomography
VA	Veterans Health Administration

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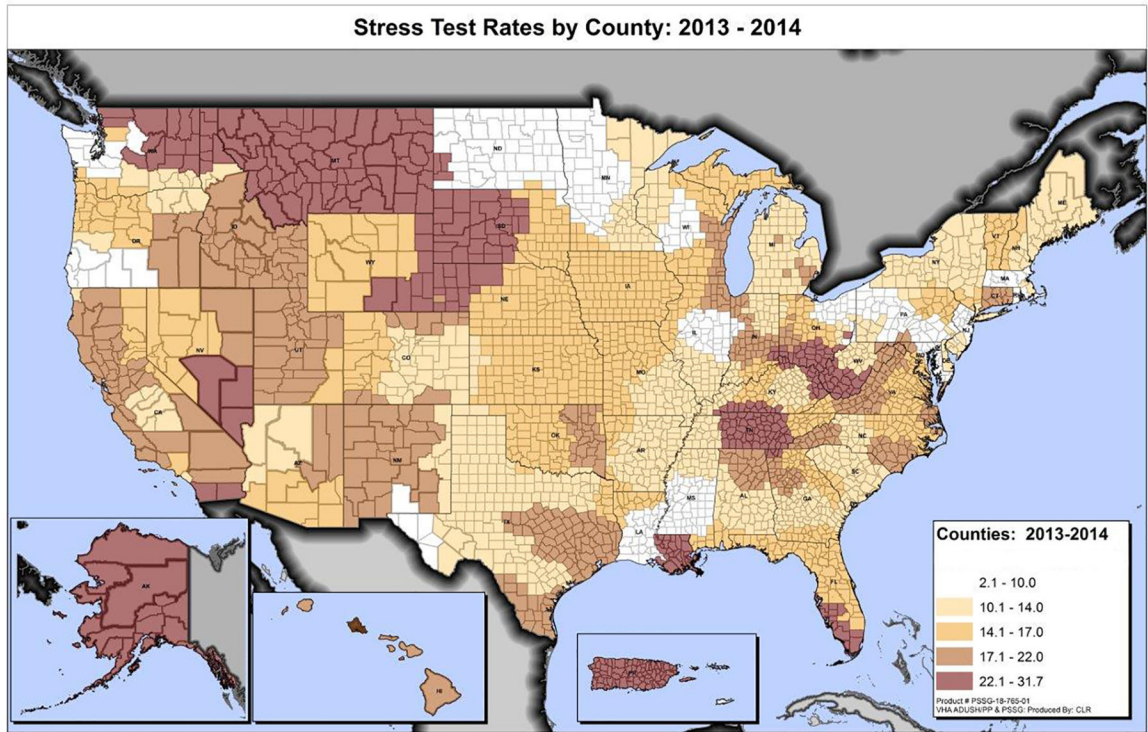


Figure 1. County-level cardiac stress utilization rates.
Rates represent unadjusted number of stress tests performed/100 patients with ischemic heart disease/county/year.