Comparative Utilization of Cardiac Stress Testing in US Patients with and without Chronic Kidney Disease

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Introduction
A "nihilistic approach" to coronary artery disease (CAD) in pts with chronic kidney disease (CKD) has previously been reported.
We have revisited this “truism” in the context of coronary artery stress testing in the modern era (2008-12).

Methods
Data source: 20% Medicare sample (2007-2012)
We assembled yearly cohorts of Medicare beneficiaries with and without CKD who were alive, aged 66 years, and had Medicare Parts A and B coverage on January 1 of each year from 2008 to 2012, and had ≥12 months continuous coverage preceding January 1 (baseline period).
We excluded patients who received PCI, CABG, angiography, kidney transplant, or participated in an HMO anytime in the baseline period, and who had AMI or ACS in the last two months of the baseline period.
Follow-up started on January 1 of each year from 2008 to 2012 and ended at the earliest of stress test, death, disenrollment from Medicare coverage, or December 31 of the year.

Definitions:
Patients with CKD were identified via diagnosis codes S85.X requiring 1 IP claim or two OP/IP claims at least 30 days apart in the baseline period. CKD stage was determined by the highest stage specific code.
Patients with ESRD were identified using the algorithm in 2013 USRDS Annual Data Report.
Stress tests were identified via CPT or ICD-9 procedure codes during the follow-up period.
If two or more tests occurred on the same day, assignment of first test type followed a hierarchal approach starting with stress echo, followed by stress nuclear, stress MRI, until stress ECG. If none of the above were found, we searched for non-invasive coronary CT angiography (CCTA). If none of the above and no angiography, we searched for CT coronary calcium scan.

Results
Statistical analyses:
Patient characteristics were described for yearly cohorts of CKD and non-CKD patients and their subgroups who received their first stress test.
Frequency distribution of type of first stress test was examined.
Unadjusted rates of first stress test (any type) were measured using number of patients who received a stress test per 100 patient-years.
Differences in trends in stress testing rates between non-CKD and CKD cohort were assessed using a generalized linear model with hierarchal approach starting with stress echo, followed by stress nuclear, stress MRI, until stress ECG. If none of the above were found, we searched for non-invasive coronary CT angiography (CCTA). If none of the above and no angiography, we searched for CT coronary calcium scan.

Conclusions
Commonly held perceptions of absolute under-utilization of stress testing for CAD in CKD pts are false in the current era.

Summary
There has been a progressive decline in rates of stress testing in both non-CKD and CKD patients from 2008 to 2012 (non-CKD: 11.5 vs 9.4 per 100 patient-years; CKD: 14.9 vs 13.4 per 100 patient-years).
CKD patients have a consistently higher rates of stress testing compared to non-CKD patients in 2008-12.
Stress nuclear imaging accounts for more than three-fourths of all stress tests.
Approximately 2,000,000 Medicare patients age 65+ received at least one stress test in 2012.

Limitations
Data based on claims. Sensitivity of CCT (Calcium) score ascertainment is reduced due to re-imbursement issues.
Reported rates of stress testing are not adjusted for potential CAD severity.
Data do not apply to pts with recent ACS events (i.e. differential utilization of stress testing in CKD vs non-CKD pts with recent ACS events may be different).
Absolute number of tests is higher since this analysis only focused on the first stress test.