Cardiac Stress Testing in US Patients with Chronic Kidney Disease: Is the Epoch of Nihilism and Renalism Ancient History?

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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 cardiac 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, CARG, angiography, kidney transplant, or participated in an HMO anytime in the baseline period, and who had A/K or A/C 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, kidney transplant, or an HMO anytime after the baseline period.

Results

Statistical analysis:
• 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 and among CKD stages 1-5D were assessed using a generalized linear model with a negative binomial distribution.

Conclusions
• Commonly held perceptions of absolute under-utilization of stress testing for CAD in CKD pts are false in the current era.
• Data based on claims. Sensitivity of CCTA and CT (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 (potentially different utilization of stress testing in CKD vs non-CKD pts with recent ACS events).
• Absolute number of tests is higher since this analysis only focused on the first stress test.

Table 1. Demographic characteristics for patients with and without CKD, 2008-2012

<table>
<thead>
<tr>
<th>CKD Stage</th>
<th>%</th>
<th>Non-CKD</th>
<th>%</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non</td>
<td>12.2</td>
<td>59.0</td>
<td>non</td>
<td>1.9</td>
</tr>
<tr>
<td>5D</td>
<td>66.7</td>
<td>87.1</td>
<td>4.7</td>
<td>7.9</td>
</tr>
<tr>
<td>End stage</td>
<td>2.3</td>
<td>2011</td>
<td>4.7</td>
<td>2012</td>
</tr>
</tbody>
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Table 2. Demographic characteristics for patients receiving stress test, by CKD status, 2008-2011

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Table 3. Distribution of type of first test (%), by CKD status, 2008-2012

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Summary
• There has been a progressive decline in rates of stress testing in both non-CKD and CKD patients, with the highest stage specific code.
• CKD patients have 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.
• There was a trend towards higher rates (per 100 patient-years) of stress testing with worse kidney function; non-CKD (9.4), Stage 1-2 (13.0), Stage 3-5D (14.0) and Stage 1D (18.4) in 2012.

Limitations
• Based on claims. Sensitivity of CCTA and CT (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 (potentially different utilization of stress testing in CKD vs non-CKD pts with recent ACS events).
• Absolute number of tests is higher since this analysis only focused on the first stress test.