Peri-Operative Outcomes of Patients with Chronic Kidney Disease Undergoing Shoulder Arthroplasty

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Summary: A national database was queried to evaluate the peri-operative outcomes of patients with chronic kidney disease undergoing total shoulder arthroplasty.
The association of chronic kidney disease on in-hospital outcomes after shoulder arthroplasty has not been well characterized.

Our aim is to determine the effect of non-dialysis dependent chronic kidney disease (NDD-CKD) and dialysis dependent chronic kidney disease (DD-CKD) on complications, hospital cost, and length of stay (LOS) after shoulder arthroplasty.
Hypothesis

• We hypothesize that NDD-CKD and DD-CKD will lead to significant increases in complications, cost, and LOS
Methods

Study Design

• The National Inpatient Sample was queried from 2007 to 2015 for all patients undergoing elective total, reverse, or partial shoulder arthroplasty.

• Patients were identified as having NDD-CKD or DD-CKD through ICD-9 procedure and diagnosis codes.

• Data regarding patient demographic, hospital characteristics, comorbidities, in-hospital complications, and mortality were retrieved.

• Patient comorbidities were stratified using the Elixhauser comorbidity index.

• Separate multivariate regression models were run to assess the contribution of NDD-CKD and DD-CKD to in-hospital complications and mortality.

• Differences on cost and LOS were assessed on cohorts matched by patient and hospital specific factors.
Results: sample groups

- 490,868 patients underwent TSA in this study period.
- 25,254 patients (5.1%) had a diagnosis of NDD-CKD
- 1,055 (0.2%) had a diagnosis of DD-CKD.
Results

• NDD-CKD and DD-CKD was an independent predictor of mortality, surgical site infection (SSI), myocardial infarction, UTI, stroke, deep vein thrombosis, transfusion, hemorrhage, pneumonia and non-home discharge.

• For the NDD patients, the most striking differences were found in mortality (OR:1.80, p<0.001), SSI (OR: 1.95, p<0.001), hemorrhage (OR: 1.74, p<0.001), pneumonia (OR: 1.49, p<0.001), deep vein thrombosis (OR: 1.41, p=0.003), and non-home discharge (OR: 1.27, p<0.001).

• For the DD patients, the most striking differences were mortality (OR: 10.64, p<0.001), stroke (OR: 4.88, p<0.001), deep vein thrombosis (OR: 4.17, p<0.001), myocardial infarction (OR: 3.95, p<0.001), SSI (3.17, p<0.001), transfusion (OR: 2.98, p<0.001), hemorrhage (OR:2.00, p<0.001), and UTI (OR:1.617, p<0.001).

• Non-infectious wound complications and pulmonary embolism were not significantly associated with either NDD-CKD (p=0.120) or DD-CKD (p=0.123).

• Post-operative prosthesis complications were not associated with NDD-CKD (p=0.468) but DD patients had 3.98 times the odds (p<0.001).
Results: cost and LOS burden

• A patient with NDD-CKD cost an additional $1,610 and had a 0.67-day greater LOS than non-CKD patients (both \( p<0.001 \)).

• Patients with DD-CKD cost an additional $8,940 and had a 3.49-day greater LOS compared to the non-CKD cohort (both \( p<0.001 \)).
<table>
<thead>
<tr>
<th>Complications</th>
<th>NDD-CKD (OR)</th>
<th>95% CI</th>
<th>P-Value</th>
<th>DD-CKD (OR)</th>
<th>95% CI</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>3.17</td>
<td>2.5, 4.0</td>
<td>&lt;.001</td>
<td>1.32</td>
<td>1.2, 1.5</td>
<td>&lt;.001</td>
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<tr>
<td>C. Difficile Infection</td>
<td>2.81</td>
<td>2.1, 3.8</td>
<td>&lt;.001</td>
<td>4.39</td>
<td>2.2, 8.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Stroke/CVA</td>
<td>1.99</td>
<td>1.6, 2.5</td>
<td>&lt;.001</td>
<td>4.88</td>
<td>2.9, 8.1</td>
<td>&lt;.001</td>
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<tr>
<td>Surgical Site Infection</td>
<td>1.95</td>
<td>1.6, 2.4</td>
<td>&lt;.001</td>
<td>1.95</td>
<td>1.6, 2.4</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Mortality</td>
<td>1.80</td>
<td>1.4, 2.2</td>
<td>&lt;.001</td>
<td>10.64</td>
<td>7.4, 15.4</td>
<td>&lt;.001</td>
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<tr>
<td>Hemorrhage</td>
<td>1.74</td>
<td>1.7, 1.8</td>
<td>&lt;.001</td>
<td>2.00</td>
<td>1.7, 2.3</td>
<td>&lt;.001</td>
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<tr>
<td>Transfusion</td>
<td>1.59</td>
<td>1.5, 1.6</td>
<td>&lt;.001</td>
<td>2.99</td>
<td>2.6, 3.4</td>
<td>&lt;.001</td>
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<tr>
<td>Urinary Tract Infection</td>
<td>1.45</td>
<td>1.4, 1.5</td>
<td>&lt;.001</td>
<td>1.62</td>
<td>1.3, 2.0</td>
<td>&lt;.001</td>
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<tr>
<td>Deep Vein Thrombosis</td>
<td>1.41</td>
<td>1.1, 1.8</td>
<td>0.003</td>
<td>4.18</td>
<td>2.6, 6.7</td>
<td>&lt;.001</td>
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<td>Myocardial Infarction</td>
<td>1.28</td>
<td>1.1, 1.5</td>
<td>0.003</td>
<td>3.95</td>
<td>2.8, 5.7</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Non-home Discharge</td>
<td>1.28</td>
<td>1.2, 1.3</td>
<td>&lt;.001</td>
<td>3.12</td>
<td>2.7, 3.6</td>
<td>&lt;.001</td>
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<tr>
<td>Wound Dehiscence</td>
<td>1.20</td>
<td>0.9, 1.5</td>
<td>0.12</td>
<td>1.60</td>
<td>0.9, 2.8</td>
<td>0.12</td>
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<tr>
<td>Prosthesis Complication</td>
<td>1.01</td>
<td>0.9, 1.10</td>
<td>0.805</td>
<td>4.39</td>
<td>3.7, 5.2</td>
<td>&lt;.001</td>
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<tr>
<td>Pulmonary Embolism</td>
<td>0.42</td>
<td>0.3, 0.6</td>
<td>&lt;.001</td>
<td>0.45</td>
<td>0.2, 1.2</td>
<td>0.121</td>
</tr>
</tbody>
</table>

**Table 1:** Multivariate Analysis of Complications and Their Association with Non-Dialysis Dependent and Dialysis Dependent Chronic Kidney Disease
Conclusions: Main Take Away Points

- Mortality, complication rates, hospital cost, and LOS were higher in the NDD-CKD cohort, and most associations were uniformly worsened further by DD-CKD.

- With elective shoulder arthroplasty volume rising in the United States, enhanced perioperative care of patients with CKD is essential to reduce the risk and cost associated with CKD.

- These findings support optimization of reversible causes of CKD and may bring into question the elective surgical candidacy of these patients.
References


