Patient Access to Care: What role does distance traveled to receive total joint arthroplasty play?

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I (and/or my co-authors) have something to disclose.

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Introduction

• Over 1 million total hip (THA) and knee replacements (TKA) are performed in the US annually
• Volume is increasing significantly
• Large volume and continued increase in TJA utilization has made it a cost concern in American healthcare policy
• Recent strategies in health policy include:
  – Bundled payment models
  – Regionalization/Referral of care
Regionalization

- Regionalization of healthcare with referrals to High Volume Hospitals (HVHs) has been shown to improve surgical outcomes
- Referral to HVHs has been suggested in total joint arthroplasty (TJA)
Objective

- Our objective was to examine how regionalization can impact access to care post-operatively in TJA patients.
- Determine whether patients’ traveling distances to undergo primary total hip and total knee arthroplasty impacted:
  - post-operative ED visits
  - clinic visits
  - readmissions
  - telephone, email, or other similar forms of communications
Methods

- Retrospective review of all elective, primary TJA from 2012-2017 in a single, multicenter, regional healthcare system (Ochsner Clinic, New Orleans, Louisiana)
- Analyzed patient travel distance to hospital based on centroid distance from the patient’s home zip code to that of the hospital
- Patients were grouped into three distance categories:
  - Short: <10km
  - Medium: 10-40km
  - Far: >40km
Methods

• Patient demographics and comorbidities were collected
• Data was collected for the 90 days after TJA and included:
  – patient presentation to the ED
  – hospital readmissions
  – clinic visits
  – physician communications in the 90 days after TJA
• Descriptive statistics:
  – chi-square for categorical variables
  – ANOVA for continuous variables
• Multivariate linear model with a Poisson distribution examined effect of distance on outcome variables
Results

4003 Patients

2892 TKAs

891 Short
1038 Medium
963 Far

1111 THAs

351 Short
310 Medium
450 Far
### Results

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Distance Group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;10 km</td>
<td>10-40km</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>64.7 (10.4)</td>
<td>66.5 (10.5)</td>
<td>64.7 (9.7)</td>
</tr>
<tr>
<td><strong>Gender</strong> Male</td>
<td>2510 (62.7)</td>
<td>803 (64.7)</td>
<td>844 (62.6)</td>
</tr>
<tr>
<td><strong>Gender</strong> Female</td>
<td>1493 (37.3)</td>
<td>439 (35.3)</td>
<td>504 (37.4)</td>
</tr>
<tr>
<td><strong>LOS</strong></td>
<td>2.6 (1.6)</td>
<td>2.6 (1.6)</td>
<td>2.5 (1.6)</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>33.0 (7.2)</td>
<td>32.2 (7.2)</td>
<td>33.7 (7.3)</td>
</tr>
<tr>
<td><strong>Elixhauser Comorbidity Index</strong></td>
<td>5 (3.6)</td>
<td>6 (3.8)</td>
<td>5 (3.5)</td>
</tr>
</tbody>
</table>

- **LOS** = Length of Stay
- **Count (%)** for categorical data
- **Mean (SD)** for continuous data
- *Statistically Significant

- Age was lower with further traveling patients
- Gender and length of stay was similar amongst all three groups
- BMI was higher in the medium and far distance groups, however comorbidity index lower in far travel patients

- Most people traveled greater than 10 km for their total joint replacement:
  - 40.5% of patients traveled >40 km to receive their total hip
  - 33% of patients traveled >40km to receive their total knee
- **129 patients >200km, 31 of those over >1000km**
# Results

<table>
<thead>
<tr>
<th>Insurance Type</th>
<th>Total</th>
<th>Distance Group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;10 km</td>
<td>10-40km</td>
</tr>
<tr>
<td>Private</td>
<td>1338 (33.4)</td>
<td>408 (32.9)</td>
<td>476 (35.3)</td>
</tr>
<tr>
<td>Medicare</td>
<td>2471 (61.7)</td>
<td>794 (63.9)</td>
<td>818 (60.7)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>71 (1)</td>
<td>10 (0.7)</td>
<td>19 (1.3)</td>
</tr>
<tr>
<td>Other/No Ins</td>
<td>152 (3.8)</td>
<td>27 (2.2)</td>
<td>44 (3.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Arthroplasty Type</th>
<th>Total</th>
<th>Distance Group</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;10 km</td>
<td>10-40km</td>
</tr>
<tr>
<td>Hip</td>
<td>1111 (27.8)</td>
<td>351 (28.3)</td>
<td>310 (23)</td>
</tr>
<tr>
<td>Knee</td>
<td>2892 (72.2)</td>
<td>891 (71.7)</td>
<td>1038 (77)</td>
</tr>
</tbody>
</table>

- Ins=Insurance
- Count (%) for categorical data
- Mean (SD) for continuous data
- * Statistically Significant

- Insurance type clinically similar except:
  - Medicaid/other (no insurance/military) patients significantly higher in the far distance group
  - More Knees than Hips
<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>&lt;10 km</th>
<th>10-40km</th>
<th>&gt;40km</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ED Visits 90 Days</strong></td>
<td>0.22 (0.64)</td>
<td>0.26 (0.77)</td>
<td>0.23 (0.6)</td>
<td>0.18 (0.55)</td>
<td>0.04*</td>
</tr>
<tr>
<td><strong>Readmission 90-days</strong></td>
<td>0.33 (0.68)</td>
<td>0.44 (0.82)</td>
<td>0.33 (0.64)</td>
<td>0.24 (0.55)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td><strong>Clinic Visit 90-days</strong></td>
<td>2.8 (1.1)</td>
<td>2.9 (1.1)</td>
<td>2.8 (1.1)</td>
<td>2.7 (1.1)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td><strong>Communication 90-days</strong></td>
<td>3.4 (3.4)</td>
<td>3.3 (3.3)</td>
<td>3.1 (3.1)</td>
<td>3.9 (3.7)</td>
<td>&lt;0.0001*</td>
</tr>
</tbody>
</table>

- **Significantly higher number of ED visits and Readmissions in the shorter distance groups**
- More clinic visits the closer the patient lived to the hospital
- Increased number communications in the Far distance group

-ED=Emergency Department
-Count (%) for categorical data
-Mean (SD) for continuous data
-* Statistically Significant
## Multivariate Linear Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>90 Day ED Presentation Rate [95% CI]</th>
<th>p value</th>
<th>90 Day Hospital Admission Rate [95% CI]</th>
<th>p value</th>
<th>90 Day Clinic Visit Rate [95% CI]</th>
<th>p value</th>
<th>90 Day Phone/Email Rate [95% CI]</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.906 [0.788-1.042]</td>
<td>0.166</td>
<td>1.063 [0.946-1.195]</td>
<td>0.302</td>
<td>0.993 [0.954-1.033]</td>
<td>0.713</td>
<td>1.128 [1.047-1.216]</td>
<td>0.002</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.71</td>
<td></td>
<td>0.066</td>
<td></td>
<td>0.109</td>
<td></td>
<td>0.197</td>
<td></td>
</tr>
<tr>
<td>Other vs Caucasian</td>
<td>0.691 [0.431-1.108]</td>
<td>0.125</td>
<td>1.346 [1.015-1.787]</td>
<td>0.039</td>
<td>0.949 [0.853-1.057]</td>
<td>0.343</td>
<td>1.095 [0.895-1.341]</td>
<td>0.377</td>
</tr>
<tr>
<td>African American vs Caucasian</td>
<td>1.118 [0.969-1.290]</td>
<td>0.126</td>
<td>1.088 [0.965-1.226]</td>
<td>0.167</td>
<td>0.959 [0.920-1.000]</td>
<td>0.047</td>
<td>1.069 [0.989-1.156]</td>
<td>0.094</td>
</tr>
<tr>
<td>Insurance Type</td>
<td>&lt;0.0001</td>
<td></td>
<td>&lt;0.0001</td>
<td></td>
<td>0.925</td>
<td></td>
<td>0.147</td>
<td></td>
</tr>
<tr>
<td>Private vs Medicare</td>
<td>0.634 [0.530-0.759]</td>
<td>&lt;0.0001</td>
<td>0.798 [0.687-0.928]</td>
<td>0.003</td>
<td>0.987 [0.941-1.036]</td>
<td>0.608</td>
<td>1.025 [0.936-1.127]</td>
<td>0.594</td>
</tr>
<tr>
<td>Other vs Medicare</td>
<td>0.642 [0.406-1.013]</td>
<td>0.057</td>
<td>0.457 [0.281-0.743]</td>
<td>0.002</td>
<td>0.999 [0.902-1.107]</td>
<td>0.991</td>
<td>0.829 [0.680-1.010]</td>
<td>0.063</td>
</tr>
<tr>
<td>Medicaid vs Medicare</td>
<td>1.722 [1.138-2.605]</td>
<td>0.001</td>
<td>0.448 [0.220-0.912]</td>
<td>0.004</td>
<td>0.951 [0.785-1.152]</td>
<td>0.607</td>
<td>0.846 [0.591-1.211]</td>
<td>0.361</td>
</tr>
<tr>
<td>Distance Group</td>
<td>&lt;0.0001</td>
<td></td>
<td>&lt;0.0001</td>
<td></td>
<td>0.01</td>
<td></td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Short vs far</td>
<td>1.364 [1.152-1.614]</td>
<td>&lt;0.0001</td>
<td>1.620 [1.410-1.862]</td>
<td>&lt;0.0001</td>
<td>1.074 [1.025-1.125]</td>
<td>0.003</td>
<td>0.850 [0.778-0.929]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Medium vs far</td>
<td>1.278 [1.078-1.514]</td>
<td>0.005</td>
<td>1.240 [1.072-1.434]</td>
<td>0.003</td>
<td>1.045 [0.998-1.094]</td>
<td>0.061</td>
<td>0.785 [0.720-0.856]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Age</td>
<td>0.973 [0.966-0.979]</td>
<td>&lt;0.0001</td>
<td>0.999 [0.993-1.006]</td>
<td>0.803</td>
<td>0.998 [0.995-1.000]</td>
<td>0.04</td>
<td>0.986 [0.982-0.990]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>BMI</td>
<td>0.987 [0.977-0.996]</td>
<td>0.005</td>
<td>1.002 [0.994-1.010]</td>
<td>0.594</td>
<td>1.001 [0.999-1.004]</td>
<td>0.375</td>
<td>0.991 [0.986-0.996]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Elkhaiser Comorbidity</td>
<td>1.126 [1.109-1.145]</td>
<td>&lt;0.0001</td>
<td>1.109 [1.094-1.124]</td>
<td>&lt;0.0001</td>
<td>1.002 [0.996-1.007]</td>
<td>0.563</td>
<td>1.022 [1.011-1.033]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Length of Stay</td>
<td>1.036 [1.005-1.068]</td>
<td>0.02</td>
<td>1.108 [1.088-1.128]</td>
<td>&lt;0.0001</td>
<td>0.972 [0.959-0.985]</td>
<td>&lt;0.0001</td>
<td>0.973 [0.951-0.995]</td>
<td>0.015</td>
</tr>
</tbody>
</table>
Multivariate Linear Regression Results

- Insurance type affects rate of ED visits:
  - Private < Medicare < Medicaid
- Distance Group (shorter) and LOS (longer stay) were significant risk factors for utilization of care
- Significantly higher number of ED visits and Readmissions in the shorter distance groups
- More clinic visits the closer you are (not significant between medium and far groups)
- Increased number communications in the Far distance group
Results

• Compared to the far distance group, multivariate analysis showed that the short distance and medium distance groups had:
  – 40% and 27% more ED presentations at 90 days, respectively
  – 64% and 24% more hospital readmissions at 90 days, respectively

• Short distance group had 7% more clinic visits than the far distance group (p=0.003)

• The far distance group had 15% and 22% more physician communications than the short and medium distance groups, respectively (p<0.0001)
Results

• Analysis of ED presentation reason:
  – Short and medium distance group
    • 8.1 times and 2.9 times more likely than the far distance group to present for postoperative pain and/or swelling, respectively
  – Similarly, frequency of ED visits not leading to readmission was inversely correlated with distance group:
    • Short > Medium > Far
Discussion

• We found that distance traveled had a significant impact on patient utilization of care resources postoperatively.

• In particular, patients with close geographic access to the ED were much more likely to present for surgical site pain and swelling.
  – This may lead to increased cost burden on the healthcare system.
Discussion

• Patients with decreased geographic access to their surgical center were more likely to communicate with their physician through phone, email, and patient portal use.

• As predicted with bundling of care, increased percentage of Medicaid or no insurance in the far traveling distance group.
Saleh et al. 2018

- Pain and swelling is most common surgical reason (35%) to return to ED within 30 days
- 80% of those not admitted to hospital
- Independent risk factors identified were African American race and being discharged home

Kelly et al. 2018

- 13.4% of THAs and 13.8% TKAs had >1 ED only (not-readmitted) visit in 90 days following procedure
- Rate of >1 readmission was 4.5% for THA and 5.5% for TKA
- Most common cause of ED visit was postoperative swelling and pain
Conclusion and Future Directions

- Patient travel distance for TJA significantly impacts their postoperative healthcare utilization
  - This must be considered as regionalization of healthcare continues and in development of future healthcare policy
- High utilization of the ED for non-emergent concerns occurred when geographic access was easier
  - represents a target for cost-saving interventions
- Trend in data for correlation between increased patient communications and decreased ED visits
- Higher percentage of Medicaid/No Insurance patients driving >40 km for their total joint
References


