Gender and BMI Differences in Physical Activity after Total Knee Replacement

Patricia D. Franklin  
University of Massachusetts Medical School, patricia.franklin@umassmed.edu

Wenjun Li  
University of Massachusetts Medical School, wenjun.li@umassmed.edu

Wenyun Yang  
University of Massachusetts Medical School, Wenyun.Yang@umassmed.edu

See next page for additional authors

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Presenter Information
Patricia D. Franklin, Wenjun Li, Wenyun Yang, and David C. Ayers

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Total knee replacement (TKR) is an effective procedure to eliminate knee pain due to osteoarthritis. However, variation in functional outcome persists. Patient attributes, including age, gender, body mass index (BMI), and emotional health, influence degree of functional gain. The level of daily physical activity (PA) is important to weight management, knee OA care, and overall health. As the arthritis population becomes more overweight and inactive, it is important to understand the physical activity benefits accrued following TKR.

Health promotion programs, conducted in community dwelling adults, have called attention to the use of accelerometers (step activity monitor devices) as a measure of general activity. The device, worn around the leg, gives an accurate number of daily steps (mean steps/day), as well as walking rate (mean steps/minute). Unfortunately, there are limited data on the use of accelerometers in patients with knee OA.

It is unknown if self-reported physical function correlates with objectively measured physical activity (e.g., steps/day) or if patient attributes influence the level of physical activity in patients with osteoarthritis before and after TKR.

We hypothesized that patient physical activity at 6 months post-TKR varies with the two patient attributes, gender and BMI.

Patients had a mean age of 67 years, mean BMI of 30, and 71% were women.

- Overall, physical activity significantly improved from a mean of 6600 steps/day before TKR to 7690 steps/day at 6 months.
- Women walked fewer steps/day than men before and after TKR (6,218 before, 7,150 after; a 15% increase).
- Non-obese patients improved steps/day, obese did not.
- While male reduced their inactive time after TKR, women did not.
- After adjusting for BMI and age, gender differences persisted in objectively measured physical activity.
- The number of steps/day was moderately but significant correlated with PCS and WOMAC function (r=0.28 – 0.4).

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**MATERIALS & METHODS**

A consecutive series of 89 TKR patients wore a small ankle accelerometer (StepWatch Activity Monitor/SAM; CYMA, Inc.) above the ankle of the operative leg before TKR and again at 6 months after surgery.

Demographic attributes, self-reported function measured with SF36 and WOMAC, and physical activity as measured by accelerometer as quantity of steps/day and % of day inactive were recorded. Descriptive statistics and mean differences were calculated.

**RESULTS**

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**CONCLUSIONS**

- Physical activity as measured by accelerometer improved after TKR, varied with patient attributes, including gender and BMI, and was moderately correlated with self-reported function.
- A 15% increase in pre to post TKR patient steps/day is highly significant and contributes to the health status improvement of patients with advanced arthritis.
- Women’s lower physical activity levels before surgery persists after TKR, despite significant pain relief.
- Physical activity differences should be considered when designing TKR patient pathways and rehabilitation programs.

**Table 1. TKR Patient Participant Attributes**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>89</td>
<td>67</td>
<td>9.4</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>26</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>89</td>
<td>29.98</td>
<td>5.6</td>
</tr>
<tr>
<td>SF12/PCS Pre-TKR</td>
<td>89</td>
<td>33.2</td>
<td>7.3</td>
</tr>
<tr>
<td>SF12/PCS Post-TKR</td>
<td>82</td>
<td>44.5</td>
<td>8.9</td>
</tr>
</tbody>
</table>

**Table 2. Pre- and Post-TKR Average Steps/Day by Gender**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Obs</th>
<th>Pre avg total steps</th>
<th>Obs</th>
<th>Post avg total steps</th>
<th>Obs</th>
<th>Change avg total steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>26</td>
<td>7496</td>
<td>23</td>
<td>9051</td>
<td>23</td>
<td>1239</td>
</tr>
<tr>
<td>Female</td>
<td>61</td>
<td>6218</td>
<td>58</td>
<td>7150</td>
<td>57</td>
<td>901</td>
</tr>
</tbody>
</table>

**Table 3. Multivariate Model, Adjusted for Age and BMI, Predicting Post-TKR Steps/Day**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Predicted Post-Steps/Day</th>
<th>95% CI (lower limit)</th>
<th>95% CI (upper limit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>7131</td>
<td>6156</td>
<td>8107</td>
</tr>
<tr>
<td>Male</td>
<td>9259</td>
<td>7678</td>
<td>10841</td>
</tr>
</tbody>
</table>

**Figure 1. Distribution of Average Steps/Day by Gender**

**Figure 2. Distribution of Average Steps/Day by BMI**

**Figure 3. Distribution of % Time Inactive by Gender**

**Figure 4. Distribution of Average Steps/Day by BMI**

**Figure 5. Correlation between Average Steps/Day and PCS**

**Figure 6. Correlation between Average Steps/Day and WOMAC**

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**References:**