Total Ankle Replacement Survival Rates Based on Kaplan-Meier Survival Analysis of National Joint Registry Data

**PURPOSE**

National joint registry data collectively provides unique information about primary total ankle replacement (TAR) survival. The Kaplan-Meier estimator forecasts the probability of an event to occur over time with graphic representation of the resultant survival probability curve. These survival curves can be digitized and recreated to determine trends between registries. We sought to recreate survival curves among published national joint registry data sets using the Kaplan-Meier estimator to determine the survival rates between registries at 1-year intervals.

**METHODOLOGY**

Survival curves based on the Kaplan-Meier estimator were digitized and recreated to determine worldwide trends.

**RESULTS**

Overall, 5,152 primary and 591 TAR revisions were included over a 2- to 13-year period (Table 1) with prosthesis survival for all national joint registries of 0.94 (CI 95% 0.90 to 0.97) at 2-years, 0.87 (CI 95% 0.82 to 0.91) at 5-years and 0.81 (CI 95% 0.74 to 0.88) at 10-years (Figure 1). For national joint registries that included the Ankle Evolutive System (AES) (Transysteme-JMT Implants, Nimes, France), Buechel-Pappas (BP) (Endotec, South Orange, NJ) or Scandinavian Total Ankle Replacement (STAR, Waldemar Link, Hamburg, Germany/Stryker Orthopaedics, Mahwah, NJ) as ≥ 35% of total prostheses implanted the survival rate was 0.78 to 0.89 at 5-years compared with registries with < 35% of these implants being 0.90 to 0.93 at 5-years.

**ANALYSIS and DISCUSSION**

Both the AES and BP have been withdrawn from the market and, based on available national registry data the STAR has fallen into worldwide disuse. This finding supports the critical evaluation of primary TAR implantation and revision trends through national joint registries with expansion to include modes of prosthesis failure. Future studies and national joint registry data sets should continue to strive for completion of data presentation to include revision definitions, modes of failure, time of failure and patients lost to follow-up or death for complete accuracy of the Kaplan-Meier estimator.

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**Table 1. National joint registries included with total ankle replacement prostheses (STAR, Waldemar Link, Hamburg, Germany/Stryker Orthopaedics, Mahwah, NJ) and reported TAR replacement success rates between registries at 1-year intervals.**

<table>
<thead>
<tr>
<th>Registry</th>
<th>Year</th>
<th>Study Start Year</th>
<th>Final Year</th>
<th>Replacements</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand Joint Registry</td>
<td>2012</td>
<td>2012</td>
<td>2013</td>
<td>644</td>
</tr>
<tr>
<td>Norwegian Arthroplasty Register</td>
<td>2003</td>
<td>2003</td>
<td>2005</td>
<td>1,882</td>
</tr>
<tr>
<td>New Zealand Joint Registry</td>
<td>2001</td>
<td>2001</td>
<td>2003</td>
<td>114</td>
</tr>
<tr>
<td>New Zealand Joint Registry</td>
<td>2013</td>
<td>2013</td>
<td>2013</td>
<td>871</td>
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<tr>
<td>National Arthroplasty Registry</td>
<td>2001</td>
<td>2001</td>
<td>2002</td>
<td>1,257</td>
</tr>
<tr>
<td>National Arthroplasty Registry</td>
<td>2012</td>
<td>2012</td>
<td>2012</td>
<td>891</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>5,152</td>
</tr>
</tbody>
</table>

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**Figure 1. Survival of total ankle replacements based on registry data of recreated Kaplan-Meier estimators separating registries that included ≥ 35% of total implants as AES, BP and/or STAR prostheses (red/pink lines) and registries that included < 35% of total implants as AES, BP and/or STAR prostheses (blue/teal lines).**

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**References**

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