The effectiveness and value of total joint replacement in the treatment of osteoarthritis
27 Million Americans Suffer from Osteoarthritis
What is osteoarthritis?

- Osteoarthritis (OA) is a progressive, destructive disease of the major joints for which there is no cure.¹
- 27 million Americans suffer from OA.²
- Osteoarthritis is one of the leading causes of disability and functional limitation in the United States.³,⁴

Leading causes of disability among U.S. non-institutionalized adults

<table>
<thead>
<tr>
<th>Disability</th>
<th>% of Disabled Adults Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis or Rheumatism</td>
<td>19%</td>
</tr>
<tr>
<td>Back or Spine</td>
<td>16.8%</td>
</tr>
<tr>
<td>Heart Trouble</td>
<td>6.6%</td>
</tr>
<tr>
<td>Lung/Respiratory</td>
<td>4.9%</td>
</tr>
<tr>
<td>Mental/Emotional</td>
<td>4.9%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>4.5%</td>
</tr>
<tr>
<td>Deafness/Hearing</td>
<td>4.2%</td>
</tr>
</tbody>
</table>

¹ MMWR, CDC, May 1, 2009
² MMWR, CDC, May 1, 2009
³ MMWR, CDC, May 1, 2009
⁴ MMWR, CDC, May 1, 2009
What is total joint replacement?

- Total joint replacement is when arthritic or damaged bone is removed and replaced with an artificial joint to restore mobility and relieve pain.\(^5\)
- The most commonly performed total joint replacement surgeries are for the hip and knee.\(^6\)
- Total joint replacement “remains the definitive treatment for advanced, symptomatic joint destruction regardless of the underlying cause.”\(^7\)

Note: Joint replacements are each cleared or approved for use in specific disease states and/or injuries and may not be appropriate for certain underlying causes of pain and mobility.
Osteoarthritis drives up employer and health costs

• Bone and joint disorders, including OA, account for 440 million lost work days and $110 billion in lost wages each year – more than any other medical condition.\(^8\)
• Workers with OA are one-third less productive than non-afflicted workers.\(^9\)
Osteoarthritis is associated with other disabilities and chronic conditions

- Patients with walking impairments from OA are reported to run a risk of early death that is 1.48 times higher than the general population. Risk factors for mortality include “a history of diabetes, cardiovascular disease, or cancer and increased walking disability.”
- 40% of men and 57% of women with knee OA are physically inactive.
- The CDC reports that 47% of adults with arthritis in the United States have one or more comorbidities.
- Common comorbidities and their rates in adults with arthritis include:
  - Heart disease, 24%
  - Chronic respiratory conditions, 19%
  - Diabetes, 16%
  - Stroke, 7%

OA sufferers with a walking disability show a higher risk of death when compared to the general population

OA sufferers with and without a walking disability: risk of death among patients from 1994-95 through February, 2009

Hazard ratio (reference = 1)

General Population (reference) | OA Sufferers with a walking disability
---|---
1 | 1.48

Knee osteoarthritis sufferers show high levels of inactivity

Percent of arthritis sufferers with each co-morbidity

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+ comorbidity</td>
<td>47%</td>
</tr>
<tr>
<td>Heart disease</td>
<td>24%</td>
</tr>
<tr>
<td>Chronic respiratory conditions</td>
<td>19%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>16%</td>
</tr>
<tr>
<td>Stroke</td>
<td>7%</td>
</tr>
</tbody>
</table>

Inactive OA Sufferers

40% 57%

Co-morbid conditions among arthritis sufferers

Percent of arthritis sufferers with each co-morbidity

Dunlop, et al., Arthritis & Rheumatism, November, 2011

Centers for Disease Control
Total joint replacement helps patients return to work and their lives

- Total joint replacement has proven successful in returning patients to their jobs.
- Studies have shown that 90% of working patients return to work after total hip replacement (THA) and 98% of working patients return to work following total knee replacement (TKA).\textsuperscript{13, 14}

**Most working patients return to work after total joint replacement**

Return-to-work among working-age patients

- **90%**
  - Return to Work - THA

- **98%**
  - Return to Work - TKA
How can total joint replacement help patients?

- Patients have shown 56% improvement in function scores after total knee replacement, and 79% improvement after total hip replacement.15

“Improved physical function is associated with higher likelihood of employment, higher household income and fewer missed work days for those who are employed, and reduced likelihood of receiving supplemental security income for disability.”16

--Dall, et al., JBJS (Am), August 21, 2013

Patients’ physical function shown to improve
56% after total knee replacement, 79% after total hip replacement

% Improvement in Physical Function Score

<table>
<thead>
<tr>
<th>IMPROVEMENT AFTER SURGERY</th>
<th>% Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Improvement after THA</td>
<td>79%</td>
</tr>
<tr>
<td>Functional Improvement after TKA</td>
<td>56%</td>
</tr>
</tbody>
</table>

Total joint replacement contributes to improved general health

- Medicare patients receiving total hip and knee replacement show nearly half the risk of death after seven years compared to OA patients not receiving total joint replacement.\textsuperscript{17,18}

Dramatically reduced risk of death following total knee and total hip replacement

Hazard ratio of mortality at 7 years

<table>
<thead>
<tr>
<th>TOTAL KNEE ARTHROPLASTY</th>
<th>TOTAL HIP ARTHROPLASTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAZARD RATIO (reference = 1)</td>
<td>HAZARD RATIO (reference = 1)</td>
</tr>
<tr>
<td>TKA</td>
<td>No TKA (Reference cohort)</td>
</tr>
<tr>
<td>\textbf{.53}</td>
<td>1</td>
</tr>
<tr>
<td>THA</td>
<td>No THA (Reference cohort)</td>
</tr>
<tr>
<td>\textbf{.52}</td>
<td>1</td>
</tr>
</tbody>
</table>


“Mortality, Cost, and Downstream Disease of Total Hip Arthroplasty Patients in the Medicare Population,” Journal of Arthroplasty, May 2013
Total joint replacements show excellent long-term durability

- Joint replacement implants have shown excellent long-term durability, with numerous registries reporting that the original joint replacements are still present in over 90% of patients at 7-11 years, depending on the registry.\textsuperscript{19, 20}

<table>
<thead>
<tr>
<th>Registry data</th>
<th>Procedure</th>
<th>Survivorship/revision</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>England and Wales, 2012</td>
<td>Primary hip replacement</td>
<td>96.1% not revised</td>
<td>8 years</td>
</tr>
<tr>
<td>England and Wales, 2012</td>
<td>Primary knee replacement</td>
<td>96.3% not revised</td>
<td>8 years</td>
</tr>
<tr>
<td>Australia, 2012</td>
<td>Primary hip replacement</td>
<td>90-97.8% not revised</td>
<td>10 years</td>
</tr>
<tr>
<td>Australia, 2012</td>
<td>Primary knee replacement</td>
<td>93.9% not revised</td>
<td>11 years</td>
</tr>
<tr>
<td>Swedish Hip, 2011</td>
<td>Primary hip replacement</td>
<td>95% survivorship</td>
<td>10 years</td>
</tr>
<tr>
<td>Swedish Knee, 2010</td>
<td>Primary cemented knee replacement</td>
<td>~4% risk of revision</td>
<td>10 years</td>
</tr>
<tr>
<td>Kaiser Permanente Registry, U.S.</td>
<td>Primary knee replacement</td>
<td>98.3% not revised</td>
<td>7 years</td>
</tr>
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<td>Kaiser Permanente Registry, U.S., 2010</td>
<td>Primary hip replacement</td>
<td>98.1% not revised</td>
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Total knee replacement surgery is cost-saving

- Total knee replacement surgery generates a net societal savings of approximately $19,000 per patient lifetime, due to reduced disability costs and improved productivity.²¹
- In 2009 alone, savings in the U.S. were an estimated $12 billion.

### Direct cost and societal savings per patient lifetime, total knee replacement

<table>
<thead>
<tr>
<th></th>
<th>Direct Cost</th>
<th>Total Societal Savings</th>
<th>Net savings per patient lifetime</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$(20,635)</td>
<td>$39,565</td>
<td>$18,930</td>
</tr>
</tbody>
</table>

Ruiz, et al., JBJS Am, August 21, 2013
Total joint replacement is under-utilized

- In 2011, it was reported that only 13% of patients with an appropriate indication for total knee replacement actually undergo the procedure.\textsuperscript{22}
- There is “widespread consensus” that fewer than 25% of people for whom total hip replacement is clinically appropriate actually undergo the procedure.\textsuperscript{23}
- This is consistent with earlier reports that only about 9%-34% of patients with hip and knee OA of sufficient severity to warrant joint replacement were willing to have the procedure.\textsuperscript{24-27}
- A New England Journal of Medicine study reported that, although women are more likely to report hip or knee joint problems, they are less often put on a joint replacement waiting list and less likely than men to undergo joint replacement.\textsuperscript{28}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{chart.png}
\caption{Only 13\% of candidates receive total knee replacements}
\end{figure}

Wide racial disparities exist in the delivery of total joint replacement surgery

- African Americans are 39% less likely than Caucasians to receive total knee replacements.29

Despite similar disease prevalence, African Americans are 39% less likely to receive total knee replacement surgery

TKR rate per 1000 population, 2000 and 2006

<table>
<thead>
<tr>
<th></th>
<th>2000 TKR Rate</th>
<th>2006 TKR Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Americans</td>
<td>3.6</td>
<td>5.7</td>
</tr>
<tr>
<td>Caucasian Americans</td>
<td>5.6</td>
<td>9.2</td>
</tr>
</tbody>
</table>


Timely treatment = better outcomes

- Patients who do not have timely treatment have been shown to deteriorate in function.30-32
- This is consistent with earlier evidence that “patients operated upon earlier in the course of functional decline had better outcomes.”33
- Patients eligible for joint replacement who undergo the procedure have better clinical outcomes at 12 months than comparable patients who do not.34
- Not having a joint replacement has a negative and significant impact on pain and may harm patients who self-ration, or are otherwise restricted in access to timely care.35-39
- Delaying surgery in patients with severe knee OA is not cost-effective.40
- In fact, delaying total knee replacement in patients who have reached end-stage knee OA that severely limits their functions “is never efficient because it leads to a lesser value per dollar spent.”41
Primary care physicians: do they make timely referrals?

- The vast majority of primary care physicians have been shown to inadequately understand the benefits of total joint replacement, and do not appropriately discuss total joint replacement as an option with many indicated patients.42, 43
- Only 17% of primary care physicians correctly identified total joint replacement success rates.44
- Only 26% of primary care physicians discussed total joint replacement with elderly candidates.45
Joint replacement surgeons expected to decline in number by 2016

- Impending surgeon shortages may result in further reductions in access to needed care.\textsuperscript{46, 47}
- From 2005-2020, the supply of all orthopaedic surgeons is expected to increase 2%, while the demand for orthopaedic surgeons’ services is expected to increase 23%.\textsuperscript{48}
- However, the number of orthopaedic surgeons who perform total joint replacement surgery is expected to decline 34% by 2016 as compared to 2008.\textsuperscript{49}

\begin{center}
\textbf{Growth in physician supply vs. patient demand, 2005-2020} \hspace{1cm} HRSA, 2008
\end{center}

\begin{center}
\begin{tabular}{lll}
\textbf{Primary Care} & PROJECTED % CHANGE 2005-2020 * \\
18\% & PHYSICIAN SUPPLY * & PATIENT DEMAND * \\
20\% & \\
\hline
\textbf{Surgical Specialists} & & \\
3\% & PHYSICIAN SUPPLY * & PATIENT DEMAND * \\
21\% & \\
\hline
\textbf{Orthopedic Surgeons} & & \\
2\% & PHYSICIAN SUPPLY * & PATIENT DEMAND * \\
23\% & \\
\end{tabular}
\end{center}
Risks associated with total joint replacement

Surgeons should explain all risks to their patients. For more information, please consult the information at the following websites:

http://orthoinfo.aaos.org/topic.cfm?topic=A00375
http://www.niams.nih.gov/Health_Info/Joint_Replacement/

Potential adverse outcomes associated with joint replacement [any of which may necessitate re-operation to revise or replace the implant(s)] include but are not limited to breakage of the device itself, loosening, intra-operative or post-operative fracture of the bone or instrument(s), infection, wear, and disassociation or migration of the implant. Risks may be affected by patient factors such as age, weight, activity level, rehabilitation compliance and the presence of co-morbidities, as well as by the surgical procedure. Complications associated with the surgical procedure can include incorrect ligament balancing, poor cement technique and mal-rotation of implant parts. Any of these can require revision surgery. Early, severe adverse events are reported in under 6% of patients and most often become manifest within four days following the implant procedure. These cannot be reliably predicted in nearly 60% of patients by preoperative risk evaluation.
References

8. Ibid.
41. Ibid.
51. Ibid.
54. Ibid.