American Joint Replacement Registry: Introduction and Highlights

www.aaos.org/registries/ajrr
Our Speakers Today

- **James A. Browne, MD, FAAOS**
  - University of Virginia
  - AJRR Publications Subcommittee Chair; AJRR Annual Report Editor

- **James I. Huddleston, III, MD, FAAOS**
  - Stanford University
  - AJRR Steering Committee Vice Chair
Disclosures: James A. Browne, MD, FAAOS

No financial conflicts of interest relevant to this presentation

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AAOS Family of Registries

AAOS Board of Directors

Registry Oversight Committee

Collaborative Registries
- Collaborative Registry with AANS & AAOS American Spine Registry (ASR)
  - Degenerative Spine
    - Lumbar
    - Degenerative Spine
      - Spine Tumor*
- American Joint Replacement Registry (AJRR)
  - Hip Arthroplasty
  - Knee Arthroplasty
  - Hip Fracture*
  - Ankle Arthroplasty*
  - Ankle Tumor*
- Musculoskeletal Tumor Registry (MSTR)
  - Orthopaedic Sarcoma

AAOS Registries
- Shoulder & Elbow Registry (SER)
  - Shoulder Arthroplasty
  - Rotator Cuff Repair
  - Elbow Arthroplasty
  - Proximal Humerus*
- Fracture & Trauma Registry (FTR)
  - Hip Fracture
  - Ankle Fracture
  - Distal Radius Fracture
  - Rotator Cuff Repair
  - Elbow Arthroplasty
  - Proximal Humerus

*Modules In development
### Why Do Sites Participate?

| Facilitate site, practice-specific, **payer-incentivized performance improvement** programs such as Blue Distinction & Centers of Excellence |
| Qualify for **national distinction programs** such as the Joint Commission Advanced Certification & AAAHC |
| Use for reporting to **quality improvement programs** such as MIPS, BPCI-A, ABOS MOC & ABNS CC |
| Early access to **surveillance alerts** for poorly performing implants |
| Improve the **value of care** delivered to Patients |

- Compare your practice to **national performance benchmarks**
- Access to on-demand practice specific **quality reports and dashboards**
- Facilitate tracking and monitoring of **longitudinal patient outcomes**
Participation in the American Academy of Orthopaedic Surgeons (AAOS) Registry Program offers a wide variety of data reuse opportunities including requirements for quality initiatives and state collaboratives.
AAOS has partnered with technology vendors to facilitate the data submission process

- Re-use data that already exists in medical record, practice management and PRO systems
- Direct data submission and management can be handled by a technology provider with sites able to fix rejected files
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  NYU Langone Health
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  University of Arkansas
AJRR Data Element Overview

Two Modules: Hip Arthroplasty & Knee Arthroplasty

Procedure

Patient
• Name, Date of Birth, SSN
• Diagnosis (ICD-9/10, CPT)
• Gender
• Race/Ethnicity
• Height + Weight/BMI
• Payer Status

Site of Service
• Name and Address (TIN, NPI)

Surgeon
• Name (NPI)
• Trainee

Procedure
• Type (ICD-9/10, CPT)
• Date of Surgery, Length of Stay
• Surgical Approach
• Surgical Technique
• Laterality
• Implants (Manufacturer, Lot #)
• Anesthesia

Comorbidities and Complications
• Comorbidities (ICD-9/10, CPT)
• CJR Risk Variables
• Height + Weight/Body Mass Index
• Length of Stay
• American Society of Anesthesiologists Score
• Charlson Index
• Operative and Post-operative Complications

Patient-reported Outcomes

Recommended:
• PROMIS-10 Global
• VR-12
• HOOS Jr. /KOOS, Jr.

Also Accepted:
• SF-36 v1
• HOOS/KOOS
• Oxford Hip and Knee Scores
• Knee Society Knee Scoring System
• Harris Hip Score
• WOMAC (Modified via HOOS and KOOS)
• SF-12, EQ-5D, WOMAC (only accepting final scores)

This page is a summary of the AJRR data elements and is not all inclusive.
Integration of Medicare Data

- Access to Medicare claims linked by full identifiers for longitudinal tracking
- Follow outcomes of AJRR patients occurring at non-AJRR participating institutions
- 2012-2022 Medicare data for all patients represented in Registry
  - Inpatient claims (148 data elements)
  - Outpatient claims (122 data elements)
2022 AJRR Annual Report

- Summary Statistics
  - Procedure, institution, and patient distributions
- Data Completeness
- Hip/Knee Arthroplasty
- Revision Procedures
- Implant Utilization and Survivorship
- Patient Reported Outcome Measures (PROMs)
- Recent publications and presentations

Data submitted to AJRR across all 50 states and the District of Columbia
- Supplementary Medicare and American Hospital Association datasets utilized where appropriate for descriptive and longitudinal analysis
AJRR Data Completeness

Table 1.1 Completeness of AJRR Data Elements, 2012-2021

<table>
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<th>Specifications Version</th>
<th>Element</th>
<th>% Reported</th>
<th>% NR</th>
<th>% Invalid</th>
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<td>Principal Diagnosis Code</td>
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<td>5.9</td>
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<td>First Implant Catalog # Listed</td>
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<td>Incision Start Time (Procedure Start Time)</td>
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<td>Sex</td>
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<td>5.5</td>
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<td>Zip Code</td>
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<th>Specifications Version</th>
<th>Element</th>
<th>% Reported</th>
<th>% NR</th>
<th>% Invalid</th>
</tr>
</thead>
<tbody>
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<td>AJRR Data 2012 - 202201 Using 2017 or Newer Specifications (N=1,405,742)</td>
<td>Comorbidity - at least one code reported</td>
<td>74.0</td>
<td>24.9</td>
<td>1.1</td>
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<td></td>
<td>Body Mass Index (BMI)</td>
<td>89.6</td>
<td>0.0</td>
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<td>Discharge Disposition Code</td>
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<td>6.2</td>
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<td>Admission Date</td>
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<td>2.2</td>
<td>0.0</td>
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<tr>
<td></td>
<td>Discharge Date</td>
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<td>2.2</td>
<td>0.0</td>
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<tr>
<td></td>
<td>Length Of Stay</td>
<td>97.8</td>
<td>0.0</td>
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<td></td>
<td>Surgical Approach (Hip/Knee)</td>
<td>14.0</td>
<td>80.8</td>
<td>5.2</td>
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<td>Computer Navigation</td>
<td>32.9</td>
<td>66.4</td>
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<td>Robotic Assisted</td>
<td>39.1</td>
<td>60.8</td>
<td>0.1</td>
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<td></td>
<td>Anesthesia Type</td>
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<td>6.4</td>
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<td></td>
<td>Periarticular Injection</td>
<td>19.6</td>
<td>80.1</td>
<td>0.3</td>
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<td>ASA Classification</td>
<td>26.7</td>
<td>72.9</td>
<td>0.4</td>
</tr>
</tbody>
</table>
**Procedure Submission & COVID-19 Impact Summary**

- 1,251 submitting institutions across 50 states
- ASC submitted procedure volume grew 57% since 2021
- Despite the lasting impact of the COVID-19 pandemic, the 2022 Annual Report had an overall cumulative procedural volume growth of 14% compared to the 2021 report.
Procedural Trends (Knee)

- **LOS decreased** for both hip and knee procedures; now 1.3 days for TKA
- **Robotic use increased 6-fold** over the last 5 years to reach 12% by 2022
- **Cementless fixation increasing** in TKA to reach 19% in 2021
Procedural Trends (Hip)

- Increased THA for femoral neck fracture trend continues
- Robotic use in THA more than doubled and computer navigation use increased over 80%
- General anesthesia use decreasing over time for THA cases
Implant Utilization

Figure 2.29 Elective Primary Total Hip Arthroplasty Femoral Stem/Acetabular Component Combinations by Year, 2012-2021 (N= 664,995)
Revision Procedures

Figure 3.25 Distribution of Diagnosis Associated with All Knee Revisions, 2012-2021 (N=107,559)

- Infection & Inflammatory Reaction: 28.4%
- Mechanical Loosening: 24.0%
- Other Mechanical Complications: 19.4%
- Instability Related Codes: 13.7%
- Other: 4.7%
- Pain: 4.5%
- Wear or Osteolysis: 2.3%
- Fracture or Fracture Related Sequelae: 1.6%
- Stiffness: 0.8%
- Hematoma or Wound Complication: 0.6%
Figure 3.13 Cumulative Percent Revision for Cemented Versus Cementless Fixation Primary Total Knee Arthroplasty in Male Patients less than 65 Years of Age with Primary Osteoarthritis in AJRR Only, 2012-2021
# Device-Specific Cumulative Revision

## Table 2.4 Unadjusted Cumulative Percent Revision of Cementless Hip Arthroplasty Construct Combinations for Primary Total Hip Arthroplasty in Patients ≥65 Years of Age with Primary Osteoarthritis, 2012-2020

<table>
<thead>
<tr>
<th>Acetabular Shell</th>
<th>Femoral Stem</th>
<th>N Total</th>
<th>N Revised</th>
<th>1 Yr</th>
<th>3 Yrs</th>
<th>5 Yrs</th>
<th>7 Yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trident</td>
<td>Accolade II</td>
<td>37,367</td>
<td>787</td>
<td>1.47 (1.35, 1.59)</td>
<td>2.05 (1.9, 2.2)</td>
<td>2.32 (2.16, 2.5)</td>
<td>2.43 (2.25, 2.62)</td>
</tr>
<tr>
<td>Pinnacle</td>
<td>Corail</td>
<td>35,617</td>
<td>363</td>
<td>0.71 (0.63, 0.8)</td>
<td>1.01 (0.91, 1.12)</td>
<td>1.16 (1.04, 1.29)</td>
<td>1.21 (1.08, 1.35)</td>
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<tr>
<td>Pinnacle</td>
<td>Summit</td>
<td>25,350</td>
<td>365</td>
<td>1.17 (1.04, 1.31)</td>
<td>1.43 (1.28, 1.59)</td>
<td>1.58 (1.42, 1.76)</td>
<td>1.71 (1.5, 1.94)</td>
</tr>
<tr>
<td>Pinnacle</td>
<td>Actis DuoFix</td>
<td>17,265</td>
<td>76</td>
<td>0.45 (0.35, 0.56)</td>
<td>0.52 (0.41, 0.65)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Pinnacle</td>
<td>Tri-Lock</td>
<td>16,653</td>
<td>224</td>
<td>0.95 (0.81, 1.1)</td>
<td>1.30 (1.13, 1.49)</td>
<td>1.54 (1.34, 1.76)</td>
<td>1.72 (1.43, 2.05)</td>
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<tr>
<td>Trident II</td>
<td>Accolade II</td>
<td>15,182</td>
<td>107</td>
<td>0.75 (0.62, 0.91)</td>
<td>0.81 (0.66, 0.99)</td>
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<tr>
<td>R3</td>
<td>Anthology</td>
<td>12,655</td>
<td>203</td>
<td>1.34 (1.15, 1.56)</td>
<td>1.65 (1.43, 1.89)</td>
<td>1.77 (1.53, 2.03)</td>
<td>1.87 (1.6, 2.19)</td>
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<tr>
<td>Continuum</td>
<td>M/L Taper</td>
<td>11,618</td>
<td>280</td>
<td>1.77 (1.54, 2.03)</td>
<td>2.30 (2.03, 2.6)</td>
<td>2.70 (2.39, 3.04)</td>
<td>2.79 (2.46, 3.14)</td>
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<tr>
<td>G7</td>
<td>Taperloc 133</td>
<td>11,080</td>
<td>140</td>
<td>1.12 (0.93, 1.33)</td>
<td>1.39 (1.17, 1.65)</td>
<td>1.50 (1.23, 1.81)</td>
<td>1.50 (1.23, 1.81)</td>
</tr>
<tr>
<td>G7</td>
<td>Taperloc 133 Microplasty</td>
<td>6,798</td>
<td>98</td>
<td>1.30 (1.04, 1.59)</td>
<td>1.51 (1.24, 1.84)</td>
<td>1.56 (1.27, 1.9)</td>
<td>1.56 (1.27, 1.9)</td>
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<tr>
<td>R3</td>
<td>Synergy</td>
<td>6,437</td>
<td>145</td>
<td>1.92 (1.61, 2.29)</td>
<td>2.33 (1.97, 2.73)</td>
<td>2.50 (2.11, 2.95)</td>
<td>2.50 (2.11, 2.95)</td>
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<tr>
<td>R3</td>
<td>PolarStem</td>
<td>5,565</td>
<td>51</td>
<td>0.84 (0.61, 1.12)</td>
<td>1.10 (0.82, 1.45)</td>
<td>1.10 (0.82, 1.45)</td>
<td>1.10 (0.82, 1.45)</td>
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<td>Trilvogy</td>
<td>M/L Taper</td>
<td>4,365</td>
<td>102</td>
<td>1.42 (1.1, 1.8)</td>
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<td>2.49 (2.02, 3.04)</td>
<td>3.11 (2.43, 3.92)</td>
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<td>Pinnacle</td>
<td>S-ROM</td>
<td>3,746</td>
<td>79</td>
<td>1.24 (0.92, 1.64)</td>
<td>2.07 (1.62, 2.6)</td>
<td>2.39 (1.87, 3.01)</td>
<td>3.48 (2.45, 4.78)</td>
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<tr>
<td>Trident</td>
<td>Secur-Fit Max</td>
<td>3,304</td>
<td>79</td>
<td>1.40 (1.04, 1.85)</td>
<td>2.19 (1.73, 2.75)</td>
<td>2.43 (1.92, 3.02)</td>
<td>2.81 (2.16, 3.59)</td>
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<tr>
<td>Trident</td>
<td>Accolade TMZF</td>
<td>2,954</td>
<td>66</td>
<td>1.22 (0.87, 1.67)</td>
<td>1.56 (1.16, 2.06)</td>
<td>2.07 (1.59, 2.65)</td>
<td>2.43 (1.88, 3.09)</td>
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<tr>
<td>G7</td>
<td>Echo Bi-Metric</td>
<td>2,809</td>
<td>29</td>
<td>0.79 (0.51, 1.18)</td>
<td>1.10 (0.75, 1.58)</td>
<td>1.20 (0.81, 1.72)</td>
<td>1.20 (0.81, 1.72)</td>
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</table>
Diagnosis-Specific Survivorship

Figure 3.15 Cumulative Percent Revision for Infection of Cemented Versus Cementless Fixation for a Primary Total Knee Arthroplasty in Medicare Patients 65 Years of Age and Older with Primary Osteoarthritis, 2012-2021
Patient Reported Outcome Measures

• Over 400 sites submitted PROMs (38% increase from the prior Annual Report)
• Over 85% achieve MCID on HOOS-Jr. and KOOS-Jr.
• Patients older than 75 years of age showed less improvement compared to younger patients

Table 3.10 Age-stratified Change Between Preoperative and 1-Year Postoperative PROM Scores after Primary Knee Arthroplasty by PROM for Patients 55 Years and Over, 2012-2021

<table>
<thead>
<tr>
<th>Patient-Reported Outcome Measure (PROM)</th>
<th>PROM Component</th>
<th>Age Group (Years)</th>
<th>Patients with Preoperative Score</th>
<th>Patients with Linked Postoperative Score</th>
<th>Response Rate, Percentage of Patients Who Completed a Preoperative and 1-Year Score</th>
<th>Patients with Meaningful Improvement*</th>
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<tbody>
<tr>
<td>KOOS, JR. (Knee Disability and Osteoarthritis Outcome Score)</td>
<td>Score</td>
<td>55-64</td>
<td>19,438</td>
<td>4,270</td>
<td>22.00%</td>
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<td>65-74</td>
<td>31,476</td>
<td>8,487</td>
<td>27.00%</td>
<td>85.40%</td>
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<td>75-84</td>
<td>15,512</td>
<td>3,941</td>
<td>25.40%</td>
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<td></td>
<td></td>
<td>&gt;85</td>
<td>1,906</td>
<td>439</td>
<td>23.00%</td>
<td>85.40%</td>
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<tr>
<td>PROMIS-10 (Patient-Reported Outcomes Measurement Information System 10)</td>
<td>Mental T</td>
<td>55-64</td>
<td>13,978</td>
<td>3,092</td>
<td>22.10%</td>
<td>36.50%</td>
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<td>65-74</td>
<td>23,447</td>
<td>6,543</td>
<td>27.90%</td>
<td>32.40%</td>
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<td>75-84</td>
<td>11,582</td>
<td>3,137</td>
<td>27.10%</td>
<td>28.90%</td>
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<td>&gt;85</td>
<td>1,476</td>
<td>338</td>
<td>22.90%</td>
<td>26.60%</td>
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<td>Physical T</td>
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<td>67.20%</td>
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<td>6,544</td>
<td>27.90%</td>
<td>65.60%</td>
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<td>75-84</td>
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<td>3,137</td>
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<td>61.00%</td>
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<td></td>
<td>&gt;85</td>
<td>1,476</td>
<td>338</td>
<td>22.90%</td>
<td>57.70%</td>
</tr>
</tbody>
</table>

*Meaningful Improvement was calculated by minimal clinical important difference (MCID). MCID was determined to be a positive change score of half the pooled standard deviation.
Recent Publications


And MORE at www.aaos.org/registries/publications
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