AAOS Shoulder & Elbow Registry
Highlights from the 2022 Annual Report

Oke A. Anakwenze, MD, MBA, FAAOS
Grant E. Garrigues, MD, FAAOS

www.aaos.org/registries/ser
Speaker Introductions

- **Oke A. Anakwenze MD, MBA**
  - Chief of Shoulder Surgery & Associate Profession of Orthopedic Surgery, Duke University Hospital
  - AAOS YP Representative to SER Steering Committee

- **Grant E. Garrigues, MD, FAAOS**
  - Associate Professor & Director of Upper Extremity Research, Rush University/Midwest Orthopaedics at Rush
  - American Shoulder and Elbow Surgeons (ASES) Representative to SER Steering Committee
I (and/or my co-authors) have something to disclose.

All relevant financial relationships have been mitigated.

Detailed disclosure information is available via: AAOS Disclosure Program on the AAOS website at http://www.aaos.org/disclosure
SER Steering Committee

- Gerald R. Williams Jr., MD, Chair
  The Rothman Institute
- Oke A. Anakwenze, MD, MBA
  Duke University
- Mark E. Baratz, MD
  American Society for Surgery of the Hand (ASSH) Representative
  Orthopaedic Specialists-UPMC
- Stephen F. Brockmeier, MD
  American Orthopaedic Society for Sports Medicine (AOSSM) Representative
  University of Virginia
- Grant E. Garrigues, MD
  American Shoulder and Elbow Surgeons (ASES) Representative
  Midwest Orthopaedics at Rush
- John E. Kuhn, MD
  Vanderbilt University Medical Center
- Ronald A. Navarro, MD
  Kaiser Permanente South Bay
- Carolyn M. Hettrich, MD, MPH
  Brigham and Women’s Hospital
- Joaquin Sanchez-Sotelo, MD
  Mayo Clinic
- Richard Seiden, Esq.
  Public Advisory Board (PAB) Representative
- Patrick St. Pierre, MD
  Arthroscopy Association of North America (AANA) Representative
  Desert Orthopedic Center
  Eisenhower Health
- Samuel A. Taylor, MD
  Hospital for Special Surgery
- Stephen C. Weber, MD
  The Johns Hopkins School of Medicine
About SER

- Working in collaboration with the specialty societies, the Academy created this Registry to collect shoulder and elbow procedural data across the United States.

- National data allows for establishing survivorship curves, tracking revisions, and improving the quality of patient care.

- Individual data can be accessed and used for performance improvement and quality initiatives on RegistryInsights® for site and surgeon users.
SER Progress

- 140 contracted sites
- Over 20,000 procedures submitted across 40 states
- Representing over 18,000 unique patient cases
SER Publications

• Current Comparative Use of Anatomic and Reverse Arthroplasty in the United States According to the American Academy of Orthopedic Surgeons (AAOS)
  o Poster presentation at AAOS 2021 Annual Meeting

• Off-Label use of Reverse Arthroplasty: The American Academy of Orthopedic Surgeons (AAOS) Shoulder and Elbow Registry (SER)
  o Podium presentation at AAOS 2021 Annual Meeting

• Trends in the Use of Superior Capsular Reconstruction in the United States using the AAOS Shoulder and Elbow Registry
  o Poster presentation at American Shoulder and Elbow Surgeons 2020 Annual Meeting

• Incidence of ATSA vs RTSA in Cuff Intact Osteoarthritis in Males vs Females 70+
  • Podium presentation at International Society of Arthroplasty Registries (ISAR) 2022

▪ Read more about our publications at aaos.org/registries/publications/
SER Data Element Overview

Module-specific Procedural Elements
- Shoulder Arthroplasty Module: Includes codes for replacements, revisions, and fractures
- Elbow Arthroplasty Module: Ulnar Nerve Management
- Rotator Cuff Repair Module: Expanded ICD-10 and CPT options for shoulder, including muscle, tendon, and arthroscopy codes

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

Patient-reported Outcome
- PROMIS-10 Global
- VR-12
- SANE
- ASES

Three Modules Available
- Shoulder Arthroplasty
- Elbow Arthroplasty
- Rotator Cuff Repair

This page is a summary of the SER data elements and is not all inclusive.
Decrease Data Collection Burden

- 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.
Qualified Clinical Data Registry

- AAOS maintains a QCDR designation
  - Specialty society driven participation in the Quality Payment Program (QPP) Merit-incentive Based Payment System (MIPS)

- Benefits of QCDR participation:
  - Qualify for MIPS Promoting Interoperability (PI) and Improvement Activities
  - Performance feedback available via the RegistryInsights® dashboards
  - Assistance with MIPS quality measure data submission
Integration of Medicare Data

- Access to **Medicare claims** linked by full identifiers for longitudinal tracking
- Follow outcomes of Registry patients occurring at non-Registry participating institutions
- 2012-2021 Medicare data for all patients represented in the Registry
  - Inpatient claims (148 data elements)
  - Outpatient claims (122 data elements)
Why Do Sites Participate?

- Compare your practice to national performance benchmarks
- Access to on-demand practice specific reports and dashboards
- Attain certification credits for ABOS MOC & ABNS CC

- Facilitate site, practice-specific, payer-incentivized performance improvement programs such as Aetna IOQ & Blue Distinction
- Use for reporting to quality improvement programs such as the QPP Merit-based Incentive Payment System (MIPS)
- Inform orthopaedic practice & contribute to orthopaedic advocacy
- Improve the value of care delivered to Patients
Shoulder & Elbow Registry
Third Annual Report

Figure 1.1: Cumulative Procedural Volume by Year, 2015-2021 (N=17,617)

@2022 AAOS Shoulder & Elbow Registry
Figure 2.1: Distribution of Shoulder Arthroplasty Procedures, 2015-2021 (N=10,302)

- Reverse Total Shoulder Arthroplasty (n=5,380, 52.22%)
- Anatomic Total Shoulder Arthroplasty (n=3,398, 32.98%)
- Revision Shoulder Arthroplasty (n=725, 7.04%)
- Other Shoulder Procedure (n=730, 7.09%)
- Shoulder Resurfacing (n=49, 0.48%)
- Shoulder Hemi-Arthroplasty (n=20, 0.19%)
Figure 2.2: Shoulder Arthroplasty Procedures by Age Group, 2015-2021 (N=9,503)
Figure 2.3: Sex Distribution for All Shoulder Arthroplasty Procedures by Age Group, 2015-2021 (N=9,226)
Figure 2.6b: Primary Diagnosis for Reverse Total Shoulder Arthroplasty Procedures, 2015-2021 (N=5,192)

- Other and unspecified osteoarthritis (n=3,099) - 59.69%
- Rotator Cuff Tear (n=942) - 18.14%
- Fracture (n=596) - 11.48%
- Arthropathy (n=286) - 5.51%
- Other joint disorder, not elsewhere classified (n=193) - 3.72%
- Dislocation of joints and ligaments of shoulder (n=25) - 0.48%
- Rheumatoid arthritis related to shoulder (n=21) - 0.40%
- Osteonecrosis (n=15) - 0.29%
- Sprain of Shoulder Joint (n=3) - 0.06%
- Other Instability (n=4) - 0.08%
- Impingement Syndrome (n=2) - 0.04%
- Adhesive Capsulitis (Frozen Shoulder) (n=4) - 0.08%
- Other disorders of muscles (n=1) - 0.02%
- Juvenile rheumatoid arthritis (n=1) - 0.02%
Figure 2.7: Top 10 Comorbidities for Shoulder Arthroplasty Procedures, 2015-2021

- Hypertension (n=4,652) 24.55%
- Obesity (n=2,312) 12.20%
- Diabetes Mellitus (n=1,747) 9.22%
- Pulmonary Lung Disease (n=1,609) 8.49%
- Chronic Kidney Disease (n=1,488) 7.85%
- Cardiac Arrhythmias (n=1,023) 5.40%
- Depression (n=1,091) 5.76%
- Coronary Artery Disease (n=1,040) 5.49%
- Cancer (n=865) 4.56%
- Anemia (n=847) 4.47%

*Each case may belong to multiple comorbidity groups*
Table 3.1: Frequency and Age of Rotator Cuff Procedures by Group Type, 2015-2021

<table>
<thead>
<tr>
<th>Rotator Cuff Procedural Grouping</th>
<th>CPT Code</th>
<th>Frequency</th>
<th>% of Total</th>
<th>Mean Age</th>
<th>SD Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthroscopic Rotator Cuff Repair (N=3,974)</td>
<td>29827</td>
<td>3,974</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>w/ Subacromial Decompression</td>
<td>29826</td>
<td>3,096</td>
<td>77.9%</td>
<td>59.61</td>
<td>10.10</td>
</tr>
<tr>
<td>w/ Biceps Tenodesis</td>
<td>29828 or 23430</td>
<td>1,622</td>
<td>40.8%</td>
<td>58.89</td>
<td>9.69</td>
</tr>
<tr>
<td>w/ Distal Clavicle Excision</td>
<td>29824 or 23120</td>
<td>1,023</td>
<td>25.7%</td>
<td>59.76</td>
<td>9.80</td>
</tr>
<tr>
<td>w/ Debridement</td>
<td>29822 or 29823</td>
<td>891</td>
<td>22.4%</td>
<td>60.68</td>
<td>9.93</td>
</tr>
<tr>
<td>w/ SLAP Repair (Superior Labrum Anterior and Posterior)</td>
<td>29807</td>
<td>154</td>
<td>3.9%</td>
<td>54.58</td>
<td>11.34</td>
</tr>
<tr>
<td>w/ Lysis of Adhesions</td>
<td>29825</td>
<td>46</td>
<td>1.2%</td>
<td>62.20</td>
<td>8.73</td>
</tr>
<tr>
<td>w/ Capsulorrhaphy</td>
<td>29806</td>
<td>31</td>
<td>0.8%</td>
<td>51.00</td>
<td>16.77</td>
</tr>
<tr>
<td>w/ Bankart Procedure</td>
<td>23455</td>
<td>3</td>
<td>0.1%</td>
<td>52.33</td>
<td>6.66</td>
</tr>
</tbody>
</table>
Table 3.1: Frequency and Age of Rotator Cuff Procedures by Group Type, 2015-2021

<table>
<thead>
<tr>
<th>Procedure</th>
<th>23410 or 23412</th>
<th>210</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Rotator Cuff Repair (CPT 23410 or 23412)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>w/ Arthroscopic Debridement</td>
<td>29823 or 29822</td>
<td>112</td>
<td>53.33%</td>
<td>59.82</td>
<td>11.24</td>
</tr>
<tr>
<td>w/ Distal Clavicle Excision</td>
<td>23120</td>
<td>60</td>
<td>28.57%</td>
<td>59.85</td>
<td>10.57</td>
</tr>
<tr>
<td>w/ Biceps Tenodesis</td>
<td>23430</td>
<td>70</td>
<td>33.33%</td>
<td>57.79</td>
<td>10.24</td>
</tr>
<tr>
<td>w/ SLAP Repair</td>
<td>29807</td>
<td>12</td>
<td>5.71%</td>
<td>55.42</td>
<td>9.99</td>
</tr>
<tr>
<td>w/ Bankart Procedure</td>
<td>23455</td>
<td>4</td>
<td>1.90%</td>
<td>47.75</td>
<td>15.48</td>
</tr>
<tr>
<td>w/ Capsulorrhaphy</td>
<td>29806</td>
<td>3</td>
<td>1.43%</td>
<td>39.67</td>
<td>8.39</td>
</tr>
<tr>
<td>w/ Acromioplasty</td>
<td>23130</td>
<td>2</td>
<td>0.95%</td>
<td>58.00</td>
<td>4.24</td>
</tr>
<tr>
<td>Open Rotator Cuff Repair w/ Acromioplasty</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(Reconstruction of Complete Rotator Cuff Avulsion) (N=179)</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>w/ Distal Clavicle Excision</td>
<td>23120</td>
<td>132</td>
<td>73.74%</td>
<td>60.98</td>
<td>9.90</td>
</tr>
<tr>
<td>w/ Arthroscopic Debridement</td>
<td>29824 or 29822</td>
<td>128</td>
<td>71.51%</td>
<td>60.92</td>
<td>9.64</td>
</tr>
<tr>
<td>w/ Biceps Tenodesis</td>
<td>23430</td>
<td>25</td>
<td>13.97%</td>
<td>57.68</td>
<td>8.58</td>
</tr>
<tr>
<td>w/ SLAP Repair</td>
<td>29807</td>
<td>18</td>
<td>10.06%</td>
<td>58.72</td>
<td>9.69</td>
</tr>
<tr>
<td>w/ Capsulorrhaphy</td>
<td>29806</td>
<td>2</td>
<td>1.12%</td>
<td>67.00</td>
<td>12.73</td>
</tr>
</tbody>
</table>
Figure 3.1: Sex Distribution of Rotator Cuff Procedures by Age, 2015-2021 (N=6,724)
Table 2.1: Reverse and Anatomic Total Shoulder Arthroplasty Linked Revision Rates, 2015-2021 (N=8,778)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number of Primaries</th>
<th>Number of Linked Revisions</th>
<th>Linked Revision Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Total Shoulder Arthroplasty</td>
<td>5,380</td>
<td>40</td>
<td>0.74%</td>
</tr>
<tr>
<td>Anatomic Total Shoulder Arthroplasty</td>
<td>3,398</td>
<td>22</td>
<td>0.65%</td>
</tr>
</tbody>
</table>

@2022 AAOS Shoulder & Elbow Registry
Table 4.1: Distribution of Cases with Patient-Reported Outcome Measure (PROM) Submissions for Shoulder Procedures, 2015-2021 (N=527)

<table>
<thead>
<tr>
<th>Patient-Reported Outcome Measure</th>
<th>Number of Cases with a Preoperative PROM</th>
<th>Number of Cases with a Postoperative PROM</th>
<th>Number of Cases with a Linked Postoperative PROM</th>
<th>Percent of Cases with a Linked PROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROMIS-10 (Patient-Reported Outcomes Measurement Information System 10)</td>
<td>134</td>
<td>133</td>
<td>133</td>
<td>99.3%</td>
</tr>
<tr>
<td>VR-12 (Veterans Rand 12-item Health Survey)</td>
<td>403</td>
<td>402</td>
<td>402</td>
<td>99.8%</td>
</tr>
<tr>
<td>ASES (American Shoulder and Elbow Surgeons Score)</td>
<td>224</td>
<td>85</td>
<td>44</td>
<td>19.6%</td>
</tr>
<tr>
<td>SANE (Single Assessment Numeric Evaluation)</td>
<td>195</td>
<td>80</td>
<td>38</td>
<td>19.5%</td>
</tr>
</tbody>
</table>
What’s Next?

Scaling & Improving Data Capture and Quality

- Identifying Best formats to query and accept data
  - Aligning with standard
  - Varying formats across health technology
- Additional tools and resources to capture necessary data
  - Establishing a minimum data set
  - Operative Forms to capture data in non-discrete fields
Questions?

RegistryInfo@aaos.org
www.aaos.org/registries/ser
Contact the AAOS Registry Program

General: RegistryInfo@aaos.org

Technical Support: RegistrySupport@aaos.org

Contracts, Invoicing, & Onboarding: RegistryEngagement@aaos.org

Custom Analytics: RegistryAnalytics@aaos.org

Registry Analytics Institute: RegistryAnalyticsInstitute@aaos.org

Phone: (847) 292-0530

Business Hours: Monday through Friday, 8 a.m. to 4 p.m. Central Time
Thank You!

RegistryInfo@aaos.org
www.aaos.org/registries/ser