# Australian Orthopaedic Association National Joint Replacement Registry

2024 SUPPLEMENTARY REPORT

# Partial Shoulder Arthroplasty


AOA
AUSTRALIAN ORTHOPAEDIC ASSOCIATION

Australian Orthopaedic Association National Joint Replacement Registry

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# Primary Partial Shoulder Arthroplasty

## 2024 Supplementary Report

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# Australian Orthopaedic Association
# National Joint Replacement Registry

## Primary Partial Shoulder Replacement

## 2024 Supplementary Report

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The Registry greatly appreciates the participation of all joint replacement patients throughout Australia. Their contribution allows ongoing improvements in arthroplasty outcomes to be achieved.

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# Contents

# Primary Partial Shoulder Replacement Introduction

This supplementary report provides detailed information on partial shoulder replacement. The Partial Shoulder Arthroplasty Report is one of 14 supplementary reports to complete the AOANJRR Annual Report for 2024.

## CLASSES OF PARTIAL SHOULDER REPLACEMENT

The Registry subcategorises primary partial shoulder replacement into four main classes. These are defined by the type of prostheses used.

**Partial resurfacing anatomic** involves the use of one or more button prostheses to replace part of the natural articulating surface, on one or both sides of the shoulder joint.

**Hemi resurfacing anatomic** involves the use of a humeral prosthesis that replaces the humeral articular surface only, without resecting the head.

**Hemi stemless anatomic** involves resection of part of the humeral head and replacement with a humeral head and an epiphyseal fixation prosthesis.

**Hemi stemmed anatomic** involves the resection of the humeral head and replacement with a humeral head and a humeral stem prosthesis. A humeral stem prosthesis may have either metaphyseal or diaphyseal fixation.

Detailed information on demographics of each class of primary partial shoulder replacement is available in the supplementary report 'Demographics of Hip, Knee & Shoulder Arthroplasty' on the AOANJRR website: https://aoanjrr.sahmri.com/annual-reports-2024

## USE OF PARTIAL SHOULDER REPLACEMENT

There have been 8,107 primary partial shoulder replacements reported to the Registry up to 31 December 2023. This is an additional 231 procedures compared to the number reported last year.

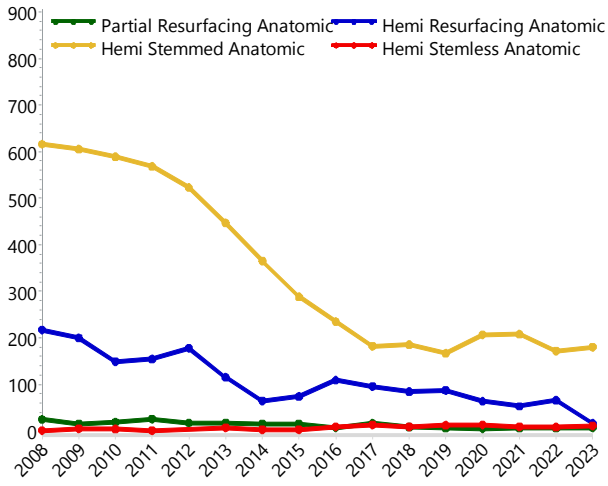
The most common class of primary partial shoulder replacement is hemi stemmed anatomic. This accounts for 72.9% of all partial shoulder replacements, followed by hemi resurfacing anatomic (23.1%), partial resurfacing anatomic (2.7%) and hemi stemless anatomic (1.3%) (Table SPS1).

**Table SPS1 Primary Partial Shoulder Replacement by Class**

| Shoulder Class | Number | Percent |
|---|---|---|
| Partial Resurfacing Anatomic | 218 | 2.7 |
| Hemi Resurfacing Anatomic | 1874 | 23.1 |
| Hemi Stemmed Anatomic | 5907 | 72.9 |
| Hemi Stemless Anatomic | 108 | 1.3 |
| **TOTAL** | **8107** | **100.0** |

The use of the two main classes of primary partial shoulder replacement has declined over the last 10 years. The number of hemi resurfacing anatomic procedures decreased from 178 in 2012 to 16 in 2023. The number of hemi stemmed anatomic procedures decreased from 616 in 2008 to 180 in 2023 (Figure SPS1).

**Figure SPS1 Primary Partial Shoulder Replacement by Class**




There is gender variation depending on the class of primary partial shoulder replacement. The proportions of primary partial shoulder replacement undertaken in females are hemi stemmed anatomic (66.7%), hemi stemless anatomic (34.3%), hemi resurfacing anatomic (39.9%) and partial resurfacing anatomic (22.0%) (Table SPS2).

**Table SPS2 Primary Partial Shoulder Replacement by Class and Gender**

| Shoulder Class | Male | | Female | | TOTAL | |
|---|---|---|---|---|---|---|
| | N | Row% | N | Row% | N | Row% |
| Partial Resurfacing Anatomic | 170 | 78.0 | 48 | 22.0 | 218 | 100.0 |
| Hemi Resurfacing Anatomic | 1126 | 60.1 | 748 | 39.9 | 1874 | 100.0 |
| Hemi Stemmed Anatomic | 1968 | 33.3 | 3939 | 66.7 | 5907 | 100.0 |
| Hemi Stemless Anatomic | 71 | 65.7 | 37 | 34.3 | 108 | 100.0 |
| **TOTAL** | **3335** | **41.1** | **4772** | **58.9** | **8107** | **100.0** |

The proportion of patients aged ≥65 years also varies depending on the class of primary partial shoulder replacement: hemi stemmed anatomic (64.7%), hemi resurfacing anatomic (47.2%), hemi stemless anatomic (26.9%) and partial resurfacing anatomic (17.4%) (Table SPS3).

Overall, males undergoing primary partial shoulder replacement are younger (mean age 59.9 years) compared to females (70.7 years) (Table SPS4).

The most common primary diagnosis for females is fracture (51.3%). For males, the most common primary diagnosis is osteoarthritis (59.4%) (Table SPS5).

The cumulative percent revision varies depending on class. Partial resurfacing anatomic and hemi stemless anatomic have only been used in small numbers (218 and 108 procedures, respectively). This makes any assessment of comparative performance difficult. However, there is a clear difference in the two more commonly used classes of hemi resurfacing anatomic and hemi stemmed anatomic. Devices in these classes have a longer follow-up and the cumulative percent revision at 14 years for hemi resurfacing anatomic is greater than for hemi stemmed anatomic (19.3% compared to 13.3%, respectively) (Table SPS6 and Figure SPS2).

Primary partial shoulder replacement by joint class and head material are shown in Table SPS7.

**Table SPS3 Primary Partial Shoulder Replacement by Class and Age**

| Shoulder Class | <55 | | 55-64 | | 65-74 | | ≥75 | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Row% | N | Row% | N | Row% | N | Row% | N | Row% |
| Partial Resurfacing Anatomic | 163 | 74.8 | 17 | 7.8 | 22 | 10.1 | 16 | 7.3 | 218 | 100.0 |
| Hemi Resurfacing Anatomic | 463 | 24.7 | 526 | 28.1 | 552 | 29.5 | 333 | 17.8 | 1874 | 100.0 |
| Hemi Stemmed Anatomic | 832 | 14.1 | 1256 | 21.3 | 1671 | 28.3 | 2148 | 36.4 | 5907 | 100.0 |
| Hemi Stemless Anatomic | 55 | 50.9 | 24 | 22.2 | 20 | 18.5 | 9 | 8.3 | 108 | 100.0 |
| **TOTAL** | **1513** | **18.7** | **1823** | **22.5** | **2265** | **27.9** | **2506** | **30.9** | **8107** | **100.0** |

**Table SPS4 Age and Gender of Primary Partial Shoulder Replacement**

| Gender | Number | Percent | Minimum | Maximum | Median | Mean | Std Dev |
|---|---|---|---|---|---|---|---|
| Male | 3335 | 41.1% | 14 | 94 | 61 | 59.9 | 14.4 |
| Female | 4772 | 58.9% | 13 | 101 | 72 | 70.7 | 11.9 |
| **TOTAL** | **8107** | **100.0%** | **13** | **101** | **68** | **66.3** | **14.0** |

**Table SPS5 Primary Partial Shoulder Replacement by Primary Diagnosis and Gender**

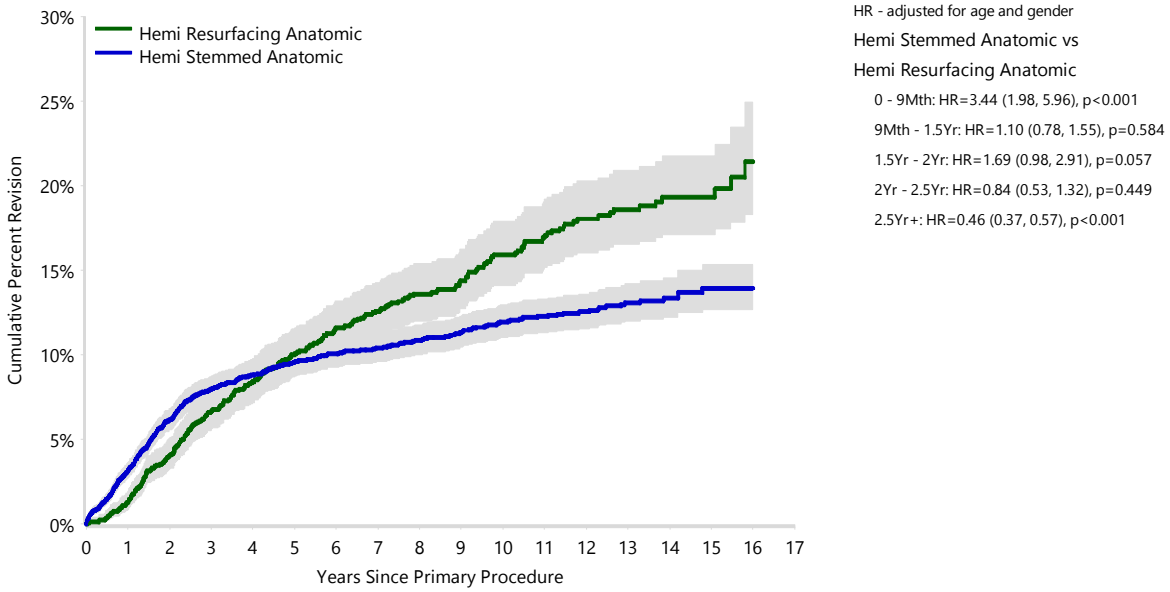
| Primary Diagnosis | Male | | Female | | TOTAL | |
|---|---|---|---|---|---|---|
| | N | Col% | N | Col% | N | Col% |
| Osteoarthritis | 1982 | 59.4 | 1640 | 34.4 | 3622 | 44.7 |
| Fracture | 773 | 23.2 | 2446 | 51.3 | 3219 | 39.7 |
| Rotator Cuff Arthropathy | 131 | 3.9 | 227 | 4.8 | 358 | 4.4 |
| Osteonecrosis | 127 | 3.8 | 166 | 3.5 | 293 | 3.6 |
| Instability | 165 | 4.9 | 74 | 1.6 | 239 | 2.9 |
| Tumour | 119 | 3.6 | 82 | 1.7 | 201 | 2.5 |
| Rheumatoid Arthritis | 23 | 0.7 | 106 | 2.2 | 129 | 1.6 |
| Other Inflammatory Arthritis | 12 | 0.4 | 29 | 0.6 | 41 | 0.5 |
| Osteochondritis Dissecans | 2 | 0.1 | . | . | 2 | 0.0 |
| Other | 1 | 0.0 | 2 | 0.0 | 3 | 0.0 |
| **TOTAL** | **3335** | **100.0** | **4772** | **100.0** | **8107** | **100.0** |

Note: Instability includes instability, dislocation, and Hills-Sachs Defect

**Table SPS6 Cumulative Percent Revision of Primary Partial Shoulder Replacement by Class (All Diagnoses)**

| Shoulder Class | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| Partial Resurfacing Anatomic | 17 | 218 | 0.5 (0.1, 3.3) | 1.4 (0.5, 4.4) | 3.1 (1.4, 6.7) | 5.4 (2.9, 9.9) | 7.6 (4.4, 12.8) | |
| Hemi Resurfacing Anatomic | 269 | 1874 | 1.3 (0.9, 1.9) | 6.6 (5.6, 7.9) | 10.0 (8.7, 11.5) | 12.6 (11.1, 14.3) | 15.9 (14.1, 17.9) | 19.3 (17.1, 21.8) |
| Hemi Stemmed Anatomic | 589 | 5907 | 3.2 (2.7, 3.7) | 8.0 (7.3, 8.7) | 9.6 (8.8, 10.4) | 10.4 (9.6, 11.3) | 12.0 (11.0, 13.0) | 13.3 (12.2, 14.6) |
| Hemi Stemless Anatomic | 15 | 108 | 4.9 (2.1, 11.5) | 11.7 (6.6, 20.2) | 17.3 (10.7, 27.3) | | | |
| **TOTAL** | **890** | **8107** | | | | | | |

**Figure SPS2 Cumulative Percent Revision of Primary Partial Shoulder Replacement by Class (All Diagnoses)**




| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| Hemi Resurfacing Anatomic | 1874 | 1826 | 1580 | 1330 | 1080 | 782 | 286 |
| Hemi Stemmed Anatomic | 5907 | 5313 | 4323 | 3567 | 2861 | 1818 | 550 |

**Table SPS7 Primary Partial Shoulder Replacement by Joint Class and Head Material (All Diagnoses)**

| Joint Class | Ceramic | | Metal | | Pyrocarbon | | TOTAL | |
|---|---|---|---|---|---|---|---|---|
| | N | Row% | N | Row% | N | Row% | N | Row% |
| Hemi Resurfacing Anatomic | . | . | 1189 | 63.5 | 684 | 36.5 | 1873 | 100.0 |
| Hemi Stemmed Anatomic | 48 | 0.8 | 5121 | 86.8 | 733 | 12.4 | 5902 | 100.0 |
| Hemi Stemless Anatomic | 70 | 64.8 | 38 | 35.2 | . | . | 108 | 100.0 |
| **TOTAL** | **118** | **1.5** | **6348** | **80.5** | **1417** | **18.0** | **7883** | **100.0** |

# PRIMARY PARTIAL RESURFACING ANATOMIC SHOULDER REPLACEMENT

## DEMOGRAPHICS AND OUTCOMES

There have been 218 primary partial resurfacing anatomic shoulder replacement procedures reported to the Registry. This is an additional 9 procedures compared to the previous report.

This procedure is undertaken more commonly in males (78.0%). The mean age for males is 38.7 years compared to 55.1 years for females (Table SPS8).

The most common primary diagnosis for males is instability (57.1%), whereas the most common primary diagnosis for females is osteoarthritis (43.8%) (Table SPS9).

The cumulative percent revision at 10 years is 7.6% (Table SPS6). Of the 17 revisions, 10 are for glenoid erosion, 2 are for instability/dislocation, 2 are for rotator cuff insufficiency, and 1 each for loosening, progression of disease and infection. All but two underwent a humeral/glenoid revision.

**Table SPS8 Age and Gender of Primary Partial Resurfacing Anatomic Shoulder Replacement**

| Gender | Number | Percent | Minimum | Maximum | Median | Mean | Std Dev |
|---|---|---|---|---|---|---|---|
| Male | 170 | 78.0% | 14 | 87 | 35 | 38.7 | 17.2 |
| Female | 48 | 22.0% | 16 | 88 | 55 | 55.1 | 19.4 |
| **TOTAL** | **218** | **100.0%** | **14** | **88** | **40** | **42.3** | **18.9** |

**Table SPS9 Primary Partial Resurfacing Anatomic Shoulder Replacement by Primary Diagnosis and Gender**

| Primary Diagnosis | Male | | Female | | TOTAL | |
|---|---|---|---|---|---|---|
| | N | Col% | N | Col% | N | Col% |
| Instability | 97 | 57.1 | 20 | 41.7 | 117 | 53.7 |
| Osteoarthritis | 52 | 30.6 | 21 | 43.8 | 73 | 33.5 |
| Fracture | 15 | 8.8 | 3 | 6.3 | 18 | 8.3 |
| Osteonecrosis | 2 | 1.2 | 3 | 6.3 | 5 | 2.3 |
| Osteochondritis Dissecans | 2 | 1.2 | . | . | 2 | 0.9 |
| Rotator Cuff Arthropathy | 2 | 1.2 | . | . | 2 | 0.9 |
| Rheumatoid Arthritis | . | . | 1 | 2.1 | 1 | 0.5 |
| **TOTAL** | **170** | **100.0** | **48** | **100.0** | **218** | **100.0** |

# PRIMARY HEMI RESURFACING ANATOMIC SHOULDER REPLACEMENT

## DEMOGRAPHICS

There have been 1,874 primary hemi resurfacing anatomic shoulder replacements reported to the Registry. This is an additional 23 procedures compared to the previous report. The use of primary hemi resurfacing has declined by 55.8% since 2008.

This procedure is more common in males (60.1%). The mean age is 59.6 years for males and 67.5 years for females (Table SPS10).

Osteoarthritis is the most common primary diagnosis (88.5%). The range of diagnoses is similar for males and females (Table SPS11).

In 2023, all primary hemi resurfacing procedures reported to the Registry used the PyroTITAN (Table SPS12).

**Table SPS10 Age and Gender of Primary Hemi Resurfacing Anatomic Shoulder Replacement**

| Gender | Number | Percent | Minimum | Maximum | Median | Mean | Std Dev |
|---|---|---|---|---|---|---|---|
| Male | 1126 | 60.1% | 19 | 90 | 60 | 59.6 | 12.0 |
| Female | 748 | 39.9% | 27 | 93 | 68 | 67.5 | 11.4 |
| **TOTAL** | **1874** | **100.0%** | **19** | **93** | **64** | **62.8** | **12.4** |

**Table SPS11 Primary Hemi Resurfacing Anatomic Shoulder Replacement by Primary Diagnosis and Gender**

| Primary Diagnosis | Male | | Female | | TOTAL | |
|---|---|---|---|---|---|---|
| | N | Col% | N | Col% | N | Col% |
| Osteoarthritis | 1004 | 89.2 | 655 | 87.6 | 1659 | 88.5 |
| Rotator Cuff Arthropathy | 50 | 4.4 | 36 | 4.8 | 86 | 4.6 |
| Instability | 31 | 2.8 | 7 | 0.9 | 38 | 2.0 |
| Osteonecrosis | 19 | 1.7 | 18 | 2.4 | 37 | 2.0 |
| Rheumatoid Arthritis | 9 | 0.8 | 19 | 2.5 | 28 | 1.5 |
| Fracture | 10 | 0.9 | 4 | 0.5 | 14 | 0.7 |
| Other Inflammatory Arthritis | 3 | 0.3 | 9 | 1.2 | 12 | 0.6 |
| **TOTAL** | **1126** | **100.0** | **748** | **100.0** | **1874** | **100.0** |

Note: Instability includes instability and dislocation

**Table SPS12 Most Used Humeral Head Prostheses in Primary Hemi Resurfacing Anatomic Shoulder Replacement**

| 2008 | | 2020 | | 2021 | | 2022 | | 2023 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 124 | Copeland | 59 | PyroTITAN | 53 | PyroTITAN | 66 | PyroTITAN | 16 | PyroTITAN |
| 45 | Global CAP | 3 | Copeland | | | | | | |
| 34 | SMR | 2 | Global CAP | | | | | | |
| 11 | Aequalis | | | | | | | | |
| 2 | Epoca RH | | | | | | | | |
| 1 | Buechel-Pappas | | | | | | | | |
| **10 Most Used** | | | | | | | | | |
| 217 | (6) 100.0% | 64 | (3) 100.0% | 53 | (1) 100.0% | 66 | (1) 100.0% | 16 | (1) 100.0% |

## OUTCOME FOR ALL DIAGNOSES

### Reason for Revision

The main reasons for revision of primary hemi resurfacing anatomic shoulder replacement are glenoid erosion (27.9%), pain (19.3%), rotator cuff insufficiency (13.0%), and instability/dislocation (10.4%) (Table SPS13 and Figure SPS3).

Prior to 2023, there had been 14 reported breakages of the PyroTITAN prosthesis. Three of these breakages were reported secondary to loosening.

**Table SPS13 Primary Hemi Resurfacing Anatomic Shoulder Replacement by Reason for Revision (All Diagnoses)**

| Reason for Revision | Number | Percent |
|---|---|---|
| Glenoid Erosion | 75 | 27.9 |
| Pain | 52 | 19.3 |
| Rotator Cuff Insufficiency | 35 | 13.0 |
| Instability/Dislocation | 28 | 10.4 |
| Loosening | 22 | 8.2 |
| Implant Breakage Head | 15 | 5.6 |
| Lysis | 10 | 3.7 |
| Fracture | 10 | 3.7 |
| Infection | 8 | 3.0 |
| Malposition | 3 | 1.1 |
| Metal Related Pathology | 3 | 1.1 |
| Arthrofibrosis | 2 | 0.7 |
| Wear Glenoid Insert | 2 | 0.7 |
| Incorrect Sizing | 2 | 0.7 |
| Osteonecrosis | 1 | 0.4 |
| Implant Breakage Humeral | 1 | 0.4 |
| **TOTAL** | **269** | **100.0** |

### Type of Revision

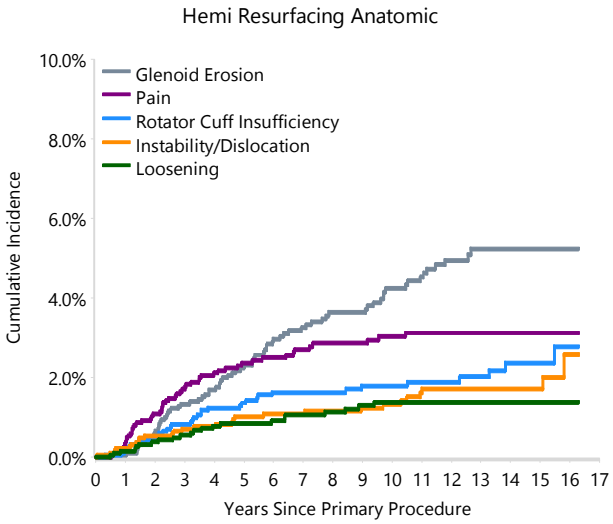
The most common type of revision is to a total shoulder replacement (88.8%) (Table SPS14). Of these, 153 (64.0%) were revised to a total reverse shoulder and 84 (35.1%) to a total stemmed shoulder replacement.

**Glenoid erosion and pain are the reasons for 47.2% of all hemi resurfacing anatomic shoulder revisions.**

**Table SPS14 Primary Hemi Resurfacing Anatomic Shoulder Replacement by Type of Revision (All Diagnoses)**

| Type of Revision | Number | Percent |
|---|---|---|
| Humeral/Glenoid | 239 | 88.8 |
| Humeral Component | 16 | 5.9 |
| Glenoid Component | 6 | 2.2 |
| Cement Spacer | 4 | 1.5 |
| Removal of Prostheses | 2 | 0.7 |
| Reoperation | 1 | 0.4 |
| Head Only | 1 | 0.4 |
| **TOTAL** | **269** | **100.0** |

**Figure SPS3 Cumulative Incidence Revision Diagnosis of Primary Hemi Resurfacing Anatomic Shoulder Replacement (All Diagnoses)**



## OUTCOME FOR OSTEOARTHRITIS

### Age and Gender

Patients aged 65-74 years have a lower rate of revision after 1.5 years compared to patients aged <55 years, whereas patients aged ≥75 years have a lower rate of revision after 2.5 years (Table SPS15 and Figure SPS4).

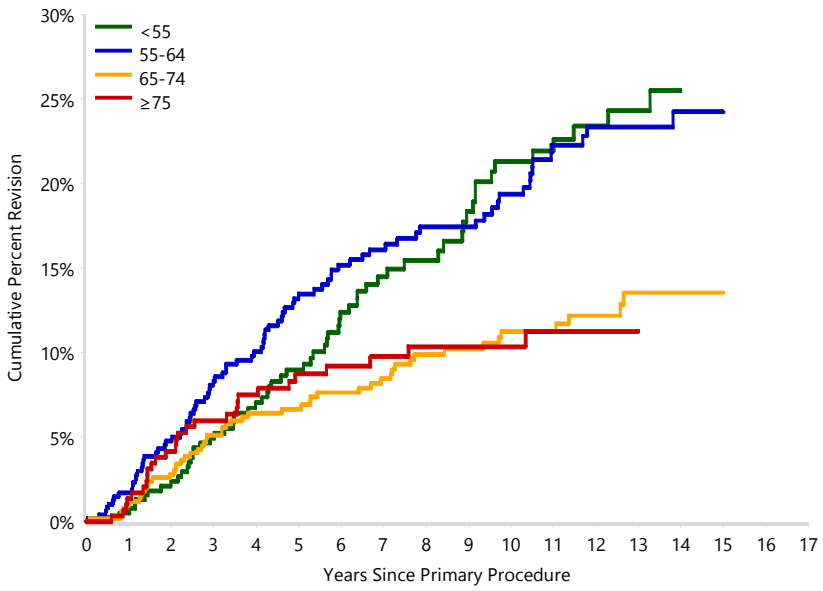
Females have a higher rate of revision than males (Table SPS16 and Figure SPS5).

The outcomes of the most commonly used prostheses are listed in Table SPS17. The PyroTITAN was the only hemi-resurfacing prosthesis remaining in use in 2023. It has a cumulative percent revision of 7.4% (95% CI 4.9, 11.0) at 10 years (Table SPS18).

**Table SPS15 Cumulative Percent Revision of Primary Hemi Resurfacing Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)**

| Age | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| <55 | 62 | 389 | 0.5 (0.1, 2.1) | 4.9 (3.1, 7.7) | 9.0 (6.4, 12.5) | 14.5 (11.0, 19.0) | 21.3 (16.6, 27.1) | 25.5 (19.9, 32.3) |
| 55-64 | 86 | 472 | 1.7 (0.9, 3.4) | 8.3 (6.1, 11.3) | 13.2 (10.3, 16.8) | 16.1 (12.9, 20.1) | 19.4 (15.7, 23.8) | 24.2 (19.8, 29.5) |
| 65-74 | 53 | 503 | 1.0 (0.4, 2.4) | 5.1 (3.5, 7.5) | 6.7 (4.8, 9.3) | 8.5 (6.2, 11.4) | 11.3 (8.6, 14.7) | 13.6 (10.3, 17.8) |
| ≥75 | 28 | 295 | 1.4 (0.5, 3.6) | 6.0 (3.8, 9.5) | 8.7 (5.9, 12.8) | 9.8 (6.7, 14.1) | 10.4 (7.2, 14.9) | |
| **TOTAL** | **229** | **1659** | | | | | | |

**Figure SPS4 Cumulative Percent Revision of Primary Hemi Resurfacing Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)**




HR - adjusted for gender

55-64 vs <55

0 - 3Yr: HR=1.32 (0.81, 2.16), p=0.271

3Yr+: HR=0.86 (0.57, 1.29), p=0.458

65-74 vs <55

0 - 1Yr: HR=0.90 (0.30, 2.67), p=0.849

1Yr - 1.5Yr: HR=0.86 (0.34, 2.21), p=0.760

1.5Yr+: HR=0.45 (0.30, 0.68), p<0.001

≥75 vs <55

0 - 1.5Yr: HR=1.05 (0.46, 2.43), p=0.901

1.5Yr - 2.5Yr: HR=0.97 (0.40, 2.37), p=0.952

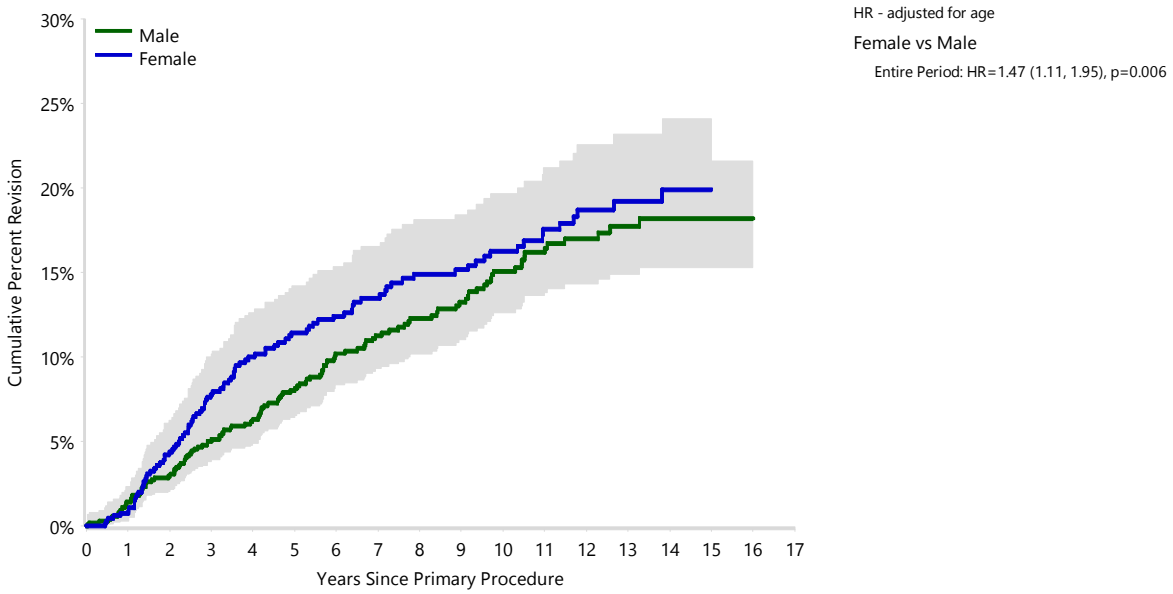
2.5Yr+: HR=0.27 (0.14, 0.52), p<0.001

| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| <55 | 389 | 381 | 324 | 261 | 191 | 129 | 45 |
| 55-64 | 472 | 456 | 377 | 317 | 269 | 203 | 84 |
| 65-74 | 503 | 494 | 445 | 391 | 331 | 246 | 84 |
| ≥75 | 295 | 287 | 256 | 209 | 157 | 105 | 34 |

**Table SPS16 Cumulative Percent Revision of Primary Hemi Resurfacing Anatomic Shoulder Replacement by Gender (Primary Diagnosis OA)**

| Gender | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| Male | 127 | 1004 | 1.4 (0.8, 2.4) | 5.0 (3.8, 6.6) | 8.0 (6.4, 10.0) | 11.3 (9.3, 13.6) | 15.1 (12.6, 17.9) | 18.2 (15.3, 21.6) |
| Female | 102 | 655 | 0.8 (0.3, 1.8) | 7.8 (5.9, 10.2) | 11.4 (9.2, 14.2) | 13.5 (11.0, 16.5) | 16.3 (13.4, 19.7) | 19.9 (16.4, 24.1) |
| **TOTAL** | **229** | **1659** | | | | | | |

**Figure SPS5 Cumulative Percent Revision of Primary Hemi Resurfacing Anatomic Shoulder Replacement by Gender (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| Male | 1004 | 977 | 845 | 705 | 564 | 401 | 139 |
| Female | 655 | 641 | 557 | 473 | 384 | 282 | 108 |

**Table SPS17 Cumulative Percent Revision of Primary Hemi Resurfacing Anatomic Shoulder Replacement by Humeral Head (Primary Diagnosis OA)**

| Humeral Head | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| Aequalis | 18 | 79 | 1.3 (0.2, 8.8) | 10.3 (5.3, 19.5) | 15.7 (9.2, 26.0) | 18.7 (11.5, 29.6) | 23.4 (15.2, 35.1) | 25.5 (16.7, 37.6) |
| Copeland | 93 | 556 | 1.6 (0.8, 3.1) | 6.6 (4.8, 9.0) | 10.1 (7.8, 12.9) | 12.8 (10.2, 16.0) | 16.1 (13.1, 19.7) | 19.3 (15.9, 23.3) |
| Global CAP | 44 | 224 | 0.4 (0.1, 3.1) | 9.0 (5.9, 13.6) | 12.2 (8.5, 17.3) | 15.6 (11.4, 21.1) | 19.7 (14.8, 25.8) | 22.3 (16.9, 29.1) |
| PyroTITAN | 33 | 631 | 1.1 (0.5, 2.3) | 3.2 (2.1, 5.0) | 4.8 (3.3, 7.1) | 5.4 (3.7, 7.8) | 7.4 (4.9, 11.0) | |
| SMR | 35 | 146 | 0.0 (0.0, 0.0) | 7.0 (3.8, 12.6) | 14.3 (9.4, 21.2) | 20.7 (14.7, 28.6) | 24.3 (17.8, 32.7) | |
| Other (3) | 6 | 23 | 4.3 (0.6, 27.1) | 17.4 (6.9, 39.9) | 17.4 (6.9, 39.9) | 22.9 (10.1, 46.9) | 22.9 (10.1, 46.9) | 30.6 (14.5, 57.4) |
| **TOTAL** | **229** | **1659** | | | | | | |

Note: Only prostheses with >50 procedures have been listed

# PRIMARY HEMI STEMLESS ANATOMIC SHOULDER REPLACEMENT

## DEMOGRAPHICS AND OUTCOME

There have been 108 primary hemi stemless anatomic shoulder replacement procedures reported to the Registry. This is an additional 12 procedures compared to the previous report.

This procedure is undertaken more commonly in males (65.7%). The mean age is 50.7 years for males and 63.6 years for females (Table SPS18).

Osteoarthritis is the most common primary diagnosis (63.0%) (Table SPS19).

Of the 15 revisions reported, 5 are for glenoid erosion, 3 for fracture, 3 for rotator cuff insufficiency, and 1 each for pain, loosening, instability/dislocation and arthrofibrosis (Table SPS20).

The most common type of revision is to a total shoulder replacement (Table SPS21).

The most common humeral head and stem prosthesis combinations are the Affinis, Comprehensive and the Eclipse.

Outcomes for the most used prosthesis combinations are presented in Table SPS22.

**Table SPS18 Age and Gender of Primary Hemi Stemless Anatomic Shoulder Replacement**

| Gender | Number | Percent | Minimum | Maximum | Median | Mean | Std Dev |
|---|---|---|---|---|---|---|---|
| Male | 71 | 65.7% | 18 | 83 | 51 | 50.7 | 12.4 |
| Female | 37 | 34.3% | 30 | 86 | 66 | 63.6 | 13.9 |
| **TOTAL** | **108** | **100.0%** | **18** | **86** | **54** | **55.1** | **14.3** |

**Table SPS19 Primary Hemi Stemless Anatomic Shoulder Replacement by Primary Diagnosis and Gender**

| Primary Diagnosis | Male | | Female | | TOTAL | |
|---|---|---|---|---|---|---|
| | N | Col% | N | Col% | N | Col% |
| Osteoarthritis | 45 | 63.4 | 23 | 62.2 | 68 | 63.0 |
| Osteonecrosis | 17 | 23.9 | 9 | 24.3 | 26 | 24.1 |
| Fracture | 3 | 4.2 | 3 | 8.1 | 6 | 5.6 |
| Rotator Cuff Arthropathy | 3 | 4.2 | . | . | 3 | 2.8 |
| Instability | 1 | 1.4 | 1 | 2.7 | 2 | 1.9 |
| Rheumatoid Arthritis | . | . | 1 | 2.7 | 1 | 0.9 |
| Other Inflammatory Arthritis | 1 | 1.4 | . | . | 1 | 0.9 |
| Other | 1 | 1.4 | . | . | 1 | 0.9 |
| **TOTAL** | **71** | **100.0** | **37** | **100.0** | **108** | **100.0** |

**Table SPS20 Primary Hemi Stemless Anatomic Shoulder Replacement by Reason for Revision**

| Reason for Revision | Number | Percent |
|---|---|---|
| Glenoid Erosion | 5 | 33.3 |
| Fracture | 3 | 20.0 |
| Rotator Cuff Insufficiency | 3 | 20.0 |
| Pain | 1 | 6.7 |
| Loosening | 1 | 6.7 |
| Instability/Dislocation | 1 | 6.7 |
| Arthrofibrosis | 1 | 6.7 |
| **TOTAL** | **15** | **100.0** |

**Table SPS21 Primary Hemi Stemless Anatomic Shoulder Replacement by Type of Revision**

| Type of Revision | Number | Percent |
|---|---|---|
| Humeral/Glenoid | 8 | 53.3 |
| Glenoid Component | 4 | 26.7 |
| Humeral Component | 2 | 13.3 |
| Head Only | 1 | 6.7 |
| **TOTAL** | **15** | **100.0** |

Note: Fracture includes proximal humerus fracture

**Table SPS22 Cumulative Percent Revision of Primary Hemi Stemless Anatomic Shoulder Replacement by Prosthesis Combination**

| Humeral Head | Humeral Stem | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|---|
| Affinis | Affinis | 6 | 70 | 3.1 (0.8, 12.0) | 6.4 (2.5, 16.3) | 10.7 (4.9, 22.4) | 10.7 (4.9, 22.4) | | |
| Affiniti | Simpliciti | 4 | 7 | 0.0 (0.0, 0.0) | 48.6 (18.7, 88.2) | 65.7 (31.5, 95.2) | 65.7 (31.5, 95.2) | 65.7 (31.5, 95.2) | |
| Comprehensive | Comprehensive | 2 | 11 | 22.2 (6.1, 63.5) | 22.2 (6.1, 63.5) | | | | |
| Eclipse | Eclipse | 1 | 10 | 0.0 (0.0, 0.0) | 11.1 (1.6, 56.7) | 11.1 (1.6, 56.7) | 11.1 (1.6, 56.7) | 11.1 (1.6, 56.7) | 11.1 (1.6, 56.7) |
| Other (5) | | 2 | 10 | 10.0 (1.5, 52.7) | 10.0 (1.5, 52.7) | 20.0 (5.4, 59.1) | 20.0 (5.4, 59.1) | | |
| **TOTAL** | | **15** | **108** | | | | | | |

Note: Only prostheses with >7 procedures have been listed

# PRIMARY HEMI STEMMED ANATOMIC SHOULDER REPLACEMENT

## DEMOGRAPHICS

There have been 5,907 primary hemi stemmed anatomic shoulder replacement procedures reported to the Registry. This is an additional 187 procedures compared to the previous report.

This procedure is more common in females (66.7%). The mean age is 71.6 years for females and 62.2 years for males (Table SPS23).

The most common primary diagnosis is fracture (53.9%), followed by osteoarthritis (30.8%) (Table SPS24). In 2023, the number of primary hemi stemmed anatomic shoulder replacements undertaken for fracture decreased by 90.5% compared to 2008. In 2023, the number of primary hemi stemmed anatomic shoulder replacements undertaken for osteoarthritis decreased by 38.2% compared to 2008 (Figure SPS6).

The most common humeral head prostheses used in 2023 are the Ascend Flex PyC, Comprehensive and Global Unite.

The 10 most used humeral head prostheses account for 98.3% of all primary hemi stemmed anatomic procedures in 2023. This has slightly increased from 98.2% in 2008 (Table SPS25).

The most common humeral stem prostheses used in 2023 are the Ascend Flex, Comprehensive, SMR and Global Unite. The 10 most used humeral stem prostheses account for 98.9% of all primary hemi stemmed procedures in 2023. This has increased from 97.2% in 2008 (Table SPS26).

**There has been a major decline in the use of primary hemi stemmed anatomic shoulder replacement for the management of osteoarthritis and fracture.**

**Table SPS23 Age and Gender of Primary Hemi Stemmed Anatomic Shoulder Replacement**

| Gender | Number | Percent | Minimum | Maximum | Median | Mean | Std Dev |
|---|---|---|---|---|---|---|---|
| Male | 1968 | 33.3% | 14 | 94 | 63 | 62.2 | 13.8 |
| Female | 3939 | 66.7% | 13 | 101 | 73 | 71.6 | 11.6 |
| **TOTAL** | **5907** | **100.0%** | **13** | **101** | **70** | **68.5** | **13.2** |

**Table SPS24 Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis and Gender**

| Primary Diagnosis | Male | | Female | | TOTAL | |
|---|---|---|---|---|---|---|
| | N | Col% | N | Col% | N | Col% |
| Fracture | 745 | 37.9 | 2436 | 61.8 | 3181 | 53.9 |
| Osteoarthritis | 881 | 44.8 | 941 | 23.9 | 1822 | 30.8 |
| Rotator Cuff Arthropathy | 76 | 3.9 | 191 | 4.8 | 267 | 4.5 |
| Osteonecrosis | 89 | 4.5 | 136 | 3.5 | 225 | 3.8 |
| Tumour | 119 | 6.0 | 82 | 2.1 | 201 | 3.4 |
| Rheumatoid Arthritis | 14 | 0.7 | 85 | 2.2 | 99 | 1.7 |
| Instability | 36 | 1.8 | 46 | 1.2 | 82 | 1.4 |
| Other Inflammatory Arthritis | 8 | 0.4 | 20 | 0.5 | 28 | 0.5 |
| Other | . | . | 2 | 0.1 | 2 | 0.0 |
| **TOTAL** | **1968** | **100.0** | **3939** | **100.0** | **5907** | **100.0** |

Note: Instability includes instability and dislocation

**Figure SPS6 Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis**

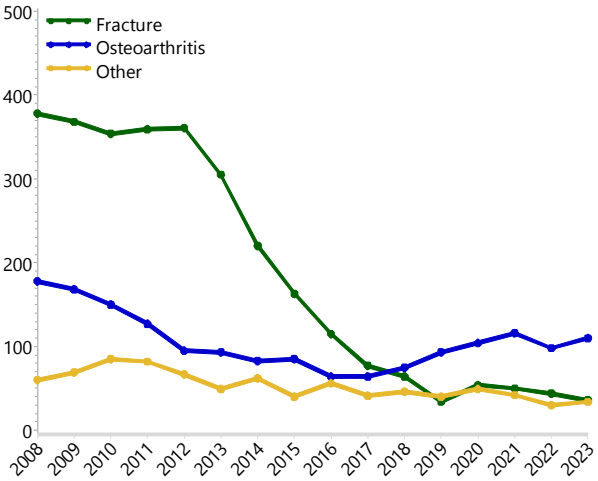



**Table SPS25 10 Most Used Humeral Head Prostheses in Primary Hemi Stemmed Anatomic Shoulder Replacement**

| 2008 | | 2020 | | 2021 | | 2022 | | 2023 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 197 | Global Advantage | 119 | Ascend Flex PyC | 129 | Ascend Flex PyC | 105 | Ascend Flex PyC | 128 | Ascend Flex PyC |
| 177 | SMR | 21 | Comprehensive | 15 | Comprehensive | 14 | Equinoxe | 14 | Comprehensive |
| 98 | Aequalis | 16 | Equinoxe | 15 | Equinoxe | 10 | Comprehensive | 9 | Global Unite |
| 38 | Bigliani/Flatow | 14 | Global Unite | 9 | SMR CTA | 8 | Mutars | 6 | Mutars |
| 31 | SMR CTA | 7 | Aequalis | 8 | Global Unite | 6 | SMR | 6 | SMR CTA |
| 22 | Global Advantage CTA | 6 | Mutars | 6 | Aequalis | 6 | SMR CTA | 4 | SMR |
| 15 | Bio-Modular | 5 | SMR | 6 | Ascend Flex | 5 | Aequalis | 3 | Delta Xtend |
| 13 | Solar | 4 | Affinis | 6 | SMR | 5 | Ascend Flex | 3 | Equinoxe |
| 8 | Global AP | 4 | Ascend Flex | 5 | Mutars | 5 | Global Unite | 2 | Aequalis |
| 6 | Univers 3D | 4 | SMR CTA | 4 | Mets | 3 | Delta Xtend | 2 | Affinis |
| **10 Most Used** | | | | | | | | | |
| 605 | (10) 98.2% | 200 | (10) 96.6% | 203 | (10) 97.6% | 167 | (10) 97.1% | 177 | (10) 98.3% |
| **Remainder** | | | | | | | | | |
| 11 | (4) 1.8% | 7 | (5) 3.4% | 5 | (3) 2.4% | 5 | (3) 2.9% | 3 | (2) 1.7% |
| **TOTAL** | | | | | | | | | |
| 616 | (14) 100.0% | 207 | (15) 100.0% | 208 | (13) 100.0% | 172 | (13) 100.0% | 180 | (12) 100.0% |

**Table SPS26 10 Most Used Humeral Stem Prostheses in Primary Hemi Stemmed Anatomic Shoulder Replacement**

| 2008 | | 2020 | | 2021 | | 2022 | | 2023 | |
|---|---|---|---|---|---|---|---|---|---|
| N | Model | N | Model | N | Model | N | Model | N | Model |
| 207 | SMR | 120 | Ascend Flex | 127 | Ascend Flex | 107 | Ascend Flex | 123 | Ascend Flex |
| 138 | Global FX | 22 | Comprehensive | 15 | Comprehensive | 14 | Equinoxe | 14 | Comprehensive |
| 98 | Aequalis | 16 | Equinoxe | 15 | Equinoxe | 12 | SMR | 10 | SMR |
| 81 | Global Advantage | 12 | Global Unite | 15 | SMR | 10 | Comprehensive | 8 | Global Unite |
| 26 | Bigliani/Flatow TM | 9 | SMR | 8 | Aequalis Flex Revive | 8 | Mutars | 6 | Aequalis Flex Revive |
| 13 | Solar | 7 | Aequalis | 6 | Aequalis | 5 | Aequalis | 6 | Mutars |
| 11 | Bigliani/Flatow | 6 | Mutars | 6 | Global Unite | 4 | Global AP | 4 | Global AP |
| 11 | Bio-Modular | 4 | Affinis | 5 | Mutars | 4 | Global Unite | 3 | Equinoxe |
| 8 | Global AP | 3 | Aequalis Flex Revive | 4 | Mets | 3 | Aequalis Flex Revive | 2 | Aequalis |
| 6 | Univers 3D | 3 | Global AP | 3 | Affinis | 2 | Affinis | 2 | Affinis |
| **10 Most Used** | | | | | | | | | |
| 599 | (10) 97.2% | 202 | (10) 97.6% | 204 | (10) 98.1% | 169 | (10) 98.3% | 178 | (10) 98.9% |
| **Remainder** | | | | | | | | | |
| 17 | (7) 2.8% | 5 | (3) 2.4% | 4 | (2) 1.9% | 3 | (2) 1.7% | 2 | (1) 1.1% |
| **TOTAL** | | | | | | | | | |
| 616 | (17) 100.0% | 207 | (13) 100.0% | 208 | (12) 100.0% | 172 | (12) 100.0% | 180 | (11) 100.0% |

## OUTCOME FOR ALL DIAGNOSES

### Primary Diagnosis

Primary hemi stemmed anatomic shoulder replacement performed for fracture has a higher rate of revision than when performed for osteoarthritis in the first 2.5 years. After this time there is no difference (Table SPS27 and Figure SPS7).

### Reason for Revision

Reasons for revision vary depending on the primary diagnosis. Rotator cuff insufficiency occurs more frequently in hemi stemmed anatomic shoulder replacement undertaken for fracture (26.4%), whereas glenoid erosion occurs more frequently in procedures undertaken for osteoarthritis (28.6%) (Table SPS28 and Figure SPS8).

### Type of Revision

The most common type of revision is to a total shoulder replacement for both primary diagnoses (72.8% for fracture and 61.7% for osteoarthritis) (Table SPS29). Most were revised to a total reverse shoulder replacement (98.1% when used for fracture and 89.5% for osteoarthritis). Glenoid component only revision occurs more commonly in procedures undertaken for osteoarthritis (23.4% compared to 4.5% for fracture).

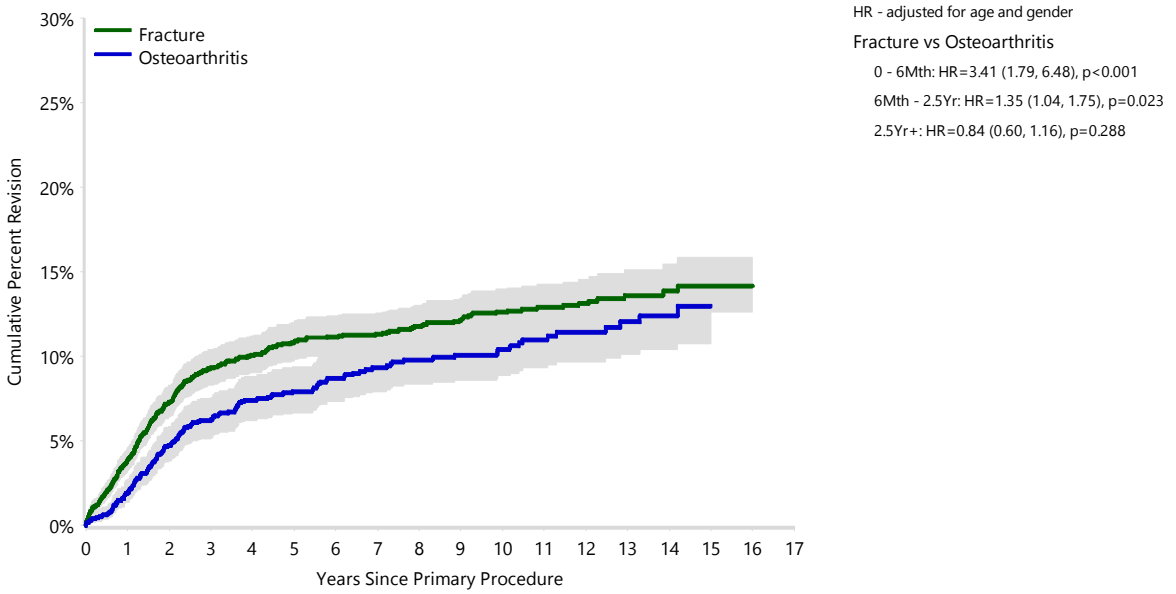
**There is no difference in the rate of revision when primary hemi stemmed anatomic shoulder replacement is performed for fracture or osteoarthritis after the first 2.5 years.**

**Table SPS27 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis**

| Primary Diagnosis | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| Fracture | 356 | 3181 | 3.9 (3.3, 4.6) | 9.3 (8.3, 10.4) | 10.9 (9.8, 12.0) | 11.3 (10.2, 12.5) | 12.6 (11.4, 14.0) | 13.9 (12.4, 15.5) |
| Osteoarthritis | 154 | 1822 | 2.0 (1.4, 2.7) | 6.2 (5.1, 7.5) | 7.9 (6.7, 9.4) | 9.3 (7.9, 11.0) | 10.4 (8.9, 12.3) | 12.4 (10.4, 14.8) |
| Rotator Cuff Arthropathy | 20 | 267 | 2.7 (1.3, 5.5) | 5.6 (3.4, 9.3) | 7.1 (4.5, 11.3) | 7.1 (4.5, 11.3) | 9.9 (6.3, 15.5) | |
| Osteonecrosis | 21 | 225 | 2.3 (1.0, 5.4) | 5.9 (3.4, 10.2) | 7.9 (4.8, 12.8) | 10.2 (6.5, 15.9) | 12.6 (8.0, 19.3) | |
| Tumour | 20 | 201 | 4.5 (2.1, 9.2) | 10.7 (6.0, 18.7) | | | | |
| Other (4) | 18 | 211 | 3.4 (1.6, 7.0) | 6.4 (3.8, 10.8) | 6.4 (3.8, 10.8) | 7.2 (4.3, 12.0) | 11.9 (7.3, 19.1) | |
| **TOTAL** | **589** | **5907** | | | | | | |

Note: Only primary diagnoses with >100 procedures have been listed

**Figure SPS7 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis**




| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| Fracture | 3181 | 2899 | 2424 | 2055 | 1687 | 1095 | 314 |
| Osteoarthritis | 1822 | 1648 | 1306 | 1032 | 806 | 509 | 172 |

Note: Only primary diagnoses with >1,000 procedures have been listed

**Table SPS28 Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis and Revision Diagnosis**

| Revision Diagnosis | Fracture | | | Osteoarthritis | | |
|---|---|---|---|---|---|---|
| | Number | % Primaries Revised | % Revisions | Number | % Primaries Revised | % Revisions |
| Rotator Cuff Insufficiency | 94 | 3.0 | 26.4 | 24 | 1.3 | 15.6 |
| Instability/Dislocation | 67 | 2.1 | 18.8 | 30 | 1.6 | 19.5 |
| Glenoid Erosion | 25 | 0.8 | 7.0 | 44 | 2.4 | 28.6 |
| Infection | 36 | 1.1 | 10.1 | 13 | 0.7 | 8.4 |
| Fracture | 34 | 1.1 | 9.6 | 6 | 0.3 | 3.9 |
| Loosening | 34 | 1.1 | 9.6 | 10 | 0.5 | 6.5 |
| Pain | 30 | 0.9 | 8.4 | 17 | 0.9 | 11.0 |
| Arthrofibrosis | 7 | 0.2 | 2.0 | 3 | 0.2 | 1.9 |
| Dissociation | 7 | 0.2 | 2.0 | 1 | 0.1 | 0.6 |
| Malposition | 7 | 0.2 | 2.0 | 1 | 0.1 | 0.6 |
| Lysis | 5 | 0.2 | 1.4 | | | |
| Incorrect Sizing | 2 | 0.1 | 0.6 | 3 | 0.2 | 1.9 |
| Heterotopic Bone | 1 | 0.0 | 0.3 | | | |
| Implant Breakage Glenoid | 1 | 0.0 | 0.3 | | | |
| Osteonecrosis | | | | 1 | 0.1 | 0.6 |
| Other | 6 | 0.2 | 1.7 | 1 | 0.1 | 0.6 |
| **N Revision** | **356** | **11.2** | **100.0** | **154** | **8.5** | **100.0** |
| **N Primary** | **3181** | | | **1822** | | |

**Figure SPS8 Cumulative Incidence Revision Diagnosis of Primary Hemi Stemmed Anatomic Shoulder by Primary Diagnosis**

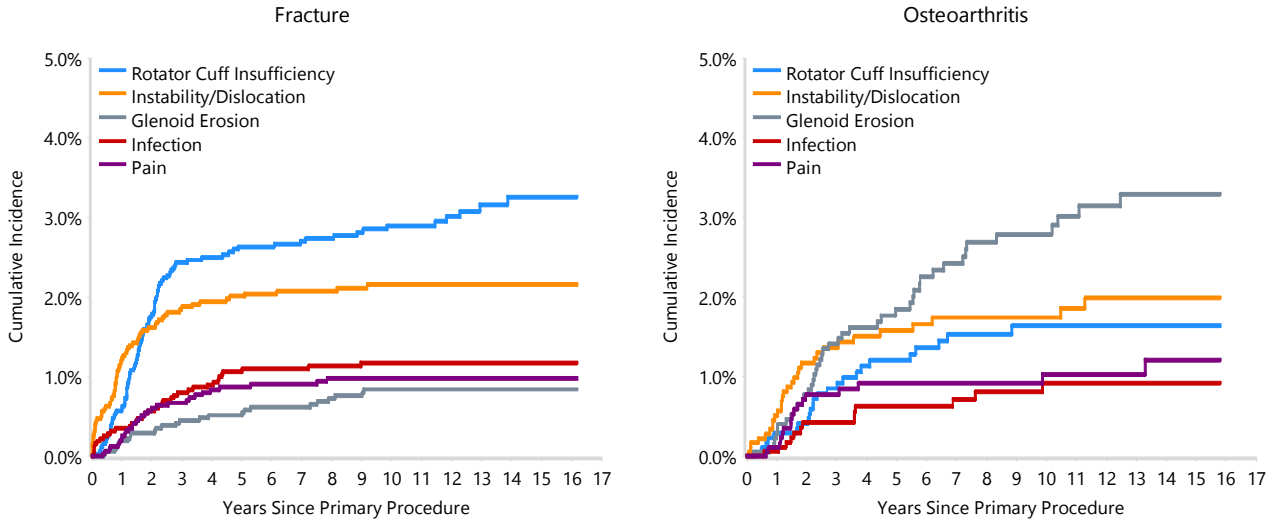


**Table SPS29 Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis and Type of Revision**

| Type of Revision | Fracture | | | Osteoarthritis | | |
|---|---|---|---|---|---|---|
| | Number | % Primaries Revised | % Revisions | Number | % Primaries Revised | % Revisions |
| Humeral/Glenoid | 259 | 8.1 | 72.8 | 95 | 5.2 | 61.7 |
| Glenoid Component | 16 | 0.5 | 4.5 | 36 | 2.0 | 23.4 |
| Humeral Component | 31 | 1.0 | 8.7 | 8 | 0.4 | 5.2 |
| Cement Spacer | 19 | 0.6 | 5.3 | 5 | 0.3 | 3.2 |
| Head Only | 17 | 0.5 | 4.8 | 3 | 0.2 | 1.9 |
| Removal of Prostheses | 8 | 0.3 | 2.2 | 1 | 0.1 | 0.6 |
| Cement Only | 4 | 0.1 | 1.1 | | | |
| Reoperation | 2 | 0.1 | 0.6 | 4 | 0.2 | 2.6 |
| Head/Insert | | | | 1 | 0.1 | 0.6 |
| Minor Components | | | | 1 | 0.1 | 0.6 |
| **N Revision** | **356** | **11.2** | **100.0** | **154** | **8.5** | **100.0** |
| **N Primary** | **3181** | | | **1822** | | |

## OUTCOME FOR FRACTURE

### Age and Gender

The rate of revision is lower for patients aged ≥75 years compared to all other age groups (Table SPS30 and Figure SPS9). Gender is not a risk factor for revision (Table SPS31 and Figure SPS10).

**Cemented fixation has a lower rate of revision than cementless fixation when a non-fracture stem is used.**

### Humeral Stem

There is no difference in the rate of revision for fracture humeral stems compared to non-fracture humeral stems (Table SPS32 and Figure SPS11).

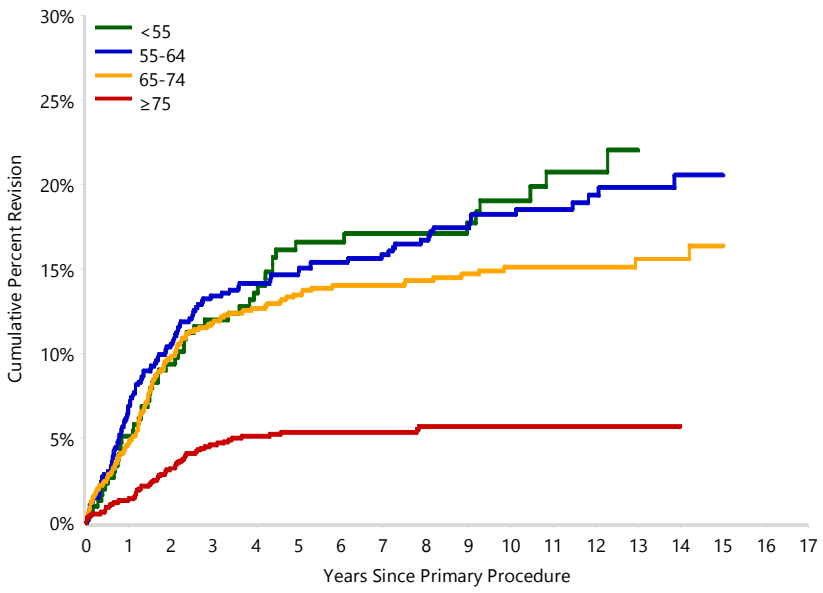
The use of cement for stem fixation in non-fracture hemiarthroplasty has a lower rate of revision than when a cementless non-fracture stem is used (Table SPS33 and Figure SPS12).

The outcomes for the most used prosthesis combinations for the treatment of fracture are listed in Table SPS34. The outcomes for individual fracture stems are presented separately in Table SPS35 and for non-fracture humeral stems in Table SPS36.

**Table SPS30 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Age (Primary Diagnosis Fracture)**

| Age | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| <55 | 52 | 303 | 5.1 (3.1, 8.3) | 12.0 (8.7, 16.4) | 16.6 (12.6, 21.6) | 17.1 (13.1, 22.2) | 19.1 (14.6, 24.6) | |
| 55-64 | 113 | 664 | 6.9 (5.2, 9.1) | 13.4 (11.0, 16.3) | 14.9 (12.3, 17.9) | 15.8 (13.2, 19.0) | 18.2 (15.3, 21.6) | 20.6 (17.1, 24.6) |
| 65-74 | 128 | 909 | 4.7 (3.5, 6.3) | 11.9 (9.9, 14.3) | 13.5 (11.4, 16.0) | 14.0 (11.9, 16.5) | 15.1 (12.8, 17.8) | 15.6 (13.2, 18.4) |
| ≥75 | 63 | 1305 | 1.4 (0.9, 2.3) | 4.6 (3.5, 6.0) | 5.3 (4.2, 6.8) | 5.3 (4.2, 6.8) | 5.7 (4.5, 7.3) | 5.7 (4.5, 7.3) |
| **TOTAL** | **356** | **3181** | | | | | | |

**Figure SPS9 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Age (Primary Diagnosis Fracture)**




HR - adjusted for gender

<55 vs ≥75

0 - 1.5Yr: HR=3.00 (1.81, 4.99), p<0.001

1.5Yr - 3.5Yr: HR=2.87 (1.53, 5.38), p=0.001

3.5Yr - 4.5Yr: HR=17.83 (7.14, 44.50), p<0.001

4.5Yr+: HR=4.52 (2.03, 10.07), p<0.001

55-64 vs ≥75

Entire Period: HR=3.44 (2.52, 4.69), p<0.001

65-74 vs ≥75

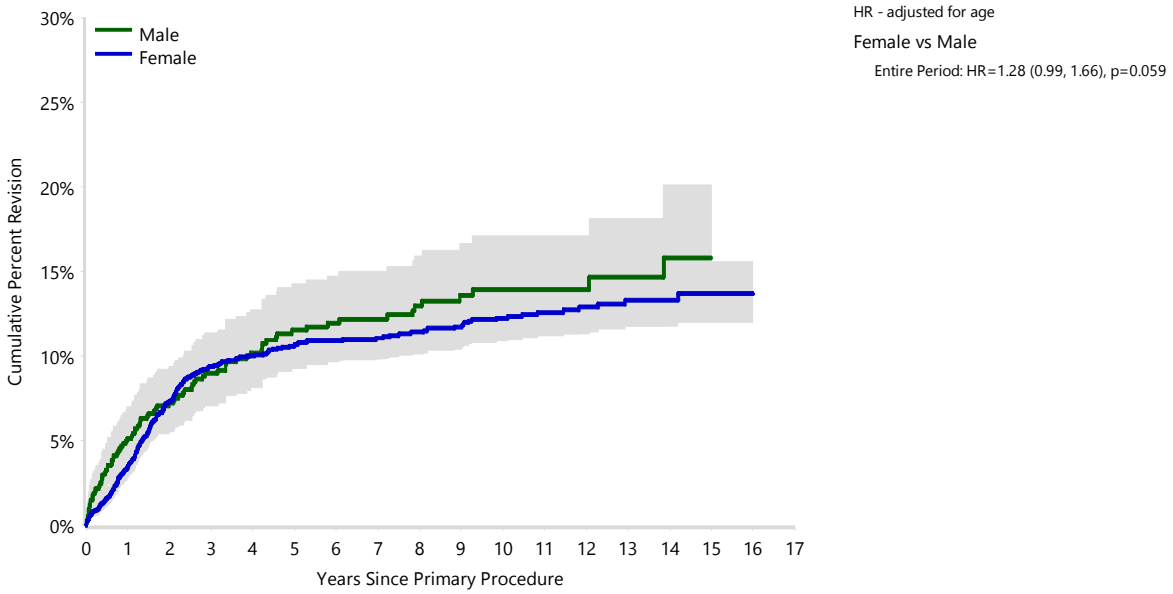
Entire Period: HR=2.77 (2.05, 3.75), p<0.001

| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| <55 | 303 | 270 | 231 | 187 | 158 | 113 | 37 |
| 55-64 | 664 | 596 | 502 | 456 | 393 | 270 | 102 |
| 65-74 | 909 | 839 | 714 | 640 | 556 | 389 | 115 |
| ≥75 | 1305 | 1194 | 977 | 772 | 580 | 323 | 60 |

**Table SPS31 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Gender (Primary Diagnosis Fracture)**

| Gender | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| Male | 87 | 745 | 5.1 (3.7, 7.0) | 9.0 (7.1, 11.4) | 11.5 (9.3, 14.3) | 12.2 (9.9, 15.0) | 13.9 (11.3, 17.1) | 15.8 (12.4, 20.1) |
| Female | 269 | 2436 | 3.5 (2.8, 4.3) | 9.4 (8.3, 10.7) | 10.7 (9.4, 12.0) | 11.1 (9.8, 12.4) | 12.2 (10.9, 13.8) | 13.3 (11.8, 15.0) |
| **TOTAL** | **356** | **3181** | | | | | | |

**Figure SPS10 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Gender (Primary Diagnosis Fracture)**

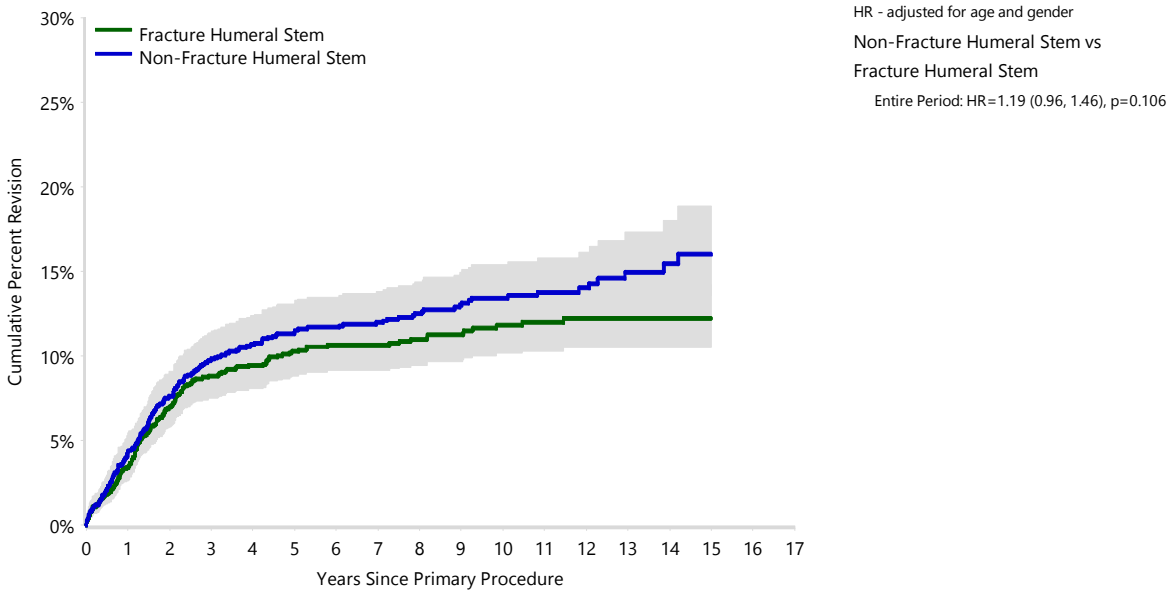



| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| Male | 745 | 651 | 547 | 443 | 352 | 221 | 70 |
| Female | 2436 | 2248 | 1877 | 1612 | 1335 | 874 | 244 |

**Table SPS32 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Stem Type (Primary Diagnosis Fracture)**

| Stem Type | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| Fracture Humeral Stem | 165 | 1588 | 3.4 (2.6, 4.4) | 8.8 (7.5, 10.4) | 10.3 (8.8, 12.0) | 10.6 (9.2, 12.4) | 11.8 (10.2, 13.7) | 12.2 (10.5, 14.2) |
| Non-Fracture Humeral Stem | 191 | 1593 | 4.3 (3.4, 5.5) | 9.8 (8.4, 11.5) | 11.4 (9.9, 13.2) | 12.0 (10.4, 13.8) | 13.4 (11.7, 15.4) | 15.4 (13.2, 18.0) |
| **TOTAL** | **356** | **3181** | | | | | | |

**Figure SPS11 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Stem Type (Primary Diagnosis Fracture)**

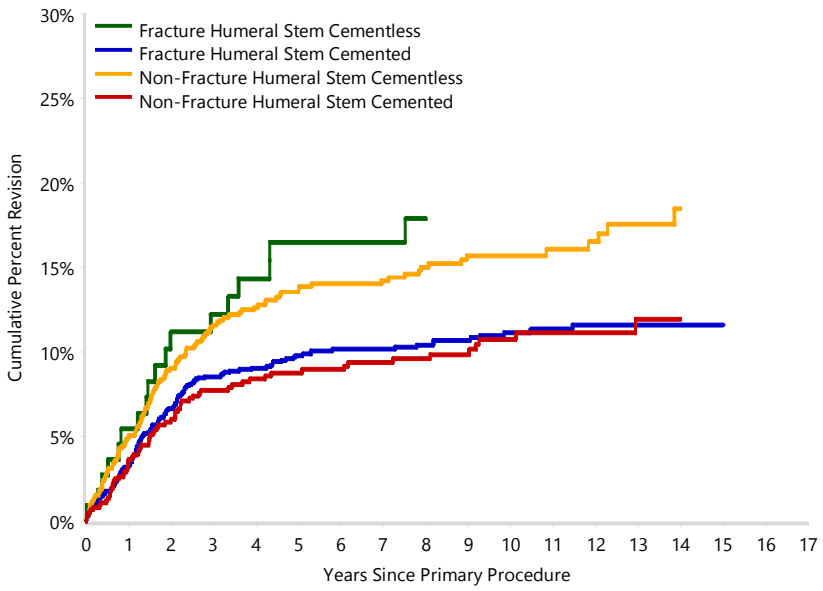



| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| Fracture Humeral Stem | 1588 | 1464 | 1228 | 1033 | 827 | 548 | 156 |
| Non-Fracture Humeral Stem | 1593 | 1435 | 1196 | 1022 | 860 | 547 | 158 |

**Table SPS33 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Stem Type and Humeral Fixation (Primary Diagnosis Fracture)**

| Stem Type | Humeral Fixation | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|---|
| Fracture Humeral Stem | Cementless | 19 | 110 | 5.5 (2.5, 11.7) | 12.2 (7.3, 20.1) | 16.5 (10.6, 25.3) | 16.5 (10.6, 25.3) | | |
| | Cemented | 146 | 1478 | 3.3 (2.5, 4.3) | 8.6 (7.2, 10.2) | 9.8 (8.3, 11.5) | 10.2 (8.7, 11.9) | 11.2 (9.5, 13.1) | 11.6 (9.9, 13.6) |
| Non-Fracture Humeral Stem | Cementless | 121 | 848 | 5.0 (3.7, 6.7) | 11.6 (9.6, 14.1) | 13.7 (11.5, 16.4) | 14.2 (11.9, 16.9) | 15.7 (13.2, 18.6) | 18.5 (15.1, 22.4) |
| | Cemented | 70 | 745 | 3.6 (2.5, 5.3) | 7.7 (6.0, 10.0) | 8.8 (6.9, 11.2) | 9.4 (7.4, 11.9) | 10.8 (8.5, 13.6) | 11.9 (9.2, 15.3) |
| **TOTAL** | | **356** | **3181** | | | | | | |

**Figure SPS12 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Stem Type and Humeral Fixation (Primary Diagnosis Fracture)**




HR - adjusted for age and gender

Fracture Humeral Stem Cementless vs Fracture Humeral Stem Cemented
Entire Period: HR=1.43 (0.88, 2.31), p=0.144

Fracture Humeral Stem Cementless vs Non-Fracture Humeral Stem Cementless
Entire Period: HR=1.00 (0.62, 1.63), p=0.984

Fracture Humeral Stem Cemented vs Non-Fracture Humeral Stem Cemented
Entire Period: HR=1.00 (0.76, 1.34), p=0.973

Non-Fracture Humeral Stem Cementless vs Non-Fracture Humeral Stem Cemented
Entire Period: HR=1.43 (1.07, 1.92), p=0.017

| Number at Risk | | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| Fracture Humeral Stem | Cementless | 110 | 102 | 84 | 74 | 63 | 28 | 4 |
| | Cemented | 1478 | 1362 | 1144 | 959 | 764 | 520 | 152 |
| Non-Fracture Humeral Stem | Cementless | 848 | 765 | 626 | 546 | 459 | 292 | 77 |
| | Cemented | 745 | 670 | 570 | 476 | 401 | 255 | 81 |

**Table SPS34 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Humeral Head and Humeral Stem (Primary Diagnosis Fracture)**

| Humeral Head | Humeral Stem | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|---|
| Aequalis | Aequalis | 40 | 472 | 2.8 (1.6, 4.8) | 7.1 (5.1, 9.9) | 7.9 (5.7, 10.9) | 8.2 (6.0, 11.2) | 9.0 (6.6, 12.2) | 10.4 (7.5, 14.3) |
| Affinis | Affinis | 7 | 49 | 6.4 (2.1, 18.4) | 13.4 (6.2, 27.5) | 16.1 (8.0, 31.0) | 16.1 (8.0, 31.0) | 16.1 (8.0, 31.0) | |
| Ascend Flex PyC | Ascend Flex | 3 | 40 | 5.7 (1.4, 20.8) | 10.1 (3.3, 29.2) | 10.1 (3.3, 29.2) | | | |
| Bigliani/Flatow | Bigliani/Flatow TM | 13 | 293 | 1.4 (0.5, 3.7) | 3.6 (2.0, 6.6) | 3.6 (2.0, 6.6) | 4.1 (2.3, 7.3) | 5.4 (3.1, 9.2) | |
| Bio-Modular | Comprehensive | 7 | 79 | 2.6 (0.6, 9.9) | 7.9 (3.6, 16.7) | 9.3 (4.6, 18.6) | 9.3 (4.6, 18.6) | 9.3 (4.6, 18.6) | |
| Comprehensive | Comprehensive | 10 | 99 | 5.3 (2.3, 12.3) | 11.3 (6.2, 20.1) | 11.3 (6.2, 20.1) | 11.3 (6.2, 20.1) | | |
| Equinoxe | Equinoxe | 5 | 38 | 8.1 (2.7, 23.1) | 14.1 (6.1, 30.7) | 14.1 (6.1, 30.7) | | | |
| Global Advantage | Global Advantage | 10 | 53 | 7.7 (2.9, 19.1) | 15.7 (8.1, 28.9) | 17.8 (9.7, 31.4) | 17.8 (9.7, 31.4) | 17.8 (9.7, 31.4) | 21.3 (11.8, 36.7) |
| | Global FX | 59 | 695 | 2.2 (1.3, 3.6) | 6.3 (4.6, 8.4) | 7.9 (6.0, 10.3) | 8.5 (6.5, 11.0) | 9.8 (7.6, 12.6) | 10.2 (7.9, 13.1) |
| Global Unite | Global Unite | 39 | 175 | 8.7 (5.3, 14.0) | 19.8 (14.5, 26.7) | 22.6 (16.9, 29.9) | 22.6 (16.9, 29.9) | | |
| SMR | SMR | 125 | 901 | 4.2 (3.1, 5.8) | 10.9 (8.9, 13.2) | 12.9 (10.8, 15.4) | 13.7 (11.5, 16.3) | 15.5 (13.1, 18.4) | 17.3 (14.3, 20.9) |
| SMR CTA | SMR | 7 | 46 | 9.5 (3.7, 23.4) | 15.9 (7.4, 32.4) | 19.9 (9.8, 38.0) | 19.9 (9.8, 38.0) | 19.9 (9.8, 38.0) | |
| Solar | Solar | 5 | 40 | 7.9 (2.6, 22.5) | 10.5 (4.1, 25.7) | 13.7 (5.9, 30.0) | 13.7 (5.9, 30.0) | 13.7 (5.9, 30.0) | 13.7 (5.9, 30.0) |
| Other (27) | | 26 | 201 | 5.2 (2.8, 9.4) | 11.6 (7.7, 17.3) | 13.0 (8.8, 19.0) | 13.0 (8.8, 19.0) | 13.9 (9.5, 20.1) | |
| **TOTAL** | | **356** | **3181** | | | | | | |

Note: Only combinations with >30 procedures have been listed

**Table SPS35 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Humeral Head and Fracture Stem (Primary Diagnosis Fracture)**

| Humeral Head | Fracture Stem | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|---|
| Aequalis | Aequalis | 38 | 454 | 2.7 (1.5, 4.7) | 7.2 (5.1, 10.1) | 8.0 (5.8, 11.1) | 8.3 (6.0, 11.4) | 9.1 (6.7, 12.5) | 9.7 (7.1, 13.2) |
| Affinis | Affinis | 7 | 46 | 6.7 (2.2, 19.4) | 14.1 (6.6, 28.8) | 17.0 (8.4, 32.5) | 17.0 (8.4, 32.5) | 17.0 (8.4, 32.5) | |
| Bio-Modular | Comprehensive | 7 | 79 | 2.6 (0.6, 9.9) | 7.9 (3.6, 16.7) | 9.3 (4.6, 18.6) | 9.3 (4.6, 18.6) | 9.3 (4.6, 18.6) | |
| Comprehensive | Comprehensive | 10 | 86 | 6.1 (2.6, 14.0) | 12.8 (7.1, 22.6) | 12.8 (7.1, 22.6) | 12.8 (7.1, 22.6) | 12.8 (7.1, 22.6) | |
| Equinoxe | Equinoxe | 3 | 30 | 3.4 (0.5, 22.1) | 11.1 (3.7, 30.6) | 11.1 (3.7, 30.6) | | | |
| Global Advantage | Global FX | 59 | 695 | 2.2 (1.3, 3.6) | 6.3 (4.6, 8.4) | 7.9 (6.0, 10.3) | 8.5 (6.5, 11.0) | 9.8 (7.6, 12.6) | 10.2 (7.9, 13.1) |
| Global Unite | Global Unite | 39 | 173 | 8.8 (5.4, 14.2) | 20.0 (14.7, 27.0) | 22.9 (17.1, 30.2) | 22.9 (17.1, 30.2) | | |
| Other (4) | | 2 | 25 | 0.0 (0.0, 0.0) | 9.1 (2.4, 31.9) | 9.1 (2.4, 31.9) | 9.1 (2.4, 31.9) | 9.1 (2.4, 31.9) | |
| **TOTAL** | | **165** | **1588** | | | | | | |

Note: Only combinations with >30 procedures have been listed

**Table SPS36 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Humeral Head and Non-Fracture Stem (Primary Diagnosis Fracture)**

| Humeral Head | Non Fracture Humeral Stem | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|---|
| Ascend Flex PyC | Ascend Flex | 3 | 40 | 5.7 (1.4, 20.8) | 10.1 (3.3, 29.2) | 10.1 (3.3, 29.2) | | | |
| Bigliani/Flatow | Bigliani/Flatow TM | 13 | 293 | 1.4 (0.5, 3.7) | 3.6 (2.0, 6.6) | 3.6 (2.0, 6.6) | 4.1 (2.3, 7.3) | 5.4 (3.1, 9.2) | |
| Global Advantage | Global Advantage | 10 | 53 | 7.7 (2.9, 19.1) | 15.7 (8.1, 28.9) | 17.8 (9.7, 31.4) | 17.8 (9.7, 31.4) | 17.8 (9.7, 31.4) | 21.3 (11.8, 36.7) |
| SMR | SMR | 125 | 901 | 4.2 (3.1, 5.8) | 10.9 (8.9, 13.2) | 12.9 (10.8, 15.4) | 13.7 (11.5, 16.3) | 15.5 (13.1, 18.4) | 17.3 (14.3, 20.9) |
| SMR CTA | SMR | 7 | 46 | 9.5 (3.7, 23.4) | 15.9 (7.4, 32.4) | 19.9 (9.8, 38.0) | 19.9 (9.8, 38.0) | 19.9 (9.8, 38.0) | |
| Solar | Solar | 5 | 40 | 7.9 (2.6, 22.5) | 10.5 (4.1, 25.7) | 13.7 (5.9, 30.0) | 13.7 (5.9, 30.0) | 13.7 (5.9, 30.0) | 13.7 (5.9, 30.0) |
| Other (29) | | 28 | 220 | 6.2 (3.6, 10.4) | 11.1 (7.4, 16.3) | 12.4 (8.4, 17.9) | 12.4 (8.4, 17.9) | 13.2 (9.0, 19.0) | |
| **TOTAL** | | **191** | **1593** | | | | | | |

Note: Only combinations with >30 procedures have been listed

## OUTCOME FOR OSTEOARTHRITIS

### Age and Gender

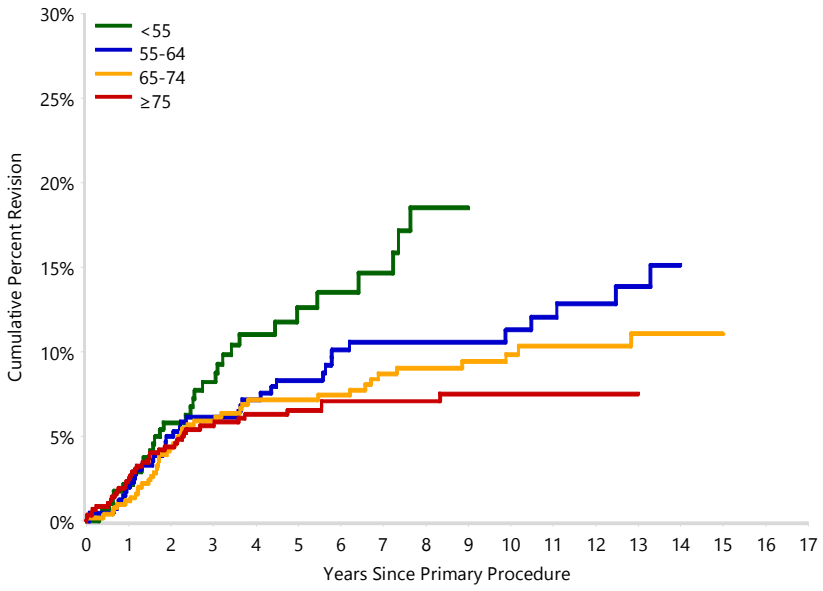
The rate of revision is lower for patients aged ≥75 years compared to patients aged <55 years after 2.5 years, and when compared to the 55-64 year age group after 2 years. There is no difference in the rate of revision when patients aged ≥75 years and 65-74 years are compared (Table SPS37 and Figure SPS13).

Gender is not a risk factor for revision (Table SPS38 and Figure SPS14).
The outcomes of the most used prosthesis combinations for osteoarthritis are listed in Table SPS39.

**Table SPS37 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)**

| Age | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| <55 | 34 | 304 | 2.1 (1.0, 4.7) | 8.2 (5.4, 12.5) | 12.6 (8.7, 18.1) | 14.6 (10.1, 20.9) | | |
| 55-64 | 40 | 426 | 2.0 (1.0, 4.0) | 6.2 (4.1, 9.1) | 8.3 (5.8, 11.8) | 10.6 (7.6, 14.7) | 11.3 (8.1, 15.6) | 15.1 (10.7, 21.2) |
| 65-74 | 43 | 522 | 1.2 (0.5, 2.6) | 5.9 (4.1, 8.4) | 7.2 (5.1, 9.9) | 8.7 (6.4, 11.8) | 9.9 (7.3, 13.3) | 11.1 (8.1, 15.0) |
| ≥75 | 37 | 570 | 2.5 (1.5, 4.2) | 5.6 (4.0, 8.0) | 6.5 (4.7, 9.0) | 7.1 (5.1, 9.7) | 7.5 (5.5, 10.3) | |
| **TOTAL** | **154** | **1822** | | | | | | |

**Figure SPS13 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)**




HR - adjusted for gender

<55 vs ≥75

0 - 1.5Yr: HR=1.64 (0.78, 3.45), p=0.191

1.5Yr - 2.5Yr: HR=1.61 (0.62, 4.13), p=0.325

2.5Yr+: HR=5.54 (2.83, 10.84), p<0.001

55-64 vs ≥75

0 - 1.5Yr: HR=1.27 (0.63, 2.53), p=0.504

1.5Yr - 2Yr: HR=1.76 (0.64, 4.82), p=0.269

2Yr+: HR=2.16 (1.18, 3.95), p=0.012

65-74 vs ≥75

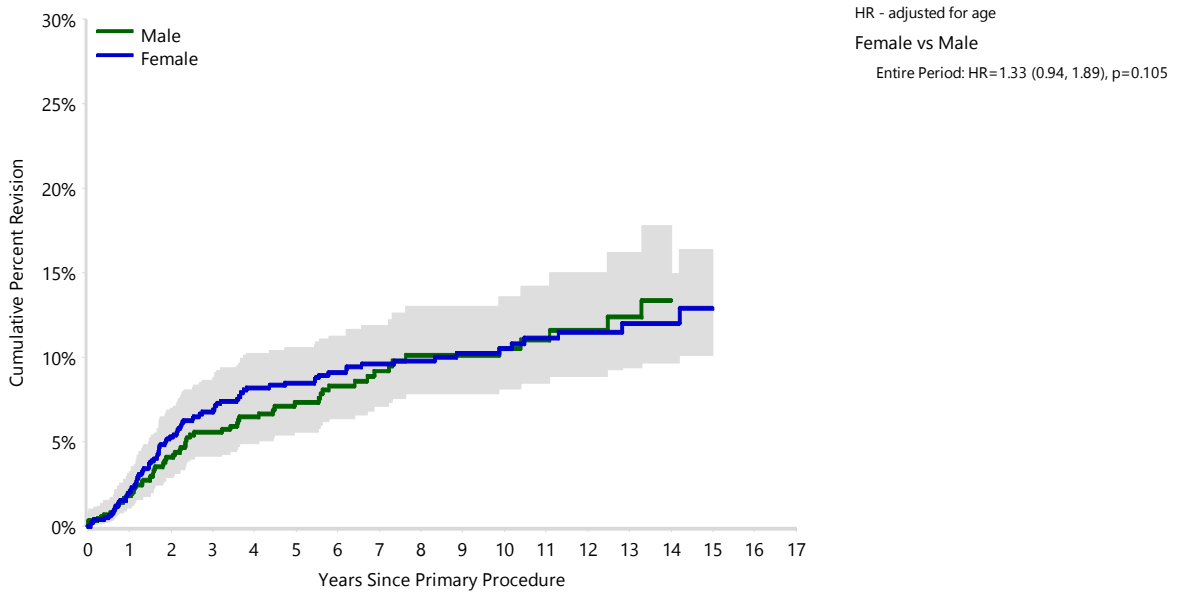
Entire Period: HR=1.27 (0.82, 1.98), p=0.284

| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| <55 | 304 | 257 | 175 | 104 | 70 | 38 | 16 |
| 55-64 | 426 | 381 | 300 | 217 | 175 | 129 | 47 |
| 65-74 | 522 | 484 | 390 | 334 | 283 | 203 | 81 |
| ≥75 | 570 | 526 | 441 | 377 | 278 | 139 | 28 |

**Table SPS38 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Gender (Primary Diagnosis OA)**

| Gender | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|
| Male | 66 | 881 | 1.8 (1.1, 3.0) | 5.6 (4.1, 7.5) | 7.3 (5.6, 9.6) | 9.2 (7.1, 11.9) | 10.5 (8.2, 13.6) | 13.4 (10.0, 17.8) |
| Female | 88 | 941 | 2.1 (1.3, 3.2) | 6.8 (5.3, 8.6) | 8.5 (6.8, 10.6) | 9.6 (7.8, 11.9) | 10.5 (8.5, 13.0) | 12.0 (9.6, 14.9) |
| TOTAL | 154 | 1822 | | | | | | |

**Figure SPS14 Cumulative Percent Revision of Primary Hemi Stemmed Shoulder Replacement by Gender (Primary Diagnosis OA)**




| Number at Risk | 0 Yr | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|
| Male | 881 | 774 | 574 | 407 | 307 | 200 | 63 |
| Female | 941 | 874 | 732 | 625 | 499 | 309 | 109 |

**Table SPS39 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Humeral Head and Humeral Stem (Primary Diagnosis OA)**

| Humeral Head | Humeral Stem | N Revised | N Total | 1 Yr | 3 Yrs | 5 Yrs | 7 Yrs | 10 Yrs | 14 Yrs |
|---|---|---|---|---|---|---|---|---|---|
| Aequalis | Aequalis | 11 | 140 | 1.4 (0.4, 5.7) | 5.2 (2.5, 10.5) | 6.0 (3.0, 11.6) | 8.8 (4.9, 15.4) | 8.8 (4.9, 15.4) | |
| Ascend Flex | Ascend Flex | 0 | 21 | 0.0 (0.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (0.0, 0.0) | | |
| Ascend Flex PyC | Ascend Flex | 19 | 563 | 0.6 (0.2, 1.8) | 3.1 (1.8, 5.3) | 5.8 (3.5, 9.7) | 7.0 (4.1, 11.9) | | |
| Bigliani/Flatow | Bigliani/Flatow TM | 5 | 53 | 3.8 (1.0, 14.3) | 7.5 (2.9, 18.9) | 7.5 (2.9, 18.9) | 10.0 (4.3, 22.6) | 10.0 (4.3, 22.6) | |
| Comprehensive | Comprehensive | 3 | 29 | 0.0 (0.0, 0.0) | 9.3 (2.4, 32.4) | 9.3 (2.4, 32.4) | 16.9 (5.5, 45.2) | 16.9 (5.5, 45.2) | |
| Delta Xtend | Delta Xtend | 3 | 33 | 3.0 (0.4, 19.6) | 9.9 (3.3, 27.7) | 9.9 (3.3, 27.7) | 9.9 (3.3, 27.7) | 9.9 (3.3, 27.7) | |
| Equinoxe | Equinoxe | 4 | 20 | 5.3 (0.8, 31.9) | 27.0 (10.8, 58.2) | 27.0 (10.8, 58.2) | | | |
| Global AP | Global AP | 12 | 168 | 0.6 (0.1, 4.1) | 4.2 (2.0, 8.6) | 6.1 (3.3, 11.0) | 6.8 (3.8, 11.9) | 6.8 (3.8, 11.9) | |
| Global AP CTA | Global AP | 5 | 50 | 2.0 (0.3, 13.4) | 10.6 (4.6, 23.7) | 10.6 (4.6, 23.7) | 10.6 (4.6, 23.7) | 10.6 (4.6, 23.7) | |
| Global Advantage | Global Advantage | 17 | 144 | 0.7 (0.1, 4.8) | 5.0 (2.4, 10.2) | 7.3 (4.0, 13.1) | 8.1 (4.6, 14.1) | 10.9 (6.6, 17.8) | 14.5 (9.1, 22.6) |
| | Global FX | 4 | 31 | 3.2 (0.5, 20.8) | 10.0 (3.3, 28.1) | 10.0 (3.3, 28.1) | 10.0 (3.3, 28.1) | 15.7 (5.9, 37.8) | |
| Global Advantage CTA | Global Advantage | 1 | 39 | 0.0 (0.0, 0.0) | 0.0 (0.0, 0.0) | 0.0 (0.0, 0.0) | 3.8 (0.6, 24.3) | 3.8 (0.6, 24.3) | 3.8 (0.6, 24.3) |
| Global Unite | Global Unite | 1 | 28 | 0.0 (0.0, 0.0) | 4.2 (0.6, 26.1) | 4.2 (0.6, 26.1) | 4.2 (0.6, 26.1) | | |
| SMR | SMR | 47 | 277 | 4.1 (2.3, 7.2) | 9.7 (6.7, 14.0) | 13.3 (9.7, 18.1) | 15.5 (11.6, 20.6) | 17.1 (13.0, 22.4) | 19.6 (14.8, 25.7) |
| SMR CTA | SMR | 10 | 104 | 5.9 (2.7, 12.6) | 10.2 (5.6, 18.2) | 10.2 (5.6, 18.2) | 10.2 (5.6, 18.2) | | |
| Other (24) | | 12 | 122 | 3.3 (1.3, 8.6) | 7.8 (4.1, 14.4) | 8.8 (4.8, 15.8) | 8.8 (4.8, 15.8) | 10.8 (5.9, 19.4) | |
| **TOTAL** | | **154** | **1822** | | | | | | |

Note: Only combinations with >20 procedures have been listed

# List of Tables



# List of Figures

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