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Brief communication

Highlights of the 2019 American Joint Replacement Registry Annual Report

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ABSTRACT

The 2019 American Joint Replacement Registry shows continued growth in cases and data recorded. There are several trends noted in the registry that have been highlighted in this brief communication. More granular data collection is projected for future reports that may shed light on specific procedure and device survivorship and patient-reported outcomes. The authors encourage you to read the full report, available at the following link: http://ajrr.net/publications-data/annual-reports.

In November of 2019, the American Joint Replacement Registry (AJRR) published their annual report on participating institution procedures between 2012 and 2018. There has been substantial growth in reporting with more than 1200 enrolled sites and greater than 1.5 million hip and knee arthroplasty procedures. In the current report, greater attention toward capturing ambulatory surgery center procedures, collecting patient-reported outcomes, and longitudinal tracking of outcomes was prioritized to enhance data collection. The AJRR updated the data specification and dictionary, leading to improvements in collection of procedural and postoperative data. To fill in data gaps, the AJRR was able to match more than 790,000 Medicare files out of the 1.2 million files submitted and more than 26,000 records from the National Death Index. This has led to a high level of completeness for standard data elements, Table 1.

The 2019 AJRR report includes data from more than 5000 surgeons with varying procedural volumes, Table 2 for hip and Table 3 for knees. The number of procedures increased by 28.5% from the 2018 to the 2019 reports. The distribution of procedures was reported as the following: 55.1% primary total knee arthroplasty (TKA)—of which 2.2% of these cases were medial or lateral unicompartmental knee arthroplasties, 33.1% primary total hip arthroplasty (THA), 4.6% hemiarthroplasty, 3.9% revision TKA, 3.0% revision THA, and 0.3% hip resurfacing. There remains a predominance of procedures being performed in female patients (59.0%) and a disparity in ethnic representation with 72.1% being Caucasian, 5.0% African American, and 1.0% Asian. The procedural volumes collected from ambulatory surgery centers have raised from 5 in 2012 to 1436 in 2018. This may partially contribute to declining revision burden demonstrated in the registry data, Table 3. The following are some highlights of relevant data from the 2019 AJRR annual report.

THA highlights

The average age distribution included 80.8 years for hemiarthroplasty, 65.6 years for primary hip arthroplasty, 53.4 years for hip resurfacing, 67.3 years for hip revision, and 72.4 years for hip arthroplasty for hip fracture.

- The average length of stay after primary THA continued to decrease to 1.9 days, whereas that for hemiarthroplasty (5.3 days) and THA for fracture (4.5 days) remained relatively constant
- The number of THAs for displaced femoral neck fractures continued to increase to just more than 25% of cases up from 19.6% in 2012.
- Unipolar heads for hemiarthroplasty increased to 44.5% with a greater prevalence in patients older than 80 years.
- There has been a slight reversal in the trend for cementless femoral fixation for managing hip fractures, with an increase in cemented hemiarthroplasties and THAs in the last 3 years (the percentage of cemented stems increases with each advancing decade of life).

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Table 1
Completeness of the AJRR data elements (N = 1,525,435).

Data Elements	% of cases with accepted value	% of cases with missing value	% of cases with invalid value
Date of Birth	100.00%	0.00%	0.00%
Sex	100.00%	0.00%	0.00%
Race	98.70%	0.00%	1.30%
Ethnicity	99.10%	0.00%	0.90%
City	88.40%	11.60%	0.00%
State	100.00%	0.00%	0.00%
First Implant Catalog # Listed	100.00%	0.00%	0.00%
Implant Lot #	93.10%	6.90%	0.00%
Unique Device Identification (UDI)	31.50%	68.50%	0.00%
Procedure Date	100.00%	0.00%	0.00%
Principal Diagnosis Code	90.10%	0.00%	9.90%
Laterality	99.70%	0.10%	0.20%
Procedure Site	100.00%	0.00%	0.00%
Body Mass Index (BMI)[a]	91.40%	0.00%	8.60%
Comorbidity - at least one comorbidity code reported[a]	100.00%	0.00%	0.00%
Anesthesia Type[a]	97.00%	1.50%	1.40%
Computer navigation (Y/N)[a]	Y - 3.4% N - 95.6%	0.00%	1.00%
Robotic assisted (Y/N)[a]	Y - 3.3% N - 95.8%	0.0%	0.90%
Surgical approch[a]	61.00%	1.90%	37.70%
Periarticular injection[a]	99.10%	0.00%	0.90%
Discharge disposition[a]	99.10%	0.00%	0.90%
Length of stay[a]	98.20%	1.70%	0.00%
Procedure duration[a]	98.10%	1.70%	0.20%

[a] Data element collection started in February 2017.

- Hip resurfacing has declined from 3.2% in 2012 to 0.4% in 2018, with 72% of these cases being completed by 6 surgeons and more than 25% by a single physician.
- The use of dual-mobility heads has increased to almost 7% of primary cases, with 32-mm heads decreasing to 22.8%, 36-mm heads increasing to 63%, and 28-mm heads dropping over 50% to 2.4% during the full length of AJRR data collection.
- There has been a near-complete turnaround in the use of ceramic heads vs cobalt chrome, 38.7% to 67.3% increase, and 61.3% to 32.7% decrease in ceramic and cobalt chrome femoral head use from 2012 to 2018.
- Conventional polyethylene has almost completely dropped out of use in the current report, while antioxidant polyethylene usage continues to rise, from 6.3% to 14.4% regardless of the femoral head material used.
- Survivorship rates (adjusted for age, sex, and patients older than 65 years) are as follows:
  - The order of survivorship for the femoral head diameter was 36 mm > 32 mm > 40 mm (or larger) > 28 mm—36 mm compared with 28 mm, which did show a significant improvement in survivorship.
  - Conventional femoral heads had a greater survivorship than dual-mobility heads for primary THA.
  - Cementless stems had a greater survivorship than cemented stems for primary THA.
  - Smoking status impacted survivorship with a revision rate 1.5 times higher for patients who currently smoke vs those who had never smoked.
- For revision THA, the most common etiologies include the following: instability (19.1%), aseptic loosening (17.4%), other (17.1%), mechanical complications (15%), and infection (13.3%).
- In cases with linked (initial and revision cases logged into the AJRR) early revisions, the most common etiologies included the following: infection (23%), instability (19.7%), fracture or related sequelae (16.6%), other (15.8%), periprosthetic fracture (15.5%), and aseptic loosening (5.3%).

TKA Highlights

The average age distribution included 67 years for primary TKA, 64.2 years for partial knee arthroplasty, and 65.6 years for knee revision.

- The average length of stay after primary TKA and partial knee arthroplasty continued to decrease to 2.0 and 1.1 days, respectively, whereas that after revision TKA increased to 3.5 days.
- There has been some growth in ultracongruent and cruciate-retaining bearings in primary TKA with mild increases to 4.5% and 43.8% of cases, respectively (posterior stabilized has decreased to 51.6% of cases and constrained implants are stable at 0.1%).

Table 2
Average hip procedural volume for participating surgeons.

Procedure	Total surgeons	Total procedures	Per surgeon mean	Per surgeon median	Interquartile range (25th percentile-75th percentile)
Elective primary total hip arthroplasty[a]	2,911	93,122	32.0	13	2-39
Total hip arthroplasty for fracture	966	2,277	2.4	1	1-2
Hemiarthoplasty for fracture	2,499	6,884	2.8	1	1-3
Revision hip arthroplasty	1,279	4,336	3.4	2	1-4
Hip resurfacing	45	388	8.6	3	1-5

[a] Procdures for conversion of previous non-arthroplasty hip Surgery to total hip arthroplasty were excluded.

Table 3
Average knee procedural volume for participating surgeons.

Procedure	Total surgeons	Total procedures	Per surgeon mean	Per surgeon median	Interquartile range (25th percentile-75th percentile)
Total knee arthroplasty	3,113	139,582	44.8	23	7-56
Partial knee arthroplasty	939	4,603	4.9	2	1-4
Revision knee arthroplasty	1,959	10,507	5.4	3	1-6

- Mobile-bearing primary TKAs have varied between 7 and 9% over the data collection but has recently declined to 7% use in 2018.
- Survivorship rates (adjusted for age, sex, and patients older than 65 years) are as follows:
  - In light of some possible confounders, cruciate-retaining primary TKAs have shown a less than 1% improved survivorship over posterior-stabilized designs.
  - TKAs with a resurfaced patella had a higher survivorship than cases that were not resurfaced, although there were far more cases of resurfacing in the AJRR data (>88,000 vs >4000 cases).
  - No difference in survivorship was found between cemented and uncemented TKA cases.
  - Smoking status impacted survivorship with a revision rate 1.48 times higher for patients who currently smoke vs those who had never smoked.
  - TKA had a better survivorship than unicompartmental procedures.
- Antioxidant polyethylene use has significantly increased from 2012 (2.5%) to 2018 (23.2%) in primary TKA cases.
- Patella resurfacing occurs in 90.6% of cases, which represents a downward trend from the high in 2012 (93.6%).
- Cementless TKA saw an increase over time from 5.9% to 8.4% in the AJRR data.
- The number of surgeons performing partial knee arthroplasty was relatively low, with 2.9% and 15.9% of physicians documenting they perform patellofemoral arthroplasty or medial and/or lateral unicompartmental knee arthroplasties (this represents a significant decrease over time).
- For revision TKA, the most common etiologies include the following: mechanical loosening (25%), other mechanical complications (22.5%), infection (20.5%), other (14.2%), and instability (12.6%).
- In cases with linked (initial and revision cases logged into the AJRR) early revisions, the most common etiologies included the following: infection (63.2%), other (15.6%), mechanical complications (7.4%), instability (16.7%), fracture or fracture-related sequelae (3.9%), and aseptic loosening (2.8%).

Patient-reported outcomes are now being collected at a greater rate, and it is hopeful that a more granular look at the success of our hip and knee procedures is coming in the near future. In addition, implant-specific survivorship was initially reported in the supplement of the AJRR report; however, this was out of the scope of this report on the AJRR highlights. Overall, the data for "linked" outcomes are becoming more robust, affording a deeper dive into specific procedure and implant survivorship with the upcoming AJRR reports. We look forward to the 2020 AJRR report as this document continues to provide higher quality data each year on important THA and TKA trends. The complete 2019 report can be found at the following link: http://ajrr.net/publications-data/annual-reports.

Conflict of interests

B. Levine is a paid consultant for Link, Exactech, and Merete, receives institutional support from Zimmer Biomet, receives royalties, financial, or material support from Human Kinetics and Slack Inc., is a member of the editorial/governing board of the JOA, AT (deputy editor), and Orthopedics, and is a board/committee for the AAHKS (the patient education and research committees), the AAOS (the Hip and knee evaluation committee), and the MAOA (the education committee); G.J. Golladay receives research support from OrthoSensor, Inc, is a member of the speakers' bureau of OrthoSensor, Inc, is a paid consultant for a company OrthoSensor, Inc, holds stock ownership in OrthoSensor, Inc, receives research support from OrthoSensor, Inc, OrthoSensor, Inc, KCI, Inc, and Cerus, receives royalties, financial support, or material support from *Arthroplasty Today*, is a member of the editorial/governing board of the *Arthroplasty Today* and the *Journal of Arthroplasty*, and is a member of the AAHKS Publications Committee and Virginia Orthopaedic Society Board; B.D. Springer receives royalties from Stryker and Osteoremedies, is a paid consultant for Convatec and Joint purification systems (medical advisory board), is a member of the editorial/governing board of *Arthroplasty Today*, and is a board/committee for the AJRR, ICJR, and AAHKS; Allison D and J.A. Byrd declare no potential conflicts of interest.