AAOS
American Academy of Orthopaedic Surgeons

AJRR American Joint Replacement Registry

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

- American Association of Hip and Knee Surgeons: Board or committee member
- American Joint Replacement Registry (AAOS): Board or committee member
- DJO Surgical: IP royalties; Paid consultant
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- Journal of Arthroplasty: Editorial or governing board; Publishing royalties, financial or material support
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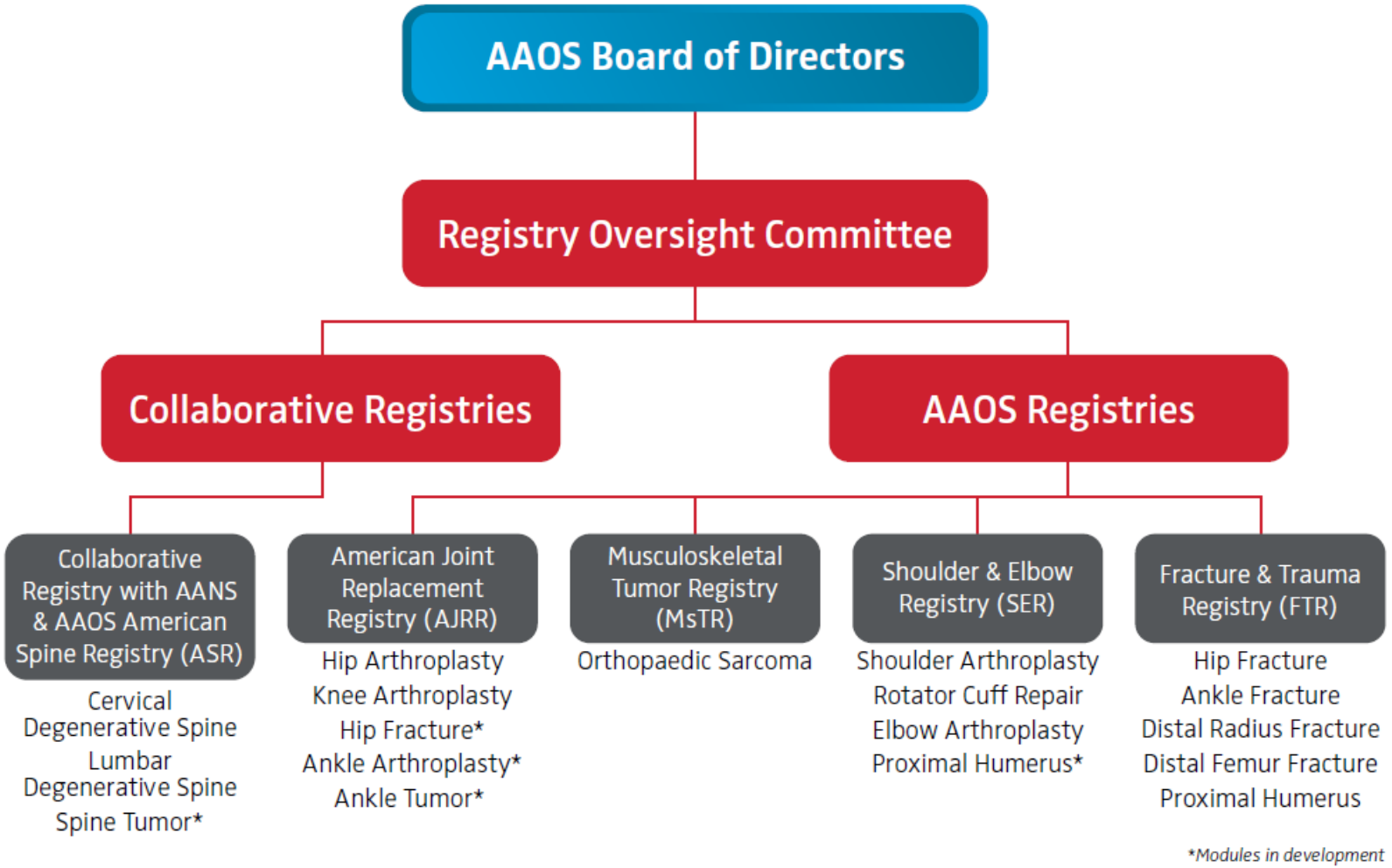
AAOS Family of Registries



*Modules in development

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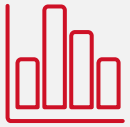
Why Do Sites Participate?



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

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

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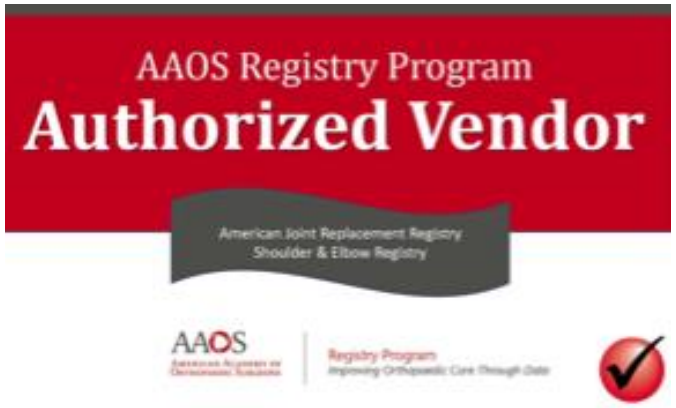
Data Reuse Opportunities

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.

- The Joint Commission (TJC) Advanced Certification for Total Hip and Total Knee Replacement
- American Board of Orthopaedic Surgery (ABOS) Maintenance of Certification (MOC) program for Part II Self-Assessment Examination (SAE) credit
- Centers for Medicare & Medicaid Services (CMS) Bundled Payments for Care Improvement Advanced (BPCI-A) for the 2022 reporting year
- CMS Comprehensive Care for Joint Replacement (CJR) Model
- CMS Merit-based Incentive Payment System (MIPS) Promoting Interoperability (PI) and Quality Payment Program (QPP)
- Accreditation Association for Ambulatory HealthCare (AAAHC) Advanced Orthopaedic Certification
- Aetna Institutes of Quality (IOQ) Orthopaedic Surgery
- BlueCross BlueShield Blue Distinction Specialty Care
- Blue Shield of California waiver of prior authorization for their patients' hip or knee replacement procedures
- Bree Collaborative
- Cigna Surgical Treatment Support Program
- Det Norske Veritas & Germanischer Lloyd (DNV GL) Orthopaedic Center of Excellence
- The Alliance QualityPath



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

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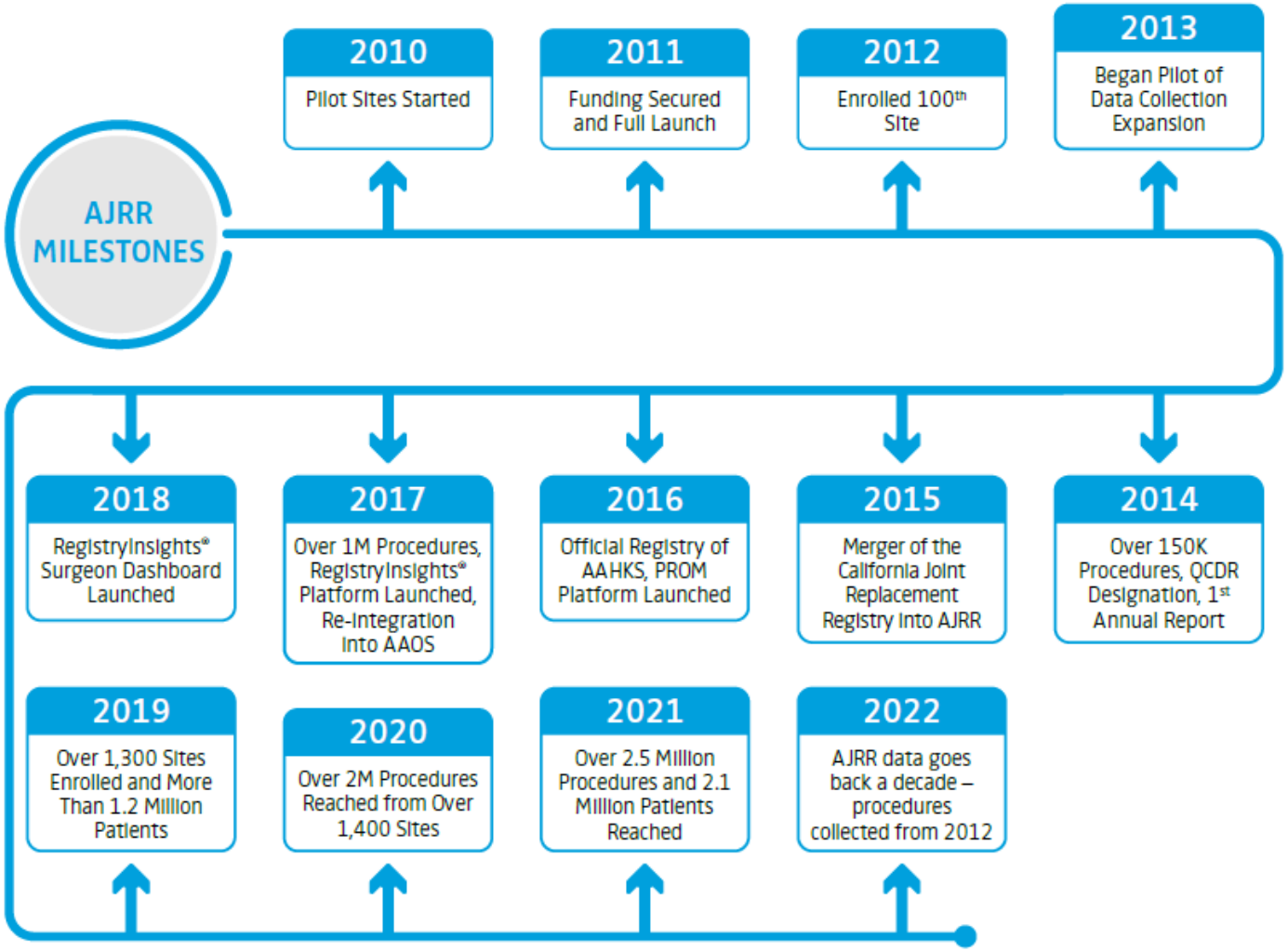
About AJRR


AJRR MILESTONES
2010
Pilot Sites Started
2011
Funding Secured and Full Launch
2012
Enrolled 100th Site
2013
Began Pilot of Data Collection Expansion
2014
Over 150K Procedures, QCDR Designation, 1st Annual Report
2015
Merger of the California Joint Replacement Registry into AJRR
2016
Official Registry of AAHKS, PROM Platform Launched
2017
Over 1M Procedures, RegistryInsights® Platform Launched, Re-integration into AAOS
2018
RegistryInsights® Surgeon Dashboard Launched
2019
Over 1,300 Sites Enrolled and More Than 1.2 Million Patients
2020
Over 2M Procedures Reached from Over 1,400 Sites
2021
Over 2.5 Million Procedures and 2.1 Million Patients Reached
2022
AJRR data goes back a decade – procedures collected from 2012

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- **Jeffrey B. Stambough, MD, FAAOS**
  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)

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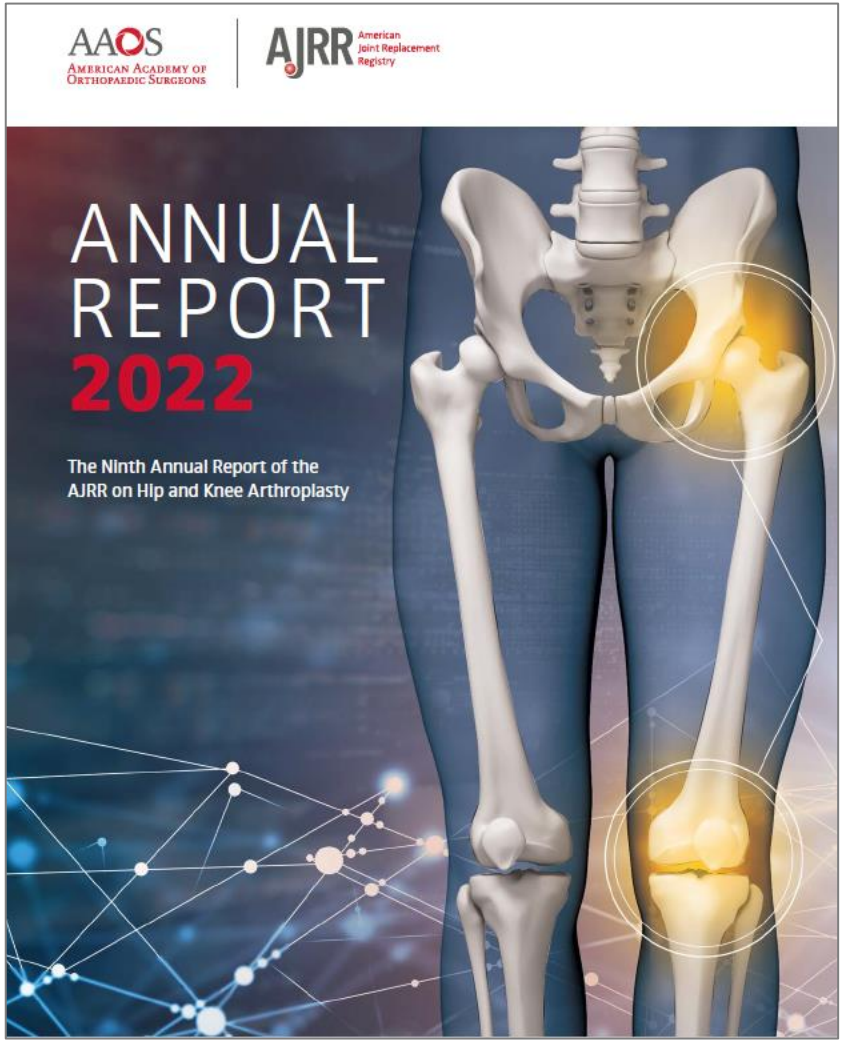
This page is a summary of the AJRR data elements and is not all inclusive.

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)

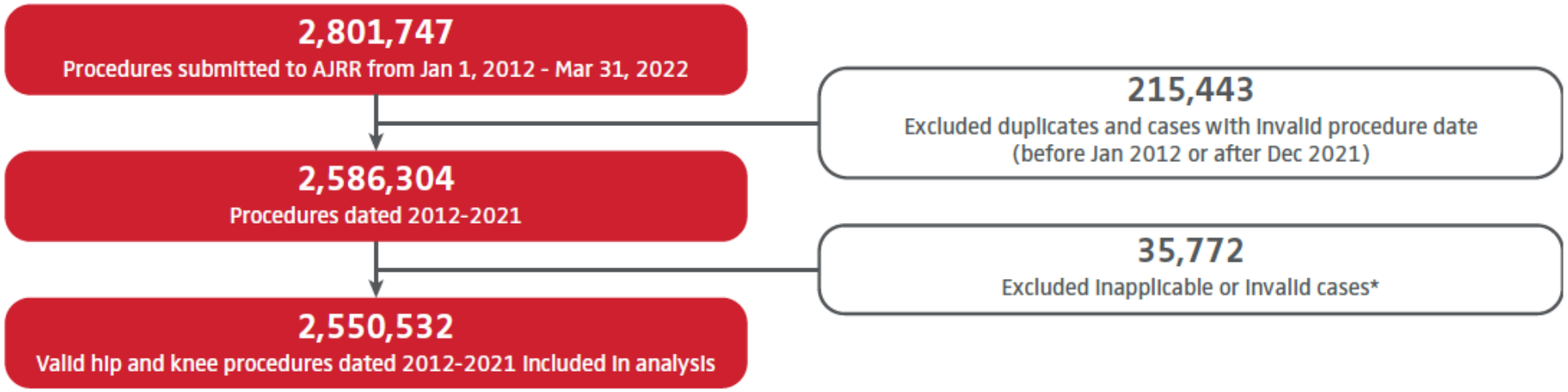
2022 AJRR Annual Report

- 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



Download the 2022 Annual Report and Annual Report Supplement: www.aaos.org/registries/publications

AJRR Annual Report Overview



**Invalid data=joint procedures not in the hip or knee, procedure codes outside of approved AJRR data specifications, and hemiarthroplasty procedures without a diagnosis of femoral neck fracture.*

- 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

Specifications Version	Element	% Reported	% NR	% Invalid
AJRR Data 2012 - 2022Q1 (N=2,637,325)				
All Versions	Surgeon Information	99.7	0.0	0.3
	Principal Procedure Code	99.9	0.0	0.1
	Principal Diagnosis Code	94.2	0.0	5.9
	First Implant Catalog # Listed	93.9	0.0	6.1
	First Implant Lot # Listed	91.7	0.0	8.3
	Incision Start Time (Procedure Start Time)	70.3	28.5	1.3
	Skin Closure Time (Procedure End Time)	70.4	28.4	1.2
	Ethnicity	83.4	16.2	0.3
	Race	85.4	14.2	0.4
	Date of Birth	100.0	0.0	0.0
	Sex	99.7	0.4	0.0
	City	93.5	6.5	0.0
	State	94.5	5.5	0.0
	Zip Code	95.0	0.0	5.0
AJRR Data 2012 - 2022Q1 Using 2017 or Newer Specifications (N=1,405,742)				
2017-2021 Versions	Comorbidity - at least one code reported	74.0	24.9	1.1
	Body Mass Index (BMI)	89.6	0.0	10.4
	Discharge Disposition Code	92.7	6.2	1.1
	Admission Date	97.8	2.2	0.0
	Discharge Date	97.8	2.2	0.0
	Length Of Stay	97.8	0.0	2.2
	Surgical Approach (Hip/Knee)	14.0	80.8	5.2
	Computer Navigation	32.9	66.4	0.8
	Robotic Assisted	39.1	60.8	0.1
	Anesthesia Type	65.5	28.1	6.4
	Periarticular Injection	19.6	80.1	0.3
	ASA Classification	26.7	72.9	0.4

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.

Figure 1.1 Hospital Case Volume by Month, Jul 2019 - Dec 2021

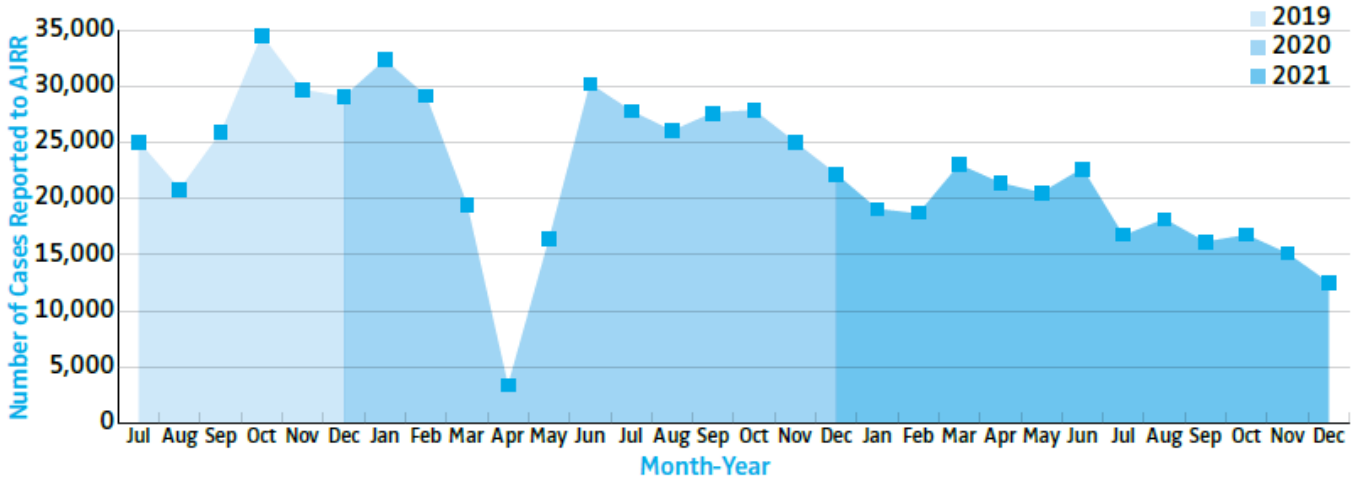
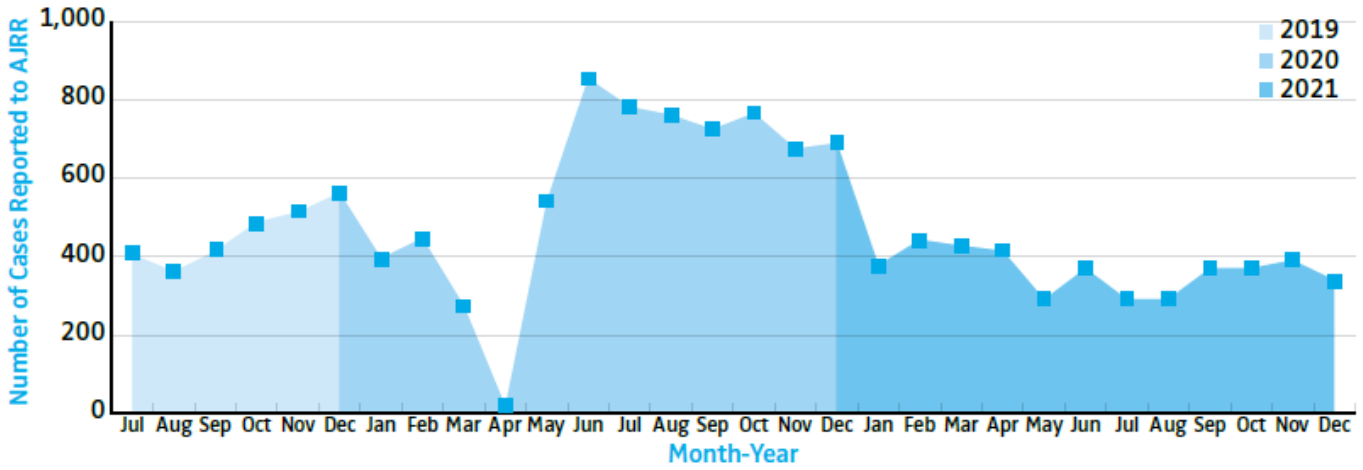


Figure 1.2 Ambulatory Surgical Center Case Volume by Month, Jul 2019 - Dec 2021



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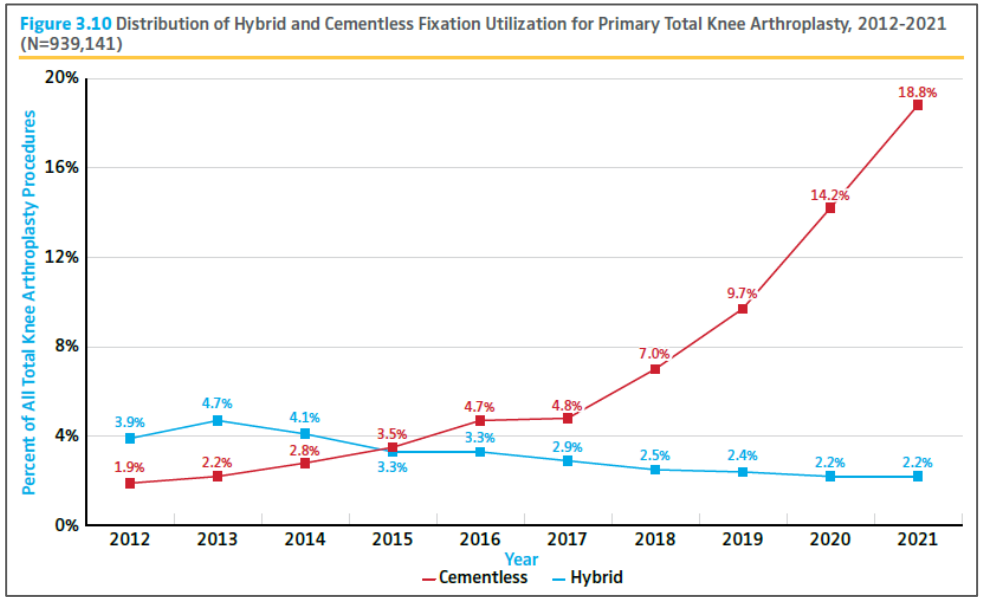
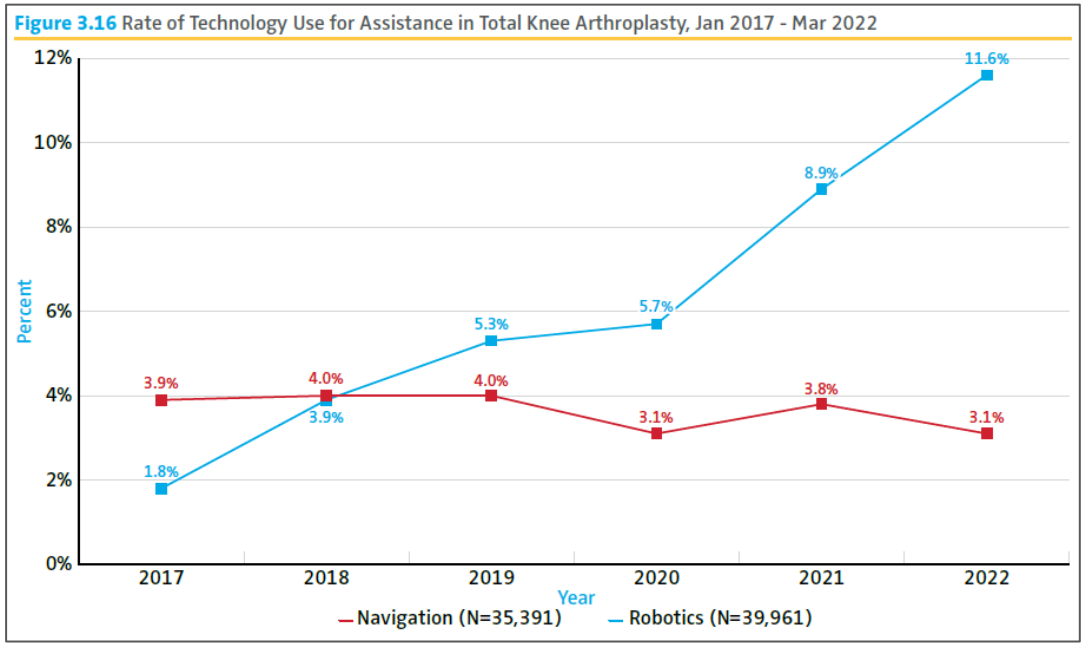
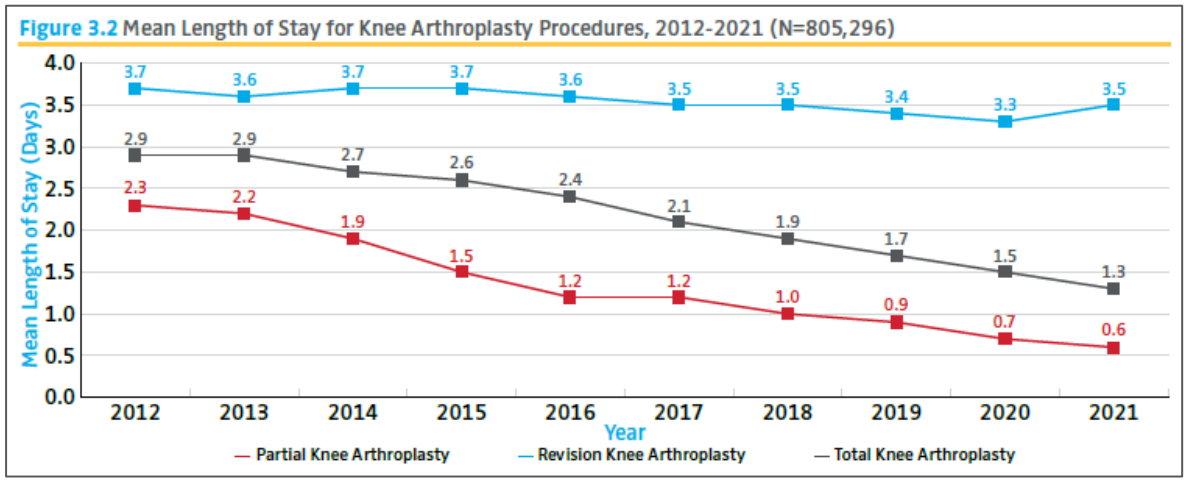
Procedural Trends (Knee)

- **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







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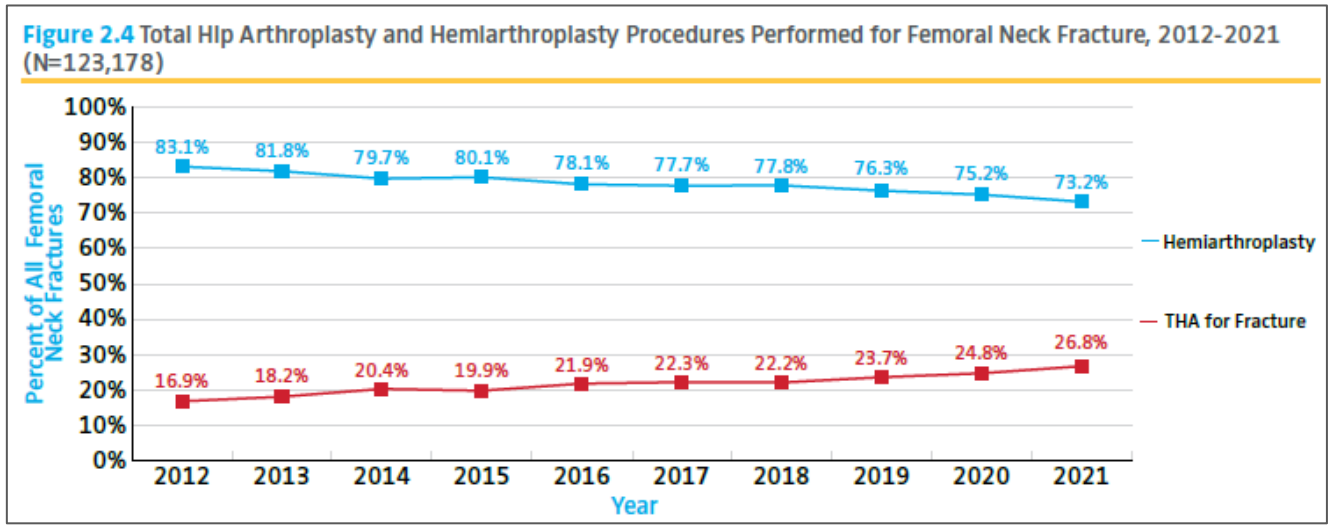
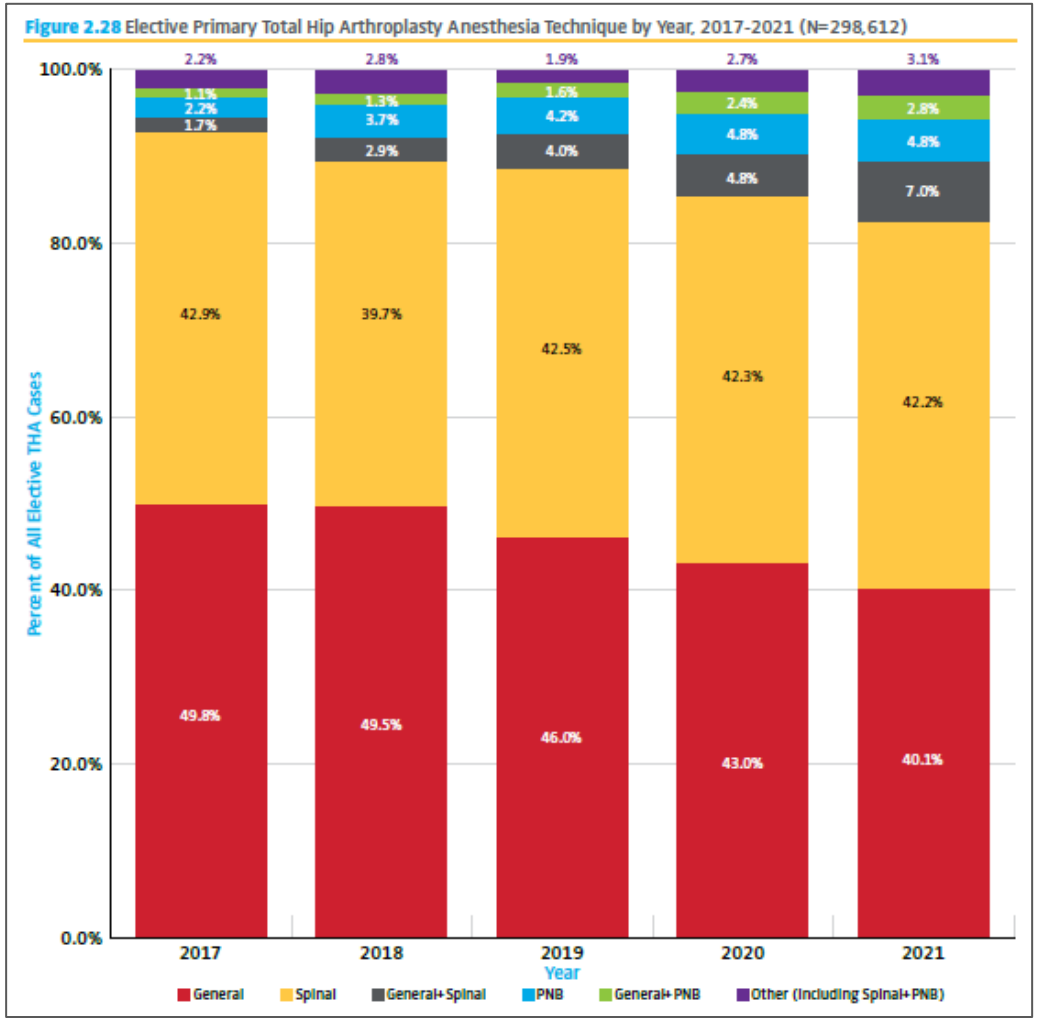
Procedural Trends (Hip)

- **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





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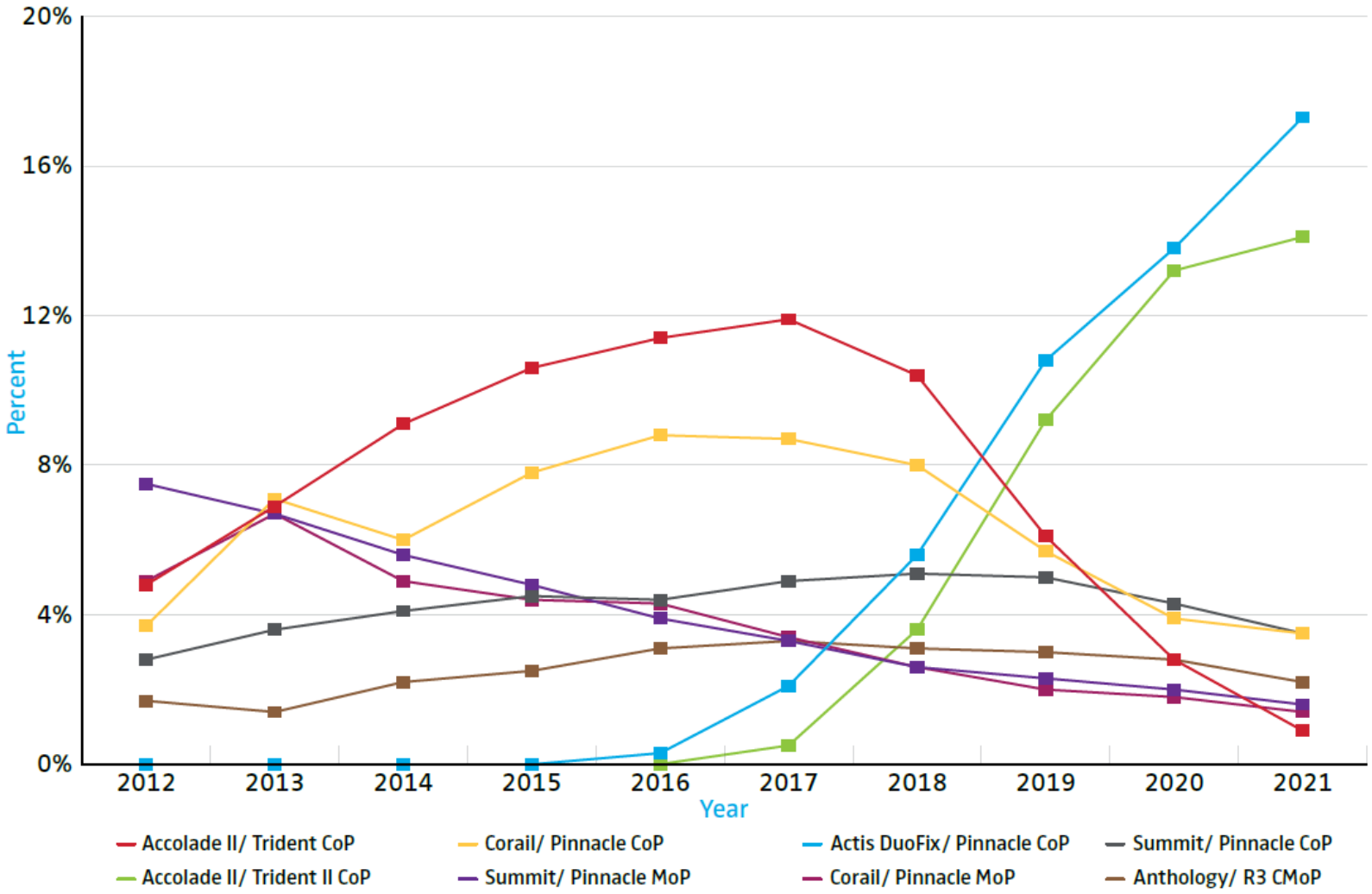
Implant Utilization

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



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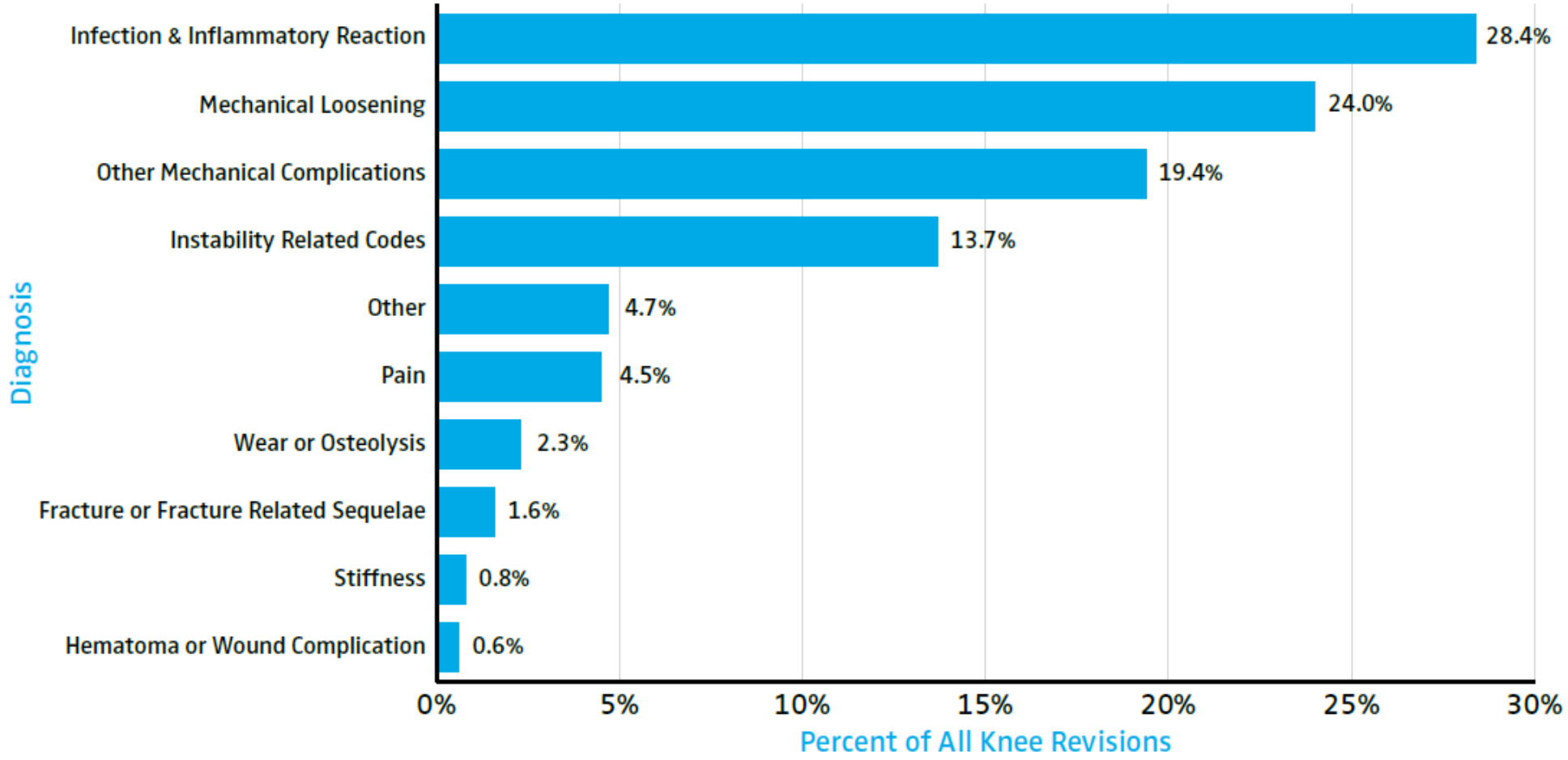
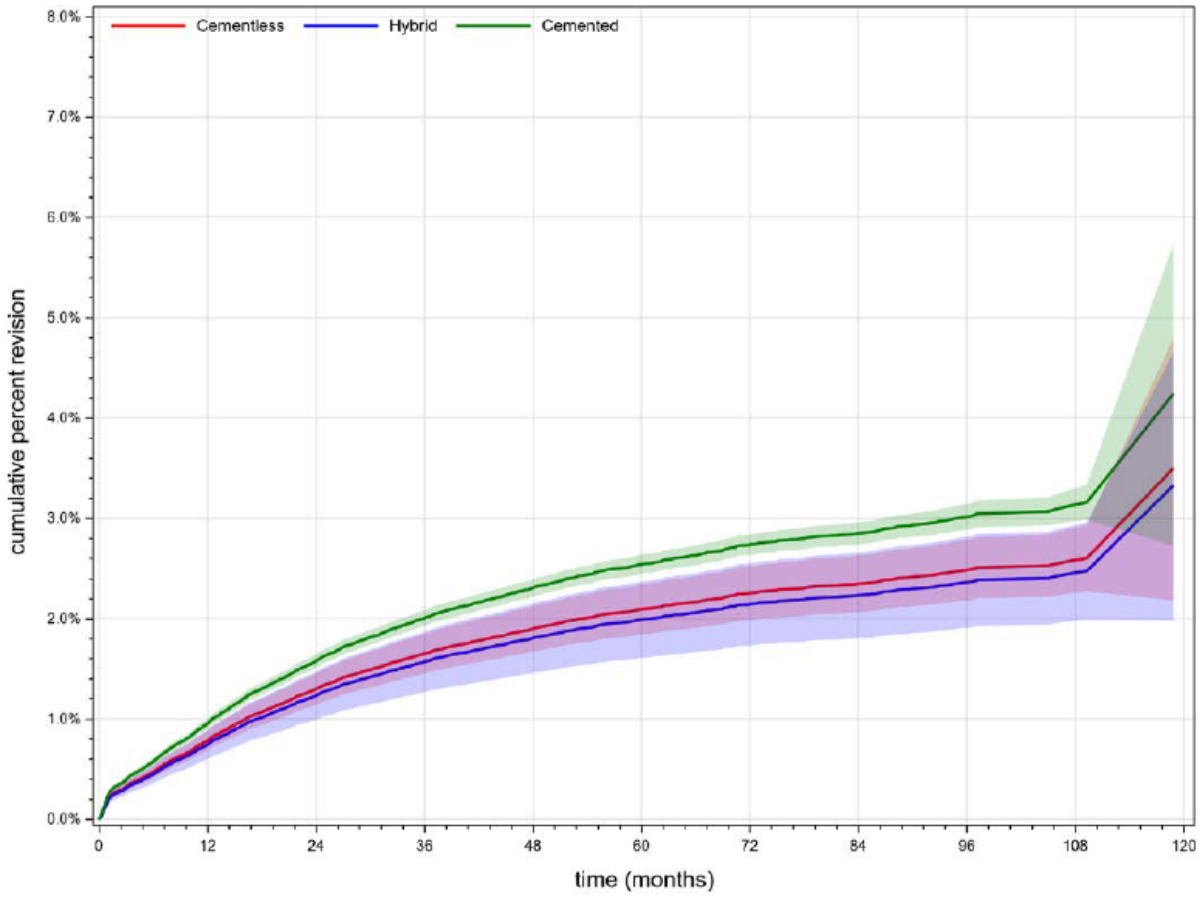
Revision Procedures

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



Cumulative Percent Revision

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



Number at Risk (Months)	0	12	24	36	48	60	72	84	96	108	120
Cemented	132,298	121,619	109,046	93,652	76,142	55,236	35,516	20,064	9,082	2,834	9
Cementless	18,278	14,187	10,810	7,949	5,645	3,559	1,854	988	410	125	1
Hybrid	5,555	5,146	4,747	4,270	3,575	2,689	1,775	1,144	530	157	1
Total	156,131	140,952	124,603	105,871	85,362	61,484	39,145	22,196	10,022	3,116	11

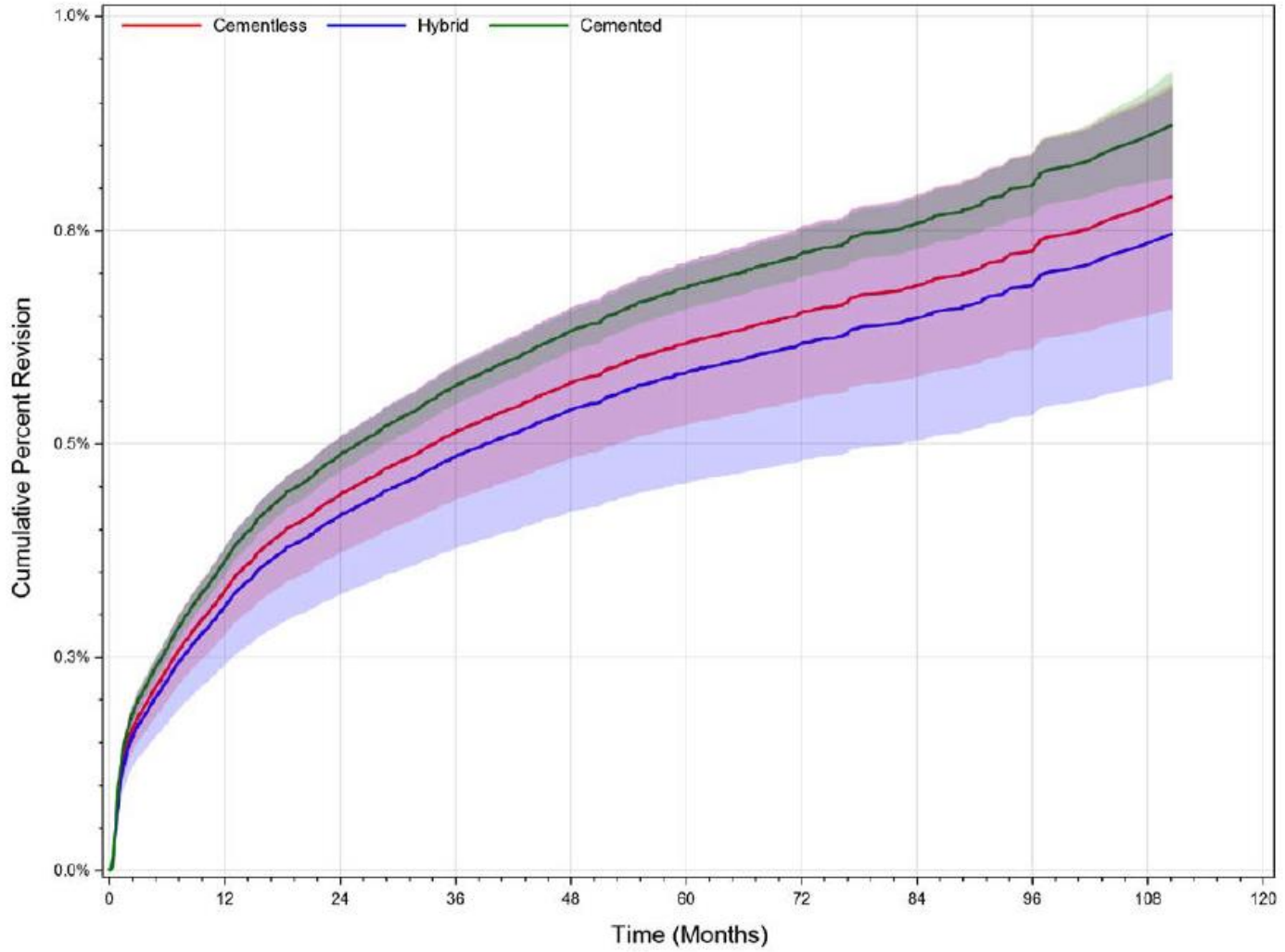
Device-Specific Cumulative Revision

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

Acetabular Shell	Femoral Stem	N Total	N Revised	1 Yr	3 Yrs	5 Yrs	7 Yrs
Trident	Accolade II	37,367	787	1.47 (1.35, 1.59)	2.05 (1.9, 2.2)	2.32 (2.16, 2.5)	2.43 (2.25, 2.62)
Pinnacle	Corail	35,617	363	0.71 (0.63, 0.8)	1.01 (0.91, 1.12)	1.16 (1.04, 1.29)	1.21 (1.08, 1.35)
Pinnacle	Summit	25,350	365	1.17 (1.04, 1.31)	1.43 (1.28, 1.59)	1.58 (1.42, 1.76)	1.71 (1.5, 1.94)
Pinnacle	Actis DuoFix	17,265	76	0.45 (0.35, 0.56)	0.52 (0.41, 0.65)	—	—
Pinnacle	Tri-Lock	16,653	224	0.95 (0.81, 1.1)	1.30 (1.13, 1.49)	1.54 (1.34, 1.76)	1.72 (1.43, 2.05)
Trident II	Accolade II	15,182	107	0.75 (0.62, 0.91)	0.81 (0.66, 0.99)	—	—
R3	Anthology	12,655	203	1.34 (1.15, 1.56)	1.65 (1.43, 1.89)	1.77 (1.53, 2.03)	1.87 (1.6, 2.19)
Continuum	M/L Taper	11,618	280	1.77 (1.54, 2.03)	2.30 (2.03, 2.6)	2.70 (2.39, 3.04)	2.79 (2.46, 3.14)
G7	Taperloc 133	11,080	140	1.12 (0.93, 1.33)	1.39 (1.17, 1.65)	1.50 (1.23, 1.81)	1.50 (1.23, 1.81)
G7	Taperloc 133 Microplasty	6,798	98	1.30 (1.04, 1.59)	1.51 (1.24, 1.84)	1.56 (1.27, 1.9)	1.56 (1.27, 1.9)
R3	Synergy	6,437	145	1.92 (1.61, 2.29)	2.33 (1.97, 2.73)	2.50 (2.11, 2.95)	2.50 (2.11, 2.95)
R3	PolarStem	5,565	51	0.84 (0.61, 1.12)	1.10 (0.82, 1.45)	1.10 (0.82, 1.45)	1.10 (0.82, 1.45)
Trilogy	M/L Taper	4,365	102	1.42 (1.1, 1.8)	2.03 (1.63, 2.5)	2.49 (2.02, 3.04)	3.11 (2.43, 3.92)
Pinnacle	S-ROM	3,746	79	1.24 (0.92, 1.64)	2.07 (1.62, 2.6)	2.39 (1.87, 3.01)	3.48 (2.45, 4.78)
Trident	Secur-Fit Max	3,304	79	1.40 (1.04, 1.85)	2.19 (1.73, 2.75)	2.43 (1.92, 3.02)	2.81 (2.16, 3.59)
Trident	Accolade TMZF	2,954	66	1.22 (0.87, 1.67)	1.56 (1.16, 2.06)	2.07 (1.59, 2.65)	2.43 (1.88, 3.09)
G7	Echo Bi-Metric	2,809	29	0.79 (0.51, 1.18)	1.10 (0.75, 1.58)	1.20 (0.81, 1.72)	1.20 (0.81, 1.72)

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



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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

Patient-Reported Outcome Measure (PROM)	PROM Component	Age Group (Years)	Patients with Preoperative Score	Patients with Linked Postoperative Score	Response Rate, Percentage of Patients Who Completed a Preoperative and 1-Year Score	Patients with Meaningful Improvement*
KOOS, JR. (Knee Disability and Osteoarthritis Outcome Score)	Score	55-64	19,438	4,270	22.00%	86.10%
		65-74	31,476	8,487	27.00%	85.40%
		75-84	15,512	3,941	25.40%	84.60%
		>85	1,906	439	23.00%	85.40%
PROMIS-10 (Patient-Reported Outcomes Measurement Information System 10)	Mental T	55-64	13,978	3,092	22.10%	36.50%
		65-74	23,447	6,543	27.90%	32.40%
		75-84	11,582	3,137	27.10%	28.90%
		>85	1,476	338	22.90%	26.60%
	Physical T	55-64	13,969	3,090	22.10%	67.20%
		65-74	23,447	6,544	27.90%	65.60%
		75-84	11,578	3,137	27.10%	61.00%
		>85	1,476	338	22.90%	57.70%

*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

- **Is American Joint Replacement Registry Data Representative of National Data? A Comparative Analysis.** Porter KR, Illgen RL, Springer BD, Bozic KJ, Sporer SM, Huddleston JI, Lewallen DG, Browne JA.J Am Acad Orthop Surg. 2022 Jan 1;30(1):e124-e130. doi:10.5435/JAAOS-D-21-0053

- **Highlights of the 2021 American Joint Replacement Registry Annual Report.** Siddiqui FA, DO, Levine BR, and Springer BD. Arthroplasty Today. 2022 Feb; 13: 205–207. doi: 10.1016/j.artd.2022.01.020

- **Trends in Polyethylene Design and Manufacturing Characteristics for Total Knee Arthroplasty: An Analysis from the American Joint Replacement Registry.** Kendall JA, Pelt CE, Imlay B, Yep PJ, Mullen KJ, Ka… RP. Poster Presentation. 2022 AAOS Annual Meeting; March 22-26. Chicago, IL.

2022 AAOS Best Poster Award

- **Increased Revision Risk with Rotating Platform Bearings in Total Knee Arthroplasty: An Analysis of the American Joint Replacement Registry.** Hegde VV, Kendal JA, Schabel KL, Yep PJ, Mullen KJ, De A, Pelt CE, Kagan RP. Podium Presentation. 2022 11th International Congress of Arthroplasty Registries, September 2… Ireland.

2022 James A. Rand, MD Young Investigator's Award Winner

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

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

AAOS
American Academy of Orthopaedic Surgeons

AJRR American Joint Replacement Registry

Questions?

RegistryInfo@aaos.org

www.aaos.org/registries