

Kaiser Permanente National Implant Registries



2020 Annual Report

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Leadership Message

Dear Colleagues,

In 2020, the COVID-19 pandemic completely transformed patient care, our work environment, and all aspects of our lives. We would like to thank all of you who are on the frontline and behind the scenes caring for our families and members in these difficult times. You are making a difference and we are proud of our organization which has risen to this challenge.

It is in challenging times such as these, that data is critical for guiding clinical strategies and responses. The Kaiser Permanente National Implant Registries played an important role during the pandemic in rapidly developing and coordinating a regional intake process to manage COVID-19 data requests, approvals, and data access allowing daily COVID-19 data access at the regional and medical center level. In addition, we added key quality metrics to our reporting to address surgical COVID-19 concerns, monitor the impact of the pandemic on patient outcomes, and help guide clinical decision making. We also evaluated the impact of COVID-19 and stay at home orders on surgical volumes to help with planning and prepping for future pandemics and surges. As the pandemic persists into 2021, the registries will continue to monitor the impact on surgical outcomes.

Despite the pandemic, the National Implant Registries team continued to use a collaborative approach to evidence-based research supporting our National Product Council purchasing teams with contracting decisions, providing safety and efficacy metrics for our same-day surgery initiatives for our total joint and shoulder arthroplasty care teams, and partnering with Cornell to help establish FDA US-based performance standards for total joint device evaluations.

Highlights of this collaborative model include:

- National implant contract savings through contract negotiations support
- Revision prevention in the identification of underperforming implants
- Feedback mechanisms to frontline surgeons reporting average length of stay and return to care metrics for outpatient total joint and shoulder arthroplasty procedures
- The development of implant evaluation tools based on two-year objective performance criteria

The success of the National Implant Registries is a direct reflection of our dedicated Kaiser Permanente physician leadership and their commitment to providing high quality care based on evidence-based medicine.

Thank you all for your contributions and continued support. Stay safe and well.

Liz Paxton, PhD, MA

Director, National Implant Registries

Tad Funahashi, MD

Chair, Inter-Regional Implant Registries Committee

Inter-Regional Implant Registries Committee Members

Active IIRC Membership

Ralph G. Brindis, MD, MPH, MACC

Clinical Professor of Medicine

Department of Medicine & the Philip R. Lee Institute for Health Policy Studies

University of California, San Francisco

Christopher M. Grant, BA

Executive Vice President and Chief Operating Officer, The Permanente Federation

Murray N. Ross, PhD

Vice President, Kaiser Permanente Health Plan

Director, Kaiser Permanente Institute for Health Policy

Ronald A. Navarro, MD

Regional Coordinating Chief of Orthopedic Surgery, Southern California Permanente Medical Group

Inter-Regional Chief of Orthopedic Surgery – The Permanente Federation

Regional Assistant Medical Director – SCPMG, Business Management for Retail Strategy

Lead, Kaiser Permanente Shoulder Arthroplasty Registry

Eric Cain, MD, MBA, FAAOS

The Permanente Medical Group

Physician-in-Chief, Kaiser Permanente Fremont Medical Center

Margaret Mentakis, MD, FACS

TPMG Technology Leader

KPHC Procedural and Perioperative Services

Newly Elected IIRC Membership

Nancy E. Gin, MD, FACP

Executive Vice President Quality and Chief Quality Officer, The Permanente Federation

Medical Director Quality and Clinical Analysis, Southern California Permanente Medical Group

Sande B. Irwin, MD

Otolaryngology/Head and Neck Surgery

Vice Chair, National Product Council

Chair, Core Group Capital

Co-chair, Northwest Regional Product Council

Timothy M. Cotter, MD, FACC, CPC

Chief of Cardiology, Kaiser Baldwin Park

SCAL Regional Chief of Cardiology

Vice Chair, National Cardiology Core SST

Chair, National Physiologic Monitoring SST



National Implant Registries: By the Numbers

12.4 Million Members Monitored Program-Wide

78 Medical Centers with 3,401 Participating Surgeons



209 Publications in 18 Peer-Reviewed Journals



231 Posters and Presentations at National and International Symposia

110,086 Patients with Enhanced Surveillance Due to 102 Recalls

790,000+ Procedures Captured and Tracked for the Patient's Lifetime



3.26 Million Implants Registered

OUR FOCUS

Identifying the most effective surgical techniques and implant devices for quality improvement and safety

Providing risk-adjusted hospital outcomes and benchmarking for quality improvement

Tracking implant usage and assessing performance for national contract decision-making

Integrating research methodologies with facility level reporting to help support the growth of a transformative care model



A Collaborative Effort

National Collaborations



- Leading along with Cornell, the USA Orthopaedic Coordinated Registries network (ORTHO CRN) to enhance postmarket surveillance in the USA
- Member of The Medical Device Epidemiology network (MDEpiNet), a global public-private partnership advancing the use of real-world data to improve patient outcomes
- National Evaluation System for Health Technology (NEST) pilot project developing objective performance criteria for arthroplasty devices in the USA

International Collaborations



- Full member and President of International Society of Arthroplasty Registries (ISAR) focused on enhancing arthroplasty registries' collaboration to improve global arthroplasty outcomes
- Anterior Cruciate Ligament Reconstruction (ACLR) registry international collaborations with Denmark, Luxembourg, Norway, Sweden, Australia, New Zealand, and the United Kingdom
- Shoulder Arthroplasty Registry (SAR) international collaborations with Denmark, Australia, and Sweden



Highlights of a Collaborative Care Model



Highlights of a Collaborative Care Model

National Implant Contract Savings Through Contract Negotiations Support

The Kaiser Permanente Orthopaedic Core Group (OCG) is a surgeon-led purchasing organization that emphasizes physician leadership and clinical expertise, with the hospitals and health plans providing key analytical, financial, and administrative support. This system empowers orthopedic surgeons to make patient-centric, value-based contracting decisions. Within this new model a collaborative approach between surgeons and hospitals has been shown to be essential to align organizational goals while continuing to focus on improved patient outcomes at a reduced cost.

The National Kaiser Permanente Implant Registries has the unique opportunity to partner with the OCG by providing real-time implant performance metrics based on clinical outcomes. "The partnership between the KP Implant Registries and the OCG purchasing team is an integral part of our strategic mission to provide value-based patient care," said

Dr. Ronald Wyatt, Walnut Creek Medical Center. "The Implant Registries collects essential data on implant performance and the impact of new technologies on clinical outcomes."

High and low performing implants, recall information, and potential cost savings opportunities are evaluated by the KP Implant Registries and presented to the OCG to help assist in the contract selection and purchasing decision process. "The OCG uses this information to negotiate contracts for the highest products with the greatest cost savings," said Dr. Wyatt. "This collaboration between researchers and clinicians facilitates evidence-based purchasing decisions and superior patient outcomes."

This partnership and data driven solution methods allows Kaiser Permanente to continually provide affordable, high quality healthcare services to its 12.4 million members program-wide.





Highlights of a Collaborative Care Model

Feedback Mechanisms to Frontline Surgeons for Same-day Total Joint and Shoulder Arthroplasty Procedures

Kaaiser Permanente (KP) has been on the forefront of same-day surgery for total-joint and shoulder arthroplasty procedures allowing patients to return home safely after surgery since 2016.

"In an era of value-based care, same-day discharge joint replacement delivers on Kaiser Permanente's commitment to improve both clinical quality and the patient experience while reducing the cost of care to ensure affordable access to all the communities we serve," said Dr. Nithin Reddy, Southern California physician champion for the same-day total joint arthroplasty program.

The KP National Implant Registries have played an integral role in building this program, working alongside surgeon leadership, assessing the safety and efficacy of same-day procedures. Findings in peer-reviewed research studies showed no additional risk for patients to return home the day of surgery, with an increased rate of recovery and patient satisfaction scores.

To ensure the practice of same-day surgery continues to be the right solution for both patient and hospital the KP National Implant Registries provide monthly and quarterly quality reports tracking the outcomes of each patient. These reports are shared program-wide, regionally, and locally to each hospital highlighting patient length of stay and return to care quality metrics including hospital readmissions and return to emergency department or urgent care facilities. This routine feedback mechanism allows KP to help track patient safety and cultivate best practice learnings amongst hospitals allowing KP to continue its dedication to provide high quality care to its members program-wide.

Dr. Anshuman Singh, Southern California physician champion for the same-day shoulder arthroplasty program said, "The KP National Implant Registries are the backbone of our Outpatient Shoulder Arthroplasty Program. Accurate and timely outcome and complication data allowed our team to create a safe and reliable program that is one of the largest in the country."





Highlights of a Collaborative Care Model

The Effect of COVID-19 on Hip and Shoulder Fracture Surgery

The landscape of patient care shifted dramatically in 2020 due to COVID-19. To help assist front line physicians and patients alike, the National Implant Registries created and managed data platforms reporting inpatient volumes of those affected with the novel virus throughout Kaiser Permanente's Southern California medical centers. Also, in response to COVID-19 concerns, we added key quality metrics including deep vein thrombosis, pulmonary embolism, and pneumonia to existing national quarterly quality reports to help track the suspected COVID-19 related increase after surgery.

Alongside reporting enhancements, the National Implant Registries analyzed the volumes of surgically treated hip and shoulder fractures and surgical outcomes within its Northern and Southern California facilities during the statewide stay-at-home COVID-19 order. While elective orthopedic procedure volumes

were expected to decline during the shutdown, a significant decline in traumatic procedure volumes were observed as well.

"Unlike elective procedures, patients with fractures often still required surgery, despite the ongoing pandemic," said Dr. Mark Dillon, Sacramento Medical Center. "Although a decline in traumatic procedures was observed, we learned that patients that underwent shoulder arthroplasty for fracture could be candidates for same day discharge, similar to those undergoing surgery electively."

"Within the setting of a COVID-19 surge," Dr. Kanu Okike, Moanalua Medical Center, said, "Understanding these volume patterns is important as it may allow for better allocation of staff and resources within the perioperative space."



Updates from our Registries



2019 Registry Summaries

Established

2001

Total Joint Replacement Registry

The Total Joint Replacement Registry collects demographic, surgical, and implant information to monitor outcomes, identify best practices, and identify patients in case of a recall. There are 125,299 primary and 12,140 revision procedures for Total Hip Arthroplasty; there are 228,967 primary and 14,638 revision procedures for Total Knee Arthroplasty.

2005

Anterior Cruciate Ligament Reconstruction Registry

The Anterior Cruciate Ligament Reconstruction Registry tracks primary, revision, and reoperation procedures. There are 54,003 procedures in total, including 47,677 primary and 6,326 revision cases. The registry tracks over 5,000 reoperations and, starting in 2017, over 100 anterior cruciate ligament repairs.

Shoulder Arthroplasty Registry

The Shoulder Arthroplasty Registry has captured 22,354 primary shoulder arthroplasty procedures. The registry tracks elective and urgent shoulder arthroplasty procedures including total shoulder arthroplasty, reverse total shoulder arthroplasty, hemiarthroplasty, and humeral head resurfacing.

2007

Cardiac Device Registry

The Cardiac Device Registry tracks pacemakers, implantable cardioverter defibrillators, and cardiac resynchronization therapy. There are 146,996 devices in the registry. Lifetime tracking of clinical outcomes for both the device and leads are captured in the registry.

2009

Hip Fracture Registry

The Hip Fracture Registry tracks primary hip fracture cases and revision procedures after primary fracture treatment. There are 58,125 hip fracture procedures in total, including 56,115 primary and 2,010 revision cases.

Spine Registry

The Spine Registry tracks over 56,689 instrumented and non-instrumented spinal procedures performed by the neurosurgery and orthopedic spine surgeons. This represents more than 364,000 total implants with lifetime surveillance of outcomes.

2010

Endovascular Stent Graft Registry

The Endovascular Stent Graft Registry has effectively tracked the deployment and ensured outcomes surveillance of graft devices used in endovascular aneurysm repair procedures for the repair of abdominal aortic aneurysm. The registry monitors 4,903 primary and 535 revision procedures.

Anterior Cruciate Ligament Reconstruction Registry

Recent Clinical Findings

- Mirzayan et al. evaluated the risk of aseptic revision surgery after primary ACLR using a soft tissue allograft compared with ACLR using hybrid graft in patients 25 years and younger. Soft tissue allografts had a 2-fold higher risk of aseptic revision compared with hybrid graft after ACLR.
- Hurvitz et al. evaluated the association between tibial fixation, either with or without a sheath and screw construct, and the risk of deep infection after hamstring autograft ACLR, using BPTB autograft as a reference group. Hamstring autograft ACLR using a screw and sheath construct had a higher likelihood of 90-day deep infection when compared to BPTB ACLR. No difference in 90-day infection rates was observed for hamstring autograft ACLR without screw and sheath compared to BPTB ACLR.

Anterior Cruciate Ligament Reconstruction KP Compared To Benchmarks				
	Kaiser Permanente	Danish Cruciate Ligament Register	Norwegian National Knee Ligament Register	Swedish National ACL Register
Start Date	Feb-05	Jul-05	Jun-04	Mar-05
Total N	54,003	35,946	31,868	53,051
Primaries	47,667 (88.3)	31,059 (91.2)	27,027 (84.9)	49,375 (93.1)
Revisions	6,326 (11.7)	2,984 (8.8)	2,647 (8.3)	3,676 (6.9)
Males	29,057 (60.9)	21,568 (60.0)	15,145 (56.0)	30,046 (56.6)
Females	18,610 (39.1)	14,378 (40.0)	11,882 (44.0)	23,005 (43.4)
Age years (at time of surgery)				
<25	23,923 (44.3)	15,816 (44.0)	12,059 (44.6)	25,874 (48.8)
≥25	30,071 (55.7)	20,130 (56.0)	14,968 (55.4)	27,177 (51.2)

Outcomes

Total Reoperations	5,132 (10.8)	Not reported	862 (3.2)	Not reported
Contralateral Knee Operations, (5.1)	1,550 (3.3)	Not reported	853 (3.2)	2,505 (5.1)
Revisions	1,792 (3.8)	Not reported	1,321 (4.9)	2,730 (5.5)
Revisions 100 persons-yrs	0.76	Not reported	0.78	Not reported

Registry Champions: Gregory Maletis, MD, Tadashi Funahashi, MD, Anita Rao, MD, Mark Shaieb, MD, Ron Wyatt, MD, Anne Denys, MD, Mark Davies, MD

Cardiac Device Registry

Quality Initiative

- Registry data is the foundation for efforts in Northern and Southern California to increase rates of remote monitoring for CIED patients. Remote monitoring, as an evidence-based clinical practice, can help lessen time to clinical intervention if a problem arises and can reduce the number of visits for asymptomatic clinic device checks. The registry identified all patients with devices with remote monitoring capability to support this clinical initiative.

Registry Volume By Device Type (2007-2019)				
Device	Dual	Single	Leadless	Total
Pacemakers	83,839	15,035	177	99,051
ICDs	17,851	16,296	—	34,147
	CRT-D	CRT-P		
CRTs	12,273	1,525	—	13,798

Overall Complication Rate, for Devices (2007-2019)			
Device	Total Volume	Complication	% Complication Rate
Pacemaker			
Dual	60,864	724	1.19
Single	9,483	65	0.69
Leadless	177	1	.56
ICD			
Dual	12,721	190	1.50
Single	12,189	102	0.84
CRT			
D	10,397	543	5.22
P	1,276	31	2.43

Overall Complication Rate, For Leads (2007-2019)			
Function	Total Volume	Complication Volume	% Complication Rate
Brady	112,913	2,232	1.98
Heart Failure	7,979	232	2.91
Tachy	24,359	790	3.24

Registry Champions: Nigel Gupta, MD, Cesar Alberte-Lista, MD, Jason Rashkin, MD, Brant Liu, MD, Jitesh Vasadia, MD

Endovascular Stent Graft Registry

Quality Initiative

- Registry data continued to support post-market surveillance of devices and to proactively respond to recalls. Kaiser Permanente surgeons and medical centers are provided roster of patients with affected implants, ensuring patients receive appropriate post-operative care and long-term management of potential adverse events. Collaboration with the FDA allows for further dissemination of the Kaiser Permanente experience to the broader medical community.

Endovascular Stent Graft KP Compared To Benchmarks					
	Kaiser Permanente 2010-2019	Japan JACSM 2007-2015	Systematic Review 1995-2015		
Volume	4,903	38,008	27,058		
Demographics					
Age: years	74.5	77	73		
Gender: female	14.7%	17.3%	11.0%		
Endoleaks					
Type 1 Endoleak	202 (4.1%)	2,032 (5.3%)	17,068 (63%)		
Type 2 Endoleak	182 (3.7%)	6,143 (16.1%)	17,900 (66%)		
Type 3 Endoleak	86 (1.7%)	348 (.09%)	16,116 (59%)		
Aneurysm Size					
Diameter (mean)	58mm	51mm	57mm		
Trunk Graft Company					
Cook	699 (14.3%)	8,370 (22.0%)	5,814 (21.5%)		
Endologix (Trivascular)	731 (14.9%)	2,365 (6.2%)	1,203 (4.4%)		
Gore	1,965 (40.1%)	16,817 (44.3%)	5,155 (19.1%)		
Lombard	6 (0.1%)	253 (0.7%)	170 (0.6%)		
Medtronic	1,136 (23.2%)	9,892 (26.0%)	12,979 (48.0%)		
Vascutek (Terumo)	3 (0.1%)	--	1,449 (5.4%)		
Missing/Not reported	363 (7.4%)	306 (0.8%)	288 (1.1%)		
	Mean Follow-up Time		Estimated 2-year Event Rate		
	Kaiser Permanente	Systematic Review	Kaiser Permanente	Systematic Review	Japan JACSM
Type 1 Endoleak	3.53	2.10	2.21	3.39	5.3
Type 2 Endoleak ^a	3.27	1.84	7.80	13.04	16.2
Type 3 Endoleak ^b	3.53	1.87	0.74	0.76	0.9
Cumulative Endoleak	3.27	2.09	10.02	18.86	--
Cumulative Endoleak excluding type 2 ^c	3.53	1.88	2.78	5.67	--
Re-intervention ^d	3.53	2.26	10.36	11.12	16.7
Mortality	4.19	--	12.71	--	17.2

a Type II endoleak adjusted for the proportion of male patients. Reintervention adjusted for median patient age and mean aneurysm size.

b Intraoperative endoleaks and overall re-intervention reported.

c A class I medical device recall has been issued for the device contributing to the higher type 3 endoleak rate within the KP patient population.

d Reintervention adjusted for median patient age and mean aneurysm size.

Registry Champions: Jeffrey Hsu, MD, Nicolas Nelken, MD, Thomas Rehring, MD, Homayon Hajarizadeh, MD, Robert Chang, MD

Hip Fracture Registry

Recent Clinical Findings

- Okike et al. compared the outcomes associated with cemented vs uncemented hemiarthroplasty in a large US integrated health system. In a cohort of 12,491 patients who underwent hemiarthroplasty for hip fracture, uncemented fixation was associated with a significantly higher risk of aseptic revision (cumulative incidence at 1 year after operation, 3.0% vs 1.3%; absolute difference, 1.7% [95% CI, 1.1%-2.2%]; hazard ratio [HR], 1.77 [95% CI, 1.43-2.19]; $P < .001$). These findings suggest that US surgeons should consider cemented fixation in the hemiarthroplasty treatment of displaced femoral neck fractures in the absence of contraindications.
- Sadeghi et al. evaluated the association between cephalomedullary nail length and outcomes for the treatment of intertrochanteric femur fractures. In a cohort of 5,526 patients who underwent surgical treatment for cephalomedullary nails for an intertrochanteric femur fracture, no association was found in risk of all-cause revision (hazard ratio = 0.75, 95% confidence interval [CI] = 0.48-1.15) or revision for periprosthetic fracture (hazard ratio = 0.59, 95% CI = 0.23-1.48) for long nails compared with short nails. Use of longer nails resulted in 18.80 more minutes of operative time (95% CI = 17.33-20.27 minutes), 41.10 ml more of estimated blood loss (95% CI = 31.71-50.48 ml), and a longer hospitalization (8.4 hours; $\beta = 0.35$, 95% CI = 0.12-0.58 hours). These findings suggest that routine use of short cephalomedullary nails is safe and effective in the treatment of intertrochanteric fractures.

Hip Fracture KP Compared To Benchmarks						
	Kaiser Permanente	UK-Wales-Northern Ireland	Ireland	Australia & New Zealand	Sweden	Norway
Period	Historic: 2009-2019 Current: 2019	Historic: 2007-2018 Current: 2018	Historic: 2012-2018 Current: 2018	Historic: 2013-2018 Current: 2018	Historic: 2014-2018 Current: 2018	Historic: 2005-2018 Current: 2018
Cases	Historic: 56,115 Current: 6,272	Current: 66,313	Current: 3,751	Current: 11,995	Historic: 31,315 Current: 6,446	Historic: 113,362 Current: 8,334
Female	69%	Not Reported	69%	AUS: 68% / NZ: 72%	65%	69%
Mean Age	Male: 77 Female: 80	82	81	Mean: 82 Median: Male 83 Median: Female 85	Male: 81 Female: 83	Overall: 80 Male: 77 Female: 82
Time to Surgery	Mean: 24.4 hours 93.3% < 48 hours	Mean: 33 hours 80% < 36 hours	72% < 48 hours	77% < 48 hours AUS Mean: 37 hours NZ Mean: 34 hours	Not Reported	93.6% < 48 hours
Length of Stay	Mean: 4.3 days	Mean: 20 days	Mean: 18.7 days Median: 12 days	AUS Median 7.5 days NZ Median: 6.7 days	Not Reported	Not Reported
Revision Rate	3.5%	Not Reported	1% < 30 days	Not Reported	3.1% < 6 months	Reoperation: 9.9%
Mortality	.09% < 90 days	6.1% < 30 days	Not Reported	<1 20 days AUS: 13% NZ: 10%	13% < 90 days	Not Reported

Registry Champions: Christopher Grimsrud, MD, PhD, James Jackman, MD, Kanu Okike, MD, Gary Zohman, MD

Shoulder Arthroplasty Registry

Recent Clinical Findings

- Dillon et al. evaluated the risk of revision after anatomic TSA according to the glenoid component design. Glenoid component designs were observed to be associated with differential risks in revision due to glenoid loosening with polyethylene all-cemented pegged glenoids and polyethylene cemented keeled glenoids having higher risks when compared with polyethylene central-pegged ingrowth glenoids.
- Yian et al. determined whether infection rates differ between prophylactic antibiotic use for patients with or without penicillin allergy before shoulder arthroplasty surgery. A higher risk of postoperative infection is found after prophylactic use of intravenous clindamycin antibiotic. Vancomycin is preferred over clindamycin for patients with penicillin allergy.

Shoulder Arthroplasty KP Compared To Benchmarks			
	Kaiser Permanente	Australia Orthopaedic Association Shoulder Arthroplasty	The New Zealand Joint Registry
Time Period	2005-2019	2004-2019	2000-2018
Volume	22,354	53,981	10,324
Gender, Female	56.37%	61.55%	62.81%
Mean Age (yrs)	69.58	71.59	71.0
Revision Rate	TSA: 0.69/ 100 obs yrs RTSA: 1.16/ 100 obs yrs	TSA: 1.49/ 100 obs yrs RTSA: 1.06/ 100 obs yrs	TSA: 0.94/ 100 obs yrs RTSA: 0.76/ 100 obs yrs
Top 3 Reasons for Primary	Osteoarthritis Rotator Cuff Arthropathy Fracture	Osteoarthritis Rotator Cuff Arthropathy Fracture	Osteoarthritis Rotator Cuff Arthropathy Fracture
Top 3 Reasons for Revision	Instability/Dislocation Infection Glenoid Component Loosening	Instability/Dislocation Loosening Rotator Cuff Insufficiency	Pain Subacromial Cuff Impingement Dislocation/Instability anterior
Outcomes			
Infection	0.78%	Not Reported	Not Reported
DVT	0.79%	Not Reported	Not Reported
PE	0.52%	Not Reported	Not Reported

Registry Champions: Ronald Navarro, MD, Mark Dillon, MD, Mark Shaieb, MD, Matthew Budge, MD, Anita Rao, MD, Tyler Skaife, MD, Daniel Robertson, MD

Spine Surgery Registry

Recent Clinical Findings

- In a cohort of 8,340 elective lumbar fusion patients, Ganocy et al. failed to observe a difference in risk of reoperation, infection, or DVT when comparing octogenarians to patients >50 years of age. However, the higher risk of intraoperative durotomy, 90-day PE, and 90-day readmission suggests closer intra- and postoperative surveillance may be warranted for these older patients. We did observe a higher mortality risk for octogenarians when compared to patients aged 50-79; this risk did not change between 90-days and 2-years, suggesting the elevated risk is unrelated to undergoing a lumbar fusion and more likely the age groups compared in this study.
- Norheim et al. assessed elective lumbar nonunion reoperation rates in anterior lumbar interbody fusions with pedicle screws (ALIFs+PS) versus posterolateral fusions with pedicle screws (PLFs): In 2,061 patients (ALIF+PS=570 vs. PLF=1491) with an average follow-up time of 4.8(±3.1) years, unadjusted incidence rates were higher for PLF vs. ALIF+PS for 1-level ([PLF=0.9%, 95% CI=0.4-1.6] vs [ALIF+PS=0.6%, 95% CI=0.1-2.1]) and 2-level fusions ([PLF=2.0%, 95% CI=0.8-4.0] vs [ALIF+PS=0.9%, 95% CI=0.1-3.3]). However, after adjustment for age and diabetes we found no significant differences in risk of nonunion by instrumentation type (HR=0.3, 95% CI=0.1-1.1).

Spine Surgery KP Compared To Benchmarks		
	Kaiser Permanente	Euro Spine/Spine Tango
Time Period	2009-2014, 2016-2019	2005-2019
Volume	56,689	129,600
Demographics		
Age in Years (Mean)	58.6 years	58.8 years
Gender	48.60% female	51.00% female
Current Smoker	9.10%	8.50%
Diagnosis - Degenerative	70.60%	76.20%
Fusion Approach		
Anterior Only	21.60%	21.30%
Posterior Only	70.00%	18.80%
Outcomes		
Dural Tear	3.30%	2.60%
Superficial Infection	0.64%	0.20%
Deep Infection	0.32%	0.10%
Nonunion	1.38%	Not Reported
Adjacent Segment Disease	5.16%	2.70%

Registry Champions: Kern Guppy, MD, PhD, Calvin Kuo, MD, Johannes Bernbeck, MD, Harsimran Brara, MD, Kristophe Karami, MD

Total Joint Replacement Registry



Recent Clinical findings

- Charney et al. compared risk of dislocation and cause-specific revision between direct anterior and posterior approach following elective cementless total hip arthroplasty. The direct anterior approach was found to have higher risk of revision for aseptic loosening ($P = .002$) and lower risk for 90-day unplanned readmissions ($P = .037$), dislocation ($P < .001$), periprosthetic fracture ($P = .033$), revision for instability ($P < .001$), and all-cause revision ($P = .029$). There was no difference in risk for revision for infection ($P = .528$), any other revision reason ($P = .864$), likelihood of 90-day ED visits ($P = .242$), or 90-day complications ($P = .120$). Surgeons should discuss direct anterior and posterior surgical approaches with their patients and the associated risk differences for specific revision reasons and adverse postoperative events.
- Hinman et al. evaluated the association of race/ethnicity and total knee arthroplasty outcomes in a universally insured population, with findings comparing minority to white patients. Asian patients had a lower risk of all-cause ($P < .001$), aseptic ($P < .001$), septic ($P = .049$) revision, likelihood of 90-day unplanned readmission ($P = .046$), and 90-day VTE ($P < .001$). Black patients had a higher risk of all-cause ($P < .001$), aseptic ($P < .001$) revision, likelihood of readmission ($P = .015$), and 90-day ED visit ($P < .001$). Hispanic patients had a lower risk of all-cause ($P = .003$), septic ($P < .001$) revision, 90-day deep infection ($P < .001$), and a higher likelihood of ED visit ($P < .001$). No difference was observed for mortality when comparing minority patients to white patients. Higher risks of revisions, readmissions, and ED visits for some patients can help guide postoperative follow up care.

Registry Champions: Maurice Cates, MD, Adrian Hinman, MD, Matthew Kelly, MD, Erik Kroger, MD, Gregory Lee, MD, Mark Melberg, MD, Le Don Robinson, MD, Thomas Stoll, MD

Total Joint Replacement Registry

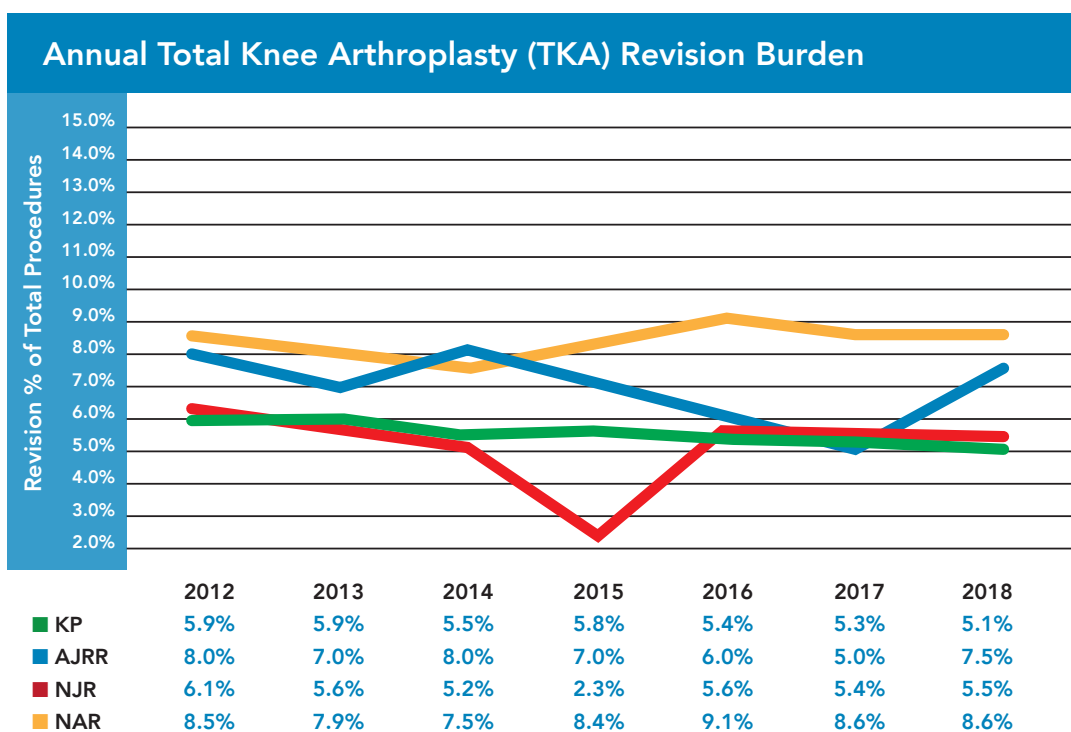
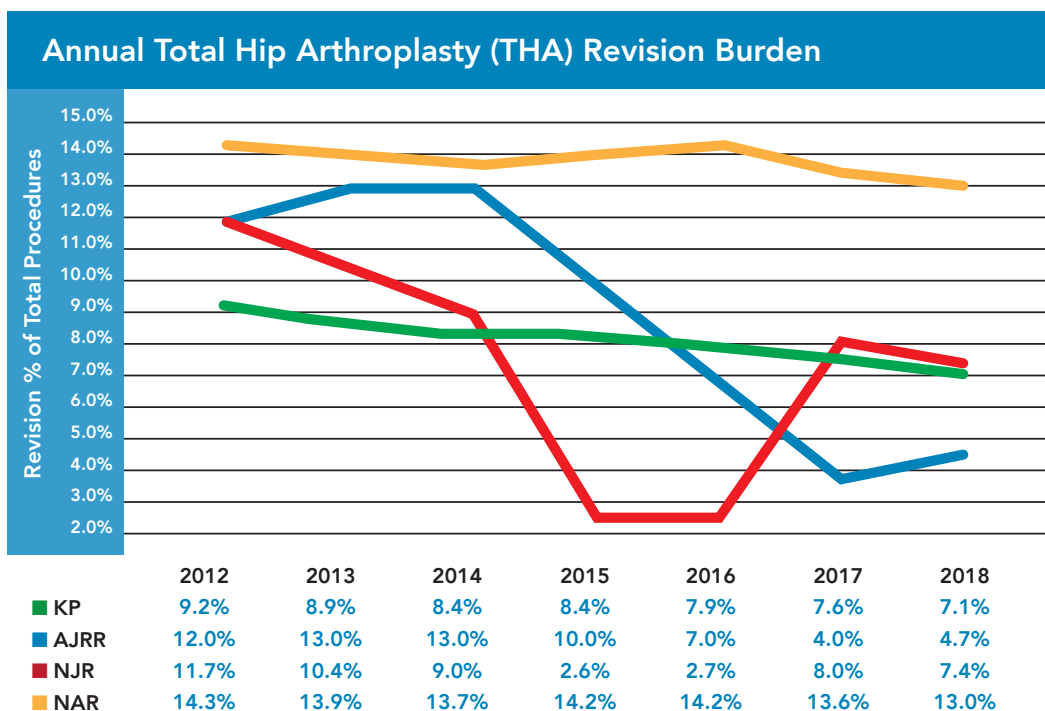
Total Hip Replacement KP Compared To Benchmarks

	Established	Current Period	Primary Cases	Revision Cases	Age	Female %	10 yr. Survival % (CI)
Kaiser Permanente	2001	2019	12,326	957	Mean: 65.7 Male: 64.1, Female: 66.9	57.4	95.4 (95.2-95.5)
AJRR	2012	2018	93,122	4,336	Mean: 65.6	59.0	Not Reported
Australia	1999	1999-2018	477,252	70,730	Mean: 67.7 Male: 64.1, Female: 66.9	54.9	95.0 (94.9-95.1)
United Kingdom	2003	2018	92,874	7,379	Mean: 68.0 Median: 69 (IQR 61-76)	59.8	95.2 (95.1-95.3)
Sweden	1979	2018	18,629	1,863	Male: 67, Female: 69	57.0	95.8 (95.6-95.9)
Norway	1987	2018	9,553	1,422	Mean: 68.9 Male: 67.0, Female: 69.8	66.7	93.7 (93.5-93.9)

Total Knee Replacement KP Compared To Benchmarks

	Established	Current Period	Primary Cases	Revision Cases	Age	Female %	10 yr. Survival % (CI)
Kaiser Permanente	2001	2019	21,803	1,338	Mean: 67.4 Male: 67.3, Female: 67.5	61.5	95.7 (95.6-95.8)
AJRR	2012	2018	139,582	10,507	Mean: 67.0	59.0	Not Reported
Australia	1999	1999-2018	658,596	62,999	Mean: 68.5 Male: 68.1, Female: 68.8	56.6	94.7 (94.7-94.8)
United Kingdom	2003	2018	99,093	5,793	Mean: 68.9 Median: 69 (IQR 63-76)	56.7	95.6 (95.6-95.7)
Sweden	1975	2018	13,885	771	Mean: 68.8	56.0	95.5 (95.4-95.6)
Norway	1994	2018	6,905	648	Mean: 68.2 Male: 67.9, Female: 68.4	62.5	94.3 (93.9-94.7)

Total Joint Replacement Registry



Registries:

KP: Kaiser Permanente Implant Registries
 AJRR: American Joint Replacement Registry
 NJR: National Joint Registry, UK
 NAR: Norwegian Arthroplasty Register

Implant Registries Staff

Management Team

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Jessica Harris, MS, RD	Manager
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Donna Leck	Research Administrative Analyst

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Data Consultants/Programmers

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Data Quality

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Nicole Caballero, BS	Research Associate II
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Publications

Anterior Cruciate Ligament Reconstruction

2020

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Publications

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continued

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