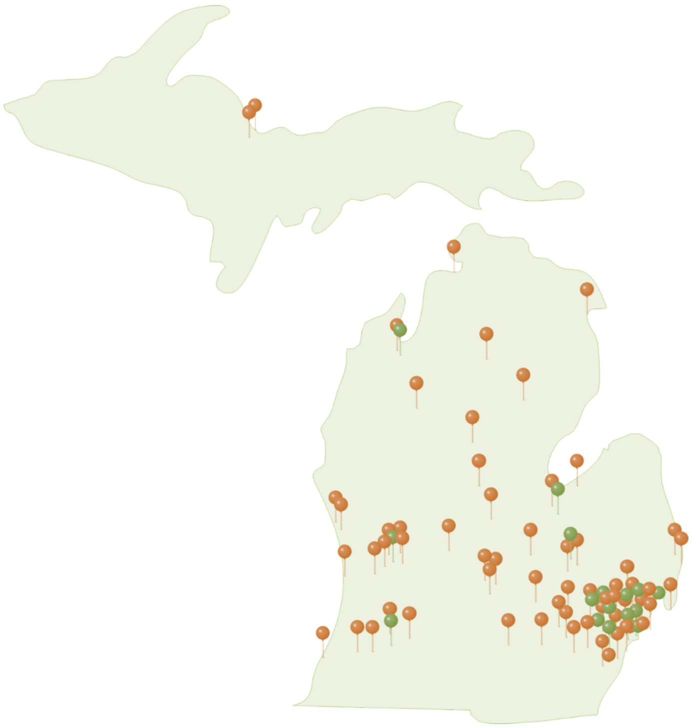
2023 Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) Annual Report

December 2023

MARCQI Sites



Alliance Surgery Center, Traverse City
Ascension Borgess Medical Center, Kalamazoo
Ascension Genesys Regional Medical Center, Grand Blanc
Ascension Providence Hospital (Novi)
Ascension Providence Hospital (Southfield)
Ascension Providence Rochester Hospital, Rochester
Ascension St. John Hospital - Detroit
Ascension St. John Hospital - Macomb Oakland
Ascension St. Mary's Hospital, Saginaw
Bronson Battle Creek, Battle Creek
Bronson Lakeview Hospital, Paw Paw
Bronson Methodist Hospital, Kalamazoo
Corewell Health Beaumont Grosse Pointe Hospital
Corewell Health Beaumont Troy Hospital
Corewell Health Dearborn Hospital
Corewell Health Farmington Hills Hospital
Corewell Health Grand Haven Center, Grand Haven
Corewell Health Grand Rapids Hospitals Blodgett
Corewell Health Lake Drive Surgery Center, Grand Rapids
Corewell Health Lakeland Hospitals, Niles
Corewell Health Lakeland Hospitals, St. Joseph
Corewell Health Taylor Hospital
Corewell Health Watervliet Hospital, Watervliet
Corewell Health William Beaumont University Hospital
Covenant Medical Center, Saginaw
DMC Harper University Hospital, Detroit
DMC Huron Valley-Sinai Hospital, Commerce Township
DMC Sinai-Grace Hospital, Detroit
E. W. Sparrow Hospital, Lansing
Garden City Hospital, Garden City
Grand Rapids Surgical Suites, Grand Rapids
Henry Ford - Cottage
Henry Ford - Jackson
Henry Ford - Macomb, Clinton Township
Henry Ford - Royal Oak
Henry Ford - West Bloomfield
Henry Ford - Wyandotte
Henry Ford Hospital - Detroit
Holland Hospital, Holland
Hurley Medical Center, Flint
Lake Huron Medical Center, Port Huron
Lakes Surgery Center, West Bloomfield
McLaren - Bay Region, Bay City
McLaren - Central Michigan, Mt. Pleasant
McLaren - Flint
McLaren - Greater Lansing, Lansing
McLaren - Lapeer Region, Lapeer
McLaren - Macomb, Mt. Clemens
McLaren - Northern Michigan, Petoskey
McLaren - Oakland, Pontiac
McLaren - Port Huron
Memorial Healthcare, Owosso
Michigan Medicine, Ann Arbor
Michigan Medicine - Brighton Center for Specialty Care, Brighton
Munson Health Cadillac
Munson Health Grayling
Munson Medical Center, Traverse City
MyMichigan Health, Alpena
MyMichigan Health, Clare
MyMichigan Health, Gratiot
MyMichigan Health, Midland
MyMichigan Health, West Branch
Muskegon Surgery Center, Muskegon
OAM Surgery Center, Grand Rapids
Precision Surgery Center, Macomb Township
Premier Surgical Center, Clinton Township
Red Cedar Surgery Center, Haslett
Sparrow Hospital, Ionia
Straith Hospital for Special Surgery, Southfield
Trinity Health Ann Arbor
Trinity Health Brighton Surgery Center
Trinity Health Chelsea Hospital
Trinity Health Grand Rapids
Trinity Health Livingston
Trinity Health Muskegon
Trinity Health Oakland
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Suggested citation

Hughes, R.E., Zheng, H., and Hallstrom, B.R. (2023) 2023 Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) Annual Report. University of Michigan, Ann Arbor.

Conflict of interest disclosure

None of the authors have financial relationships with the pharmaceutical or medical device industries.

Disclaimer

Although Blue Cross Blue Shield of Michigan/Blue Care Network (BCBSM/BCN) and the Michigan Arthroplasty Registry Collaborative Quality Initiative work collaboratively, the opinions, beliefs, and viewpoints expressed by the authors do not necessarily reflect the opinions, beliefs, and viewpoints of BCBSM/BCN or any of its employees.

Acknowledgements

We thank all members of MARCQI, including clinical data abstractors, clinical champions, site quality leads, and orthopaedic surgeons across the state. Without their participation, MARCQI would not exist. We are grateful for the MARCQI device committee for reviewing this document, especially Eric Cornish, M.D., who made a special effort to scrutinize it. We also thank specific MARCQI staff for helping produce this report: Qi Zhu (database management), Anne Kagay-Lidster (cover design), Sara Koralewski (proofreading), and Jeanette Lamphere (proofreading).

We would like to acknowledge and thank Curvo Labs for making their device library available to us and the Michigan Health & Hospital Association for providing access to the Michigan Inpatient and Outpatient Database. Within the University of Michigan, we thank Derek Granzow for his help with administration.

Support for the Michigan Arthroplasty Registry Collaborative Quality Initiative is provided by Blue Cross and Blue Shield of Michigan and Blue Care Network (BCBSM/BCN) as part of their Value Partnerships program. We express our gratitude to BCBSM/BCN staff who have pioneered the CQI model in Michigan and supported MARCQI (Faris Ahmad, M.D., Marc Cohen, Sheri Lee, Tom Leyden, Emily Santer, and Monica Whitted) and the University of Michigan-BCBSM/BCN liaisons (Matt Callow, Mike Englesbe, and Chad Jobin).

Contents

Preface

Just a decade ago, surgeons and hospitals in Michigan had very little information regarding the outcomes for their patients who underwent hip and knee replacement surgery. These common procedures help thousands of people every year, yet not every patient did well. Surgeons have many anecdotes and dogma about how and why they provide specific care or why a particular patient may have a complication or poor outcome. Both of us are engineers with experience in orthopaedics. We had read about the arthroplasty registries across the world and our mentors and teachers had taught us to base our decisions on science. Still, we had not figured out how to apply science or research to improving orthopaedic surgery outcomes, particularly joint replacement.

When Blue Cross Blue Shield of Michigan proposed expanding their Collaborative Quality Initiative (CQI) project to orthopaedics, we were in the process of applying to the Agency for Healthcare Research and Quality for a grant to start an arthroplasty registry in Michigan. We both realized that the CQI model provided a huge opportunity to accomplish our goal on a larger scale with a potentially more sustainable basis. We knew that this provided a great opportunity to apply our technical and analytical skills to a larger population and have a much broader effect on public health in Michigan. In 2010 our proposal to Blue Cross Blue Shield of Michigan was accepted. We opened the Coordinating Center in 2011 and began data collection in 2012.

MARCQI has been collecting, anayzing, and reporting data for over ten years. Now hospitals and surgeons in Michigan no longer have to rely on anecdote or respond to their last complication with a change in practice. Together the providers in Michigan have dramatically improved the quality of care for elective hip and knee arthroplasty patients in Michigan. Colleagues and competitors have met together almost 40 times to discuss the data, talk about variation and opportunities and make plans to improve. Statewide providers have returned to their hospitals and practices and made thoughtful, data driven changes leading to better care for all our patients.

As a result of this collaboration and data review, we have seen the risks of transfusion and discharge to a nursing home fall and the amount of opioid prescribed at discharge diminished. The percentage of patients sustaining blood clots after surgery has also dropped despite a switch to aspirin from more expensive and potentially risky anticoagulants. Infection rates have remained stable in Michigan despite a rise in arthroplasty infection rates around the world.

We have also been leaders in public reporting of implant performance in the United States. MARCQI was the first registry in the United States to produce a publicly available annual report containing revision risks by implant product name. The report has been used by surgeons and hospitals to select implants based on clinical evidence. Implant manufacturers have told us that their companies pay close attention to the results we report and have encouraged us to continue and expand this work.

MARCQI has also gained international recognition for the quality of its data and improvement work through presentations at the International Society of Arthroplasty Registries. We are recognized for having reliable data with high coverage across Michigan. This strengthens our message and results as we work toward improving public health through data driven quality improvement.

MARCQI could not be what it is without the hard work and dedication of many people at the participating sites, Coordinating Center, and Ortech. The data abstractors, clinical champions and quality leads across the state are our backbone. MARCQI would also not exist without financial support from Blue Cross Blue Shield of Michigan / Blue Care Network and participating hospitals. Everyone involved has contributed to improving the lives of the people in Michigan both the patients who have the surgery and their families who benefit from their improved mobility and independence.

MARCQI is the most meaningful project we have ever worked on in our careers. We are grateful to everyone who has worked with us and contributed to making MARCQI successful. We look forward to the future of MARCQI as we continue to collaborate.

Sincerely,

Brian R. Hallstrom, M.D.
MARCQI Director

Richard E. Hughes, Ph.D.
MARCQI Senior Advisor

Executive Summary

This report is based on cases performed at MARCQI participating sites between 2/15/12 and 12/31/2022. MARCQI celebrated its 10th anniversary in 2022 and this document reports cumulative percent revision (CPR) to 10 years. In addition, the catalog numbers used to generate the data for each implant have been moved from the report supplement and are included on the page where that data is presented. This facilitates review of the included implants. As in past years, a threshold of 500 cases was used to determine which implants were included in the report.

HIPS

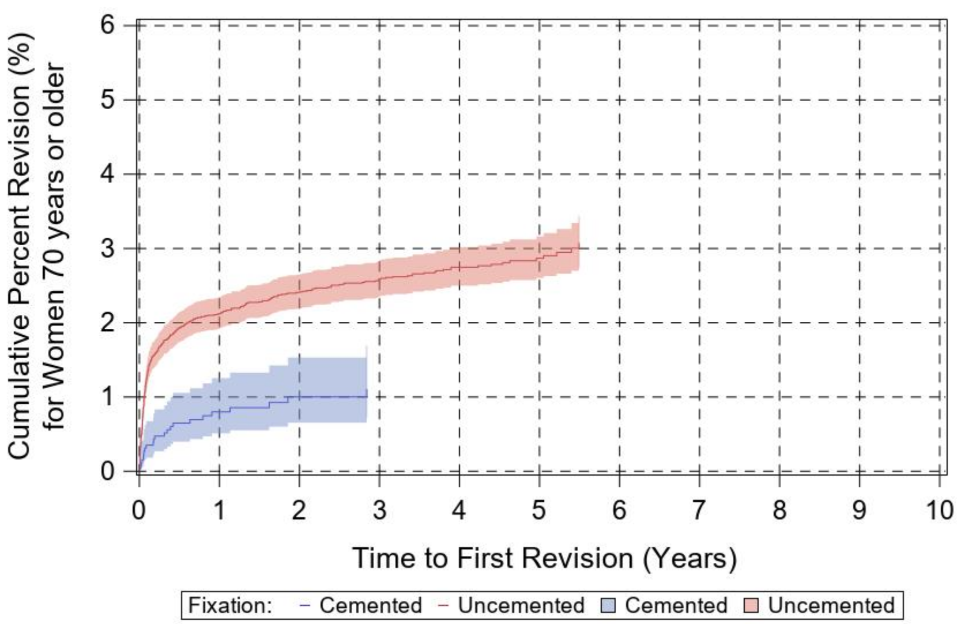

Figure 1: Cumulative percent revision for primary conventional THA by stem fixation for women 70 years or older.

There were 160,941 THA cases in the cohort, and 7.7% were revisions. A slight majority (54.5%) of primary cases were performed in women. The mean age at the time of primary procedure was 65.2 years.

One additional stem/cup combination met the 500 case threshold for inclusion this year, so there were 36 combinations included in this report. There was substantial variation in CPR at 10 years. Thirteen stem/cup combinations had follow-up to 10 years, and the CPR ranged from 1.85% (95% C.I., 1.36%-2.47%) to 4.87 (95% C.I., 3.62%-6.53%). For the 15 stems that had 10-year CPR estimates, the range was 1.86% (95% C.I., 1.41%-2.45%) to 6.92% (95% C.I., 3.92%-12.08%). There were nine cups having CPR estimates at 10 years. The range was 2.27% (95% C.I., 1.16-4.42) to 4.65% (95% C.I., 3.67%-5.88%). Note that the 95% C.I.'s at 10 years are wide due to small sample sizes with 10-year follow up. The 5-year CPR data provide clearer differences between implants due to more follow up at that time point.

MARCQI′s efforts to reduce early revisions continues. As in previous years, MARCQI data demonstrates lower revision risk for cases in which stems were cemented for women 70 years or older (Figure 1). However, only 3.9% of primary conventional hip cases had cemented stems in the cohort. There continues to be significant opportunity for reducing revisions by cementing stems in properly selected patients. In this report, some cemented stems have reached the threshold for reporting for the first time. However, it is also true that some uncemented stems appeared to be performing well in the early post-op period without the early elevated hazard of revision associated with peri-prosthetic fracture. While cementing stems is known to reduce risk of revision in older women, it may also be that carefully selected uncemented technology may also provide good results.

KNEES

There were 277,093 knee cases in the dataset, 8.0% of these were revisions. The majority (62%) of primary cases were performed in women. The average age of primary procedure was 66.5 years. The average BMI of TKA patients was 33.2 kg/m^2. TKAs made up 91.6% of knee replacement cases while 6.8% were UKAs.

TKA

There were no additional knee implant combinations included in this year's report, so 34 TKA implant combinations are included. Of these, 29 had sufficient follow-up to compute CPR estimates at 10 years. Point estimates of CPR at 10 years ranged from 1.2% (95% C.I., 0.62%-2.70%) to 7.4% (95% C.I., 4.93%-11.07%). This wide variation in outcomes provides opportunities for quality improvement. Sites and surgeons using implants with high revision rates in Michigan can use these data to look deeper into their data, their practices, and other potential effects.

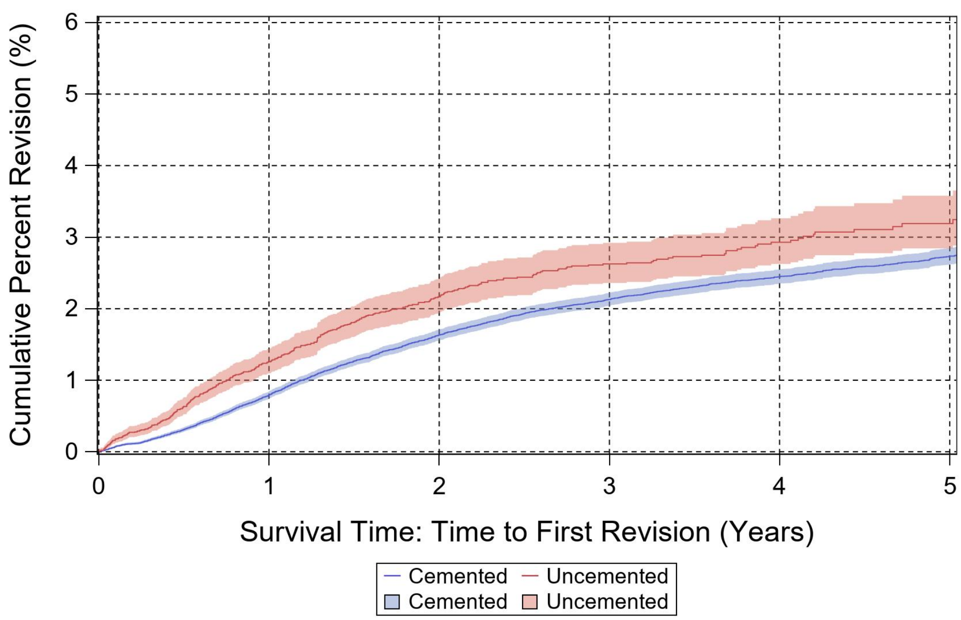

Figure 2: Cumulative percent revision for primary TKA cases by fixation.

Chapter 1 reports the analysis of uncemented knees in the MARCQI dataset. Uncemented knee replacement has been adopted rapidly and there were more than 18,000 uncemented TKA cases in the database. Figure 2 demonstrates that uncemented TKA implants had a higher revision risk than cemented. These data suggest caution in adopting this new technology. Chapter 1 discusses this in detail.

UKA

There were more than 17,000 unicompartmental knee arthroplasty (UKA) cases in the dataset for this report. In the five years before the pandemic there were an average of 2,129 UKA cases done in Michigan per year. Since 2020 that number has remained about 1,500 cases on average. Four UKA implant designs met the 500 case threshold for inclusion in the report, but only three had follow-up to 10 years. The range of 10-year CPR estimates was 5.93% (95% C.I.,4.82%-7.29%) to 13.10% (95% C.I.,10.71%-15.97%) with an average of 9.57% (95% C.I.,8.31%-11.01%). The Oxford UKA has a higher CPR curve and its usage in Michigan has declined significantly since its peak in 2015. In contrast, the ZUK UKA had a lower CPR curve. This implant has not been used in Michigan since the first quarter of 2022.

PFJ

Patellofemoral arthroplasty (PFJ) cases continued to be the least common type of knee arthroplasty (N=1,409) and no PFJ implants met the 500 case threshold for inclusion in the report. The 10-year CPR for PFJ was 18.8% (95% C.I., 15.05%-23.37%).

Chapter 1

Assessing the Value of Innovation and Change: Uncemented Knee Replacement in MARCQI

Since the beginning of MARCQI, the goal has been to make Michigan the best place in the world to have a joint replacement. Much of that work has been focused on reducing complications, eliminating unnecessary care, and optimizing patients for surgery. In the 2022 MARCQI Annual Report we detailed these efforts and the progress that we made over the first decade of MARCQI. Without exception, the changes not only improved the quality of care for patients in Michigan, but also reduced the cost of care for patients, hospitals, and payers.

This is the definition of improving value in health care. The numerator of the value equation is the outcome of the care while the denominator is cost (Porter *et al.*, 2010). What is missing from many value equations is appropriateness since an unindicated treatment or surgery provides no value to the patient or the system and only introduces risk of complication or worsening health condition (Alyesh *et al.*, 2018). Improving quality while reducing costs improves the lives of our patients and the sustainability of our health care system. Increasing cost without providing significant benefit to the system reduces value.

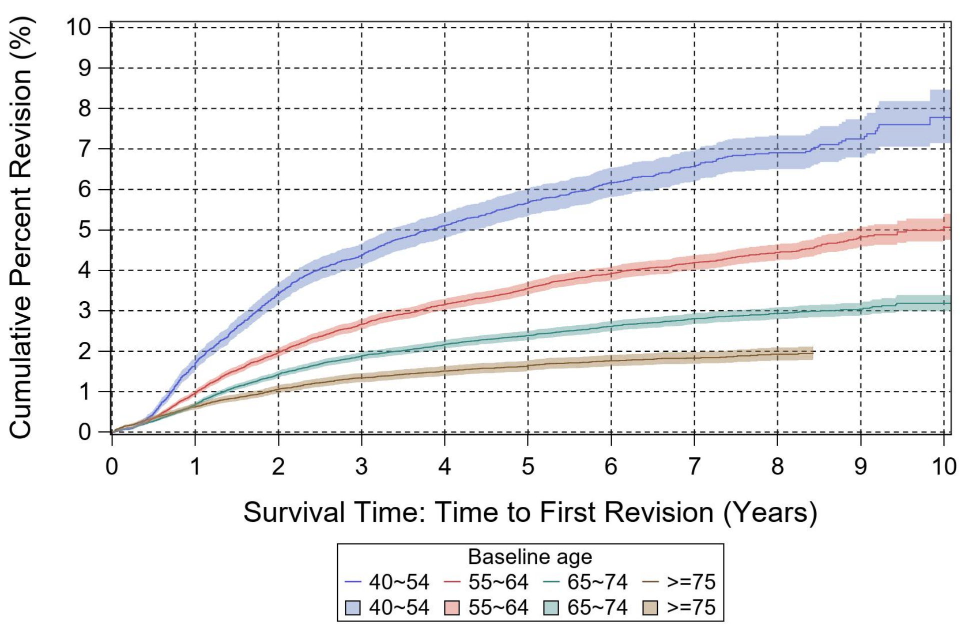

Figure 3: Total Knee Replacement Survivorship by Age in Michigan.

The introduction of new technologies has the potential to improve care or outcomes such as survivorship. Conversely, unexpected consequences of change can affect outcomes in a negative way. There are many examples of this in hip and knee arthroplasty. Malchau, Graves, Porter, Harris and Troelsen commented on the failure of implant regulatory bodies to protect patients from harm and the important role of arthroplasty registries in monitoring the outcomes of newly introduced implants (Malchau *et al*., 2015). They suggest “registry-based monitoring of new implants” accompanied by a “healthy skepticism” among surgeons. The rapid adoption of new implants, as evidenced by the usage curves in this 2023 MARCQI Annual Report, would suggest that this skepticism is absent. With this year′s report, MARCQI is beginning to share 10-year follow-up data on implants in Michigan and is developing methodology to begin tracking newly introduced implants. We are accepting the challenge issued by these senior statesmen of arthroplasty.

An example of a new technology that has been rapidly adopted in Michigan is uncemented knee replacement. While uncemented knees came onto the market in the 1980's and 1990's, there were problems with implant fixation, polyethylene quality, sterilization practices, locking mechanism wear, and patellar failures. While some early uncemented knees performed reasonably well, most of these knee designs were withdrawn from the market and little long-term follow-up was available. Over the last decade, new manufacturing technologies such as highly porous surfaces, 3-D printed coatings, and the desire to reduce revisions in higher risk patient groups has led to the resurgence of uncemented knee replacements in the arthroplasty market.

The hope of surgeons and patients selecting uncemented knee replacement is improved long-term durability, especially in younger patients who are known to have higher failure rates of knee replacements. Figure 3 demonstrates the significant differences in knee replacement survivorship in MARCQI by age group. The youngest patients clearly have the highest revision rates with more than 6% being revised by five years post-op while in patients over 65 years old, fewer than 3% have been revised by five years. Advertisements abound implying that uncemented knee replacements are superior or offer better durability for younger, more active patients. Uncemented knees are also appealing to surgeons since they can shorten the length of the surgery by avoiding the time it takes for cement to be mixed, applied, cleaned, and set.

Uncemented knee replacements are more expensive to manufacture. Though the costs of the cement are avoided and surgeries can be a few minutes shorter, hospitals paid 9%-20% more for uncemented knee implants in 2023 compared to the same system in a cemented version (Orthopaedic Network News, 2023). Studies evaluating the overall relative cost of using these implants have had mixed findings (Manoli *et al*., 2019; Rassir *et al*., 2020). Due to the high volume of these procedures, small increases in cost can have dramatic effects on overall health care costs. Uncemented knees are often marketed along with robotic techniques. New implants, navigation, additional imaging, and robotic technologies can all drive up the overall cost of care.

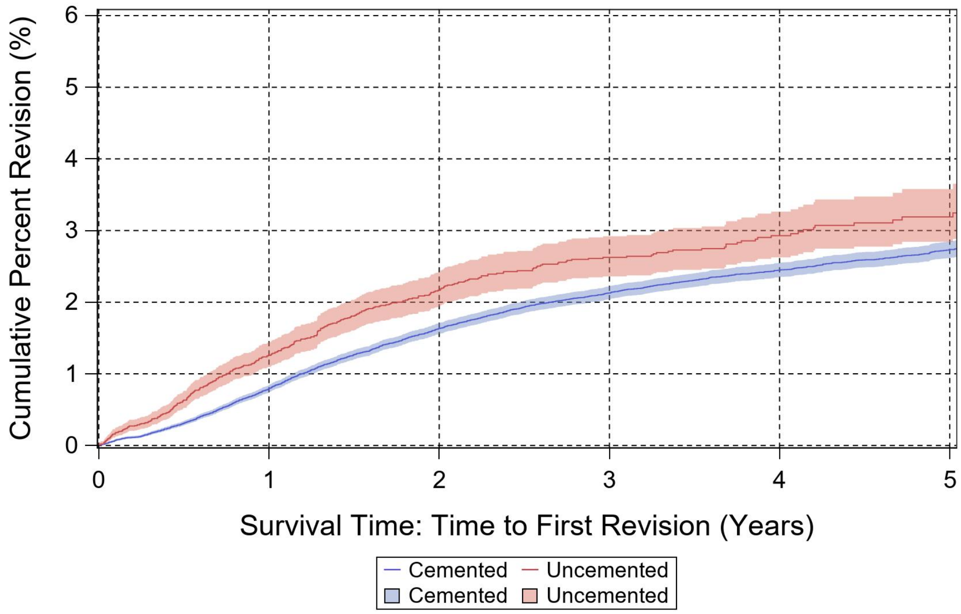

Figure 4: Uncemented and Cemented Knee Overall Survivorship.

In Michigan, there has been a rapid adoption of uncemented knee replacements that has increased from less than 5% to over 15% since 2017. From January 1, 2017 to December 31, 2022, out of 147,838 TKAs performed, 18,461 were uncemented total knee replacements and 2,061 had hybrid fixation. The frequency of use of these implants decreases with age in both males and females. They are used 18.9% of the time in men under the age of 55 and in 6.7% of women over 75 years old. However, usage is increasing over time in all age and sex categories. Overall survivorship of uncemented knees is worse than cemented knee replacements ($p < 0.0001$) (Figure 4). The four most common uncemented knee systems in the database are the Triathlon (81%), Evolution MP (7%), Persona (6%) and Attune (2%).

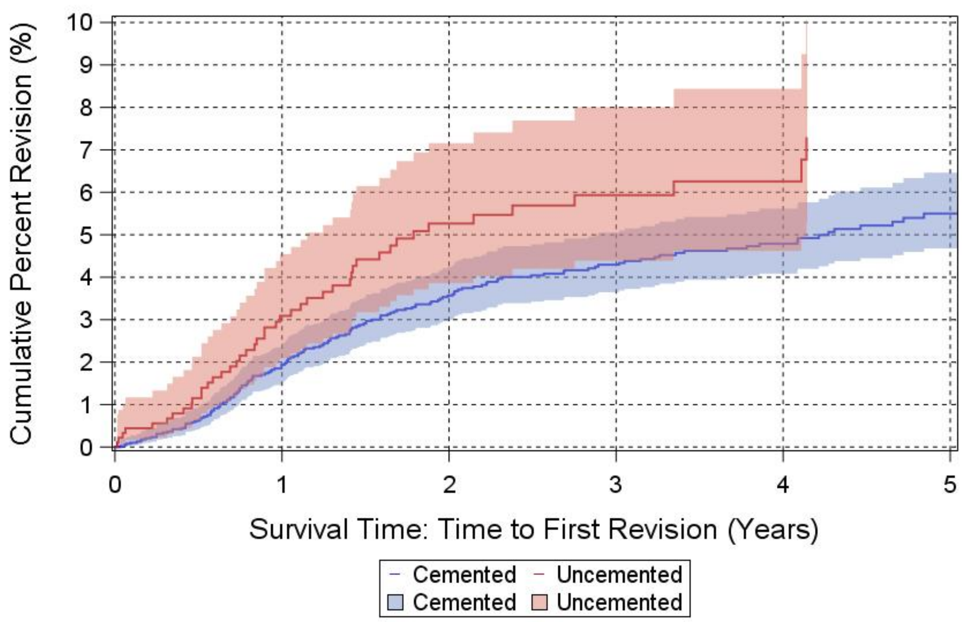

Figure 5: Cumulative Percent Revision for Uncemented and Cemented TKA in Men Under 55 years old.

When broken down by sex, overall survivorship is worse for both men (*p* = 0.0089) and women (*p* = 0.0046). By age, both uncemented and cemented implants have an equivalent and much higher failure rate in patients under 55 years of age (CPR at five years: uncemented 5.42% (95% C.I., 4.43-6.76), cemented 5.56% (95% C.I., 5.06-6.10). Patients 65-75 and greater than 75 years old have significantly worse survivorship with uncemented knee replacement at five years. Most surprising and disappointing is that young men (under 55 years old) did significantly worse with uncemented knees than with cemented knees (*p* = 0.0473) (Figure 5). This was consistent for each of the three most commonly used uncemented knee systems when compared to their cemented versions. Other recent studies have shown similar higher early revision rates with modern uncemented knee replacements, especially in women over 70 (Chiou *et al.*, 2023; Powell *et al.*, 2023).

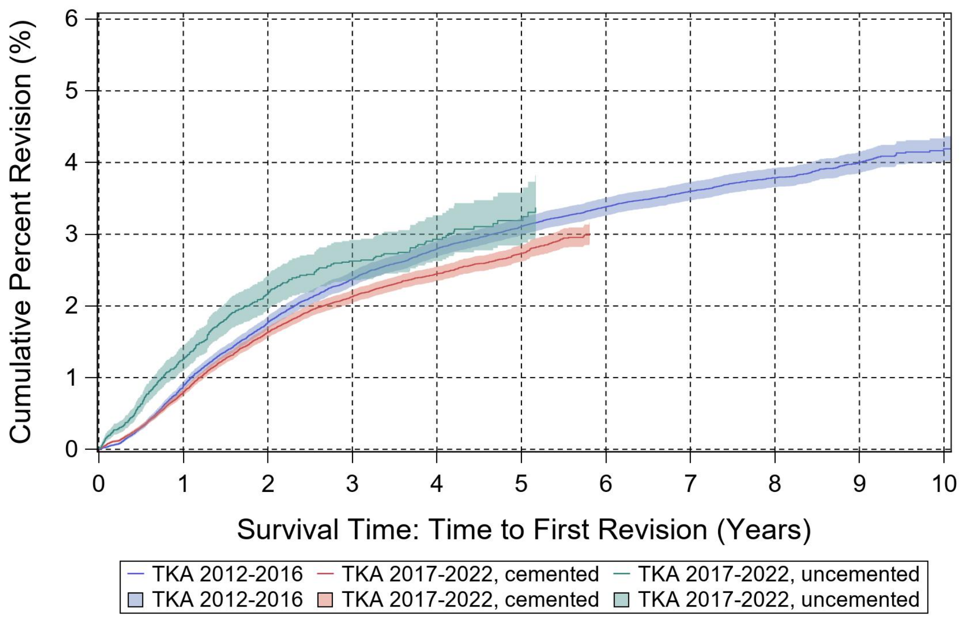

Figure 6: Total Knee Survivorship in Michigan by Time Period and With Uncemented Knees Excluded.

MARCQI's focus on improving quality and reducing complications leaves open the question whether revision rates in Michigan have improved overall. When the first five years of MARCQI data (2012-2016) is compared to cases done 2017-2022 we see a small but significant improvement in five-year knee replacement survivorship from 3.11% (95% C.I., 2.99-3.23) to 2.82% (95% C.I., 2.71-2.93) (*p* = 0.0024). Given the difference in outcomes between uncemented and cemented knee replacement described above, the question is “how would our patients have done if the surgeons in Michigan had not adopted these new, unproven implants?” Figure 6 shows the survivorship curves for cases in MARCQI done from 2012 to 2016, cases done from 2017 to 2022 with cemented knees, and the cases done 2017 to 2022 with uncemented knees. From 2017 to 2022, cemented knees had lower five-year CPR of 2.7% (95% C.I., 2.62-2.85) compared with 3.2% for uncemented (95% C.I., 2.84-3.58) ($p < 0.0001$).

If we had not used these implants, fewer of our patients may have had to undergo revision procedures within five years of their primary procedure. This is a simplified analysis and is potentially influenced by many factors such as surgeon learning curves, patellar resurfacing, patient selection biases, and other measured and unmeasured confounders, but it raises the question about our adoption of these unproven devices. If these more expensive implants do not have better survivorship, then the value of our care is decreasing. We are not accomplishing any of our goals of improving care, quality, and value.

Going forward, MARCQI will continue to track new implants and technologies with the continued goal of improving arthroplasty care and making Michigan the best place in the world to have a joint replacement. In addition, rising to the challenge made by Malchau *et al*. (2015) for registries to provide post-market surveillance data in a transparent way, MARCQI strives to improve public health and health care value in the United States and around the world.

Chapter 2

Total hip arthroplasty statistics, devices, and revisions

Selection of the most suitable implant is a critical component of providing high quality hip arthroplasty care. Since revision is an undesirable outcome and is widely reported across arthroplasty registries, chapters on revision risk have been included. Chapter two reports on hips; chapter three on knees. These data are based on primary cases performed from 2/15/2012 to 12/31/2022.

2.1 All total hip arthroplasty cases

This section presents data on all THA cases, including primary and revision cases.

Table 1: THA cases over time (numerical values)

Year	Annual cases	Cumulative cases
2012	2490	2490
2013	6722	9212
2014	11886	21098
2015	15019	36117
2016	16822	52939
2017	16979	69918
2018	17889	87807
2019	18680	106487
2020	16191	122678
2021	18258	140936
2022	20005	160941

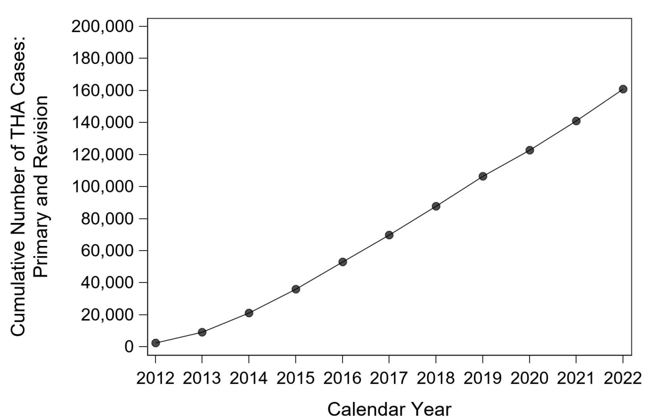

Figure 7: THA cases over time. These cases were performed in a total of 151,767 patients.

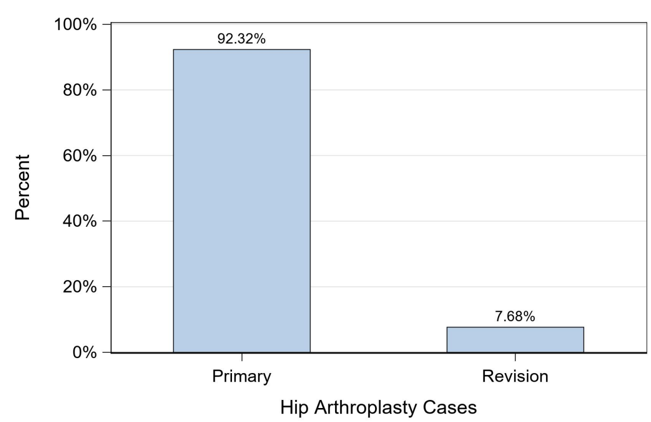

Figure 8: Percent of THA cases by primary or revision.

Table 2: Descriptive statistics of THA cases.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	87882	54.6	
Age (years)	160941	65.3(11.2)	66(15)
Height (cm)	160245	169.8(10.5)	170(15.2)
Weight (kg)	160245	88.4(21.3)	86.5(28.7)
BMI(kg/m^2)	160242	30.5(6.4)	29.8(8.3)
Smoking - never (%)	77480	48.1	
Smoking - previous (%)	60633	37.7	
Smoking - current (%)	22206	13.8	
Smoking - unknown (%)	622	0.4	

Table 4: Descriptive statistics of primary THA cases.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	80961	54.5	
Age (years)	148585	65.2(11.1)	66(15)
Height (cm)	147926	169.9(10.5)	170(15.2)
Weight (kg)	147926	88.6(21.2)	86.7(28.7)
BMI(kg/m^2)	147924	30.6(6.3)	29.8(8.3)
Smoking - never (%)	72042	48.5	
Smoking - previous (%)	55641	37.5	
Smoking - current (%)	20357	13.7	
Smoking - unknown (%)	545	0.4	

2.1.1 Primary THA cases

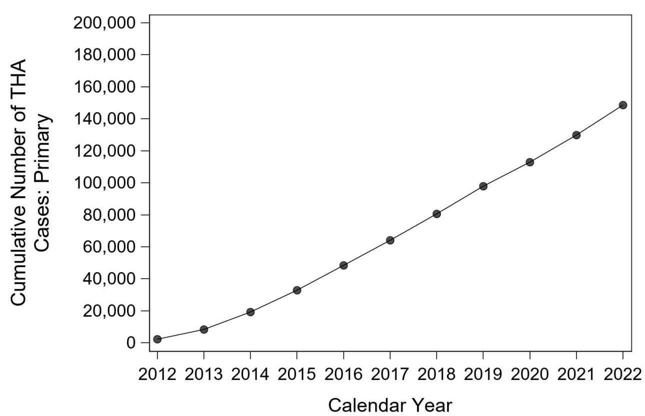

Figure 9: Primary THA cases over time. These cases were performed in a total of 126,196 patients.

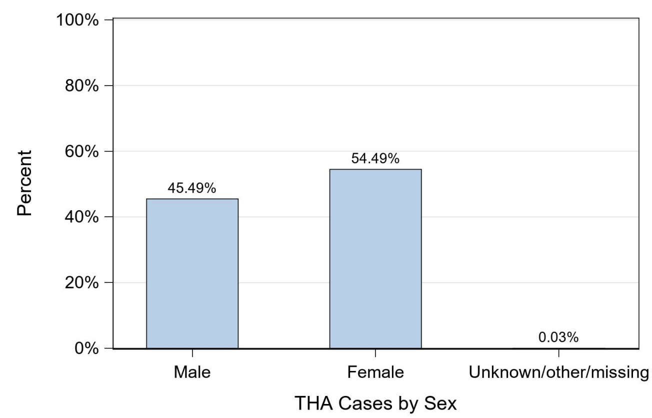

Figure 10: Percent of primary THA cases by sex.

Table 3: Primary THA cases over time (numerical values)

Year	Annual cases	Cumulative cases
2012	2249	2249
2013	6088	8337
2014	10911	19248
2015	13625	32873
2016	15524	48397
2017	15682	64079
2018	16506	80585
2019	17294	97879
2020	15020	112899
2021	16924	129823
2022	18762	148585

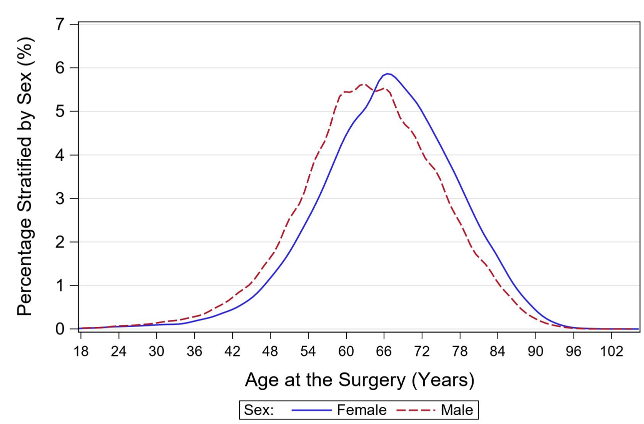

Figure 11: Age distribution of primary THA cases by sex.

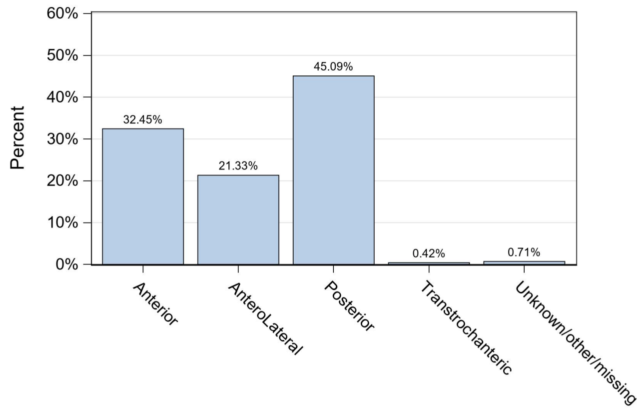

Figure 12: Percent of primary THA cases by approach.

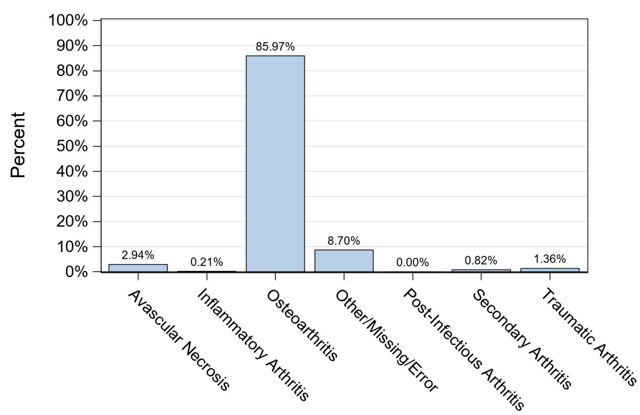

Figure 13: Percent of primary THA cases by diagnosis.

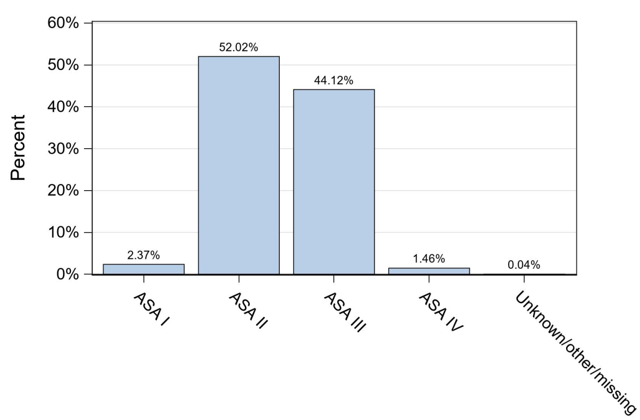

Figure 14: Percent of primary THA cases by ASA class.

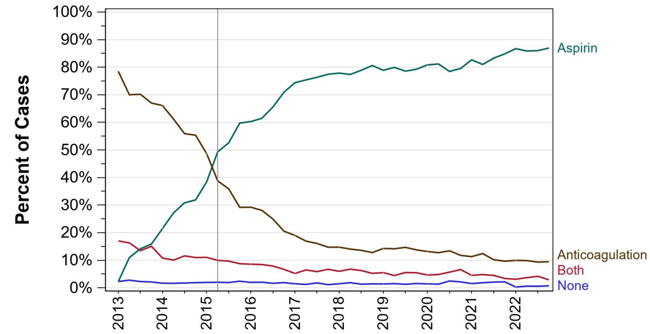

Figure 15: Percent of primary THA patients (first case) by thrombosis prophylaxis.

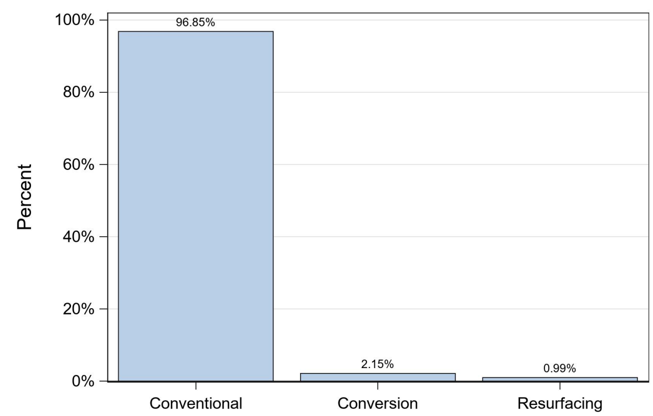

Figure 16: Percent of primary THA cases by procedure.

Note the data element for procedure, which was used to create the figure above, was changed in January of 2015 to include conversion.

2.2 Conventional THA cases

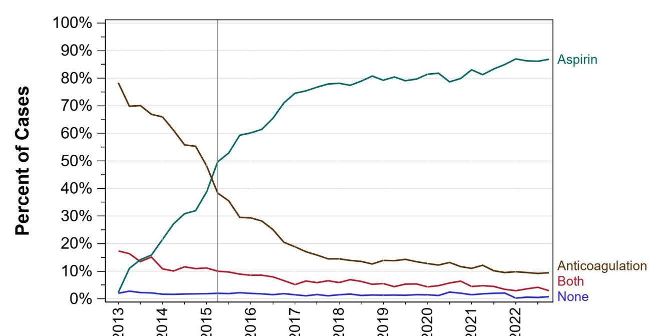

Figure 17: Percent of primary conventional THA patients (first case) by thrombosis prophylaxis.

2.2.1 Conventional THA stem fixation

MARCQI began abstracting which components were cemented as of 1/1/2017, so the analyses presented in this section are based on cases performed between 1/1/2017 and 12/31/2022.

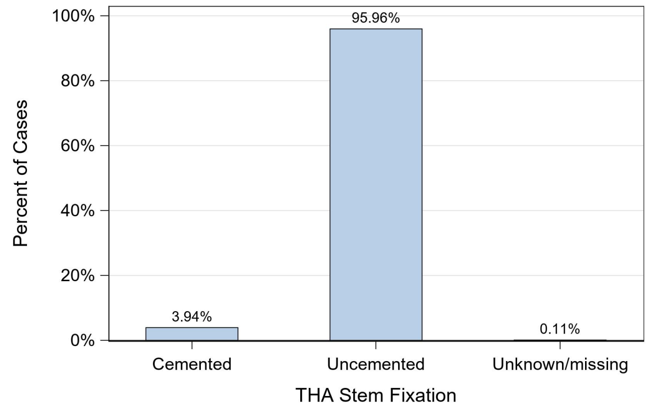

Figure 18: Distribution of stem fixation in primary conventional THA cases.

Table 5: Descriptive statistics of primary conventional THA cases by stem fixation.

Quantity	Cemented N	Cemented Mean (SD)	Cemented Median (IQR)	Uncemented N	Uncemented Mean (SD)	Uncemented Median (IQR)
Female (%)	3068	81.1		49398	53.6	
Age (years)	3782	77.2(8.7)	78(11)	92204	65(10.4)	65(13)
Height (cm)	3758	163.5(9.4)	162.6(11.4)	91589	170.2(10.4)	170.2(15.2)
Weight (kg)	3758	75.4(17.6)	72.7(23.6)	91589	89.6(21)	88(27.9)
BMI(kg/m^2)	3758	28.1(5.8)	27.3(7.8)	91589	30.8(6.3)	30.1(8.3)
Smoking - never (%)	2013	53.2		45170	49	
Smoking - previous (%)	1518	40.1		34097	37	
Smoking - current (%)	235	6.2		12720	13.8	
Smoking - unknown (%)	16	0.4		217	0.2	

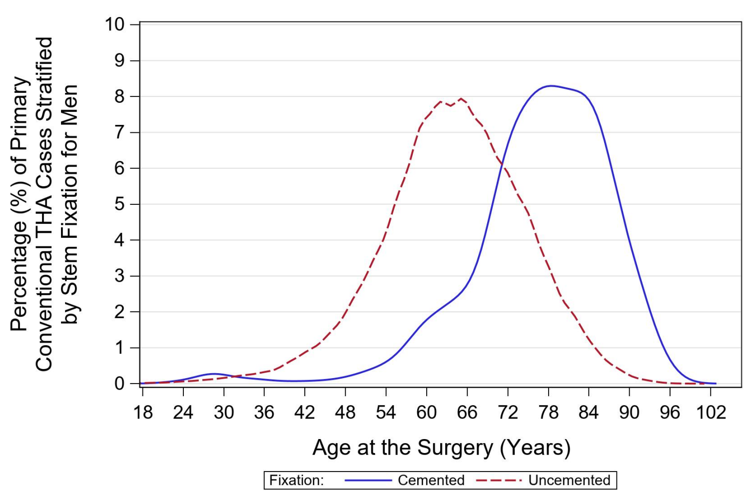

Figure 19: Histogram of age for primary conventional THA cases by stem fixation for men.

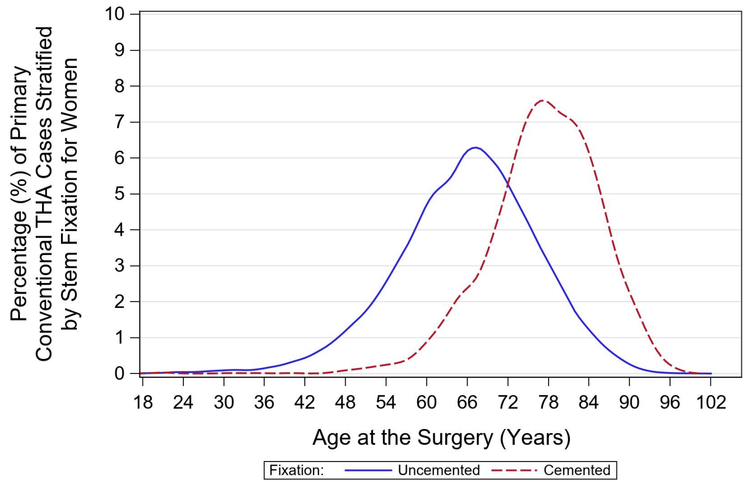

Figure 20: Histogram of age for primary conventional THA cases by stem fixation for women.

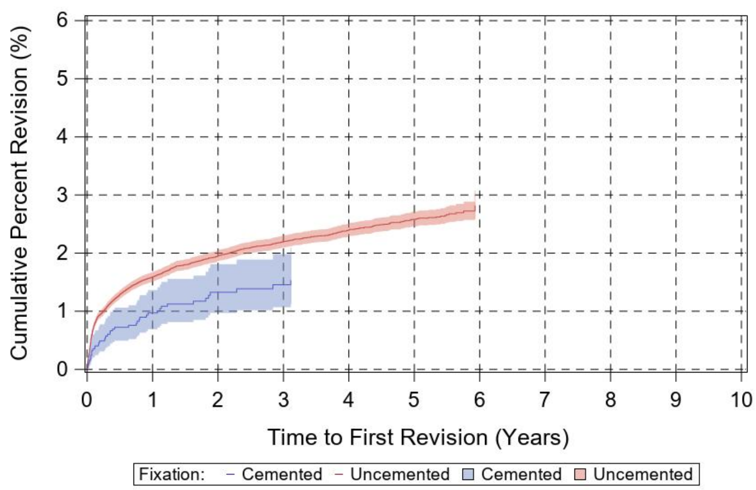

Figure 21: Cumulative percent revision for primary conventional THA by stem fixation.

Table 6: Cumulative percent revision for primary conventional THA by stem fixation (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Cemented stem	3758	0.97 (0.69,1.36)	1.46 (1.07,1.99)	1.54 (1.13,2.09)	N/A	N/A
Uncemented stem	91897	1.59 (1.51,1.68)	2.20 (2.10,2.30)	2.58 (2.46,2.71)	N/A	N/A
Unknown/missing	104					

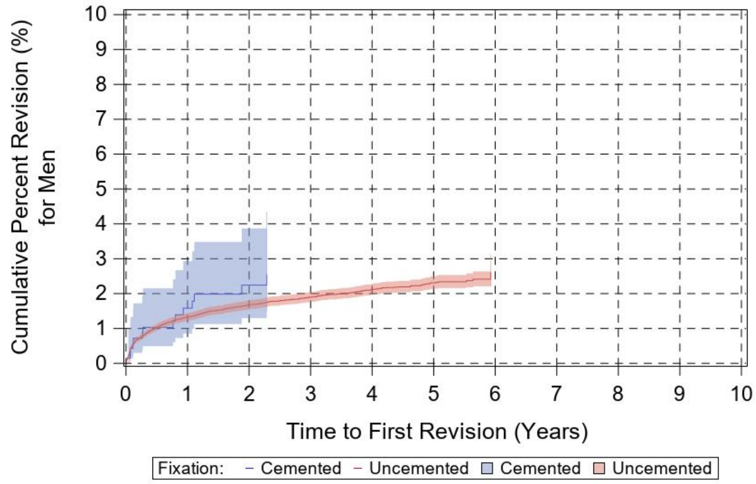

Figure 22: Cumulative percent revision for primary conventional THA by stem fixation for men.

Table 7: Cumulative percent revision for primary conventional THA by stem fixation for men (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Cemented stem	706	1.58 (0.85,2.93)	2.55 (1.49,4.35)	2.55 (1.49,4.35)	N/A	N/A
Uncemented stem	42627	1.33 (1.22,1.44)	1.90 (1.76,2.04)	2.31 (2.13,2.49)	N/A	N/A
Unknown/missing	54					

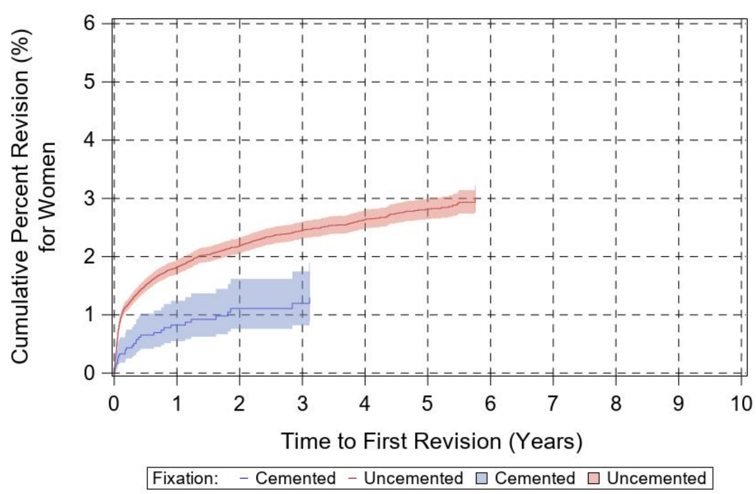

Figure 23: Cumulative percent revision for primary conventional THA by stem fixation for women.

Table 8: Cumulative percent revision for primary conventional THA by stem fixation for women (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Cemented stem	3051	0.83 (0.55,1.24)	1.20 (0.82,1.75)	1.30 (0.89,1.89)	N/A	N/A
Uncemented stem	49251	1.82 (1.70,1.94)	2.45 (2.31,2.61)	2.81 (2.64,3.00)	N/A	N/A
Unknown/missing	50					

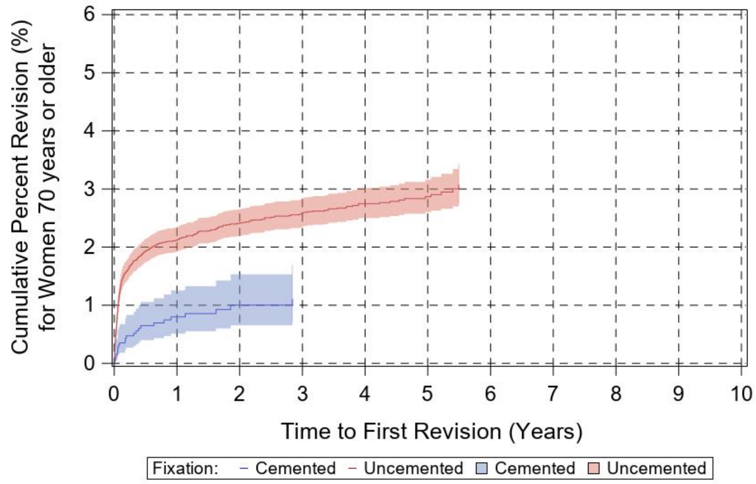

Figure 24: Cumulative percent revision for primary conventional THA by stem fixation for women 70 years or older.

Table 9: Cumulative percent revision for primary conventional THA by stem fixation for women 70 years or older (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Cemented stem	2583	0.80 (0.51,1.25)	1.11 (0.72,1.70)	1.11 (0.72,1.70)	N/A	N/A
Uncemented stem	18413	2.12 (1.92,2.34)	2.59 (2.35,2.84)	2.87 (2.60,3.16)	N/A	N/A
Unknown/missing	18					

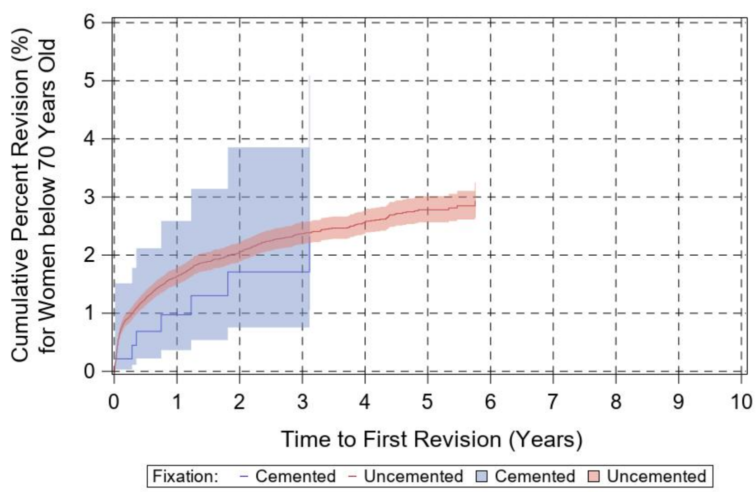

Figure 25: Cumulative percent revision for primary conventional THA by stem fixation for women under 70 years.

Table 10: Cumulative percent revision for primary conventional THA by stem fixation for women under 70 years (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Cemented stem	468	0.97 (0.36,2.59)	1.71 (0.76,3.85)	2.33 (1.05,5.09)	N/A	N/A
Uncemented stem	30838	1.64 (1.50,1.79)	2.37 (2.19,2.56)	2.78 (2.56,3.02)	N/A	N/A
Unknown/missing	32					

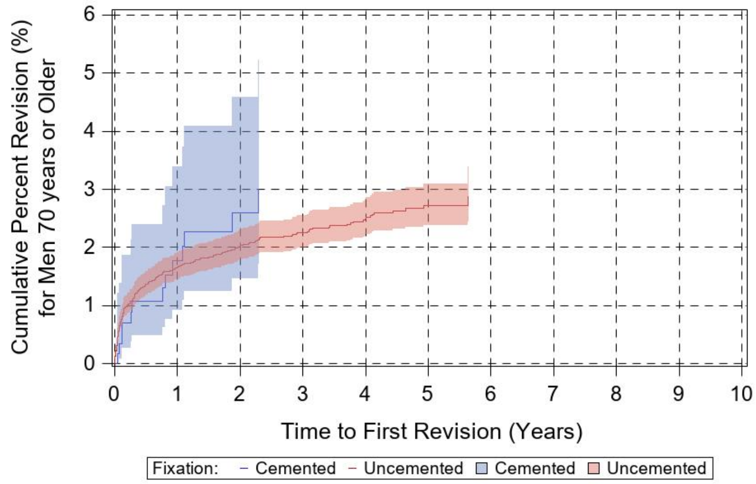

Figure 26: Cumulative percent revision for primary conventional THA by stem fixation for men 70 years or older.

Table 11: Cumulative percent revision for primary conventional THA by stem fixation for men 70 years or older (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Cemented stem	580	1.77 (0.92,3.39)	3.00 (1.71,5.23)	3.00 (1.71,5.23)	N/A	N/A
Uncemented stem	12816	1.67 (1.45,1.91)	2.25 (1.99,2.55)	2.72 (2.39,3.10)	N/A	N/A
Unknown/missing	17					

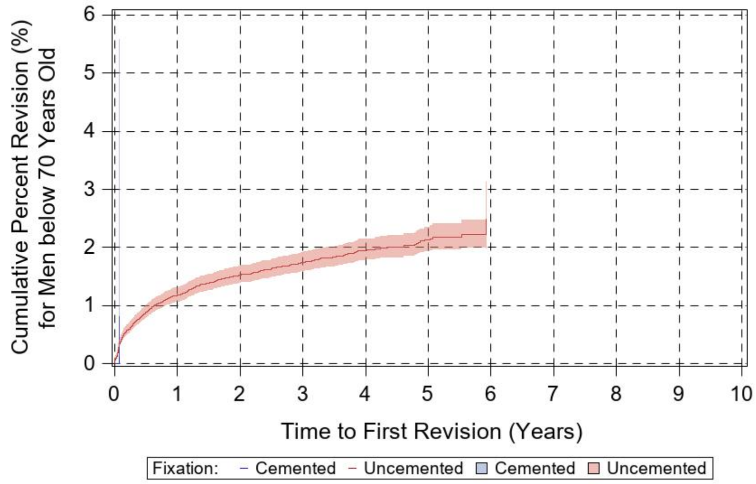

Figure 27: Cumulative percent revision for primary conventional THA by stem fixation for men under 70 years. Only one revision occured in cemented group, and it was within one month of primary procedure.

Table 12: Cumulative percent revision for primary conventional THA by stem fixation for men under 70 years (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Cemented stem	126	0.81 (0.11,5.59)	0.81 (0.11,5.59)	0.81 (0.11,5.59)	N/A	N/A
Uncemented stem	29811	1.18 (1.06,1.31)	1.74 (1.59,1.92)	2.13 (1.93,2.35)	N/A	N/A
Unknown/missing	37					

Table 13: Reasons for revision following primary cemented stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	15	34.1
2	Joint Infection	10	22.7
3	Aseptic Loosening	8	18.2
4	Peri-prosthetic fracture - Femur	7	15.9
5	Implant Failure	2	4.5
6	Peri-prosthetic fracture - Acetabulum	2	4.5

Table 14: Reasons for revision following primary cemented stem cases in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	14	42.4
2	Joint Infection	9	27.3
3	Peri-prosthetic fracture - Femur	4	12.1
4	Aseptic Loosening	3	9.1
5	Peri-prosthetic fracture - Acetabulum	2	6.1
6	Implant Failure	1	3.0

Table 15: Reasons for revision following primary cemented stem cases in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	5	62.5
2	Joint Infection	1	12.5
3	Implant Failure	1	12.5
4	Peri-prosthetic fracture - Femur	1	12.5

Table 16: Reasons for revision following primary cemented stem cases in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	2	100.0

Table 17: Reasons for revision following primary uncemented stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	545	28.8
2	Dislocation/Instability	399	21.1
3	Joint Infection	381	20.1
4	Aseptic Loosening	326	17.2
5	Implant Failure	77	4.1
6	Malalignment	73	3.9
7	Pain	50	2.6
8	Peri-prosthetic fracture - Acetabulum	30	1.6
9	Metal Reaction/Metallosis	9	0.5
10	Osteolysis	2	0.1
11	Poly liner wear	2	0.1

Table 18: Reasons for revision following primary uncemented stem cases in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	506	36.3
2	Dislocation/Instability	298	21.4
3	Joint Infection	263	18.9
4	Aseptic Loosening	161	11.6
5	Implant Failure	64	4.6
6	Malalignment	39	2.8
7	Pain	31	2.2
8	Peri-prosthetic fracture - Acetabulum	27	1.9
9	Poly liner wear	2	0.1
10	Osteolysis	1	0.1
11	Metal Reaction/Metallosis	1	0.1

Table 19: Reasons for revision following primary uncemented stem cases in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	76	30.8
2	Joint Infection	63	25.5
3	Dislocation/Instability	52	21.1
4	Malalignment	19	7.7
5	Peri-prosthetic fracture - Femur	18	7.3
6	Pain	8	3.2
7	Implant Failure	6	2.4
8	Peri-prosthetic fracture - Acetabulum	2	0.8
9	Metal Reaction/Metallosis	2	0.8
10	Osteolysis	1	0.4

Table 20: Reasons for revision following primary uncemented stem cases in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	42	32.8
2	Dislocation/Instability	25	19.5
3	Joint Infection	21	16.4
4	Peri-prosthetic fracture - Femur	11	8.6
5	Malalignment	10	7.8
6	Pain	9	7.0
7	Implant Failure	6	4.7
8	Metal Reaction/Metallosis	3	2.3
9	Peri-prosthetic fracture - Acetabulum	1	0.8

Table 21: Reasons for revision following primary cemented stem cases in women at least 70 years of age.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	11	30.6
2	Joint Infection	10	27.8
3	Aseptic Loosening	7	19.4
4	Peri-prosthetic fracture - Femur	7	19.4
5	Peri-prosthetic fracture - Acetabulum	1	2.8

Table 22: Reasons for revision following primary cemented stem cases in women at least 70 years of age in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	7	36.8
2	Joint Infection	5	26.3
3	Peri-prosthetic fracture - Femur	4	21.1
4	Aseptic Loosening	2	10.5
5	Peri-prosthetic fracture - Acetabulum	1	5.3

Table 23: Reasons for revision following primary cemented stem cases in women at least 70 years of age in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	66.7
2	Joint Infection	1	33.3

Table 24: Reasons for revision following primary cemented stem cases in women at least 70 years of age in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	1	100.0

Table 25: Reasons for revision following primary uncemented stem cases in women at least 70 years of age.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	293	40.1
2	Dislocation/Instability	159	21.8
3	Aseptic Loosening	109	14.9
4	Joint Infection	95	13.0
5	Implant Failure	29	4.0
6	Peri-prosthetic fracture - Acetabulum	19	2.6
7	Malalignment	16	2.2
8	Pain	7	1.0
9	Metal Reaction/Metallosis	3	0.4

Table 26: Reasons for revision following primary uncemented stem cases in women at least 70 years of age in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	203	53.6
2	Dislocation/Instability	73	19.3
3	Aseptic Loosening	33	8.7
4	Joint Infection	28	7.4
5	Implant Failure	20	5.3
6	Peri-prosthetic fracture - Acetabulum	13	3.4
7	Malalignment	6	1.6
8	Pain	3	0.8

Table 27: Reasons for revision following primary uncemented stem cases in women at least 70 years of age in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	19	48.7
2	Aseptic Loosening	12	30.8
3	Joint Infection	3	7.7
4	Peri-prosthetic fracture - Femur	2	5.1
5	Peri-prosthetic fracture - Acetabulum	1	2.6
6	Pain	1	2.6
7	Malalignment	1	2.6

Table 28: Reasons for revision following primary uncemented stem cases in women at least 70 years of age in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	7	36.8
2	Joint Infection	6	31.6
3	Aseptic Loosening	3	15.8
4	Implant Failure	1	5.3
5	Peri-prosthetic fracture - Femur	1	5.3
6	Malalignment	1	5.3

2.2.2 Most commonly used conventional THA implants

The following three tables provide utilization data of implants used in primary conventional THA.

Table 29: Ten most commonly used femoral components in primary total conventional THA.

Rank	Stem	N	Percent
1	Accolade II	37750	25.7
2	M/L Taper	15064	10.2
3	Taperloc 133	14068	9.6
4	Summit	7584	5.2
5	Fitmore	5903	4.0
6	Anthology	5809	4.0
7	Actis DuoFix	5757	3.9
8	Taperloc 133 Microplasty	4687	3.2
9	Tri-Lock BPS	4557	3.1
10	Corail	3557	2.4
11	Others	42371	28.7

Table 30: Ten most commonly used acetabular components in primary total conventional THA.

Rank	Cup	N	Percent
1	G7	31266	21.2
2	Trident	30643	20.8
3	Pinnacle	23931	16.3
4	Trident II	18578	12.6
5	Continuum	15740	10.7
6	Reflection 3	10422	7.1
7	RingLoc	2635	1.8
8	Trabecular Metal	1947	1.3
9	Trilogy	1603	1.1
10	Regenerex RingLoc+	1020	0.7
11	Others	9322	6.3

Table 31: Ten most commonly used femoral/acetabular component combinations used in primary total conventional THA.

Rank	Stem/cup combination	N	Percent
1	Accolade II / Trident	21124	14.4
2	Accolade II / Trident II	16016	10.9
3	Taperloc 133 / G7	10327	7.0
4	M/L Taper / Continuum	8202	5.6
5	Summit / Pinnacle	7542	5.1
6	Actis DuoFix / Pinnacle	5639	3.8
7	Anthology / Reflection 3	5204	3.5
8	Tri-Lock BPS / Pinnacle	4000	2.7
9	M/L Taper / G7	3957	2.7
10	Corail / Pinnacle	3544	2.4
11	Others	61552	41.5

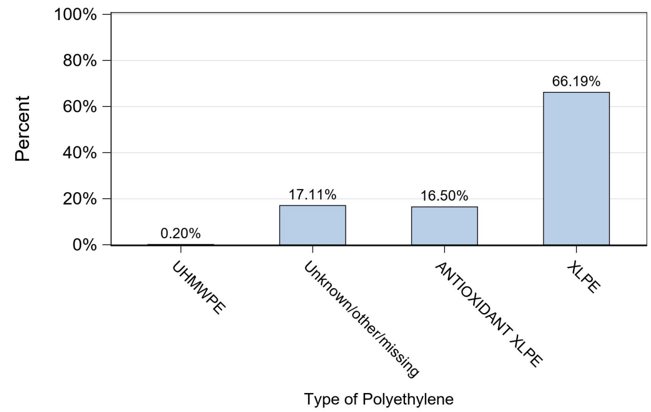

Figure 28: Percentage of polyethylene liners by type of polyethylene for primary conventional THA.

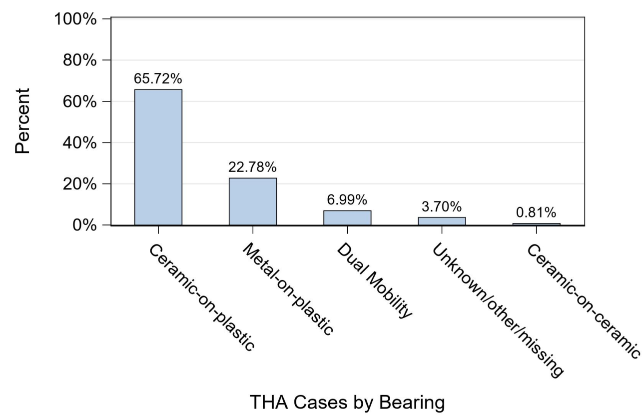

Figure 29: Percentage of bearing surface couple for primary conventional THA.

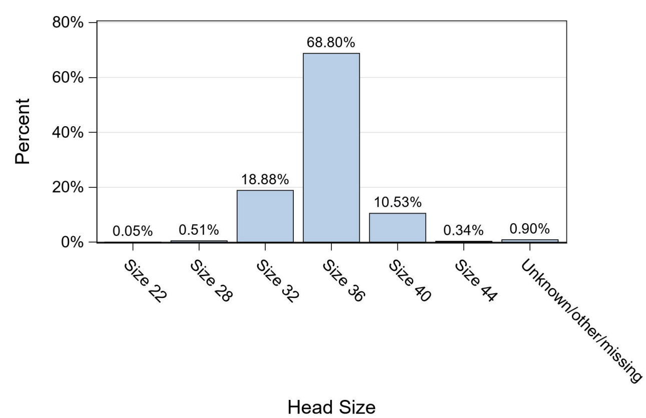

Figure 30: Distribution of head sizes for primary conventional THA, excluding dual mobility cases.

2.2.3 Conventional THA revision risk summary

The reason for revision is of central importance to quality improvement because it helps focus attention on specific causes that may be addressed. Therefore, the data are presented in two formats below: tabular and Pareto chart. The tabular format is consistent with how other arthroplasty registries report cause of revision. The Pareto chart figure presents the same data in a format commonly used in quality improvement. The Pareto chart sorts the reasons for revision by frequency (bar chart on bottom, from left to right) and presents a cumulative percent using a line graph above.

In addition to an overall summary of reason for revision, tables showing reason for revision for the first, second, and third year post-operatively are provided because the reasons change over this time horizon. It is important to note that the time window for the cases reported in reasons for revision tables and figures differ from the time window used for other figures because reason for revision was added to the database on 1/1/2015. While these data capture revisions for primaries performed back to 2/15/2012, only revisions occurring on or after 1/1/2015 are included in the reasons for revision figure and tables.

Table 32: Reasons for revision following primary conventional THA.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	796	23.7
2	Dislocation/Instability	742	22.1
3	Joint Infection	635	18.9
4	Aseptic Loosening	632	18.8
5	Pain	152	4.5
6	Implant Failure	145	4.3
7	Malalignment	121	3.6
8	Metal Reaction/Metallosis	63	1.9
9	Peri-prosthetic fracture - Acetabulum	54	1.6
10	Poly liner wear	11	0.3
11	Osteolysis	4	0.1

Table 33: Reasons for revision following primary conventional THA in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	669	32.8
2	Dislocation/Instability	477	23.4
3	Joint Infection	386	18.9
4	Aseptic Loosening	235	11.5
5	Implant Failure	95	4.7
6	Pain	74	3.6
7	Malalignment	55	2.7
8	Peri-prosthetic fracture - Acetabulum	43	2.1
9	Poly liner wear	3	0.1
10	Osteolysis	1	0.1
11	Metal Reaction/Metallosis	1	0.1

Table 34: Reasons for revision following primary conventional THA in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	151	32.6
2	Joint Infection	103	22.2
3	Dislocation/Instability	92	19.9
4	Pain	40	8.6
5	Peri-prosthetic fracture - Femur	28	6.0
6	Malalignment	24	5.2
7	Implant Failure	15	3.2
8	Peri-prosthetic fracture - Acetabulum	5	1.1
9	Metal Reaction/Metallosis	4	0.9
10	Osteolysis	1	0.2

Table 35: Reasons for revision following primary conventional THA in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	89	32.0
2	Dislocation/Instability	53	19.1
3	Joint Infection	49	17.6
4	Pain	27	9.7
5	Peri-prosthetic fracture - Femur	23	8.3
6	Malalignment	15	5.4
7	Implant Failure	11	4.0
8	Metal Reaction/Metallosis	6	2.2
9	Peri-prosthetic fracture - Acetabulum	3	1.1
10	Osteolysis	1	0.4
11	Poly liner wear	1	0.4

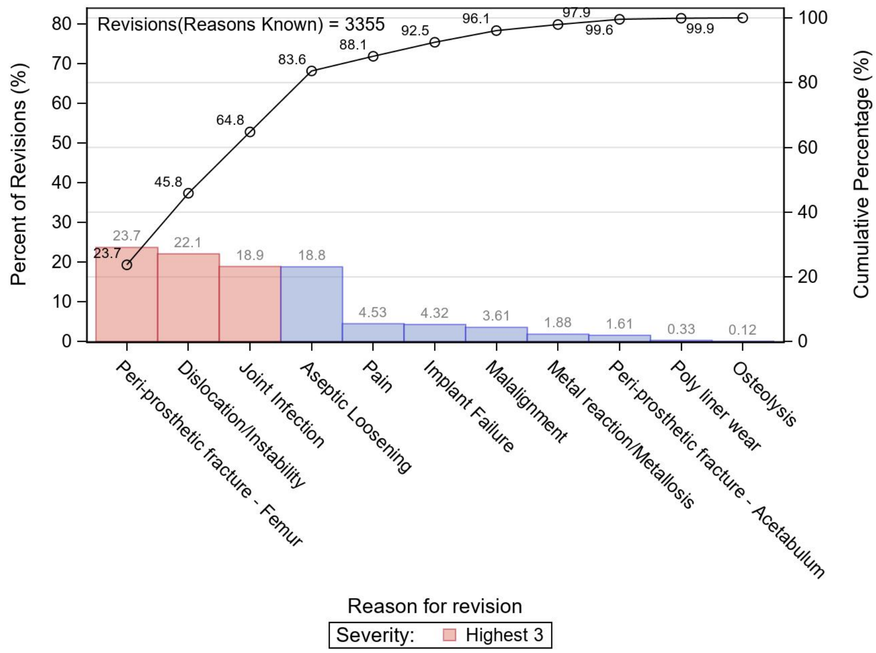

Figure 31: Reasons for revision following primary conventional THA (Pareto chart). Solid line is cumulative percent.

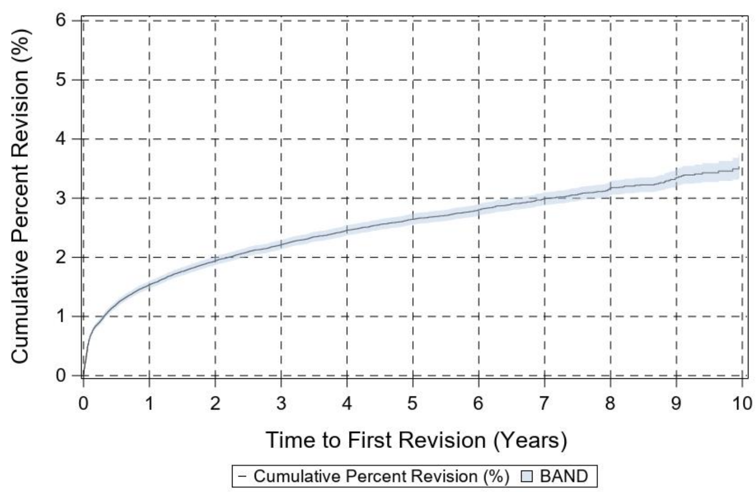

Figure 32: Cumulative percent revision for primary conventional THA.

Table 36: Cumulative percent revision and number at risk for primary conventional THA (numerical values).

	1 year	3 years	5 years	7 years	10 years
CPR	1.54 (1.47,1.60)	2.21 (2.14,2.30)	2.64 (2.55,2.73)	2.99 (2.89,3.10)	3.54 (3.34,3.74)
Number at risk	125474	93622	60838	31102	2076

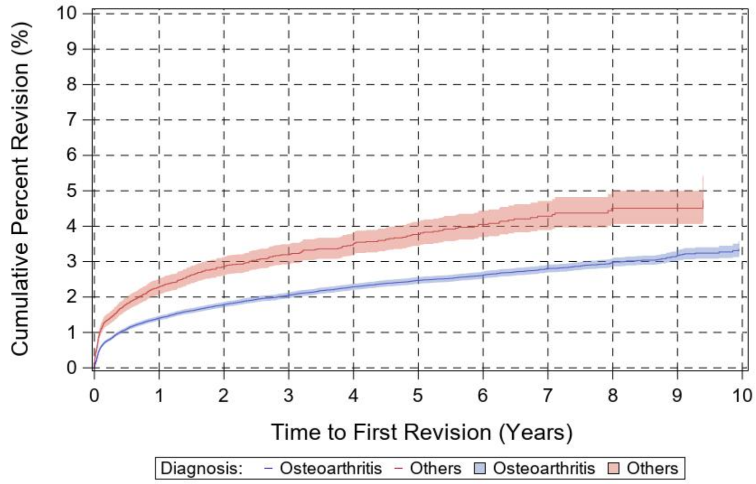

Figure 33: Cumulative percent revision for primary conventional THA by diagnosis.

Table 37: Cumulative percent revision for primary conventional THA by diagnosis (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Osteoarthritis	125551	1.41 (1.34,1.47)	2.05 (1.97,2.13)	2.47 (2.37,2.56)	2.80 (2.70, 2.91)	3.36 (3.15, 3.58)
Others	18732	2.29 (2.07,2.52)	3.19 (2.92,3.49)	3.77 (3.44,4.12)	4.28 (3.89, 4.71)	4.73 (4.13, 5.42)
Unknown/Missing	1839					

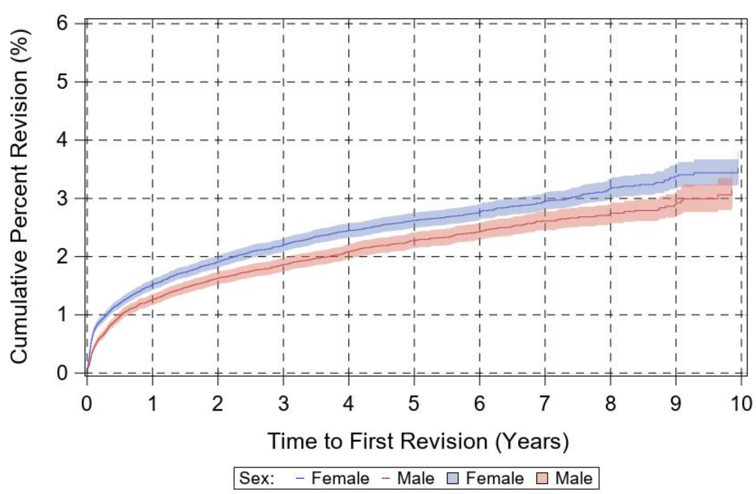

Figure 34: Cumulative percent revision for primary conventional THA by sex for osteoarthritis diagnosis.

Table 38: Cumulative percent revision for primary conventional THA by sex for osteoarthritis diagnosis (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Female	69610	1.52 (1.43,1.62)	2.20 (2.09,2.31)	2.62 (2.49,2.75)	2.95 (2.81, 3.11)	3.52 (3.25, 3.81)
Male	55911	1.26 (1.17,1.36)	1.86 (1.75,1.98)	2.27 (2.14,2.41)	2.61 (2.46, 2.78)	3.15 (2.84, 3.50)
Missing	30					

2.2.4 Revision risk for conventional THA stem/cup implant combinations

There is variation in revision risk across implants. This section provides revision risk data by stem/cup implant combination.

Table 39: Summary of cumulative percent revision following primary THA for stem/cup combinations having at least 500 cases, sorted alphabetically.

Stem/cup combination	N*	1 year	3 years	5 years	7 years	10 years
Accolade II / Trident	20979	1.18 (1.04,1.34)	1.92 (1.74,2.11)	2.43 (2.23,2.66)	2.92 (2.67,3.18)	3.72 (3.26,4.24)
Accolade II / Trident II	15981	1.58 (1.40,1.80)	2.13 (1.88,2.41)	2.55 (1.94,3.35)	N/A	N/A
Accolade C / Trident II	571	0.97 (0.40,2.33)	1.84 (0.81,4.14)	1.84 (0.81,4.14)	N/A	N/A
Accolade TMZF / Trident	891	0.90 (0.45,1.79)	2.02 (1.28,3.19)	2.81 (1.90,4.12)	3.32 (2.31,4.74)	3.91 (2.76,5.52)
Actis DuoFix / Pinnacle	5622	0.67 (0.48,0.93)	0.89 (0.65,1.22)	1.05 (0.70,1.58)	N/A	N/A
AML / Pinnacle	787	1.28 (0.69,2.36)	2.15 (1.32,3.49)	3.06 (2.00,4.69)	3.36 (2.20,5.13)	3.36 (2.20,5.13)
Anthology / PolarCup	551	0.55 (0.18,1.69)	1.49 (0.75,2.95)	2.00 (1.07,3.71)	2.00 (1.07,3.71)	N/A
Anthology / Reflection 3	5174	2.01 (1.65,2.44)	2.91 (2.46,3.45)	3.38 (2.86,3.99)	3.91 (3.29,4.64)	4.16 (3.47,4.98)
Avenir (Cemented) / G7	882	0.87 (0.41,1.83)	1.08 (0.53,2.20)	1.73 (0.73,4.05)	N/A	N/A
Avenir (Cementless) / Continuum	521	1.34 (0.64,2.80)	1.92 (1.04,3.55)	2.13 (1.18,3.81)	2.66 (1.55,4.57)	N/A
Avenir (Cementless) / G7	677	1.94 (1.13,3.31)	2.13 (1.27,3.58)	2.13 (1.27,3.58)	N/A	N/A
Avenir Complete / G7	2704	0.88 (0.55,1.39)	0.88 (0.55,1.39)	N/A	N/A	N/A
Corail / Pinnacle	3495	1.22 (0.90,1.65)	1.86 (1.44,2.40)	1.92 (1.49,2.47)	2.06 (1.59,2.65)	2.66 (1.92,3.68)
Corail Coxa Vara / Pinnacle	753	0.14 (0.02,0.96)	0.78 (0.33,1.88)	0.98 (0.44,2.19)	0.98 (0.44,2.19)	0.98 (0.44,2.19)
Echo Bi-Metric / G7	1627	2.78 (2.08,3.71)	3.54 (2.73,4.58)	3.83 (2.97,4.93)	3.83 (2.97,4.93)	N/A
Echo Bi-Metric Microplasty / G7	1837	2.01 (1.45,2.77)	2.64 (1.97,3.52)	3.06 (2.28,4.10)	3.06 (2.28,4.10)	N/A
Fitmore / Continuum	2802	1.32 (0.96,1.82)	2.00 (1.55,2.60)	2.35 (1.85,2.99)	2.86 (2.27,3.59)	2.86 (2.27,3.59)
Fitmore / G7	2684	1.36 (0.98,1.88)	1.76 (1.31,2.35)	1.94 (1.44,2.60)	1.94 (1.44,2.60)	N/A
M/L Taper** / Continuum	8132	1.71 (1.45,2.02)	2.39 (2.07,2.75)	2.82 (2.47,3.22)	3.06 (2.69,3.48)	3.65 (3.02,4.40)
M/L Taper** / G7	3938	1.62 (1.26,2.08)	2.32 (1.86,2.90)	2.48 (1.98,3.12)	2.89 (2.06,4.04)	N/A
M/L Taper** / Trabecular Metal	1040	2.51 (1.71,3.66)	3.35 (2.40,4.66)	3.90 (2.84,5.34)	4.23 (3.05,5.86)	4.23 (3.05,5.86)
M/L Taper** / Trilogy	1325	1.58 (1.04,2.42)	2.99 (2.19,4.07)	3.54 (2.65,4.71)	4.45 (3.40,5.82)	4.60 (3.52,5.99)
Polarstem / Reflection 3	2790	1.59 (1.18,2.15)	1.91 (1.44,2.53)	2.61 (1.96,3.48)	2.61 (1.96,3.48)	N/A
Secur-Fit / Trident	1090	3.76 (2.78,5.07)	4.96 (3.82,6.42)	5.65 (4.42,7.20)	6.22 (4.90,7.89)	N/A
Secur-Fit / Trident II	674	3.06 (1.99,4.71)	3.06 (1.99,4.71)	3.59 (2.25,5.69)	N/A	N/A
Secur-Fit Max / Trident	3023	2.10 (1.64,2.68)	2.91 (2.36,3.58)	3.49 (2.87,4.23)	4.06 (3.34,4.92)	4.35 (3.55,5.32)
Secur-Fit Plus Max / Trident	1984	1.71 (1.23,2.39)	2.12 (1.57,2.85)	2.53 (1.92,3.33)	2.96 (2.29,3.82)	3.47 (2.69,4.46)
SROM / Pinnacle	1109	1.27 (0.75,2.13)	2.55 (1.77,3.68)	3.16 (2.27,4.39)	3.79 (2.77,5.16)	3.96 (2.91,5.39)
Summit / Pinnacle	7455	1.47 (1.22,1.77)	1.98 (1.68,2.34)	2.14 (1.82,2.51)	2.29 (1.95,2.68)	2.86 (2.19,3.72)
Synergy / Reflection 3	1269	2.33 (1.63,3.34)	3.35 (2.47,4.55)	3.72 (2.76,5.00)	4.59 (3.43,6.13)	4.87 (3.62,6.53)
Taperloc 133 / Continuum	792	3.06 (2.06,4.53)	4.95 (3.62,6.74)	5.78 (4.31,7.73)	5.78 (4.31,7.73)	N/A
Taperloc 133 / G7	10292	1.62 (1.38,1.89)	2.23 (1.94,2.56)	2.62 (2.27,3.02)	2.68 (2.31,3.09)	N/A
Taperloc 133 / RingLoc	1678	1.73 (1.20,2.48)	2.45 (1.81,3.31)	2.64 (1.97,3.53)	2.72 (2.03,3.62)	2.94 (2.17,3.99)
Taperloc 133 Microplasty / Continuum	534	2.18 (1.21,3.91)	2.45 (1.39,4.28)	3.20 (1.70,5.98)	3.20 (1.70,5.98)	N/A
Taperloc 133 Microplasty / G7	3487	1.14 (0.84,1.56)	1.36 (1.02,1.83)	1.95 (1.48,2.57)	2.03 (1.54,2.68)	N/A
Trabecular Metal / Continuum	782	2.19 (1.36,3.49)	2.92 (1.93,4.40)	3.07 (2.05,4.59)	3.07 (2.05,4.59)	3.07 (2.05,4.59)
Tri-Lock BPS / Pinnacle	3978	0.65 (0.44,0.96)	1.24 (0.92,1.68)	1.63 (1.23,2.16)	1.70 (1.28,2.25)	1.84 (1.36,2.47)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.
** M/L Taper does not include M/L Taper Kinectiv.

We remind readers to be cautious in interpreting CPR values when the number at risk is low.

Table 40: Summary of cumulative percent revision following primary THA for stem/cup combinations having at least 500 cases, sorted by 10-year CPR.

Stem/cup combination	N*	1 year	3 years	5 years	7 years	10 years
Corail Coxa Vara / Pinnacle	753	0.14 (0.02,0.96)	0.78 (0.33,1.88)	0.98 (0.44,2.19)	0.98 (0.44,2.19)	0.98 (0.44,2.19)
Tri-Lock BPS / Pinnacle	3978	0.65 (0.44,0.96)	1.24 (0.92,1.68)	1.63 (1.23,2.16)	1.70 (1.28,2.25)	1.84 (1.36,2.47)
Corail / Pinnacle	3495	1.22 (0.90,1.65)	1.86 (1.44,2.40)	1.92 (1.49,2.47)	2.06 (1.59,2.65)	2.66 (1.92,3.68)
Summit / Pinnacle	7455	1.47 (1.22,1.77)	1.98 (1.68,2.34)	2.14 (1.82,2.51)	2.29 (1.95,2.68)	2.86 (2.19,3.72)
Fitmore / Continuum	2802	1.32 (0.96,1.82)	2.00 (1.55,2.60)	2.35 (1.85,2.99)	2.86 (2.27,3.59)	2.86 (2.27,3.59)
Taperloc 133 / RingLoc	1678	1.73 (1.20,2.48)	2.45 (1.81,3.31)	2.64 (1.97,3.53)	2.72 (2.03,3.62)	2.94 (2.17,3.99)
Trabecular Metal / Continuum	782	2.19 (1.36,3.49)	2.92 (1.93,4.40)	3.07 (2.05,4.59)	3.07 (2.05,4.59)	3.07 (2.05,4.59)
AML / Pinnacle	787	1.28 (0.69,2.36)	2.15 (1.32,3.49)	3.06 (2.00,4.69)	3.36 (2.20,5.13)	3.36 (2.20,5.13)
Secur-Fit Plus Max / Trident	1984	1.71 (1.23,2.39)	2.12 (1.57,2.85)	2.53 (1.92,3.33)	2.96 (2.29,3.82)	3.47 (2.69,4.46)
M/L Taper** / Continuum	8132	1.71 (1.45,2.02)	2.39 (2.07,2.75)	2.82 (2.47,3.22)	3.06 (2.69,3.48)	3.65 (3.02,4.40)
Accolade II / Trident	20979	1.18 (1.04,1.34)	1.92 (1.74,2.11)	2.43 (2.23,2.66)	2.92 (2.67,3.18)	3.72 (3.26,4.24)
Accolade TMZF / Trident	891	0.90 (0.45,1.79)	2.02 (1.28,3.19)	2.81 (1.90,4.12)	3.32 (2.31,4.74)	3.91 (2.76,5.52)
SROM / Pinnacle	1109	1.27 (0.75,2.13)	2.55 (1.77,3.68)	3.16 (2.27,4.39)	3.79 (2.77,5.16)	3.96 (2.91,5.39)
Anthology / Reflection 3	5174	2.01 (1.65,2.44)	2.91 (2.46,3.45)	3.38 (2.86,3.99)	3.91 (3.29,4.64)	4.16 (3.47,4.98)
M/L Taper** / Trabecular Metal	1040	2.51 (1.71,3.66)	3.35 (2.40,4.66)	3.90 (2.84,5.34)	4.23 (3.05,5.86)	4.23 (3.05,5.86)
Secur-Fit Max / Trident	3023	2.10 (1.64,2.68)	2.91 (2.36,3.58)	3.49 (2.87,4.23)	4.06 (3.34,4.92)	4.35 (3.55,5.32)
M/L Taper** / Trilogy	1325	1.58 (1.04,2.42)	2.99 (2.19,4.07)	3.54 (2.65,4.71)	4.45 (3.40,5.82)	4.60 (3.52,5.99)
Synergy / Reflection 3	1269	2.33 (1.63,3.34)	3.35 (2.47,4.55)	3.72 (2.76,5.00)	4.59 (3.43,6.13)	4.87 (3.62,6.53)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.
** M/L Taper does not include M/L Taper Kinectiv.

The reader should be cautious in interpreting implant cumulative percent revision (CPR) data, because there are many other factors that can affect CPR such as the characteristics of the patients who receive the implants, the volume of procedures done by the surgeons using the implant, and the volume of procedures done using that specific implant. Both mean and median volume numbers are provided for surgeons and hospitals because the distributions are skewed. Bearing surface couple, head size, and approach can also vary across implant combinations and affect CPR. Text and tables have been included to provide this information for each implant combination so the reader can make decisions based on a comprehensive view of how the implant combination is used. Note that sample size differs for CPR reporting and descriptive statistics provided in tables: the difference is due to excluding death from the CPR calculations.

Accolade II/Trident
N=21124

Distribution of utilization: 127 surgeons across 49 sites used this implant combination in primary THA.

Table 41: Volume of cases by surgeon and site for the Accolade II/Trident combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	166 (291)	21 (197)
Cases per site	431 (669)	126 (582)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 42: Descriptive statistics of cases receiving the Accolade II/Trident combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	11409	54.01	
Age (years)	21124	64.27(11.01)	65.00(14.00)
Height (cm)	21124	170.08(10.31)	170.00(15.24)
Weight (kg)	21124	88.54(21.04)	86.60(28.30)
BMI(kg/m^2)	21124	30.50(6.35)	29.74(8.29)
Smoking - never (%)	10173	48.16	
Smoking - previous (%)	8019	37.96	
Smoking - current (%)	2837	13.43	
Smoking - unknown (%)	95	0.45	

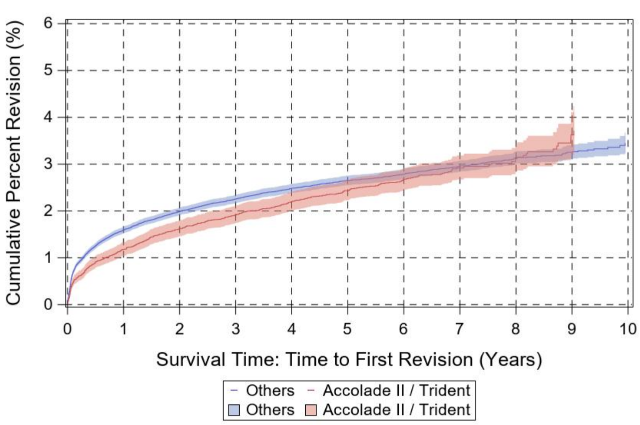

Figure 35: Cumulative percent revision curve for the Accolade II/Trident combination compared to all other implant combinations in primary THA.

Table 43: Cumulative percent revision and number at risk for Accolade II/Trident combination in primary THA cases.

Year	Number at risk	CPR
0	20979	0.00 (0.00,0.00)
1	20558	1.18 (1.04,1.34)
2	20229	1.62 (1.46,1.81)
3	19712	1.92 (1.74,2.11)
4	17402	2.20 (2.01,2.41)
5	13756	2.43 (2.23,2.66)
6	9612	2.68 (2.46,2.92)
7	5704	2.92 (2.67,3.18)
8	2953	3.12 (2.84,3.43)
9	1084	3.62 (3.20,4.11)
10*	186	3.72 (3.26,4.24)

* No revision occurred after the termination of the red curve in Figure 35; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 44: Reasons for revision following primary THA for Accolade II/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	152	28.2
2	Peri-prosthetic fracture - Femur	113	21.0
3	Joint Infection	102	18.9
4	Dislocation/Instability	75	13.9
5	Pain	30	5.6
6	Metal Reaction/Metallosis	23	4.3
7	Implant Failure	19	3.5
8	Malalignment	14	2.6
9	Peri-prosthetic fracture - Acetabulum	10	1.9
10	Osteolysis	1	0.2

Table 45: Reasons for revision in first 90 days following primary THA for Accolade II/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	72	55.8
2	Dislocation/Instability	16	12.4
3	Joint Infection	13	10.1
4	Aseptic Loosening	11	8.5
5	Implant Failure	8	6.2
6	Peri-prosthetic fracture - Acetabulum	3	2.3
7	Pain	3	2.3
8	Malalignment	3	2.3

Table 46: Reasons for revision between 91 and 365 days following primary THA for Accolade II/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	32	30.2
2	Dislocation/Instability	23	21.7
3	Aseptic Loosening	21	19.8
4	Pain	13	12.3
5	Peri-prosthetic fracture - Femur	12	11.3
6	Implant Failure	2	1.9
7	Peri-prosthetic fracture - Acetabulum	2	1.9
8	Malalignment	1	0.9

Table 47: Distribution of approach used for Accolade II/Trident combination in primary THA cases.

Approach	N	Percent
Anterior	6465	30.6
Anterolateral	3230	15.3
Posterior	11364	53.8
Transtrochanteric	19	0.1
Missing/unknown/other	46	0.2

Table 48: Distribution of head size for Accolade II/Trident combination in primary THA cases.

Size (mm)	N	Percent
22	10	0.1
28	34	0.2
32	3653	18.9
36	14356	74.2
40	1123	5.8
44	107	0.6
Missing/unknown/other	54	0.3

Table 49: Distribution of bearing surface for Accolade II/Trident combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	3485	16.5
Ceramic-on-plastic	15785	74.7
Ceramic-on-ceramic	15	0.1
Metal-on-metal	0	0.0
Dual mobility	1743	8.2
Missing/unknown/other	96	0.5

Table 50: Distribution of polyethylene used for Accolade II/Trident combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	20744	98.5
Antioxidant XLPE	0	0.0
Missing/unknown/other	308	1.5

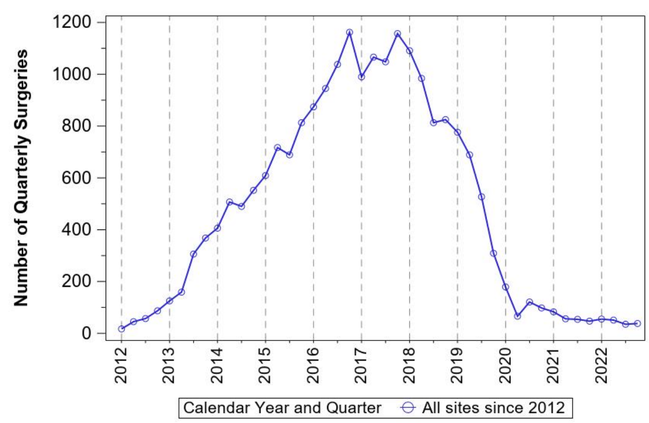

Figure 36: Utilization of the Accolade II/Trident combination in primary THA cases.

Catalog numbers of stems used in the analysis.

67210535	67210837	67200127
67210635	67200737	67201040
67210435	67210937	67211140
67210737	67200837	67210027
67200535	67210230	67201140
67200435	67200230	67200027
67210330	67200937	
67200635	67211040	
67200330	67210127	

Catalog numbers of acetabular cups used in the analysis.

5020354E	5000352D	5421162H
5021152E	5000350D	5000348C
5021154E	5020156F	5021144B
5421150E	5090254E	5081158F
5020350D	5000152E	5000364G
5021156F	5021146C	5021166H
5020352D	5001152E	5401162H
5020356E	5020364G	5081160G
5021150D	5421160G	5020154E
5020358F	5090256E	5090268H
5021158F	5000154E	5001148D
5421154F	5021164H	5090266H
5021148D	5401160G	5401146D
5020360F	5081152E	5421164H
5421146D	5020158F	5020162G
5021160G	5000148D	5401164H
5421152E	5020148D	5081146C
5421148D	5090258F	5081162G
5421156F	5401148D	5090270I
5000354E	5000150D	5421142B
5401150E	5081150D	5021168I
5020348C	5000362G	5090272I
5020362G	5000156F	5000146C
5421158G	5020346B	5000160G
5021162G	5081148D	5000164H
5401152E	5020160G	5001158F
5000356E	5090262G	5020344A
5421144C	5081154E	5401144C
5000358F	5090264G	5401166I
5401154F	5081156F	5421168I
5401156F	5090260F	65C3248
5020152E	5020366H	65C3252
5000360F	5020150D	
5401158G	5000158F	

Accolade II/Trident II
N=16016

Distribution of utilization: 112 surgeons across 53 sites used this implant combination in primary THA.

Table 51: Volume of cases by surgeon and site for the Accolade II/Trident II combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	143 (189)	66 (176)
Cases per site	302 (399)	155 (321)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 52: Descriptive statistics of cases receiving the Accolade II/Trident II combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	8451	52.77	
Age (years)	16016	64.50(10.59)	65.00(14.00)
Height (cm)	16016	170.57(10.44)	170.18(15.24)
Weight (kg)	16016	89.06(20.60)	87.40(28.06)
BMI(kg/m^2)	16016	30.50(6.06)	29.76(8.03)
Smoking - never (%)	8035	50.17	
Smoking - previous (%)	5572	34.79	
Smoking - current (%)	2380	14.86	
Smoking - unknown (%)	29	0.18	

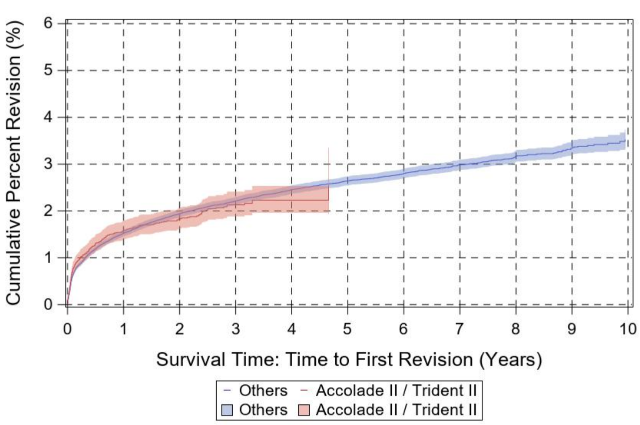

Figure 37: Cumulative percent revision curve for the Accolade II/Trident II combination compared to all other implant combinations in primary THA.

Table 53: Cumulative percent revision and number at risk for Accolade II/Trident II combination in primary THA cases.

Year	Number at risk	CPR
0	15981	0.00 (0.00,0.00)
1	11752	1.58 (1.40,1.80)
2	7578	1.82 (1.62,2.06)
3	3967	2.13 (1.88,2.41)
4	1213	2.23 (1.96,2.53)
5*	176	2.55 (1.94,3.35)
6*	13	2.55 (1.94,3.35)
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 37; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 54: Reasons for revision following primary THA for Accolade II/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	107	37.7
2	Joint Infection	67	23.6
3	Dislocation/Instability	38	13.4
4	Aseptic Loosening	34	12.0
5	Implant Failure	10	3.5
6	Malalignment	9	3.2
7	Peri-prosthetic fracture - Acetabulum	8	2.8
8	Pain	7	2.5
9	Metal Reaction/Metallosis	2	0.7
10	Osteolysis	1	0.4
11	Poly liner wear	1	0.4

Table 55: Reasons for revision in first 90 days following primary THA for Accolade II/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	91	56.5
2	Joint Infection	31	19.2
3	Dislocation/Instability	14	8.7
4	Aseptic Loosening	6	3.7
5	Implant Failure	6	3.7
6	Peri-prosthetic fracture - Acetabulum	5	3.1
7	Malalignment	5	3.1
8	Pain	2	1.2
9	Metal Reaction/Metallosis	1	0.6

Table 56: Reasons for revision between 91 and 365 days following primary THA for Accolade II/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	26	33.8
2	Dislocation/Instability	18	23.4
3	Aseptic Loosening	13	16.9
4	Peri-prosthetic fracture - Femur	11	14.3
5	Malalignment	3	3.9
6	Pain	2	2.6
7	Osteolysis	1	1.3
8	Poly liner wear	1	1.3
9	Implant Failure	1	1.3
10	Peri-prosthetic fracture - Acetabulum	1	1.3

Table 57: Distribution of approach used for Accolade II/Trident II combination in primary THA cases.

Approach	N	Percent
Anterior	5860	36.6
Anterolateral	1151	7.2
Posterior	8960	55.9
Transtrochanteric	12	0.1
Missing/unknown/other	33	0.2

Table 58: Distribution of head size for Accolade II/Trident II combination in primary THA cases.

Size (mm)	N	Percent
22	1	0.0
28	15	0.1
32	1414	10.4
36	10892	80.2
40	1099	8.1
44	113	0.8
Missing/unknown/other	39	0.3

Table 59: Distribution of bearing surface for Accolade II/Trident II combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	611	3.8
Ceramic-on-plastic	12923	80.7
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	2282	14.2
Missing/unknown/other	200	1.2

Table 60: Distribution of polyethylene used for Accolade II/Trident II combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	10160	64.2
Antioxidant XLPE	0	0.0
Missing/unknown/other	5670	35.8

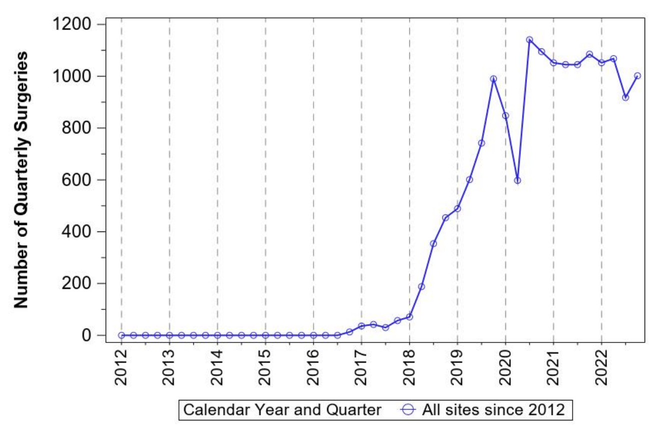

Figure 38: Utilization of the Accolade II/Trident II combination in primary THA cases.

Catalog numbers of stems used in the analysis.

67210535	67200330	67201040
67210435	67200737	67211140
67210635	67210937	67200127
67210737	67210230	67210027
67210330	67200837	67201140
67200435	67200230	67200027
67200535	67211040	
67200635	67200937	
67210837	67210127	

Catalog numbers of acetabular cups used in the analysis.

7020452E	7000458F	7090458F
7020454E	7090452E	7000446C
7020456F	7000450D	7090462G
7020450D	7000448D	7000462G
7020448D	7090448D	7090464H
7020458F	7090454E	7021164H
7021152E	7090456F	7090446C
7021150D	7021146C	7020466H
7021154E	7421152E	7421146C
7021156F	7000460G	7021166H
7020460G	7021162G	7090468I
7000452E	7421148D	7421158F
7021148D	7020444B	7021144B
7021158F	7090450D	7421160G
7000454E	7020464H	7090466H
7020446C	7421154E	7090470I
7000456F	7421150D	7421162G
7021160G	7421156F	
7020462G	7090460G	

Accolade C/Trident II

N=577

Distribution of utilization: 47 surgeons across 27 sites used this implant combination in primary THA.

Table 61: Volume of cases by surgeon and site for the Accolade C/Trident II combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	12 (12)	7 (17)
Cases per site	21 (20)	18 (31)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 62: Descriptive statistics of cases receiving the Accolade C/Trident II combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	479	83.02	
Age (years)	577	77.23(8.03)	78.00(10.00)
Height (cm)	577	163.14(8.85)	162.56(10.24)
Weight (kg)	577	74.20(17.55)	70.60(23.48)
BMI(kg/m^2)	577	27.84(6.10)	26.74(7.83)
Smoking - never (%)	319	55.29	
Smoking - previous (%)	205	35.53	
Smoking - current (%)	49	8.49	
Smoking - unknown (%)	4	0.69	

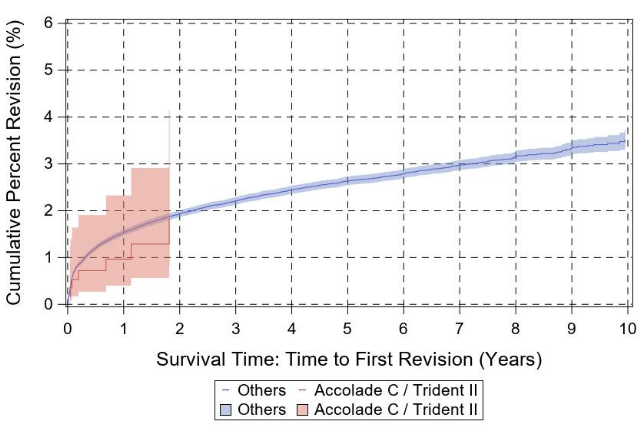

Figure 39: Cumulative percent revision curve for the Accolade C/Trident II combination compared to all other implant combinations in primary THA.

Table 63: Cumulative percent revision and number at risk for Accolade C/Trident II combination in primary THA cases.

Year	Number at risk	CPR
0	571	0.00 (0.00,0.00)
1	335	0.97 (0.40,2.33)
2*	162	1.84 (0.81,4.14)
3*	56	1.84 (0.81,4.14)
4*	15	1.84 (0.81,4.14)
5*	2	1.84 (0.81,4.14)
6	0	N/A
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 39; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.611 (0.289,1.293). It was 1.214 (1.134,1.302) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 64: Reasons for revision following primary THA for Accolade C/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	42.9
2	Aseptic Loosening	2	28.6
3	Dislocation/Instability	1	14.3
4	Peri-prosthetic fracture - Acetabulum	1	14.3

Table 65: Reasons for revision in first 90 days following primary THA for Accolade C/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	25.0
2	Dislocation/Instability	1	25.0
3	Joint Infection	1	25.0
4	Peri-prosthetic fracture - Acetabulum	1	25.0

Table 66: Reasons for revision between 91 and 365 days following primary THA for Accolade C/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	100.0

Table 67: Distribution of approach used for Accolade C/Trident II combination in primary THA cases.

Approach	N	Percent
Anterior	142	24.6
Anterolateral	65	11.3
Posterior	369	64.0
Transtrochanteric	1	0.2
Missing/unknown/other	0	0.0

Table 68: Distribution of head size for Accolade C/Trident II combination in primary THA cases.

Size (mm)	N	Percent
28	1	0.2
32	25	5.4
36	397	85.6
40	35	7.5
44	3	0.7
Missing/unknown/other	3	0.7

Table 69: Distribution of bearing surface for Accolade C/Trident II combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	58	10.1
Ceramic-on-plastic	403	69.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	108	18.7
Missing/unknown/other	8	1.4

Table 70: Distribution of polyethylene used for Accolade C/Trident II combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	278	48.8
Antioxidant XLPE	0	0.0
Missing/unknown/other	292	51.2

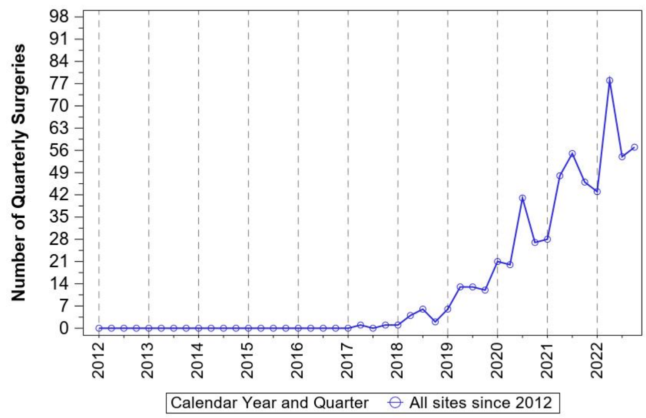

Figure 40: Utilization of the Accolade C/Trident II combination in primary THA cases.

Catalog numbers of stems used in the analysis.

60570435D	60570637D	60580740D
60570537D	60580637D	60580230D
60570335D	60580335D	
60580537D	60570740D	
60580435D	60570230D	

Catalog numbers of acetabular cups used in the analysis.

7020452E	7090448D	7000448D
7020450D	7021154E	7000456F
7020454E	7000452E	7021158F
7020448D	7000450D	7090456F
7020456F	7020460G	7000454E
7021152E	7020446C	7090454E
7021150D	7021156F	7000458F
7021148D	7090452E	7021146C
7020458F	7090450D	7090458F

7020444B	7090462G
7020462G	7090470I
7021160G	7421152E

Accolade TMZF/Trident
N=915

Distribution of utilization: 16 surgeons across 13 sites used this implant combination in primary THA.

Table 71: Volume of cases by surgeon and site for the Accolade TMZF/Trident combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	57 (134)	5 (14)
Cases per site	70 (104)	11 (122)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 72: Descriptive statistics of cases receiving the Accolade TMZF/Trident combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	509	55.63	
Age (years)	915	63.29(11.20)	63.00(16.00)
Height (cm)	915	169.96(10.57)	170.00(15.24)
Weight (kg)	915	90.26(21.34)	89.40(29.33)
BMI(kg/m^2)	915	31.09(6.17)	30.49(8.32)
Smoking - never (%)	418	45.68	
Smoking - previous (%)	353	38.58	
Smoking - current (%)	128	13.99	
Smoking - unknown (%)	16	1.75	

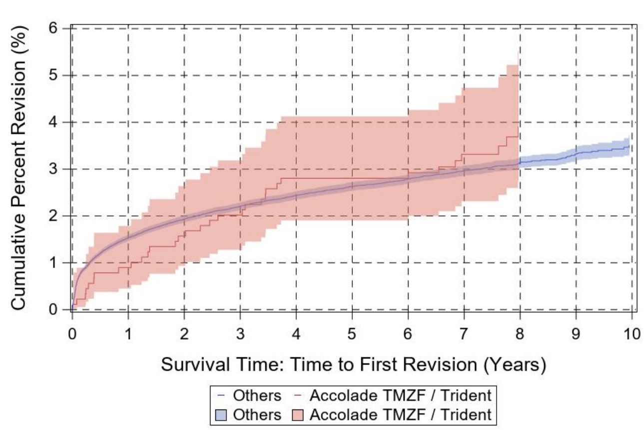

Figure 41: Cumulative percent revision curve for the Accolade TMZF/Trident combination compared to all other implant combinations in primary THA.

Table 73: Cumulative percent revision and number at risk for Accolade TMZF/Trident combination in primary THA cases.

Year	Number at risk	CPR
0	891	0.00 (0.00,0.00)
1	883	0.90 (0.45,1.79)
2	877	1.57 (0.93,2.64)
3	873	2.02 (1.28,3.19)
4	865	2.81 (1.90,4.12)
5	854	2.81 (1.90,4.12)
6	822	2.81 (1.90,4.12)
7	704	3.32 (2.31,4.74)
8*	431	3.91 (2.76,5.52)
9*	215	3.91 (2.76,5.52)
10*	58	3.91 (2.76,5.52)

* No revision occurred after the termination of the red curve in Figure 41; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 74: Reasons for revision following primary THA for Accolade TMZF/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	10	38.5
2	Metal Reaction/Metallosis	5	19.2
3	Dislocation/Instability	4	15.4
4	Joint Infection	4	15.4
5	Peri-prosthetic fracture - Femur	2	7.7
6	Malalignment	1	3.8

Table 75: Reasons for revision in first 90 days following primary THA for Accolade TMZF/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	50.0
2	Peri-prosthetic fracture - Femur	1	50.0

Table 76: Reasons for revision between 91 and 365 days following primary THA for Accolade TMZF/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	100.0

Table 77: Distribution of approach used for Accolade TMZF/Trident combination in primary THA cases.

Approach	N	Percent
Anterior	8	0.9
Anterolateral	138	15.1
Posterior	759	83.0
Transtrochanteric	3	0.3
Missing/unknown/other	7	0.8

Table 78: Distribution of head size for Accolade TMZF/Trident combination in primary THA cases.

Size (mm)	N	Percent
28	1	0.1
32	98	10.9
36	694	77.5
40	96	10.7
Missing/unknown/other	7	0.8

Table 79: Distribution of bearing surface for Accolade TMZF/Trident combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	497	54.3
Ceramic-on-plastic	389	42.5
Ceramic-on-ceramic	3	0.3
Metal-on-metal	0	0.0
Dual mobility	18	2.0
Missing/unknown/other	8	0.9

Table 80: Distribution of polyethylene used for Accolade TMZF/Trident combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	908	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	0	0.0

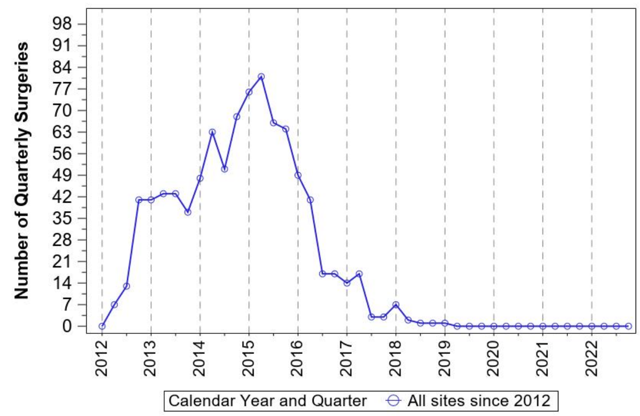

Figure 42: Utilization of the Accolade TMZF/Trident combination in primary THA cases.

Catalog numbers of stems used in the analysis.

60200335	60212530	60215537
60202530	60214535	60210130
60203535	60210435	60200637
60210335	60200537	60210637
60200230	60210537	60210740
60200435	60210230	60200030
60204535	60205537	60210030
60213535	60200130	

Catalog numbers of acetabular cups used in the analysis.

5021152E	5020152E	5421158G
5021150D	5021160G	5020158F
5021154E	5021148D	5421148D
5021156F	5020156F	5021162G
5421150E	5421152E	5020352D
5421154F	5020354E	5020356E
5021158F	5421156F	5421146D

5020154E	5020350D	5020150D
5020360F	5020358F	5020160G
5020148D	5020362G	5020364G
5021164H	5090256E	5021146C
5000352D	5421160G	5421144C
5000354E	5000350D	
5020348C	5000360F	

Actis DuoFix/Pinnacle
N=5639

All Actis DuoFix implants included in this analysis are collared version. Distribution of utilization: 54 surgeons across 37 sites used this implant combination in primary THA.

Table 81: Volume of cases by surgeon and site for the Actis DuoFix/Pinnacle combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	104 (179)	12 (132)
Cases per site	152 (254)	23 (224)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 82: Descriptive statistics of cases receiving the Actis DuoFix/Pinnacle combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	3293	58.4	
Age (years)	5639	65.97(9.92)	66.00(13.00)
Height (cm)	5639	169.47(10.38)	168.00(15.24)
Weight (kg)	5639	88.80(21.11)	87.00(28.53)
BMI(kg/m^2)	5639	30.78(6.24)	30.00(8.49)
Smoking - never (%)	2803	49.71	
Smoking - previous (%)	2049	36.34	
Smoking - current (%)	775	13.74	
Smoking - unknown (%)	12	0.21	

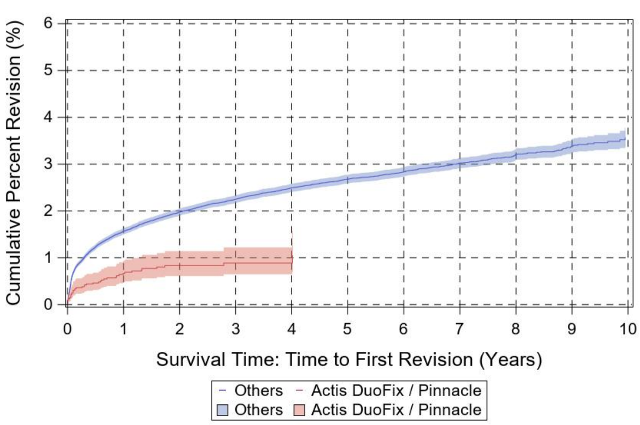

Figure 43: Cumulative percent revision curve for the Actis DuoFix/Pinnacle combination compared to all other implant combinations in primary THA.

Table 83: Cumulative percent revision and number at risk for Actis DuoFix/Pinnacle combination in primary THA cases.

Year	Number at risk	CPR
0	5622	0.00 (0.00,0.00)
1	4043	0.67 (0.48,0.93)
2	2679	0.84 (0.61,1.14)
3	1605	0.89 (0.65,1.22)
4	608	0.89 (0.65,1.22)
5*	40	1.05 (0.70,1.58)
6	0	N/A
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 43; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.442 (0.318,0.614). It was 1.216 (1.136,1.304) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 84: Reasons for revision following primary THA for Actis DuoFix/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	11	26.2
2	Joint Infection	11	26.2
3	Peri-prosthetic fracture - Femur	6	14.3
4	Pain	6	14.3
5	Aseptic Loosening	3	7.1
6	Peri-prosthetic fracture - Acetabulum	2	4.8
7	Implant Failure	1	2.4
8	Metal Reaction/Metallosis	1	2.4
9	Malalignment	1	2.4

Table 85: Reasons for revision in first 90 days following primary THA for Actis DuoFix/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	8	40.0
2	Joint Infection	4	20.0
3	Peri-prosthetic fracture - Femur	4	20.0
4	Peri-prosthetic fracture - Acetabulum	2	10.0
5	Pain	1	5.0
6	Malalignment	1	5.0

Table 86: Reasons for revision between 91 and 365 days following primary THA for Actis DuoFix/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	4	28.6
2	Pain	4	28.6
3	Dislocation/Instability	2	14.3
4	Peri-prosthetic fracture - Femur	2	14.3
5	Aseptic Loosening	1	7.1
6	Implant Failure	1	7.1

Table 87: Distribution of approach used for Actis DuoFix/Pinnacle combination in primary THA cases.

Approach	N	Percent
Anterior	3379	59.9
Anterolateral	842	14.9
Posterior	1417	25.1
Transtrochanteric	0	0.0
Missing/unknown/other	1	0.0

Table 88: Distribution of head size for Actis DuoFix/Pinnacle combination in primary THA cases.

Size (mm)	N	Percent
22	8	0.1
28	52	0.9
32	1310	23.4
36	3718	66.3
40	518	9.2
Missing/unknown/other	5	0.1

Table 89: Distribution of bearing surface for Actis DuoFix/Pinnacle combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	680	12.1
Ceramic-on-plastic	4919	87.2
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	17	0.3
Missing/unknown/other	23	0.4

Table 90: Distribution of polyethylene used for Actis DuoFix/Pinnacle combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	28	0.5
XLPE	4944	88.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	649	11.6

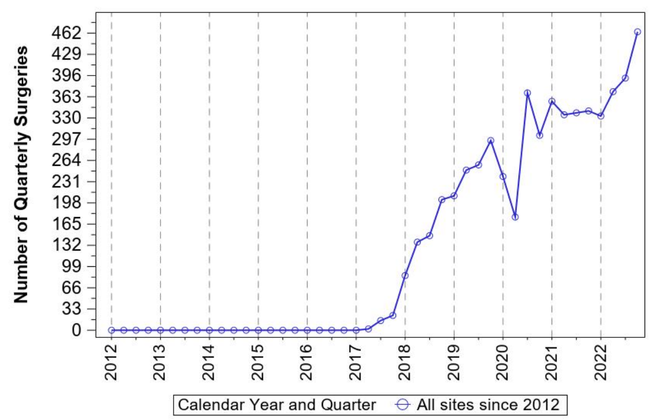

Figure 44: Utilization of the Actis DuoFix/Pinnacle combination in primary THA cases.

Catalog numbers of stems used in the analysis.

101011060	101012070	101012100
101011050	101012030	101011010
101011040	101012080	101011110
101011070	101011090	101012110
101011030	101011020	101012120
101012060	101012020	101011120
101012040	101012090	
101012050	101011100	
101011080	101012010	

Catalog numbers of acetabular cups used in the analysis.

121732052	121732064	121701050
121732054	121731058	121720046
121732056	121722048	121730044
121722052	121731048	121730060
121732058	121722058	121732066
121732050	121703056	121701054
121732048	121703048	121701056
121732060	121730052	121701058
121722054	121731060	121703060
121722050	121703050	121730062
121732062	121730054	121703062
121731052	121730048	121703064
121731054	121730050	121720044
121722056	121730056	121722062
121703052	121730058	121730066
121731056	121701052	121730068
121731050	121722060	121731046
121703054	121703058	
121730046	121701048	

AML/Pinnacle
N=790

Distribution of utilization: 17 surgeons across 14 sites used this implant combination in primary THA.

Table 91: Volume of cases by surgeon and site for the AML/Pinnacle combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	46 (111)	5 (17)
Cases per site	56 (138)	8 (37)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 92: Descriptive statistics of cases receiving the AML/Pinnacle combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	433	54.81	
Age (years)	790	66.89(10.46)	67.00(15.00)
Height (cm)	790	169.85(10.47)	170.00(15.24)
Weight (kg)	790	89.85(21.19)	88.00(28.56)
BMI(kg/m^2)	790	31.06(6.48)	30.40(8.45)
Smoking - never (%)	368	46.58	
Smoking - previous (%)	288	36.46	
Smoking - current (%)	134	16.96	
Smoking - unknown (%)	0	0.0	

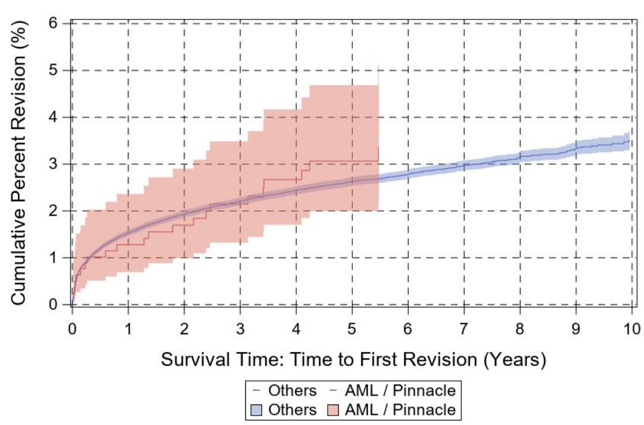

Figure 45: Cumulative percent revision curve for the AML/Pinnacle combination compared to all other implant combinations in primary THA.

Table 93: Cumulative percent revision and number at risk for AML/Pinnacle combination in primary THA cases.

Year	Number at risk	CPR
0	787	0.00 (0.00,0.00)
1	750	1.28 (0.69,2.36)
2	672	1.70 (0.99,2.90)
3	603	2.15 (1.32,3.49)
4	509	2.67 (1.71,4.17)
5	374	3.06 (2.00,4.69)
6*	270	3.36 (2.20,5.13)
7*	172	3.36 (2.20,5.13)
8*	90	3.36 (2.20,5.13)
9*	24	3.36 (2.20,5.13)
10*	6	3.36 (2.20,5.13)

* No revision occurred after the termination of the red curve in Figure 45; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.851 (0.451,1.607). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 94: Reasons for revision following primary THA for AML/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	8	36.4
2	Dislocation/Instability	7	31.8
3	Aseptic Loosening	2	9.1
4	Pain	2	9.1
5	Poly liner wear	1	4.5
6	Peri-prosthetic fracture - Acetabulum	1	4.5
7	Malalignment	1	4.5

Table 95: Reasons for revision in first 90 days following primary THA for AML/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	57.1
2	Joint Infection	1	14.3
3	Peri-prosthetic fracture - Acetabulum	1	14.3
4	Malalignment	1	14.3

Table 96: Reasons for revision between 91 and 365 days following primary THA for AML/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	2	66.7
2	Dislocation/Instability	1	33.3

Table 97: Distribution of approach used for AML/Pinnacle combination in primary THA cases.

Approach	N	Percent
Anterior	9	1.1
Anterolateral	636	80.5
Posterior	143	18.1
Transtrochanteric	0	0.0
Missing/unknown/other	2	0.2

Table 98: Distribution of head size for AML/Pinnacle combination in primary THA cases.

Size (mm)	N	Percent
22	1	0.1
28	5	0.6
32	180	22.9
36	492	62.7
40	106	13.5
Missing/unknown/other	1	0.1

Table 99: Distribution of bearing surface for AML/Pinnacle combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	699	88.5
Ceramic-on-plastic	86	10.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	5	0.6

Table 100: Distribution of polyethylene used for AML/Pinnacle combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	719	91.6
Antioxidant XLPE	0	0.0
Missing/unknown/other	66	8.4

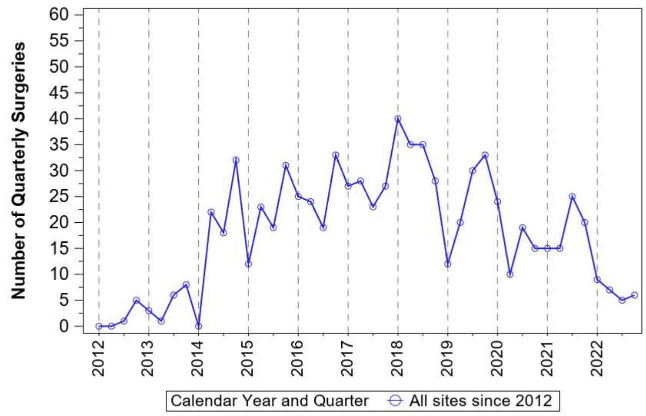

Figure 46: Utilization of the AML/Pinnacle combination in primary THA cases.

Catalog numbers of stems used in the analysis.

155402135	155401150	155401195
155402121	155401165	155401210
155401121	155402106	155403150
155402150	155402180	155403165
155401135	155403135	155403180
155402165	155401180	
155401106	155402195	

Catalog numbers of acetabular cups used in the analysis.

121701052	121732058	121703054
121701054	121732056	121722052
121732054	121732050	121732062
121701050	121701058	121701060
121701056	121732060	121703048
121732052	121732048	121703050
121701048	121703052	121703056

121732064
121701062
121703058
121722048
121722050
121730050
121731054
121720044
121722054
121730054
121731050
121731052
121703060
121722058
121722060
121730048
121720046
121720052
121722062
121730056
121730064
121731048
121731058

Anthology/PolarCup
N=551

Fewer than ten surgeons used this implant combination at fewer than ten sites in primary THA.

Table 101: Volume of cases by surgeon and site for the Anthology/PolarCup combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	137 (258)	12 (271)
Cases per site	183 (295)	25 (524)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 102: Descriptive statistics of cases receiving the Anthology/PolarCup combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	409	74.23	
Age (years)	551	62.75(11.59)	64.00(14.00)
Height (cm)	551	166.90(8.85)	167.00(12.98)
Weight (kg)	551	87.59(23.76)	83.85(28.90)
BMI(kg/m^2)	551	31.39(7.96)	29.92(8.87)
Smoking - never (%)	282	51.18	
Smoking - previous (%)	212	38.48	
Smoking - current (%)	57	10.34	
Smoking - unknown (%)	0	0.0	

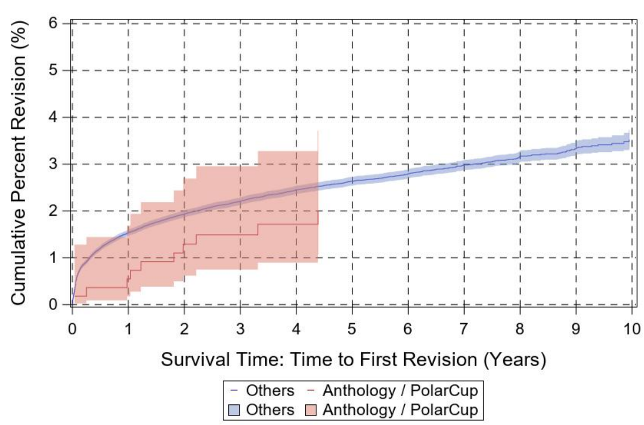

Figure 47: Cumulative percent revision curve for the Anthology/PolarCup combination compared to all other implant combinations in primary THA.

Table 103: Cumulative percent revision and number at risk for Anthology/PolarCup combination in primary THA cases.

Year	Number at risk	CPR
0	551	0.00 (0.00,0.00)
1	539	0.55 (0.18,1.69)
2	521	1.29 (0.62,2.69)
3	460	1.49 (0.75,2.95)
4	386	1.72 (0.90,3.28)
5*	294	2.00 (1.07,3.71)
6*	183	2.00 (1.07,3.71)
7*	71	2.00 (1.07,3.71)
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 47; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.406 (0.161,1.031). It was 1.214 (1.134,1.301) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 104: Reasons for revision following primary THA for Anthology/PolarCup combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	4	40.0
2	Malalignment	2	20.0
3	Joint Infection	1	10.0
4	Peri-prosthetic fracture - Acetabulum	1	10.0
5	Peri-prosthetic fracture - Femur	1	10.0
6	Metal Reaction/Metallosis	1	10.0

Table 105: Reasons for revision in first 90 days following primary THA for Anthology/PolarCup combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Acetabulum	1	100.0

Table 106: Reasons for revision between 91 and 365 days following primary THA for Anthology/PolarCup combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	50.0
2	Joint Infection	1	50.0

Table 107: Distribution of approach used for Anthology/PolarCup combination in primary THA cases.

Approach	N	Percent
Anterior	4	0.7
Anterolateral	480	87.1
Posterior	0	0.0
Transtrochanteric	67	12.2
Missing/unknown/other	0	0.0

Table 108: Distribution of bearing surface for Anthology/PolarCup combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	0	0.0
Ceramic-on-plastic	0	0.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	545	98.9
Missing/unknown/other	6	1.1

Table 109: Distribution of polyethylene used for Anthology/PolarCup combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	545	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	0	0.0

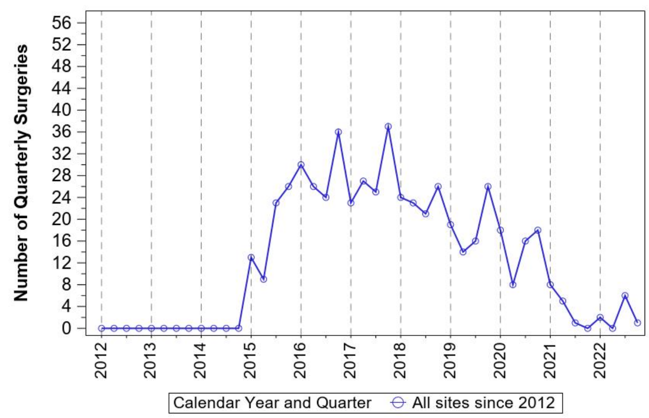

Figure 48: Utilization of the Anthology/PolarCup combination in primary THA cases.

Catalog numbers of stems used in the analysis.

71356004	71356009	71356107
71356005	71356010	71356011
71356003	71356109	71356101
71356006	71356106	71356102
71356007	71356012	71356112
71356002	71356103	71357004
71356008	71356104	71357007
71356001	71356105	

Catalog numbers of acetabular cups used in the analysis.

75100409	75100413	75100451
75100410	75100414	75100453
75100411	75100407	75100457
75100408	75100406	
75100412	75100415	

Anthology/Reflection 3
N=5204

Distribution of utilization: 60 surgeons across 38 sites used this implant combination in primary THA.

Table 110: Volume of cases by surgeon and site for the Anthology/Reflection 3 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	86 (168)	14 (71)
Cases per site	137 (199)	47 (210)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 111: Descriptive statistics of cases receiving the Anthology/Reflection 3 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2846	54.69	
Age (years)	5204	65.23(10.56)	66.00(13.00)
Height (cm)	5204	169.71(10.19)	170.00(15.24)
Weight (kg)	5204	90.88(22.04)	88.90(29.00)
BMI(kg/m^2)	5204	31.45(6.70)	30.56(8.75)
Smoking - never (%)	2469	47.44	
Smoking - previous (%)	1987	38.18	
Smoking - current (%)	737	14.16	
Smoking - unknown (%)	11	0.21	

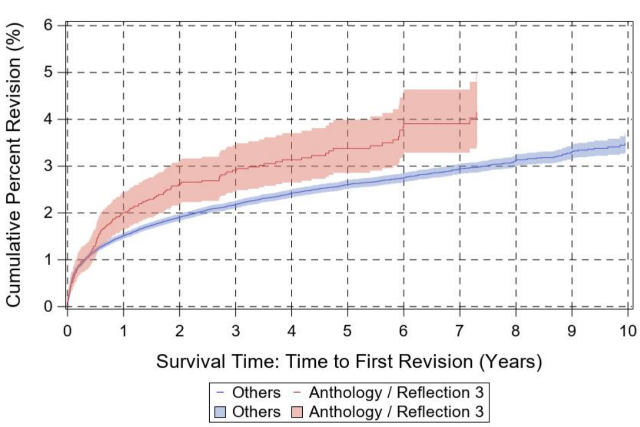

Figure 49: Cumulative percent revision curve for the Anthology/Reflection 3 combination compared to all other implant combinations in primary THA.

Table 112: Cumulative percent revision and number at risk for Anthology/Reflection 3 combination in primary THA cases.

Year	Number at risk	CPR
0	5174	0.00 (0.00,0.00)
1	4262	2.01 (1.65,2.44)
2	3579	2.60 (2.18,3.10)
3	2905	2.91 (2.46,3.45)
4	2306	3.14 (2.65,3.71)
5	1789	3.38 (2.86,3.99)
6	1381	3.91 (3.29,4.64)
7	886	3.91 (3.29,4.64)
8*	456	4.16 (3.47,4.98)
9*	128	4.16 (3.47,4.98)
10*	33	4.16 (3.47,4.98)

* No revision occurred after the termination of the red curve in Figure 49; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 113: Reasons for revision following primary THA for Anthology/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	36	24.3
2	Aseptic Loosening	32	21.6
3	Joint Infection	28	18.9
4	Peri-prosthetic fracture - Femur	25	16.9
5	Implant Failure	9	6.1
6	Malalignment	8	5.4
7	Pain	7	4.7
8	Peri-prosthetic fracture - Acetabulum	2	1.4
9	Metal Reaction/Metallosis	1	0.7

Table 114: Reasons for revision in first 90 days following primary THA for Anthology/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	20	42.5
2	Dislocation/Instability	9	19.1
3	Joint Infection	7	14.9
4	Implant Failure	4	8.5
5	Aseptic Loosening	3	6.4
6	Peri-prosthetic fracture - Acetabulum	2	4.3
7	Malalignment	2	4.3

Table 115: Reasons for revision between 91 and 365 days following primary THA for Anthology/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	16	34.8
2	Joint Infection	11	23.9
3	Aseptic Loosening	10	21.7
4	Pain	5	10.9
5	Peri-prosthetic fracture - Femur	2	4.3
6	Implant Failure	1	2.2
7	Malalignment	1	2.2

Table 116: Distribution of approach used for Anthology/Reflection 3 combination in primary THA cases.

Approach	N	Percent
Anterior	2737	52.6
Anterolateral	1738	33.4
Posterior	709	13.6
Transtrochanteric	16	0.3
Missing/unknown/other	4	0.1

Table 117: Distribution of head size for Anthology/Reflection 3 combination in primary THA cases.

Size (mm)	N	Percent
22	3	0.1
28	32	0.6
32	1126	22.5
36	3472	69.3
40	343	6.8
44	16	0.3
Missing/unknown/other	21	0.4

Table 118: Distribution of bearing surface for Anthology/Reflection 3 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1025	19.7
Ceramic-on-plastic	3966	76.2
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	182	3.5
Missing/unknown/other	31	0.6

Table 119: Distribution of polyethylene used for Anthology/Reflection 3 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	1	0.0
XLPE	4480	86.3
Antioxidant XLPE	0	0.0
Missing/unknown/other	711	13.7

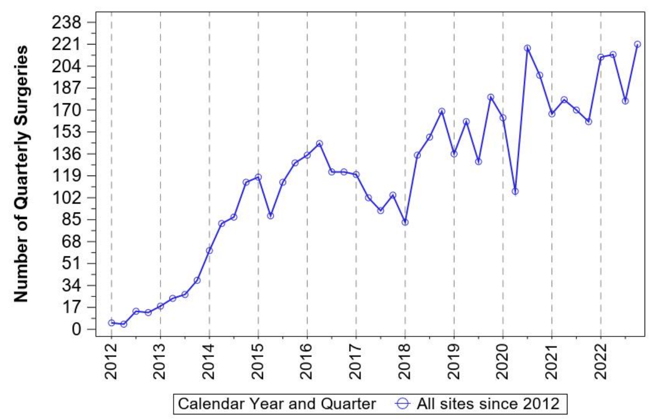

Figure 50: Utilization of the Anthology/Reflection 3 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

71356006	71356010	71357106
71356007	71356109	71357005
71356106	71356110	71356103
71356008	71357006	71356111
71356107	71357007	71357109
71356108	71356104	71357004
71356005	71356003	71356011
71356105	71357107	71357105
71356009	71357008	71357009
71356004	71357108	71357110

71357003	71357103	71356101
71356002	71356001	71356114
71357010	71357112	71357102
71357111	71357011	71357001
71357104	71357002	71357101
71356102	71357012	71356014
71356112	71356113	
71356012	71356013	

Catalog numbers of acetabular cups used in the analysis.

71335552	71335562	71338664
71335554	71331858	71331846
71335556	71331860	71338663
71335550	71331848	71331862
71335558	71338667	71331864
71335560	71335564	71335544
71335548	71338665	71335566
71331854	71335546	71335568
71331856	71338666	71338671
71331852	71338668	
71331850	71338669	

Avenir (Cemented)/G7
N=886

Distribution of utilization: 38 surgeons across 31 sites used this implant combination in primary THA.

Table 120: Volume of cases by surgeon and site for the Avenir (Cemented)/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	23 (38)	10 (35)
Cases per site	28 (39)	10 (42)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 121: Descriptive statistics of cases receiving the Avenir (Cemented)/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	669	75.51	
Age (years)	886	76.49(7.85)	77.00(10.00)
Height (cm)	876	165.26(9.59)	165.10(13.39)
Weight (kg)	876	78.45(17.81)	76.80(25.45)
BMI(kg/m^2)	876	28.67(5.77)	28.09(7.79)
Smoking - never (%)	472	53.27	
Smoking - previous (%)	367	41.42	
Smoking - current (%)	42	4.74	
Smoking - unknown (%)	5	0.56	

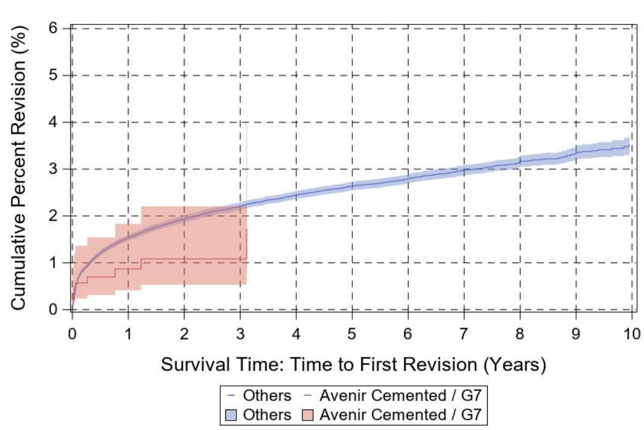

Figure 51: Cumulative percent revision curve for the Avenir (Cemented)/G7 combination compared to all other implant combinations in primary THA.

Table 122: Cumulative percent revision and number at risk for Avenir (Cemented)/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	882	0.00 (0.00,0.00)
1	514	0.87 (0.41,1.83)
2	279	1.08 (0.53,2.20)
3	165	1.08 (0.53,2.20)
4*	60	1.73 (0.73,4.05)
5*	19	1.73 (0.73,4.05)
6*	1	1.73 (0.73,4.05)
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 51; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.604 (0.307,1.187). It was 1.214 (1.134,1.301) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 123: Reasons for revision following primary THA for Avenir (Cemented)/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	4	44.4
2	Dislocation/Instability	3	33.3
3	Implant Failure	1	11.1
4	Peri-prosthetic fracture - Femur	1	11.1

Table 124: Reasons for revision in first 90 days following primary THA for Avenir (Cemented)/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	60.0
2	Dislocation/Instability	1	20.0
3	Peri-prosthetic fracture - Femur	1	20.0

Table 125: Reasons for revision between 91 and 365 days following primary THA for Avenir (Cemented)/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	50.0
2	Joint Infection	1	50.0

Table 126: Distribution of approach used for Avenir (Cemented)/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	557	62.9
Anterolateral	53	6.0
Posterior	263	29.7
Transtrochanteric	1	0.1
Missing/unknown/other	12	1.4

Table 127: Distribution of head size for Avenir (Cemented)/G7 combination in primary THA cases.

Size (mm)	N	Percent
28	2	0.3
32	68	11.0
36	494	80.2
40	45	7.3
Missing/unknown/other	7	1.1

Table 128: Distribution of bearing surface for Avenir (Cemented)/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	100	11.3
Ceramic-on-plastic	509	57.5
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	255	28.8
Missing/unknown/other	22	2.5

Table 129: Distribution of polyethylene used for Avenir (Cemented)/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	484	55.7
Antioxidant XLPE	295	34.0
Missing/unknown/other	90	10.4

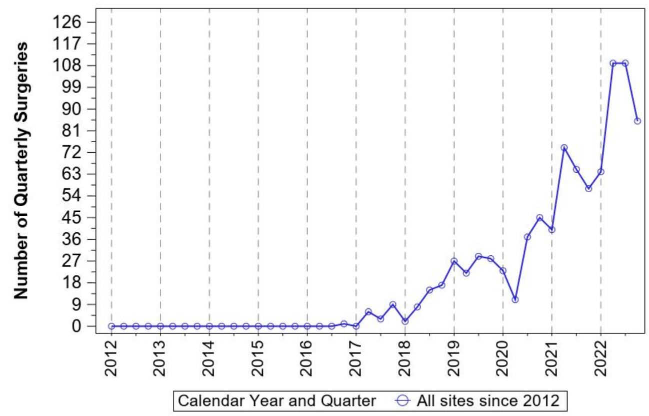

Figure 52: Utilization of the Avenir (Cemented)/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

106010205	106010201	106010302
106010204	106010306	106010307
106010203	106010206	106010208
106010202	106010303	106010308
106010304	106010301	
106010305	106010207	

Catalog numbers of acetabular cups used in the analysis.

10000663	110010247	10000660
10000662	110010242	110017104
10000664	10000666	110010263
110010243	110017102	110010265
110010244	10000667	110010241
110010245	110010248	10000668
10000665	110017103	110010249
10000661	110017101	110010266
110010246	110010264	110010267

110017105	110010240
110017106	110010262
10000669	110010268

Avenir (Cementless)/Continuum
N=525

Distribution of utilization: 17 surgeons across 14 sites used this implant combination in primary THA.

Table 130: Volume of cases by surgeon and site for the Avenir (Cementless)/Continuum combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	30 (52)	8 (16)
Cases per site	37 (61)	6 (30)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 131: Descriptive statistics of cases receiving the Avenir (Cementless)/Continuum combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	303	57.71	
Age (years)	525	65.68(10.89)	66.00(14.00)
Height (cm)	513	169.30(10.49)	168.00(16.51)
Weight (kg)	513	86.19(20.68)	84.00(27.43)
BMI(kg/m^2)	513	29.87(5.72)	29.30(7.37)
Smoking - never (%)	261	49.71	
Smoking - previous (%)	192	36.57	
Smoking - current (%)	72	13.71	
Smoking - unknown (%)	0	0.0	

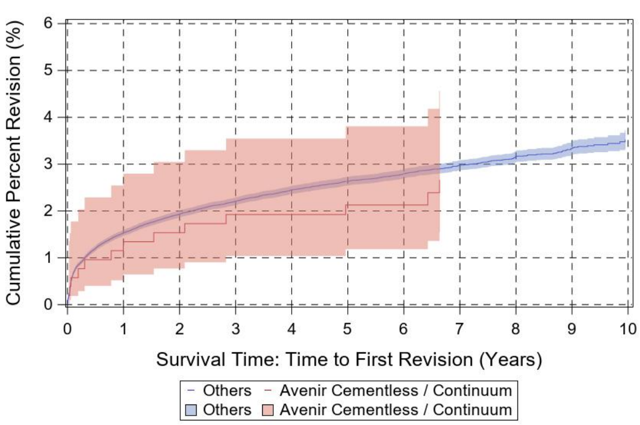

Figure 53: Cumulative percent revision curve for the Avenir (Cementless)/Continuum combination compared to all other implant combinations in primary THA.

Table 132: Cumulative percent revision and number at risk for Avenir (Cementless)/Continuum combination in primary THA cases.

Year	Number at risk	CPR
0	521	0.00 (0.00,0.00)
1	514	1.34 (0.64,2.80)
2	507	1.54 (0.77,3.05)
3	503	1.92 (1.04,3.55)
4	497	1.92 (1.04,3.55)
5	481	2.13 (1.18,3.81)
6	414	2.13 (1.18,3.81)
7*	318	2.66 (1.55,4.57)
8*	189	2.66 (1.55,4.57)
9*	27	2.66 (1.55,4.57)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 53; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.031 (0.565,1.882). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 133: Reasons for revision following primary THA for Avenir (Cementless)/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	4	33.3
2	Dislocation/Instability	3	25.0
3	Aseptic Loosening	2	16.7
4	Pain	2	16.7
5	Joint Infection	1	8.3

Table 134: Reasons for revision in first 90 days following primary THA for Avenir (Cementless)/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	2	50.0
2	Aseptic Loosening	1	25.0
3	Dislocation/Instability	1	25.0

Table 135: Reasons for revision between 91 and 365 days following primary THA for Avenir (Cementless)/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	50.0
2	Pain	1	50.0

Table 136: Distribution of approach used for Avenir (Cementless)/Continuum combination in primary THA cases.

Approach	N	Percent
Anterior	124	23.6
Anterolateral	132	25.1
Posterior	257	49.0
Transtrochanteric	0	0.0
Missing/unknown/other	12	2.3

Table 137: Distribution of head size for Avenir (Cementless)/Continuum combination in primary THA cases.

Size (mm)	N	Percent
28	3	0.6
32	111	21.2
36	359	68.6
40	46	8.8
Missing/unknown/other	4	0.8

Table 138: Distribution of bearing surface for Avenir (Cementless)/Continuum combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	286	54.5
Ceramic-on-plastic	233	44.4
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	6	1.1

Table 139: Distribution of polyethylene used for Avenir (Cementless)/Continuum combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	303	57.9
Antioxidant XLPE	200	38.2
Missing/unknown/other	20	3.8

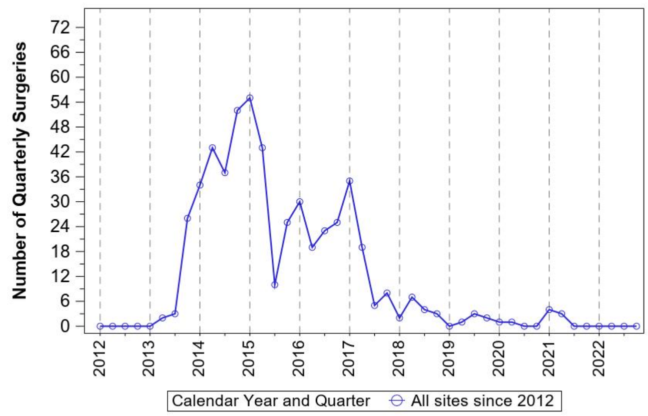

Figure 54: Utilization of the Avenir (Cementless)/Continuum combination in primary THA cases.

Catalog numbers of stems used in the analysis.

106010004	106010106	106010008
106010003	106010105	106010108
106010005	106010001	106010101
106010002	106010007	106010102
106010006	106010103	106010009
106010104	106010107	

Catalog numbers of acetabular cups used in the analysis.

875705201	875706201	875705402
875705601	875705202	875705602
875705401	875704601	875705802
875705801	875705002	875706002
875705001	875706401	875706402
875704801	875704401	
875706001	875704802	

Avenir (Cementless)/G7
N=680

Distribution of utilization: 27 surgeons across 18 sites used this implant combination in primary THA.

Table 140: Volume of cases by surgeon and site for the Avenir (Cementless)/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	25 (69)	3 (24)
Cases per site	37 (89)	6 (28)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 141: Descriptive statistics of cases receiving the Avenir (Cementless)/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	397	58.38	
Age (years)	680	66.65(10.86)	67.00(13.00)
Height (cm)	516	168.61(9.96)	167.64(14.60)
Weight (kg)	516	83.93(18.50)	82.27(26.54)
BMI(kg/m^2)	516	29.37(5.24)	29.07(7.11)
Smoking - never (%)	330	48.53	
Smoking - previous (%)	286	42.06	
Smoking - current (%)	64	9.41	
Smoking - unknown (%)	0	0.0	

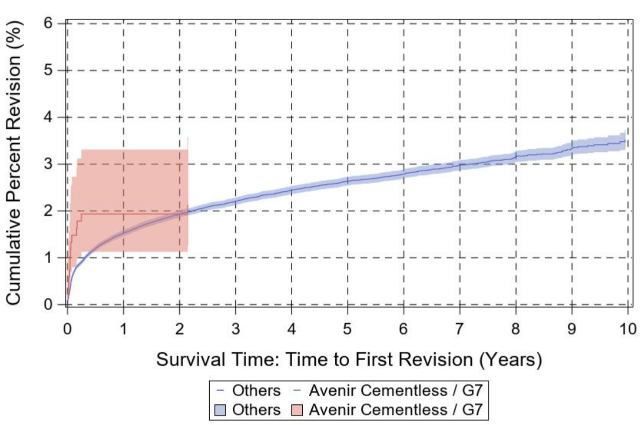

Figure 55: Cumulative percent revision curve for the Avenir (Cementless)/G7 combination compared to all other implant combinations in primary THA.

Table 142: Cumulative percent revision and number at risk for Avenir (Cementless)/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	677	0.00 (0.00,0.00)
1	572	1.94 (1.13,3.31)
2	502	1.94 (1.13,3.31)
3*	441	2.13 (1.27,3.58)
4*	302	2.13 (1.27,3.58)
5*	186	2.13 (1.27,3.58)
6*	82	2.13 (1.27,3.58)
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 55; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 143: Reasons for revision following primary THA for Avenir (Cementless)/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	5	35.7
2	Aseptic Loosening	4	28.6
3	Dislocation/Instability	4	28.6
4	Joint Infection	1	7.1

Table 144: Reasons for revision in first 90 days following primary THA for Avenir (Cementless)/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	5	41.7
2	Aseptic Loosening	4	33.3
3	Dislocation/Instability	2	16.7
4	Joint Infection	1	8.3

Table 145: Reasons for revision between 91 and 365 days following primary THA for Avenir (Cementless)/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 146: Distribution of approach used for Avenir (Cementless)/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	226	33.2
Anterolateral	30	4.4
Posterior	260	38.2
Transtrochanteric	0	0.0
Missing/unknown/other	164	24.1

Table 147: Distribution of head size for Avenir (Cementless)/G7 combination in primary THA cases.

Size (mm)	N	Percent
32	46	7.7
36	512	85.2
Missing/unknown/other	43	7.2

Table 148: Distribution of bearing surface for Avenir (Cementless)/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	102	15.0
Ceramic-on-plastic	499	73.4
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	78	11.5
Missing/unknown/other	1	0.1

Table 149: Distribution of polyethylene used for Avenir (Cementless)/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	498	73.6
Antioxidant XLPE	119	17.6
Missing/unknown/other	60	8.9

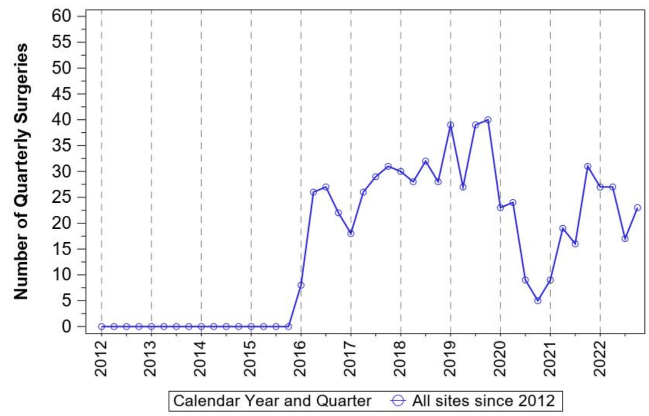

Figure 56: Utilization of the Avenir (Cementless)/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

106010004	106010105	106010001
106010005	106010106	106010101
106010002	106010103	106010008
106010006	106010107	106010108
106010003	106010102	106010109
106010104	106010007	

Catalog numbers of acetabular cups used in the analysis.

10000664	110010246	110010269
10000663	110010242	10000660
10000665	110010248	10000669
10000662	10000661	110010250
10000666	10000668	110010265
110010244	110010263	110010267
110010243	110010241	110017103
110010245	110010249	110017104
110010247	110010264	110017105
10000667	110010266	

Avenir Compete/G7
N=2711

Distribution of utilization: 56 surgeons across 41 sites used this implant combination in primary THA.

Table 150: Volume of cases by surgeon and site for the Avenir Compete/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	48 (94)	12 (50)
Cases per site	66 (78)	30 (75)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 151: Descriptive statistics of cases receiving the Avenir Compete/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1645	60.68	
Age (years)	2711	66.53(10.97)	68.00(14.00)
Height (cm)	2711	168.77(10.22)	167.64(14.01)
Weight (kg)	2711	85.30(20.40)	83.20(27.50)
BMI(kg/m^2)	2711	29.81(6.03)	29.17(7.93)
Smoking - never (%)	1396	51.49	
Smoking - previous (%)	937	34.56	
Smoking - current (%)	370	13.65	
Smoking - unknown (%)	8	0.3	

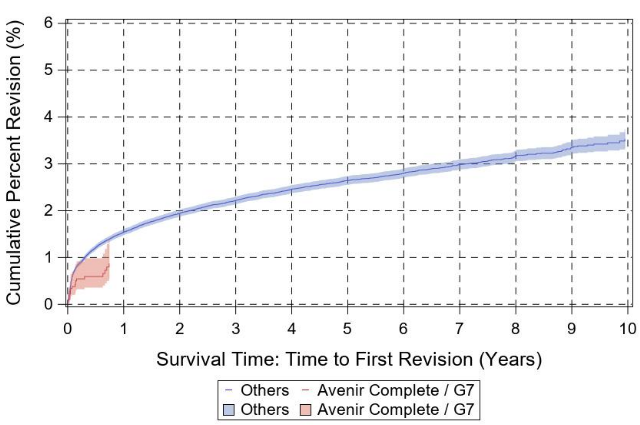

Figure 57: Cumulative percent revision curve for the Avenir Compete/G7 combination compared to all other implant combinations in primary THA.

Table 152: Cumulative percent revision and number at risk for Avenir Compete/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	2704	0.00 (0.00,0.00)
1*	952	0.88 (0.55,1.39)
2*	175	0.88 (0.55,1.39)
3*	11	0.88 (0.55,1.39)
4	0	N/A
5	0	N/A
6	0	N/A
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 57; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.53 (0.332,0.847). It was 1.214 (1.134,1.302) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 153: Reasons for revision following primary THA for Avenir Compete/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	6	31.6
2	Peri-prosthetic fracture - Femur	6	31.6
3	Joint Infection	4	21.1
4	Dislocation/Instability	2	10.5
5	Poly liner wear	1	5.3

Table 154: Reasons for revision in first 90 days following primary THA for Avenir Compete/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	6	42.9
2	Aseptic Loosening	5	35.7
3	Joint Infection	3	21.4

Table 155: Reasons for revision between 91 and 365 days following primary THA for Avenir Compete/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	40.0
2	Aseptic Loosening	1	20.0
3	Joint Infection	1	20.0
4	Poly liner wear	1	20.0

Table 156: Distribution of approach used for Avenir Compete/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	2074	76.5
Anterolateral	120	4.4
Posterior	504	18.6
Transtrochanteric	2	0.1
Missing/unknown/other	11	0.4

Table 157: Distribution of head size for Avenir Compete/G7 combination in primary THA cases.

Size (mm)	N	Percent
28	3	0.1
32	360	14.7
36	1864	76.2
40	206	8.4
Missing/unknown/other	12	0.5

Table 158: Distribution of bearing surface for Avenir Compete/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	264	9.7
Ceramic-on-plastic	2169	80.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	237	8.7
Missing/unknown/other	41	1.5

Table 159: Distribution of polyethylene used for Avenir Compete/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	917	34.4
Antioxidant XLPE	1427	53.5
Missing/unknown/other	322	12.1

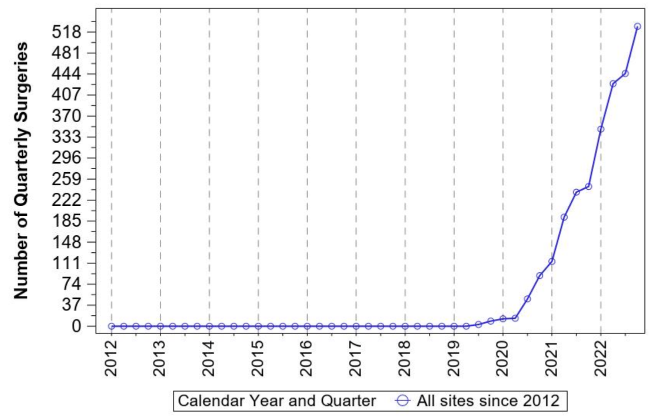

Figure 58: Utilization of the Avenir Compete/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

574202050	574101050	574101010
574202040	574101040	574201000
574202060	574102030	574102010
574201040	574203060	574203070
574202030	574101030	574103020
574201030	574102020	574103030
574201020	574202075	574101000
574201050	574102065	574101065
574203050	574201010	574102000
574203030	574101060	574102075
574202065	574202010	574101070
574102040	574201065	574201075
574202020	574203010	574102080
574203040	574103040	574201080
574102050	574102070	574102085
574102060	574201070	574101075
574203020	574203065	574101085
574201060	574103050	574101080
574202070	574203000	574101090
574101020	574202080	

Catalog numbers of acetabular cups used in the analysis.

110010244	10000667	110010262
110010243	110010249	110010269
110010245	10000661	110017106
110010246	110010240	110010261
110010242	110010265	110010271
110010247	110010250	110010251
110010241	110010264	110010268
10000662	10000668	110017100
110010248	110017103	110017101
10000663	10000660	110017102
10000664	110010263	110017104
10000665	110010266	
10000666	110010267	

Corail/Pinnacle
N=3544

Distribution of utilization: 45 surgeons across 29 sites used this implant combination in primary THA.

Table 160: Volume of cases by surgeon and site for the Corail/Pinnacle combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	78 (119)	9 (111)
Cases per site	122 (203)	22 (132)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 161: Descriptive statistics of cases receiving the Corail/Pinnacle combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2101	59.28	
Age (years)	3544	65.91(10.19)	66.00(14.00)
Height (cm)	3388	169.22(10.43)	168.00(15.30)
Weight (kg)	3388	88.17(20.55)	86.18(27.92)
BMI(kg/m^2)	3388	30.71(6.84)	29.92(8.03)
Smoking - never (%)	1655	46.7	
Smoking - previous (%)	1345	37.95	
Smoking - current (%)	538	15.18	
Smoking - unknown (%)	6	0.17	

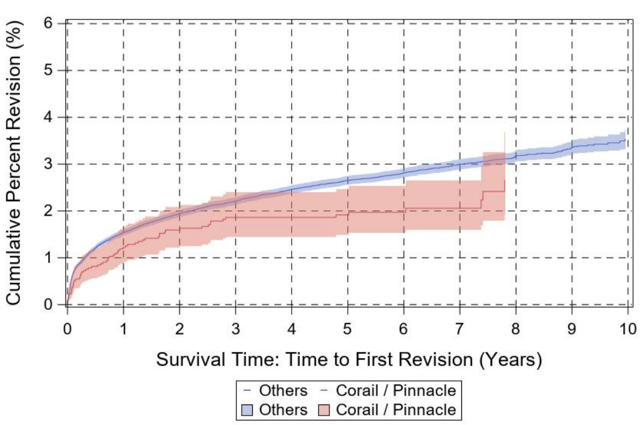

Figure 59: Cumulative percent revision curve for the Corail/Pinnacle combination compared to all other implant combinations in primary THA.

Table 162: Cumulative percent revision and number at risk for Corail/Pinnacle combination in primary THA cases.

Year	Number at risk	CPR
0	3495	0.00 (0.00,0.00)
1	3071	1.22 (0.90,1.65)
2	2686	1.59 (1.22,2.09)
3	2450	1.86 (1.44,2.40)
4	2184	1.86 (1.44,2.40)
5	1753	1.92 (1.49,2.47)
6	1159	1.97 (1.53,2.54)
7	686	2.06 (1.59,2.65)
8*	347	2.66 (1.92,3.68)
9*	64	2.66 (1.92,3.68)
10*	2	2.66 (1.92,3.68)

* No revision occurred after the termination of the red curve in Figure 59; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.887 (0.663,1.188). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 163: Reasons for revision following primary THA for Corail/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	18	27.7
2	Aseptic Loosening	15	23.1
3	Joint Infection	14	21.5
4	Peri-prosthetic fracture - Femur	10	15.4
5	Implant Failure	4	6.2
6	Malalignment	3	4.6
7	Pain	1	1.5

Table 164: Reasons for revision in first 90 days following primary THA for Corail/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	8	34.8
2	Dislocation/Instability	7	30.4
3	Aseptic Loosening	3	13.0
4	Joint Infection	3	13.0
5	Implant Failure	2	8.7

Table 165: Reasons for revision between 91 and 365 days following primary THA for Corail/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	8	44.4
2	Joint Infection	4	22.2
3	Aseptic Loosening	3	16.7
4	Implant Failure	1	5.6
5	Pain	1	5.6
6	Malalignment	1	5.6

Table 166: Distribution of approach used for Corail/Pinnacle combination in primary THA cases.

Approach	N	Percent
Anterior	2169	61.2
Anterolateral	668	18.9
Posterior	539	15.2
Transtrochanteric	7	0.2
Missing/unknown/other	161	4.5

Table 167: Distribution of head size for Corail/Pinnacle combination in primary THA cases.

Size (mm)	N	Percent
22	4	0.1
28	11	0.3
32	738	20.9
36	2475	70.2
40	275	7.8
44	16	0.5
Missing/unknown/other	7	0.2

Table 168: Distribution of bearing surface for Corail/Pinnacle combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1258	35.5
Ceramic-on-plastic	2254	63.6
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	1	0.0
Missing/unknown/other	31	0.9

Table 169: Distribution of polyethylene used for Corail/Pinnacle combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	2	0.1
XLPE	3215	91.4
Antioxidant XLPE	0	0.0
Missing/unknown/other	302	8.6

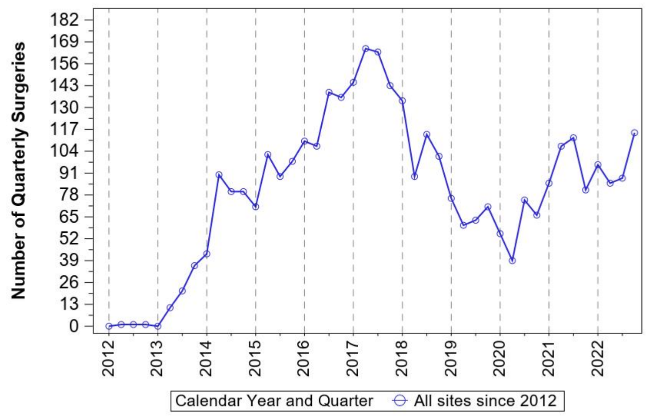

Figure 60: Utilization of the Corail/Pinnacle combination in primary THA cases.

Catalog numbers of stems used in the analysis.

3L92502	3L92510	L971118
3L92501	L971110	L971209
3L92503	L971114	L98014
3L92500	3L92498	L98013
3L92504	L20315	L971310
3L92505	3L92514	L20309
3L92499	L971115	L971208
3L92512	3L92515	L98011
L971112	L20316	L98012
3L92511	3L92508	L98115
3L92513	L971109	L98120
L971111	3L92509	L98112
L20312	L971116	3L92521
L20313	L971210	L20320
L971113	L20310	L971308
3L92506	3L92507	L98010
L20314	3L92516	L98015
L20311	L20318	L98018

L98020	L98114
L98113	L98116

Catalog numbers of acetabular cups used in the analysis.

121732052	121731052	121731060
121732054	121732064	121732066
121732056	121722054	121730046
121732058	121730050	121703062
121732050	121731054	121730068
121732048	121703058	121722056
121732060	121730060	121722060
121730052	121731056	121730064
121722052	121703050	121730066
121730054	121703048	121722058
121703052	121722048	121722064
121730056	121730048	121701052
121732062	121730062	121703064
121722050	121731048	121720046
121703054	121703060	121722062
121730058	121731050	
121703056	121731058	

Corail Coxa Vara/Pinnacle
N=757

Distribution of utilization: 28 surgeons across 22 sites used this implant combination in primary THA.

Table 170: Volume of cases by surgeon and site for the Corail Coxa Vara/Pinnacle combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	27 (32)	13 (41)
Cases per site	34 (42)	10 (61)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 171: Descriptive statistics of cases receiving the Corail Coxa Vara/Pinnacle combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	438	57.86	
Age (years)	757	65.22(10.05)	66.00(13.00)
Height (cm)	754	169.87(10.39)	170.18(15.24)
Weight (kg)	754	88.28(19.99)	87.14(24.90)
BMI(kg/m^2)	754	30.48(5.77)	29.71(7.82)
Smoking - never (%)	351	46.37	
Smoking - previous (%)	299	39.5	
Smoking - current (%)	106	14	
Smoking - unknown (%)	1	0.13	

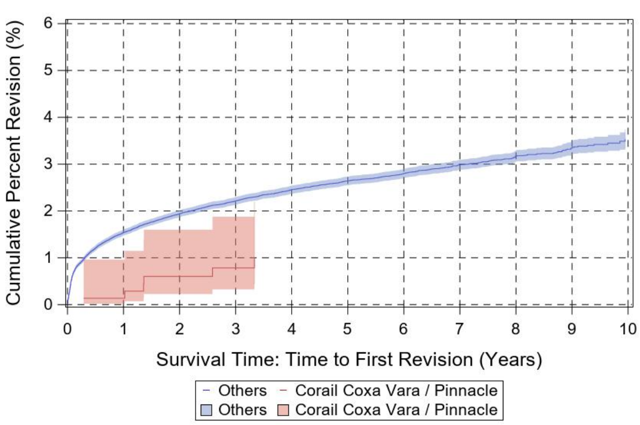

Figure 61: Cumulative percent revision curve for the Corail Coxa Vara/Pinnacle combination compared to all other implant combinations in primary THA.

Table 172: Cumulative percent revision and number at risk for Corail Coxa Vara/Pinnacle combination in primary THA cases.

Year	Number at risk	CPR
0	753	0.00 (0.00,0.00)
1	661	0.14 (0.02,0.96)
2	587	0.60 (0.23,1.60)
3	526	0.78 (0.33,1.88)
4*	434	0.98 (0.44,2.19)
5*	344	0.98 (0.44,2.19)
6*	225	0.98 (0.44,2.19)
7*	134	0.98 (0.44,2.19)
8*	63	0.98 (0.44,2.19)
9*	22	0.98 (0.44,2.19)
10*	1	0.98 (0.44,2.19)

* No revision occurred after the termination of the red curve in Figure 61; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.394 (0.175,0.889). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 173: Reasons for revision following primary THA for Corail Coxa Vara/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	5	83.3
2	Dislocation/Instability	1	16.7

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 174: Reasons for revision between 91 and 365 days following primary THA for Corail Coxa Vara/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 175: Distribution of approach used for Corail Coxa Vara/Pinnacle combination in primary THA cases.

Approach	N	Percent
Anterior	502	66.3
Anterolateral	131	17.3
Posterior	119	15.7
Transtrochanteric	0	0.0
Missing/unknown/other	5	0.7

Table 176: Distribution of head size for Corail Coxa Vara/Pinnacle combination in primary THA cases.

Size (mm)	N	Percent
28	11	1.5
32	193	25.6
36	522	69.2
40	22	2.9
44	1	0.1
Missing/unknown/other	5	0.7

Table 177: Distribution of bearing surface for Corail Coxa Vara/Pinnacle combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	207	27.3
Ceramic-on-plastic	539	71.2
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	1	0.1
Missing/unknown/other	10	1.3

Table 178: Distribution of polyethylene used for Corail Coxa Vara/Pinnacle combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	1	0.1
XLPE	694	92.3
Antioxidant XLPE	0	0.0
Missing/unknown/other	57	7.6

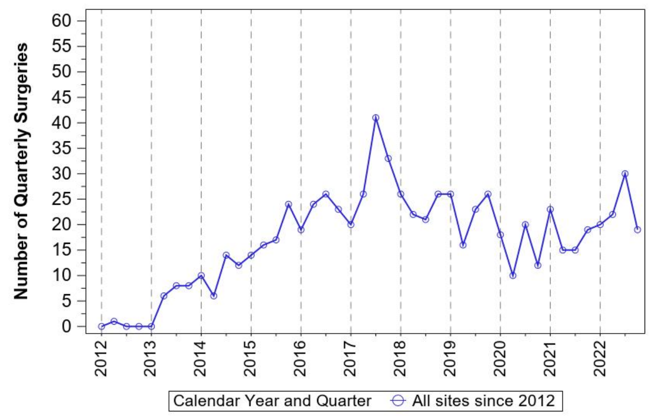

Figure 62: Utilization of the Corail Coxa Vara/Pinnacle combination in primary THA cases.

Catalog numbers of stems used in the analysis.

3L93712	3L93714	3L93718
3L93711	3L93715	
3L93713	3L93709	
3L93710	3L93716	

Catalog numbers of acetabular cups used in the analysis.

121732052	121703054	121730060
121732054	121730050	121731048
121732056	121722054	121730062
121732050	121703056	121731060
121730052	121703058	121722060
121732058	121730056	121730044
121722052	121722048	121730046
121722050	121730048	121731050
121732048	121730058	121731052
121732060	121703048	121731054
121703052	121703060	121731056
121730054	121722056	121731058
121732062	121703050	

Echo Bi-Metric/G7
N=1629

Distribution of utilization: 33 surgeons across 30 sites used this implant combination in primary THA.

Table 179: Volume of cases by surgeon and site for the Echo Bi-Metric/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	49 (136)	5 (46)
Cases per site	54 (151)	10 (38)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 180: Descriptive statistics of cases receiving the Echo Bi-Metric/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	915	56.17	
Age (years)	1629	66.68(10.84)	67.00(14.00)
Height (cm)	1629	169.72(10.39)	169.00(15.24)
Weight (kg)	1629	89.32(22.19)	87.45(29.67)
BMI(kg/m^2)	1629	30.88(6.64)	29.90(8.70)
Smoking - never (%)	796	48.86	
Smoking - previous (%)	589	36.16	
Smoking - current (%)	241	14.79	
Smoking - unknown (%)	3	0.18	

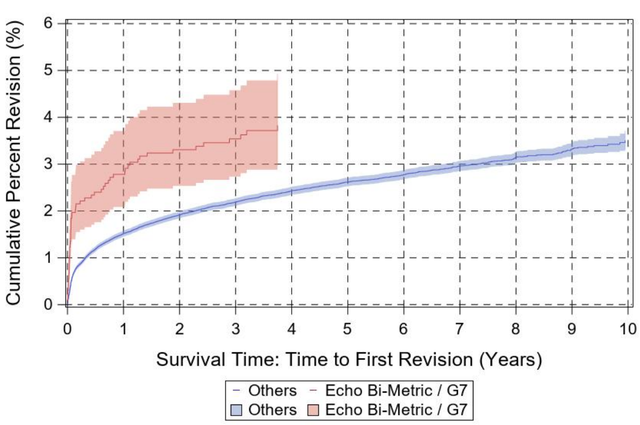

Figure 63: Cumulative percent revision curve for the Echo Bi-Metric/G7 combination compared to all other implant combinations in primary THA.

Table 181: Cumulative percent revision and number at risk for Echo Bi-Metric/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	1627	0.00 (0.00,0.00)
1	1505	2.78 (2.08,3.71)
2	1360	3.31 (2.54,4.31)
3	1140	3.54 (2.73,4.58)
4*	749	3.83 (2.97,4.93)
5*	366	3.83 (2.97,4.93)
6*	152	3.83 (2.97,4.93)
7*	44	3.83 (2.97,4.93)
8*	3	3.83 (2.97,4.93)
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 63; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 182: Reasons for revision following primary THA for Echo Bi-Metric/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	21	35.6
2	Joint Infection	14	23.7
3	Dislocation/Instability	11	18.6
4	Aseptic Loosening	7	11.9
5	Implant Failure	2	3.4
6	Malalignment	2	3.4
7	Peri-prosthetic fracture - Acetabulum	1	1.7
8	Pain	1	1.7

Table 183: Reasons for revision in first 90 days following primary THA for Echo Bi-Metric/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	19	52.8
2	Aseptic Loosening	5	13.9
3	Dislocation/Instability	4	11.1
4	Joint Infection	4	11.1
5	Malalignment	2	5.6
6	Implant Failure	1	2.8
7	Peri-prosthetic fracture - Acetabulum	1	2.8

Table 184: Reasons for revision between 91 and 365 days following primary THA for Echo Bi-Metric/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	3	33.3
2	Aseptic Loosening	2	22.2
3	Joint Infection	2	22.2
4	Implant Failure	1	11.1
5	Peri-prosthetic fracture - Femur	1	11.1

Table 185: Distribution of approach used for Echo Bi-Metric/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	132	8.1
Anterolateral	53	3.2
Posterior	1441	88.5
Transtrochanteric	1	0.1
Missing/unknown/other	2	0.1

Table 186: Distribution of head size for Echo Bi-Metric/G7 combination in primary THA cases.

Size (mm)	N	Percent
28	4	0.3
32	246	17.2
36	758	53.1
40	411	28.8
Missing/unknown/other	8	0.6

Table 187: Distribution of bearing surface for Echo Bi-Metric/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	113	6.9
Ceramic-on-plastic	1306	80.2
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	198	12.2
Missing/unknown/other	12	0.7

Table 188: Distribution of polyethylene used for Echo Bi-Metric/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	736	45.4
Antioxidant XLPE	275	16.9
Missing/unknown/other	612	37.7

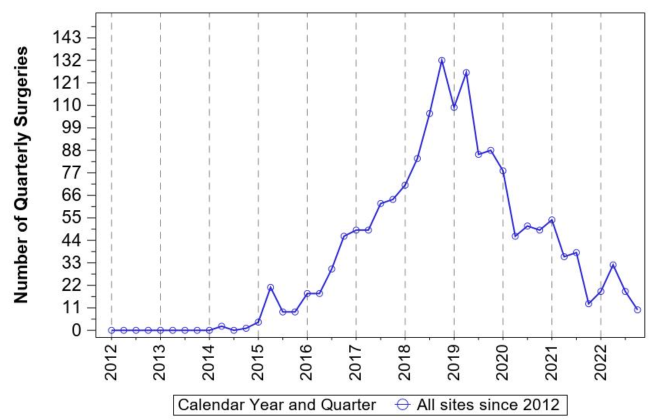

Figure 64: Utilization of the Echo Bi-Metric/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

192113	192411	192512
192112	192109	192116
192111	192115	192016
192012	192009	192108
192110	192015	192414
192114	192409	192510
192011	192410	192513
192010	192412	192408
192013	192509	192508
192014	192413	192008

192511	192007	192019
192407	192118	192020
192415	192416	192119
192117	192515	192517
192514	192018	
192017	192417	
192107	192516	

Catalog numbers of acetabular cups used in the analysis.

110010243	110010264	110010262
110010244	110010265	110010269
110010245	110010263	110017101
110010246	110017102	10000668
110010242	110010266	110010240
110010247	10000667	110010250
10000663	110017103	110010268
10000664	110017104	10000660
110010241	110017105	10000671
110010248	110010249	110010270
10000665	110010267	110017108
10000662	110017106	
10000666	10000661	

Echo Bi-Metric Microplasty/G7
N=1840

Distribution of utilization: 25 surgeons across 26 sites used this implant combination in primary THA.

Table 189: Volume of cases by surgeon and site for the Echo Bi-Metric Microplasty/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	73 (110)	8 (106)
Cases per site	70 (115)	16 (86)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 190: Descriptive statistics of cases receiving the Echo Bi-Metric Microplasty/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	974	52.93	
Age (years)	1840	65.19(10.38)	66.00(15.00)
Height (cm)	1840	170.21(10.78)	170.18(15.24)
Weight (kg)	1840	88.07(20.03)	87.54(26.00)
BMI(kg/m^2)	1840	30.39(7.56)	29.76(7.92)
Smoking - never (%)	911	49.51	
Smoking - previous (%)	649	35.27	
Smoking - current (%)	275	14.95	
Smoking - unknown (%)	5	0.27	

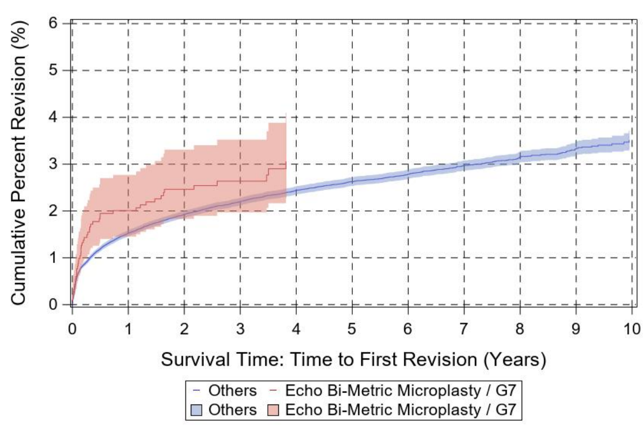

Figure 65: Cumulative percent revision curve for the Echo Bi-Metric Microplasty/G7 combination compared to all other implant combinations in primary THA.

Table 191: Cumulative percent revision and number at risk for Echo Bi-Metric Microplasty/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	1837	0.00 (0.00,0.00)
1	1617	2.01 (1.45,2.77)
2	1306	2.46 (1.83,3.31)
3	920	2.64 (1.97,3.52)
4*	580	3.06 (2.28,4.10)
5*	328	3.06 (2.28,4.10)
6*	84	3.06 (2.28,4.10)
7*	3	3.06 (2.28,4.10)
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 65; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.358 (0.976,1.891). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 192: Reasons for revision following primary THA for Echo Bi-Metric Microplasty/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	19	39.6
2	Aseptic Loosening	8	16.7
3	Dislocation/Instability	8	16.7
4	Joint Infection	5	10.4
5	Pain	3	6.2
6	Malalignment	3	6.2
7	Implant Failure	2	4.2

Table 193: Reasons for revision in first 90 days following primary THA for Echo Bi-Metric Microplasty/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	18	69.2
2	Aseptic Loosening	3	11.5
3	Dislocation/Instability	3	11.5
4	Pain	1	3.9
5	Malalignment	1	3.9

Table 194: Reasons for revision between 91 and 365 days following primary THA for Echo Bi-Metric Microplasty/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	3	30.0
2	Aseptic Loosening	2	20.0
3	Joint Infection	2	20.0
4	Implant Failure	2	20.0
5	Pain	1	10.0

Table 195: Distribution of approach used for Echo Bi-Metric Microplasty/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	1367	74.3
Anterolateral	26	1.4
Posterior	443	24.1
Transtrochanteric	3	0.2
Missing/unknown/other	1	0.1

Table 196: Distribution of head size for Echo Bi-Metric Microplasty/G7 combination in primary THA cases.

Size (mm)	N	Percent
28	1	0.1
32	260	16.1
36	1141	70.6
40	207	12.8
Missing/unknown/other	8	0.5

Table 197: Distribution of bearing surface for Echo Bi-Metric Microplasty/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	254	13.8
Ceramic-on-plastic	1355	73.6
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	169	9.2
Missing/unknown/other	62	3.4

Table 198: Distribution of polyethylene used for Echo Bi-Metric Microplasty/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	844	47.3
Antioxidant XLPE	469	26.3
Missing/unknown/other	472	26.4

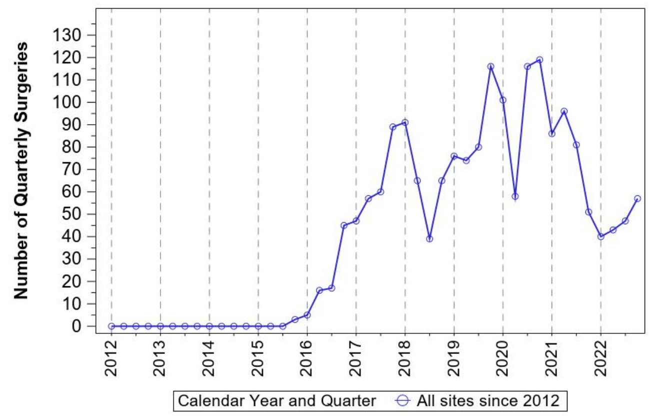

Figure 66: Utilization of the Echo Bi-Metric Microplasty/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

193112	193009	193007
193012	193109	192807
193111	193115	193107
193113	193015	193118
193010	193108	193018
193013	193008	193019
193011	193116	193119
193110	193016	
193014	193017	
193114	193117	

Catalog numbers of acetabular cups used in the analysis.

110017102	110010246	110010245
110017103	110017104	110010244
110010243	110017105	10000664

10000665
110017106
10000666
110010247
10000663
110017101
10000662
110010242
10000667
110017107
110010248
110017100
10000661
110010265
110010264
10000668
110010241
110010249
110010262
110010263
110010266
110017108
10000669
110010267
10000660
110010268
10000671
110010250
110010272
110017099
110017109

Fitmore/Continuum
N=2813

Distribution of utilization: 38 surgeons across 18 sites used this implant combination in primary THA.

Table 199: Volume of cases by surgeon and site for the Fitmore/Continuum combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	74 (234)	5 (23)
Cases per site	156 (263)	26 (223)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 200: Descriptive statistics of cases receiving the Fitmore/Continuum combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1261	44.83	
Age (years)	2813	63.67(10.21)	63.00(14.00)
Height (cm)	2729	171.63(10.18)	172.70(14.17)
Weight (kg)	2729	89.46(21.36)	87.70(28.50)
BMI(kg/m^2)	2729	30.22(6.13)	29.34(7.80)
Smoking - never (%)	1352	48.06	
Smoking - previous (%)	1092	38.82	
Smoking - current (%)	365	12.98	
Smoking - unknown (%)	4	0.14	

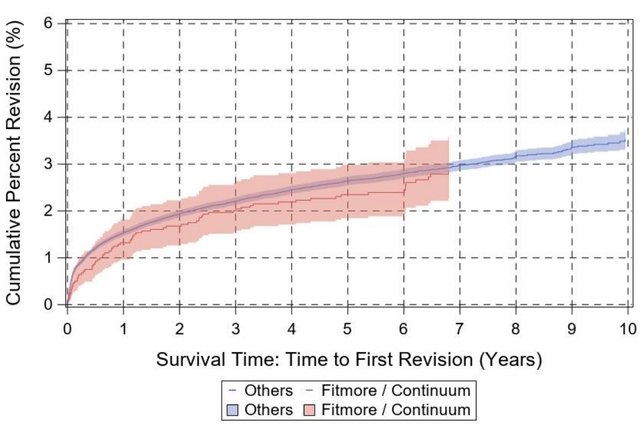

Figure 67: Cumulative percent revision curve for the Fitmore/Continuum combination compared to all other implant combinations in primary THA.

Table 201: Cumulative percent revision and number at risk for Fitmore/Continuum combination in primary THA cases.

Year	Number at risk	CPR
0	2802	0.00 (0.00,0.00)
1	2763	1.32 (0.96,1.82)
2	2731	1.68 (1.26,2.23)
3	2668	2.00 (1.55,2.60)
4	2580	2.19 (1.71,2.81)
5	2331	2.35 (1.85,2.99)
6	1827	2.39 (1.89,3.04)
7*	1309	2.86 (2.27,3.59)
8*	651	2.86 (2.27,3.59)
9*	167	2.86 (2.27,3.59)
10*	2	2.86 (2.27,3.59)

* No revision occurred after the termination of the red curve in Figure 67; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.398 (1.057,1.851). It was 1.215 (1.135,1.303) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 202: Reasons for revision following primary THA for Fitmore/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	17	23.3
2	Peri-prosthetic fracture - Femur	17	23.3
3	Dislocation/Instability	15	20.5
4	Joint Infection	11	15.1
5	Pain	7	9.6
6	Implant Failure	3	4.1
7	Malalignment	3	4.1

Table 203: Reasons for revision in first 90 days following primary THA for Fitmore/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	10	58.8
2	Dislocation/Instability	5	29.4
3	Joint Infection	1	5.9
4	Implant Failure	1	5.9

Table 204: Reasons for revision between 91 and 365 days following primary THA for Fitmore/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	5	26.3
2	Dislocation/Instability	4	21.1
3	Pain	4	21.1
4	Implant Failure	2	10.5
5	Peri-prosthetic fracture - Femur	2	10.5
6	Joint Infection	1	5.3
7	Malalignment	1	5.3

Table 205: Distribution of approach used for Fitmore/Continuum combination in primary THA cases.

Approach	N	Percent
Anterior	2390	85.0
Anterolateral	26	0.9
Posterior	313	11.1
Transtrochanteric	0	0.0
Missing/unknown/other	84	3.0

Table 206: Distribution of head size for Fitmore/Continuum combination in primary THA cases.

Size (mm)	N	Percent
28	2	0.1
32	540	19.3
36	2032	72.5
40	201	7.2
Missing/unknown/other	29	1.0

Table 207: Distribution of bearing surface for Fitmore/Continuum combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	554	19.7
Ceramic-on-plastic	2221	79.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	38	1.4

Table 208: Distribution of polyethylene used for Fitmore/Continuum combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	1	0.0
XLPE	920	32.8
Antioxidant XLPE	1722	61.4
Missing/unknown/other	161	5.7

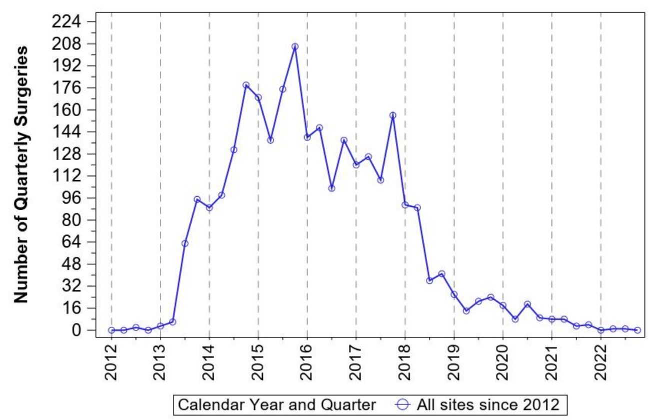

Figure 68: Utilization of the Fitmore/Continuum combination in primary THA cases.

Catalog numbers of stems used in the analysis.

100551306	100551302	100551301
100551307	100551407	100551409
100551305	100551206	100551402
100551308	100551205	100551401
100551304	100551404	100551311
100551309	100551408	100551208
100551303	100551204	100551202
100551310	100551207	100551410
100551405	100551403	100551201
100551406	100551203	100551210

100551209	100551102	100551412
100551312	100551104	100551107
100551411	100551314	100551110
100551106	100551103	100551109
100551108	100551211	100551212
100551313	100551105	

Catalog numbers of acetabular cups used in the analysis.

875705401	875705402	875704601
875705601	875705602	875706000
875705801	875705800	875704002
875705201	875705802	875705002
875706001	875705400	875706200
875705001	875706601	875706202
875706201	875704800	875706402
875704801	875705202	875706602
875706401	875704802	
875705200	875705000	
875705600	875706002	

Fitmore/G7
N=2690

Distribution of utilization: 34 surgeons across 26 sites used this implant combination in primary THA.

Table 209: Volume of cases by surgeon and site for the Fitmore/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	79 (213)	8 (55)
Cases per site	103 (223)	9 (85)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 210: Descriptive statistics of cases receiving the Fitmore/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1300	48.33	
Age (years)	2690	63.57(9.98)	64.00(13.00)
Height (cm)	2647	171.55(10.52)	171.45(17.70)
Weight (kg)	2647	90.20(20.30)	88.50(27.45)
BMI(kg/m^2)	2647	30.53(5.87)	29.84(7.82)
Smoking - never (%)	1348	50.11	
Smoking - previous (%)	1012	37.62	
Smoking - current (%)	327	12.16	
Smoking - unknown (%)	3	0.11	

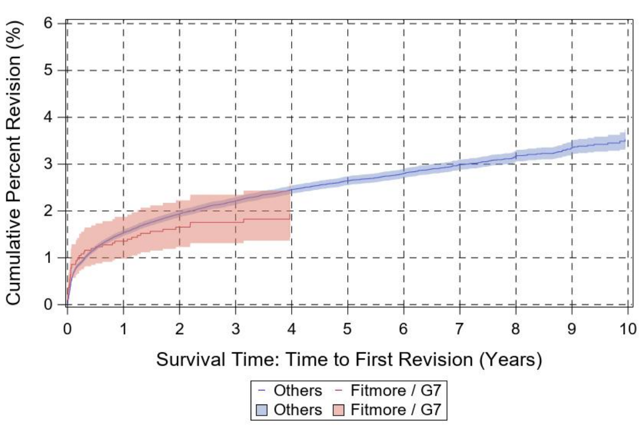

Figure 69: Cumulative percent revision curve for the Fitmore/G7 combination compared to all other implant combinations in primary THA.

Table 211: Cumulative percent revision and number at risk for Fitmore/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	2684	0.00 (0.00,0.00)
1	2427	1.36 (0.98,1.88)
2	2088	1.66 (1.23,2.23)
3	1515	1.76 (1.31,2.35)
4*	852	1.94 (1.44,2.60)
5*	436	1.94 (1.44,2.60)
6*	200	1.94 (1.44,2.60)
7*	39	1.94 (1.44,2.60)
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 69; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 212: Reasons for revision following primary THA for Fitmore/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	17	36.2
2	Dislocation/Instability	10	21.3
3	Joint Infection	8	17.0
4	Aseptic Loosening	4	8.5
5	Implant Failure	4	8.5
6	Malalignment	2	4.3
7	Peri-prosthetic fracture - Acetabulum	1	2.1
8	Pain	1	2.1

Table 213: Reasons for revision in first 90 days following primary THA for Fitmore/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	14	48.3
2	Dislocation/Instability	8	27.6
3	Implant Failure	4	13.8
4	Joint Infection	1	3.5
5	Peri-prosthetic fracture - Acetabulum	1	3.5
6	Malalignment	1	3.5

Table 214: Reasons for revision between 91 and 365 days following primary THA for Fitmore/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	28.6
2	Joint Infection	2	28.6
3	Peri-prosthetic fracture - Femur	1	14.3
4	Pain	1	14.3
5	Malalignment	1	14.3

Table 215: Distribution of approach used for Fitmore/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	2258	83.9
Anterolateral	17	0.6
Posterior	371	13.8
Transtrochanteric	0	0.0
Missing/unknown/other	44	1.6

Table 216: Distribution of head size for Fitmore/G7 combination in primary THA cases.

Size (mm)	N	Percent
28	4	0.2
32	209	8.2
36	1795	70.6
40	522	20.5
Missing/unknown/other	14	0.6

Table 217: Distribution of bearing surface for Fitmore/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	304	11.3
Ceramic-on-plastic	2226	82.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	124	4.6
Missing/unknown/other	36	1.3

Table 218: Distribution of polyethylene used for Fitmore/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	401	15.1
Antioxidant XLPE	1666	62.5
Missing/unknown/other	597	22.4

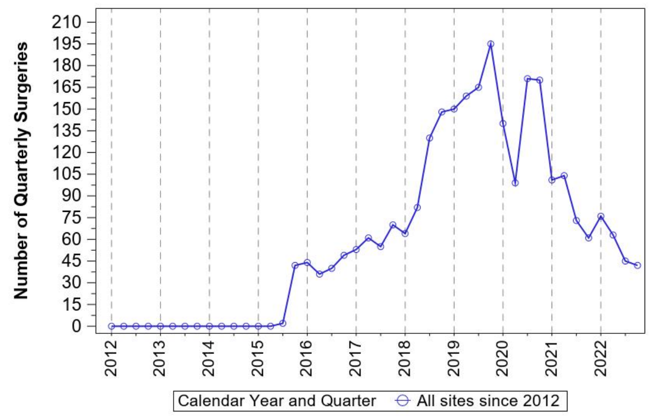

Figure 70: Utilization of the Fitmore/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

100551304	100551409	100551402
100551306	100551206	100551209
100551305	100551301	100551210
100551307	100551403	100551411
100551303	100551204	100551211
100551308	100551203	100551312
100551407	100551205	100551412
100551406	100551207	100551313
100551405	100551410	100551102
100551309	100551201	100551103
100551408	100551208	100551109
100551302	100551311	100551110
100551404	100551202	100551212
100551310	100551401	

Catalog numbers of acetabular cups used in the analysis.

110010244	10000667	10000659
110010245	110010266	10000660
110010246	10000668	10000670
110010247	110010264	10000671
110010243	110010241	110010239
110010248	110010250	110010240
10000664	110010265	110010251
10000663	110010268	110010261
10000666	10000661	110010262
10000665	110010263	110010270
110010242	10000669	110010271
10000662	110010267	110010272
110010249	110010269	

M/L Taper/Continuum

N=8202

This analysis excludes M/L Taper Kinectiv. Distribution of utilization: 69 surgeons across 35 sites used this implant combination in primary THA.

Table 219: Volume of cases by surgeon and site for the M/L Taper/Continuum combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	118 (266)	31 (88)
Cases per site	234 (600)	40 (162)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 220: Descriptive statistics of cases receiving the M/L Taper/Continuum combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	4325	52.73	
Age (years)	8202	64.83(10.50)	65.00(14.00)
Height (cm)	8193	170.35(10.38)	170.18(15.20)
Weight (kg)	8192	87.79(19.98)	86.18(27.20)
BMI(kg/m^2)	8192	30.12(5.79)	29.51(7.61)
Smoking - never (%)	4144	50.52	
Smoking - previous (%)	3111	37.93	
Smoking - current (%)	926	11.29	
Smoking - unknown (%)	21	0.26	

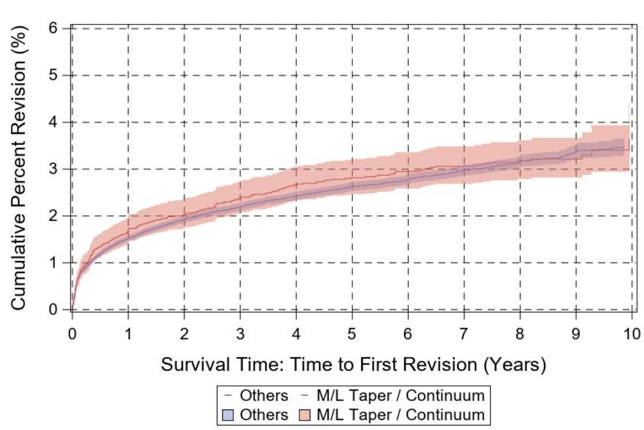

Figure 71: Cumulative percent revision curve for the M/L Taper/Continuum combination compared to all other implant combinations in primary THA.

Table 221: Cumulative percent revision and number at risk for M/L Taper/Continuum combination in primary THA cases.

Year	Number at risk	CPR
0	8132	0.00 (0.00,0.00)
1	7586	1.71 (1.45,2.02)
2	7092	2.02 (1.73,2.35)
3	6620	2.39 (2.07,2.75)
4	6074	2.67 (2.33,3.05)
5	5463	2.82 (2.47,3.22)
6	4780	2.95 (2.59,3.36)
7	3854	3.06 (2.69,3.48)
8	2648	3.18 (2.79,3.62)
9	1267	3.22 (2.82,3.67)
10*	366	3.65 (3.02,4.40)

* No revision occurred after the termination of the red curve in Figure 71; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.97 (0.81,1.163). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 222: Reasons for revision following primary THA for M/L Taper/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	55	26.8
2	Dislocation/Instability	54	26.3
3	Aseptic Loosening	33	16.1
4	Joint Infection	29	14.1
5	Implant Failure	10	4.9
6	Pain	8	3.9
7	Malalignment	8	3.9
8	Peri-prosthetic fracture - Acetabulum	4	2.0
9	Metal Reaction/Metallosis	4	2.0

Table 223: Reasons for revision in first 90 days following primary THA for M/L Taper/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	36	48.0
2	Dislocation/Instability	20	26.7
3	Aseptic Loosening	5	6.7
4	Joint Infection	5	6.7
5	Implant Failure	3	4.0
6	Peri-prosthetic fracture - Acetabulum	3	4.0
7	Malalignment	3	4.0

Table 224: Reasons for revision between 91 and 365 days following primary THA for M/L Taper/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	11	28.2
2	Dislocation/Instability	9	23.1
3	Aseptic Loosening	6	15.4
4	Peri-prosthetic fracture - Femur	6	15.4
5	Pain	4	10.3
6	Implant Failure	3	7.7

Table 225: Distribution of approach used for M/L Taper/Continuum combination in primary THA cases.

Approach	N	Percent
Anterior	1802	22.0
Anterolateral	1294	15.8
Posterior	4998	60.9
Transtrochanteric	69	0.8
Missing/unknown/other	39	0.5

Table 226: Distribution of head size for M/L Taper/Continuum combination in primary THA cases.

Size (mm)	N	Percent
28	22	0.3
32	1763	21.6
36	5538	67.9
40	756	9.3
Missing/unknown/other	72	0.9

Table 227: Distribution of bearing surface for M/L Taper/Continuum combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	2333	28.4
Ceramic-on-plastic	5743	70.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	126	1.5

Table 228: Distribution of polyethylene used for M/L Taper/Continuum combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	5369	65.9
Antioxidant XLPE	2322	28.5
Missing/unknown/other	457	5.6

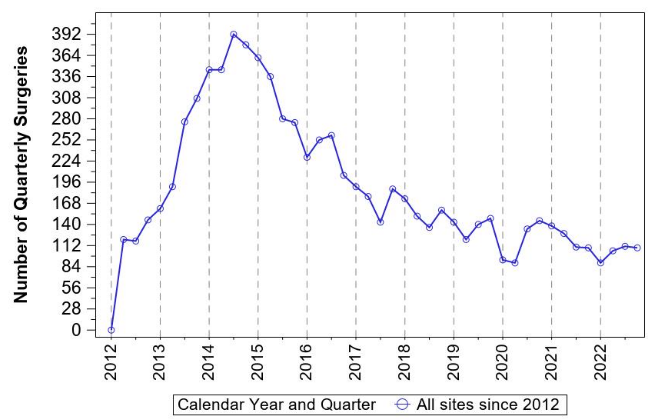

Figure 72: Utilization of the M/L Taper/Continuum combination in primary THA cases.

Catalog numbers of stems used in the analysis.

771101220	771101020	771101010
771100900	771100920	771101500
771101320	771101300	771100640
771101200	771100740	771101210
771101120	771101040	771101110
771101000	771101140	771101620
771101100	771100910	771100600
771100700	771100710	771100610
771101520	771101240	771101720
771100940	771100720	771100410

771100440	771100510	771102200
771100500	771100520	771102220
771101600	771102020	
771100540	771101700	
771100620	771102000	

Catalog numbers of acetabular cups used in the analysis.

875705201	875705402	875706801
875705401	875705200	875704800
875705601	875705400	875704601
875705801	875705600	875706200
875706001	875705802	875704401
875705001	875705800	875706202
875704801	875705602	875704402
875706201	875704602	875706402
875706401	875705000	875706602
875705002	875706601	875706802
875705202	875706000	875707001
875704802	875706002	

M/L Taper/G7
N=3957

This analysis excludes M/L Taper Kinectiv. Distribution of utilization: 35 surgeons across 27 sites used this implant combination in primary THA.

Table 229: Volume of cases by surgeon and site for the M/L Taper/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	113 (231)	14 (107)
Cases per site	146 (325)	18 (169)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 230: Descriptive statistics of cases receiving the M/L Taper/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1949	49.25	
Age (years)	3957	65.08(10.01)	66.00(13.00)
Height (cm)	3957	170.87(10.26)	170.20(15.20)
Weight (kg)	3957	89.38(19.92)	88.00(27.30)
BMI(kg/m^2)	3957	30.52(5.85)	29.82(8.15)
Smoking - never (%)	1988	50.24	
Smoking - previous (%)	1549	39.15	
Smoking - current (%)	420	10.61	
Smoking - unknown (%)	0	0.0	

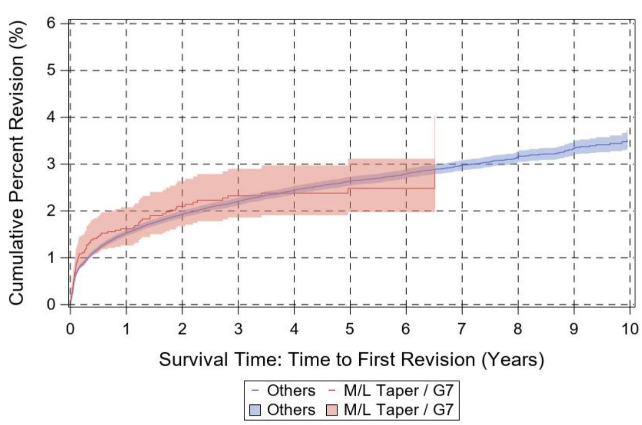

Figure 73: Cumulative percent revision curve for the M/L Taper/G7 combination compared to all other implant combinations in primary THA.

Table 231: Cumulative percent revision and number at risk for M/L Taper/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	3938	0.00 (0.00,0.00)
1	2981	1.62 (1.26,2.08)
2	2361	2.10 (1.67,2.64)
3	1953	2.32 (1.86,2.90)
4	1407	2.38 (1.91,2.97)
5	941	2.48 (1.98,3.12)
6	453	2.48 (1.98,3.12)
7*	76	2.89 (2.06,4.04)
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 73; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.979 (0.738,1.3). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 232: Reasons for revision following primary THA for M/L Taper/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	26	31.7
2	Peri-prosthetic fracture - Femur	26	31.7
3	Joint Infection	14	17.1
4	Aseptic Loosening	10	12.2
5	Implant Failure	3	3.7
6	Pain	2	2.4
7	Malalignment	1	1.2

Table 233: Reasons for revision in first 90 days following primary THA for M/L Taper/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	25	58.1
2	Dislocation/Instability	10	23.3
3	Joint Infection	3	7.0
4	Implant Failure	3	7.0
5	Aseptic Loosening	2	4.7

Table 234: Reasons for revision between 91 and 365 days following primary THA for M/L Taper/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	9	50.0
2	Joint Infection	6	33.3
3	Aseptic Loosening	2	11.1
4	Peri-prosthetic fracture - Femur	1	5.6

Table 235: Distribution of approach used for M/L Taper/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	1003	25.4
Anterolateral	275	7.0
Posterior	2677	67.7
Transtrochanteric	2	0.1
Missing/unknown/other	0	0.0

Table 236: Distribution of head size for M/L Taper/G7 combination in primary THA cases.

Size (mm)	N	Percent
28	2	0.1
32	253	6.7
36	3006	79.8
40	499	13.2
Missing/unknown/other	5	0.1

Table 237: Distribution of bearing surface for M/L Taper/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	385	9.7
Ceramic-on-plastic	3375	85.3
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	172	4.3
Missing/unknown/other	25	0.6

Table 238: Distribution of polyethylene used for M/L Taper/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	963	24.7
Antioxidant XLPE	2089	53.5
Missing/unknown/other	849	21.8

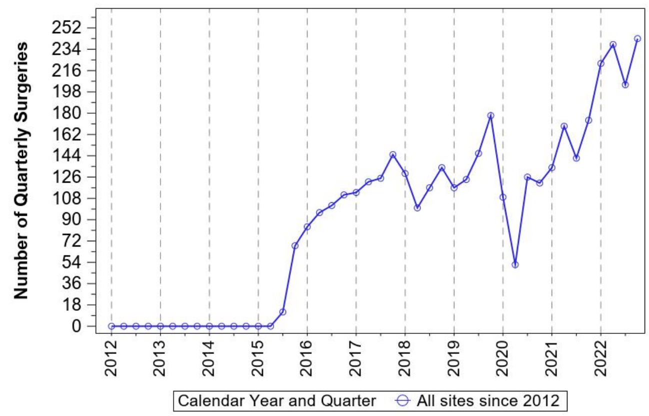

Figure 74: Utilization of the M/L Taper/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

771101320	771101020	771100440
771100900	771100920	771101110
771100940	771101300	771100540
771101240	771100600	771101210
771101140	771100720	771100520
771100700	771101620	771101720
771101040	771100910	771101600
771101100	771100640	771100510
771101000	771100710	771100410
771100740	771101500	771102020
771101220	771101010	771101700
771101520	771100610	
771101120	771100500	
771101200	771100620	

Catalog numbers of acetabular cups used in the analysis.

10000664	10000668	110010250
10000665	110010242	110010263
10000663	110010248	110010269
10000662	110010249	10000670
10000666	10000660	110010268
10000667	110010241	110010270
110010245	10000669	110010272
110010246	110010264	110017100
110010244	110010267	110017102
110010243	110010266	
110010247	110010265	
10000661	110010240	

M/L Taper/Trabecular Metal
N=1043

This analysis excludes M/L Taper Kinectiv. Distribution of utilization: 22 surgeons across 15 sites used this implant combination in primary THA.

Table 239: Volume of cases by surgeon and site for the M/L Taper/Trabecular Metal combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	47 (136)	2 (6)
Cases per site	69 (162)	4 (60)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 240: Descriptive statistics of cases receiving the M/L Taper/Trabecular Metal combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	579	55.51	
Age (years)	1043	62.56(10.70)	62.00(13.00)
Height (cm)	1043	169.56(10.82)	168.00(15.80)
Weight (kg)	1042	91.62(22.71)	89.86(30.79)
BMI(kg/m^2)	1042	31.98(8.82)	30.92(9.96)
Smoking - never (%)	364	34.9	
Smoking - previous (%)	345	33.08	
Smoking - current (%)	332	31.83	
Smoking - unknown (%)	2	0.19	

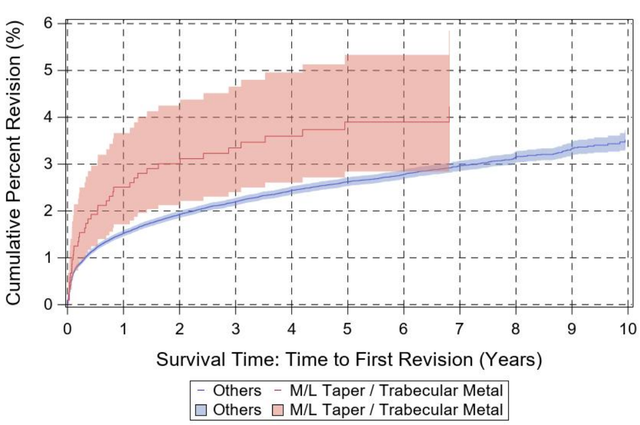

Figure 75: Cumulative percent revision curve for the M/L Taper/Trabecular Metal combination compared to all other implant combinations in primary THA.

Table 241: Cumulative percent revision and number at risk for M/L Taper/Trabecular Metal combination in primary THA cases.

Year	Number at risk	CPR
0	1040	0.00 (0.00,0.00)
1	999	2.51 (1.71,3.66)
2	897	3.01 (2.12,4.25)
3	809	3.35 (2.40,4.66)
4	707	3.60 (2.60,4.96)
5	598	3.90 (2.84,5.34)
6	473	3.90 (2.84,5.34)
7*	269	4.23 (3.05,5.86)
8*	184	4.23 (3.05,5.86)
9*	100	4.23 (3.05,5.86)
10*	45	4.23 (3.05,5.86)

* No revision occurred after the termination of the red curve in Figure 75; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.338 (0.819,2.188). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 242: Reasons for revision following primary THA for M/L Taper/Trabecular Metal combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	12	30.8
2	Aseptic Loosening	10	25.6
3	Joint Infection	6	15.4
4	Dislocation/Instability	5	12.8
5	Implant Failure	4	10.3
6	Pain	1	2.6
7	Malalignment	1	2.6

Table 243: Reasons for revision in first 90 days following primary THA for M/L Taper/Trabecular Metal combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	9	56.2
2	Dislocation/Instability	4	25.0
3	Aseptic Loosening	3	18.8

Table 244: Reasons for revision between 91 and 365 days following primary THA for M/L Taper/Trabecular Metal combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	3	30.0
2	Implant Failure	3	30.0
3	Joint Infection	1	10.0
4	Peri-prosthetic fracture - Femur	1	10.0
5	Pain	1	10.0
6	Malalignment	1	10.0

Table 245: Distribution of approach used for M/L Taper/Trabecular Metal combination in primary THA cases.

Approach	N	Percent
Anterior	6	0.6
Anterolateral	384	36.8
Posterior	625	59.9
Transtrochanteric	23	2.2
Missing/unknown/other	5	0.5

Table 246: Distribution of head size for M/L Taper/Trabecular Metal combination in primary THA cases.

Size (mm)	N	Percent
28	31	3.0
32	512	49.3
36	442	42.5
40	33	3.2
Missing/unknown/other	21	2.0

Table 247: Distribution of bearing surface for M/L Taper/Trabecular Metal combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	410	39.3
Ceramic-on-plastic	608	58.3
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	25	2.4

Table 248: Distribution of polyethylene used for M/L Taper/Trabecular Metal combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	862	83.0
Antioxidant XLPE	1	0.1
Missing/unknown/other	176	16.9

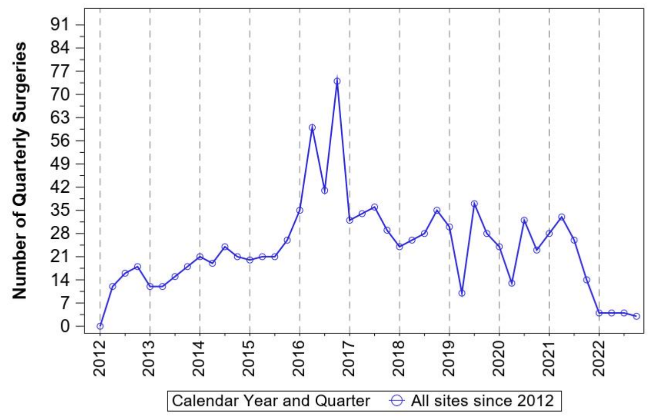

Figure 76: Utilization of the M/L Taper/Trabecular Metal combination in primary THA cases.

Catalog numbers of stems used in the analysis.

771100700	771101520	771101140
771100900	771101500	771100740
771101200	771100440	771101240
771101100	771100620	771102020
771101000	771100520	771100610
771101220	771101600	771100710
771101020	771101620	771101040
771101120	771100410	771102000
771101320	771101700	771100540
771100500	771100910	771100940
771100920	771101720	771102220
771100600	771101210	
771101300	771101010	
771100720	771101110	

Catalog numbers of acetabular cups used in the analysis.

620204822	620206222	620205220
620205022	620205020	620205420
620205222	620205820	620207022
620205422	620205620	620206420
620205622	620206220	620206820
620205822	620206020	620207020
620206022	620206422	712306254
620204622	620204820	

M/L Taper/Trilogy
N=1335

This analysis excludes M/L Taper Kinectiv. Distribution of utilization: 16 surgeons across 10 sites used this implant combination in primary THA.

Table 249: Volume of cases by surgeon and site for the M/L Taper/Trilogy combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	83 (138)	27 (93)
Cases per site	133 (205)	13 (271)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 250: Descriptive statistics of cases receiving the M/L Taper/Trilogy combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	744	55.73	
Age (years)	1335	67.56(9.36)	67.00(13.00)
Height (cm)	1335	169.13(10.29)	167.64(16.80)
Weight (kg)	1335	87.03(19.64)	85.30(27.70)
BMI(kg/m^2)	1335	30.31(5.81)	29.67(7.55)
Smoking - never (%)	600	44.94	
Smoking - previous (%)	558	41.8	
Smoking - current (%)	176	13.18	
Smoking - unknown (%)	1	0.07	

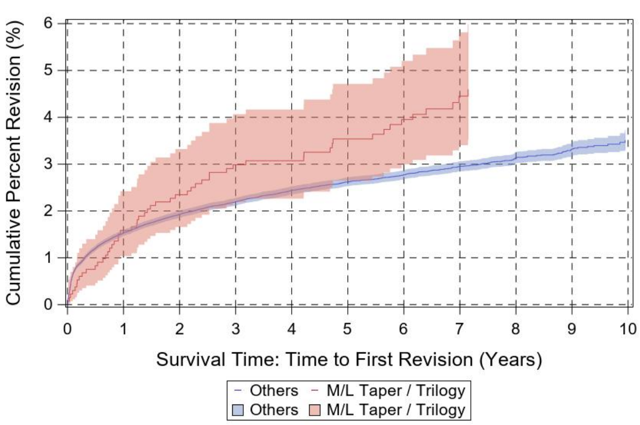

Figure 77: Cumulative percent revision curve for the M/L Taper/Trilogy combination compared to all other implant combinations in primary THA.

Table 251: Cumulative percent revision and number at risk for M/L Taper/Trilogy combination in primary THA cases.

Year	Number at risk	CPR
0	1325	0.00 (0.00,0.00)
1	1304	1.58 (1.04,2.42)
2	1262	2.35 (1.66,3.32)
3	1175	2.99 (2.19,4.07)
4	1083	3.07 (2.26,4.17)
5	999	3.54 (2.65,4.71)
6	895	3.95 (3.00,5.21)
7	691	4.45 (3.40,5.82)
8*	494	4.60 (3.52,5.99)
9*	298	4.60 (3.52,5.99)
10*	109	4.60 (3.52,5.99)

* No revision occurred after the termination of the red curve in Figure 77; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 252: Reasons for revision following primary THA for M/L Taper/Trilogy combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	10	20.4
2	Aseptic Loosening	9	18.4
3	Peri-prosthetic fracture - Femur	9	18.4
4	Joint Infection	7	14.3
5	Metal Reaction/Metallosis	5	10.2
6	Malalignment	3	6.1
7	Implant Failure	2	4.1
8	Peri-prosthetic fracture - Acetabulum	2	4.1
9	Poly liner wear	1	2.0
10	Pain	1	2.0

Table 253: Reasons for revision in first 90 days following primary THA for M/L Taper/Trilogy combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	5	71.4
2	Dislocation/Instability	1	14.3
3	Peri-prosthetic fracture - Acetabulum	1	14.3

Table 254: Reasons for revision between 91 and 365 days following primary THA for M/L Taper/Trilogy combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	40.0
2	Aseptic Loosening	2	20.0
3	Joint Infection	2	20.0
4	Peri-prosthetic fracture - Acetabulum	1	10.0
5	Peri-prosthetic fracture - Femur	1	10.0

Table 255: Distribution of approach used for M/L Taper/Trilogy combination in primary THA cases.

Approach	N	Percent
Anterior	6	0.5
Anterolateral	1037	77.7
Posterior	267	20.0
Transtrochanteric	23	1.7
Missing/unknown/other	2	0.1

Table 256: Distribution of head size for M/L Taper/Trilogy combination in primary THA cases.

Size (mm)	N	Percent
28	15	1.1
32	786	59.0
36	484	36.3
40	15	1.1
Missing/unknown/other	32	2.4

Table 257: Distribution of bearing surface for M/L Taper/Trilogy combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1009	75.6
Ceramic-on-plastic	291	21.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	35	2.6

Table 258: Distribution of polyethylene used for M/L Taper/Trilogy combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	1260	94.6
Antioxidant XLPE	0	0.0
Missing/unknown/other	72	5.4

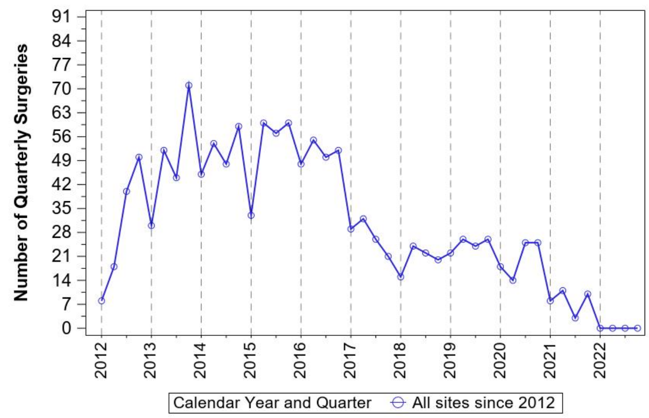

Figure 78: Utilization of the M/L Taper/Trilogy combination in primary THA cases.

Catalog numbers of stems used in the analysis.

771100910	771101300	771101620
771100710	771101200	771101700
771101010	771101220	771101720
771100940	771101040	771100500
771100900	771100610	771100540
771101240	771100920	771101600
771100740	771100720	771100440
771101000	771100640	771100620
771100700	771101520	771100520
771101140	771101120	771102000
771101100	771101500	771102020
771101210	771101020	
771101110	771100600	
771101320	771100510	

Catalog numbers of acetabular cups used in the analysis.

620005222	620004822	620005824
620005422	620005020	620006024
620005022	620006422	620006622
620005822	620006224	620006624
620005622	620005024	
620006022	620005424	
620006222	620005624	

Polarstem/Reflection 3
N=2804

Distribution of utilization: 42 surgeons across 30 sites used this implant combination in primary THA.

Table 259: Volume of cases by surgeon and site for the Polarstem/Reflection 3 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	66 (175)	12 (49)
Cases per site	93 (201)	16 (60)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 260: Descriptive statistics of cases receiving the Polarstem/Reflection 3 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1213	43.26	
Age (years)	2804	64.55(10.96)	65.00(14.00)
Height (cm)	2804	171.64(10.70)	172.70(17.70)
Weight (kg)	2804	91.77(21.92)	89.81(27.57)
BMI(kg/m^2)	2804	31.03(6.40)	30.29(8.25)
Smoking - never (%)	1241	44.26	
Smoking - previous (%)	1061	37.84	
Smoking - current (%)	490	17.48	
Smoking - unknown (%)	12	0.43	

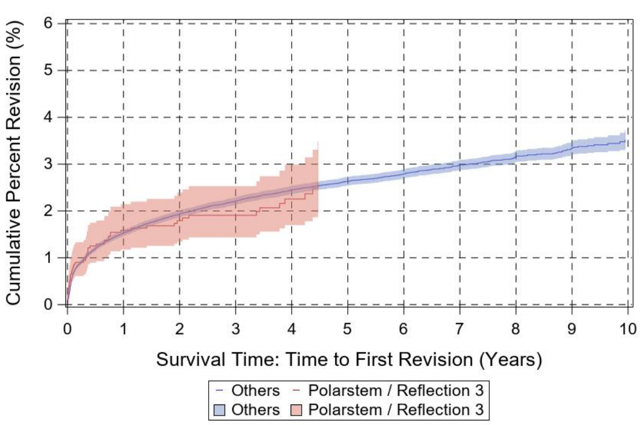

Figure 79: Cumulative percent revision curve for the Polarstem/Reflection 3 combination compared to all other implant combinations in primary THA.

Table 261: Cumulative percent revision and number at risk for Polarstem/Reflection 3 combination in primary THA cases.

Year	Number at risk	CPR
0	2790	0.00 (0.00,0.00)
1	2210	1.59 (1.18,2.15)
2	1764	1.79 (1.34,2.39)
3	1413	1.91 (1.44,2.53)
4	971	2.25 (1.70,2.99)
5*	599	2.61 (1.96,3.48)
6*	314	2.61 (1.96,3.48)
7*	47	2.61 (1.96,3.48)
8*	6	2.61 (1.96,3.48)
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 79; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.993 (0.721,1.368). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 262: Reasons for revision following primary THA for Polarstem/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	21	38.2
2	Joint Infection	13	23.6
3	Aseptic Loosening	9	16.4
4	Dislocation/Instability	7	12.7
5	Pain	3	5.5
6	Implant Failure	1	1.8
7	Malalignment	1	1.8

Table 263: Reasons for revision in first 90 days following primary THA for Polarstem/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	18	72.0
2	Dislocation/Instability	3	12.0
3	Joint Infection	3	12.0
4	Aseptic Loosening	1	4.0

Table 264: Reasons for revision between 91 and 365 days following primary THA for Polarstem/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	7	41.2
2	Aseptic Loosening	4	23.5
3	Dislocation/Instability	2	11.8
4	Peri-prosthetic fracture - Femur	2	11.8
5	Pain	1	5.9
6	Malalignment	1	5.9

Table 265: Distribution of approach used for Polarstem/Reflection 3 combination in primary THA cases.

Approach	N	Percent
Anterior	2235	79.7
Anterolateral	226	8.1
Posterior	340	12.1
Transtrochanteric	2	0.1
Missing/unknown/other	1	0.0

Table 266: Distribution of head size for Polarstem/Reflection 3 combination in primary THA cases.

Size (mm)	N	Percent
22	1	0.0
28	4	0.1
32	464	17.6
36	2035	77.1
40	127	4.8
Missing/unknown/other	8	0.3

Table 267: Distribution of bearing surface for Polarstem/Reflection 3 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	90	3.2
Ceramic-on-plastic	2541	90.6
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	160	5.7
Missing/unknown/other	13	0.5

Table 268: Distribution of polyethylene used for Polarstem/Reflection 3 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	1	0.0
XLPE	2515	89.8
Antioxidant XLPE	0	0.0
Missing/unknown/other	283	10.1

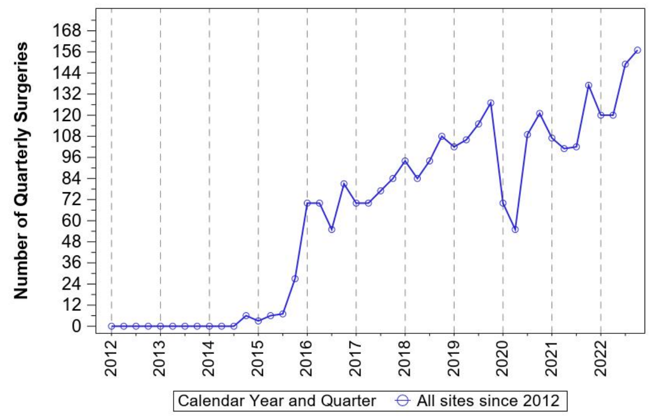

Figure 80: Utilization of the Polarstem/Reflection 3 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

75100466	75100476	75100482
75100467	75100480	75102246
75100465	75018401	75102251
75100468	75018406	75102210
75100464	75018419	75102211
75100469	75100471	75102244
75018402	75102209	75102255
75018403	75100475	75102256
75018417	75100481	75100483
75018416	75018413	75102245
75100463	75018400	75102257
75018404	75018407	75102258
75100470	75100472	75102248
75018415	75100474	75100473
75100477	75102253	75102074
75100478	75102254	75102249
75018405	75102250	75102076
75018418	75102252	75102259
75100479	75018408	
75018414	75018409	

Catalog numbers of acetabular cups used in the analysis.

71335552	71338666	71335546
71335554	71335562	71331852
71335556	71338667	71338671
71335548	71338664	71331848
71335558	71338669	71331850
71335550	71338668	71331854
71335560	71338663	71338672
71338665	71335564	

Secur-Fit/Trident
N=1103

Distribution of utilization: 34 surgeons across 22 sites used this implant combination in primary THA.

Table 269: Volume of cases by surgeon and site for the Secur-Fit/Trident combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	32 (68)	4 (21)
Cases per site	50 (79)	14 (56)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 270: Descriptive statistics of cases receiving the Secur-Fit/Trident combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	638	57.84	
Age (years)	1103	64.73(10.48)	65.00(13.00)
Height (cm)	1103	169.54(10.32)	170.00(15.30)
Weight (kg)	1103	90.47(21.80)	87.70(29.05)
BMI(kg/m^2)	1103	31.37(6.59)	30.54(9.17)
Smoking - never (%)	507	45.97	
Smoking - previous (%)	400	36.26	
Smoking - current (%)	186	16.86	
Smoking - unknown (%)	10	0.91	

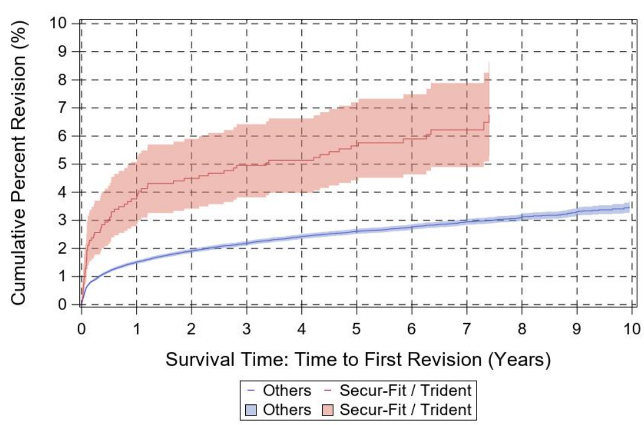

Figure 81: Cumulative percent revision curve for the Secur-Fit/Trident combination compared to all other implant combinations in primary THA.

Table 271: Cumulative percent revision and number at risk for Secur-Fit/Trident combination in primary THA cases.

Year	Number at risk	CPR
0	1090	0.00 (0.00,0.00)
1	1049	3.76 (2.78,5.07)
2	1041	4.50 (3.42,5.90)
3	1030	4.96 (3.82,6.42)
4	993	5.14 (3.98,6.63)
5	855	5.65 (4.42,7.20)
6	655	5.90 (4.63,7.49)
7	415	6.22 (4.90,7.89)
8*	213	6.77 (5.30,8.64)
9*	44	6.77 (5.30,8.64)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 81; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.92 (1.389,2.655). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 272: Reasons for revision following primary THA for Secur-Fit/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	18	28.1
2	Aseptic Loosening	15	23.4
3	Joint Infection	12	18.8
4	Dislocation/Instability	11	17.2
5	Implant Failure	4	6.2
6	Malalignment	2	3.1
7	Peri-prosthetic fracture - Acetabulum	1	1.6
8	Metal Reaction/Metallosis	1	1.6

Table 273: Reasons for revision in first 90 days following primary THA for Secur-Fit/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	15	55.6
2	Dislocation/Instability	8	29.6
3	Joint Infection	3	11.1
4	Aseptic Loosening	1	3.7

Table 274: Reasons for revision between 91 and 365 days following primary THA for Secur-Fit/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	5	45.5
2	Aseptic Loosening	2	18.2
3	Implant Failure	2	18.2
4	Dislocation/Instability	1	9.1
5	Malalignment	1	9.1

Table 275: Distribution of approach used for Secur-Fit/Trident combination in primary THA cases.

Approach	N	Percent
Anterior	2	0.2
Anterolateral	510	46.2
Posterior	587	53.2
Transtrochanteric	1	0.1
Missing/unknown/other	3	0.3

Table 276: Distribution of head size for Secur-Fit/Trident combination in primary THA cases.

Size (mm)	N	Percent
28	1	0.1
32	150	16.1
36	535	57.5
40	237	25.5
Missing/unknown/other	8	0.9

Table 277: Distribution of bearing surface for Secur-Fit/Trident combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	271	24.6
Ceramic-on-plastic	652	59.1
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	168	15.2
Missing/unknown/other	12	1.1

Table 278: Distribution of polyethylene used for Secur-Fit/Trident combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	1099	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	0	0.0

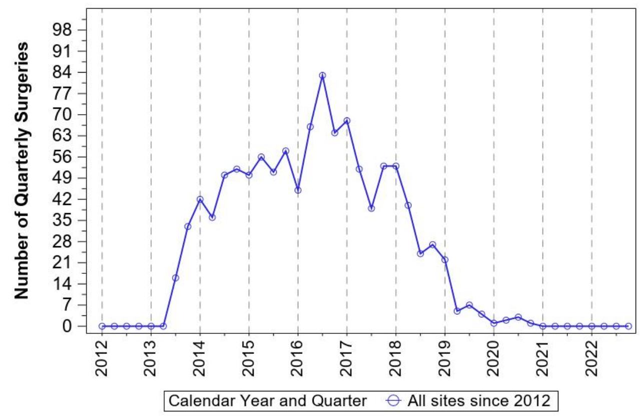

Figure 82: Utilization of the Secur-Fit/Trident combination in primary THA cases.

Catalog numbers of stems used in the analysis.

160108132	160106132	160111127
160107132	160110132	160112132
160109132	160110127	160112127
160108127	160106127	
160107127	160105132	
160109127	160111132	

Catalog numbers of acetabular cups used in the analysis.

5020354E	5020358F	5020362G
5021152E	5421152E	5021162G
5020352D	5421154F	5421158G
5021150D	5021158F	5000356E
5020356E	5021160G	5000360F
5020350D	5020360F	5000354E
5021154E	5421156F	5000358F
5021156F	5020348C	5020346B
5421150E	5021148D	5421160G

5421148D
5000352D
5020364G
5421146D
5000350D
5021164H
5090268H
5401156F
5000362G
5020152E
5020156F
5020366H
5021146C
5081152E
5081158F
5081160G
5090254E
5090256E
5090258F
5090260F
5401150E
5401158G
5421144C
5421162H

Secur-Fit/Trident II
N=677

Distribution of utilization: 23 surgeons across 19 sites used this implant combination in primary THA.

Table 279: Volume of cases by surgeon and site for the Secur-Fit/Trident II combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	29 (58)	5 (39)
Cases per site	35 (63)	9 (38)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 280: Descriptive statistics of cases receiving the Secur-Fit/Trident II combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	365	53.91	
Age (years)	677	64.55(10.66)	65.00(12.00)
Height (cm)	677	170.49(10.26)	170.18(15.20)
Weight (kg)	677	93.36(22.75)	91.17(29.70)
BMI(kg/m^2)	677	32.07(7.17)	30.86(9.15)
Smoking - never (%)	312	46.09	
Smoking - previous (%)	218	32.2	
Smoking - current (%)	146	21.57	
Smoking - unknown (%)	1	0.15	

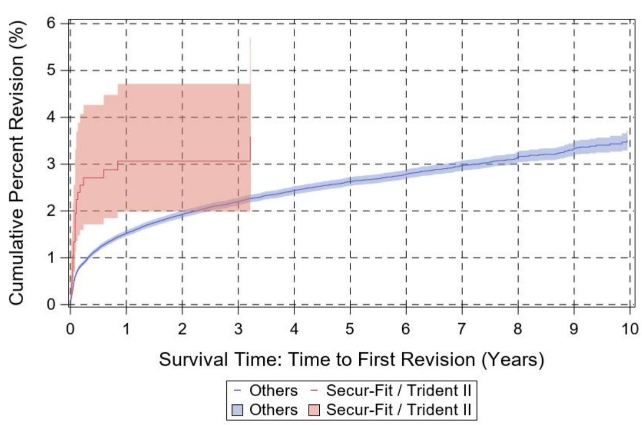

Figure 83: Cumulative percent revision curve for the Secur-Fit/Trident II combination compared to all other implant combinations in primary THA.

Table 281: Cumulative percent revision and number at risk for Secur-Fit/Trident II combination in primary THA cases.

Year	Number at risk	CPR
0	674	0.00 (0.00,0.00)
1	498	3.06 (1.99,4.71)
2	345	3.06 (1.99,4.71)
3	224	3.06 (1.99,4.71)
4*	64	3.59 (2.25,5.69)
5*	1	3.59 (2.25,5.69)
6	0	N/A
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 83; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 282: Reasons for revision following primary THA for Secur-Fit/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	10	47.6
2	Implant Failure	4	19.0
3	Aseptic Loosening	3	14.3
4	Joint Infection	2	9.5
5	Dislocation/Instability	1	4.8
6	Malalignment	1	4.8

Table 283: Reasons for revision in first 90 days following primary THA for Secur-Fit/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	10	55.6
2	Implant Failure	3	16.7
3	Aseptic Loosening	2	11.1
4	Dislocation/Instability	1	5.6
5	Joint Infection	1	5.6
6	Malalignment	1	5.6

Table 284: Reasons for revision between 91 and 365 days following primary THA for Secur-Fit/Trident II combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	50.0
2	Implant Failure	1	50.0

Table 285: Distribution of approach used for Secur-Fit/Trident II combination in primary THA cases.

Approach	N	Percent
Anterior	2	0.3
Anterolateral	513	75.8
Posterior	156	23.0
Transtrochanteric	0	0.0
Missing/unknown/other	6	0.9

Table 286: Distribution of head size for Secur-Fit/Trident II combination in primary THA cases.

Size (mm)	N	Percent
28	2	0.4
32	71	14.1
36	308	61.1
40	119	23.6
Missing/unknown/other	4	0.8

Table 287: Distribution of bearing surface for Secur-Fit/Trident II combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	6	0.9
Ceramic-on-plastic	494	73.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	170	25.1
Missing/unknown/other	7	1.0

Table 288: Distribution of polyethylene used for Secur-Fit/Trident II combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	477	70.8
Antioxidant XLPE	0	0.0
Missing/unknown/other	197	29.2

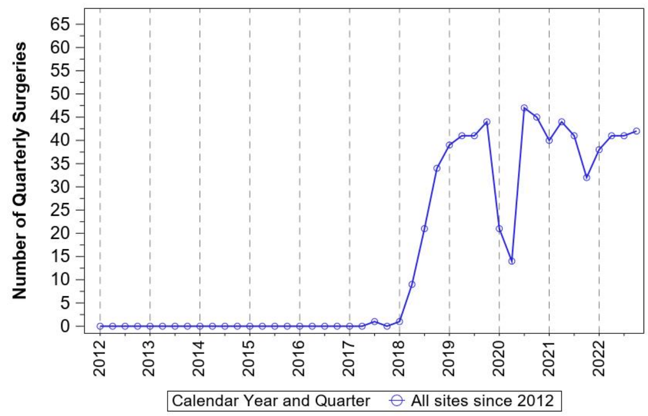

Figure 84: Utilization of the Secur-Fit/Trident II combination in primary THA cases.

Catalog numbers of stems used in the analysis.

160108127	160110127	160112132
160107127	160106127	160105132
160109127	160110132	160112127
160108132	160111132	
160109132	160111127	
160107132	160106132	

Catalog numbers of acetabular cups used in the analysis.

7020452E	7000452E	7021158F
7020454E	7021154E	7021160G
7020450D	7000454E	7021148D
7020456F	7090450D	7000456F
7020458F	7000448D	7000446C
7020448D	7000450D	7090464H
7020460G	7020446C	7021146C
7020462G	7021150D	7421154E
7021152E	7021156F	7421160G

7000458F	7021164H	7090466H
7000460G	7090448D	7421152E
7020464H	7090452E	7421156F
7021162G	7090454E	

Secur-Fit Max/Trident
N=3041

Distribution of utilization: 57 surgeons across 26 sites used this implant combination in primary THA.

Table 289: Volume of cases by surgeon and site for the Secur-Fit Max/Trident combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	53 (166)	8 (43)
Cases per site	117 (235)	22 (108)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 290: Descriptive statistics of cases receiving the Secur-Fit Max/Trident combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1538	50.58	
Age (years)	3041	63.64(11.20)	65.00(14.00)
Height (cm)	3041	170.52(10.24)	170.18(15.20)
Weight (kg)	3041	91.84(21.71)	89.50(28.00)
BMI(kg/m^2)	3041	31.48(6.51)	30.80(8.44)
Smoking - never (%)	1430	47.02	
Smoking - previous (%)	1171	38.51	
Smoking - current (%)	431	14.17	
Smoking - unknown (%)	9	0.3	

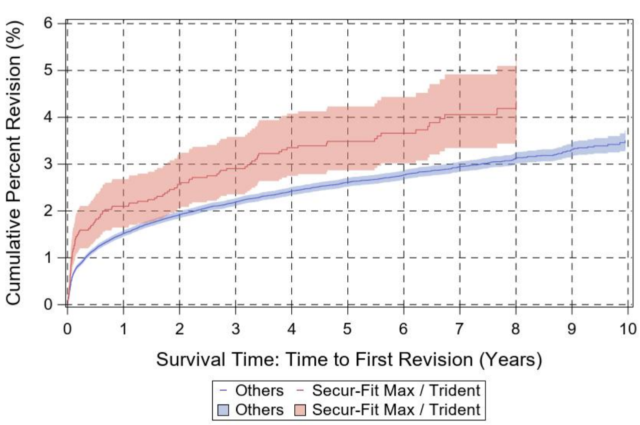

Figure 85: Cumulative percent revision curve for the Secur-Fit Max/Trident combination compared to all other implant combinations in primary THA.

Table 291: Cumulative percent revision and number at risk for Secur-Fit Max/Trident combination in primary THA cases.

Year	Number at risk	CPR
0	3023	0.00 (0.00,0.00)
1	2822	2.10 (1.64,2.68)
2	2662	2.57 (2.05,3.20)
3	2493	2.91 (2.36,3.58)
4	2297	3.35 (2.75,4.08)
5	1906	3.49 (2.87,4.23)
6	1440	3.66 (3.02,4.44)
7	996	4.06 (3.34,4.92)
8	605	4.19 (3.44,5.10)
9*	341	4.35 (3.55,5.32)
10*	127	4.35 (3.55,5.32)

* No revision occurred after the termination of the red curve in Figure 85; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.166 (0.887,1.535). It was 1.214 (1.133,1.301) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 292: Reasons for revision following primary THA for Secur-Fit Max/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	43	41.0
2	Aseptic Loosening	20	19.0
3	Joint Infection	13	12.4
4	Dislocation/Instability	11	10.5
5	Malalignment	7	6.7
6	Implant Failure	4	3.8
7	Peri-prosthetic fracture - Acetabulum	3	2.9
8	Metal Reaction/Metallosis	2	1.9
9	Pain	2	1.9

Table 293: Reasons for revision in first 90 days following primary THA for Secur-Fit Max/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	30	63.8
2	Joint Infection	5	10.6
3	Dislocation/Instability	4	8.5
4	Aseptic Loosening	3	6.4
5	Implant Failure	2	4.3
6	Peri-prosthetic fracture - Acetabulum	1	2.1
7	Pain	1	2.1
8	Malalignment	1	2.1

Table 294: Reasons for revision between 91 and 365 days following primary THA for Secur-Fit Max/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	4	30.8
2	Aseptic Loosening	3	23.1
3	Joint Infection	3	23.1
4	Dislocation/Instability	2	15.4
5	Peri-prosthetic fracture - Acetabulum	1	7.7

Table 295: Distribution of approach used for Secur-Fit Max/Trident combination in primary THA cases.

Approach	N	Percent
Anterior	17	0.6
Anterolateral	1717	56.5
Posterior	1265	41.6
Transtrochanteric	22	0.7
Missing/unknown/other	20	0.7

Table 296: Distribution of head size for Secur-Fit Max/Trident combination in primary THA cases.

Size (mm)	N	Percent
22	3	0.1
28	36	1.3
32	990	35.2
36	1614	57.3
40	161	5.7
44	2	0.1
Missing/unknown/other	10	0.4

Table 297: Distribution of bearing surface for Secur-Fit Max/Trident combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1047	34.4
Ceramic-on-plastic	591	19.4
Ceramic-on-ceramic	1168	38.4
Metal-on-metal	0	0.0
Dual mobility	184	6.0
Missing/unknown/other	51	1.7

Table 298: Distribution of polyethylene used for Secur-Fit Max/Trident combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	1823	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	1	0.1

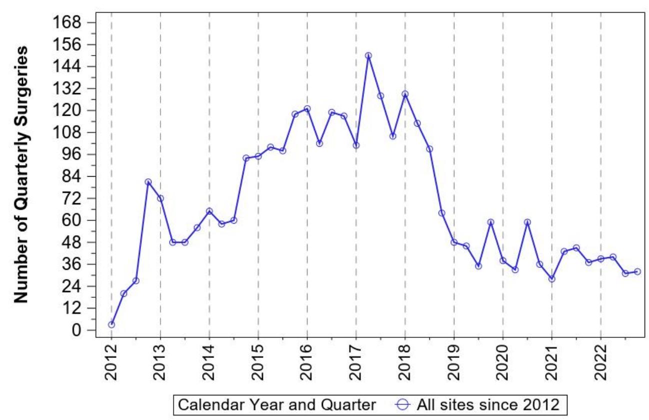

Figure 86: Utilization of the Secur-Fit Max/Trident combination in primary THA cases.

Catalog numbers of stems used in the analysis.

60510935S	60521035S	60510525S
60510830S	60520730S	60521340S
60511035S	60510625S	60511340S
60510730S	60511240S	60511440S
60520830S	60520625S	60510425S
60520935S	60521140S	
60511140S	60521240S	

Catalog numbers of acetabular cups used in the analysis.

5421150E	5401156F	5401160G
5421154F	5020362G	5000356E
5421152E	5021148D	5000360F
5421158G	5421146D	5020348C
5421156F	5090256E	5000350D
5020356E	5421164H	5000352D
5020354E	5000354E	5081154E
5021154E	5401148D	5081156F
5421148D	5020364G	5081158F
5021152E	5401158G	5401144C
5421160G	5421162H	5020346B
5021156F	5021160G	5020366H
5020352D	5081152E	5021164H
5020358F	5090260F	5081160G
5021150D	5000358F	5090268H
5401150E	5081150D	5090270I
5020360F	5090254E	5421144C
5401154F	5090262G	5421168I
5021158F	5090258F	
5020350D	5090264G	
5401152E	5401146D	

Secur-Fit Plus Max/Trident
N=2019

Distribution of utilization: 31 surgeons across 19 sites used this implant combination in primary THA.

Table 299: Volume of cases by surgeon and site for the Secur-Fit Plus Max/Trident combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	65 (192)	8 (67)
Cases per site	106 (263)	29 (101)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 300: Descriptive statistics of cases receiving the Secur-Fit Plus Max/Trident combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1003	49.68	
Age (years)	2019	62.18(13.16)	63.00(16.00)
Height (cm)	2019	169.85(10.67)	170.00(15.24)
Weight (kg)	2019	87.16(19.81)	86.00(26.70)
BMI(kg/m^2)	2019	30.11(6.13)	29.54(7.22)
Smoking - never (%)	958	47.45	
Smoking - previous (%)	741	36.7	
Smoking - current (%)	279	13.82	
Smoking - unknown (%)	41	2.03	

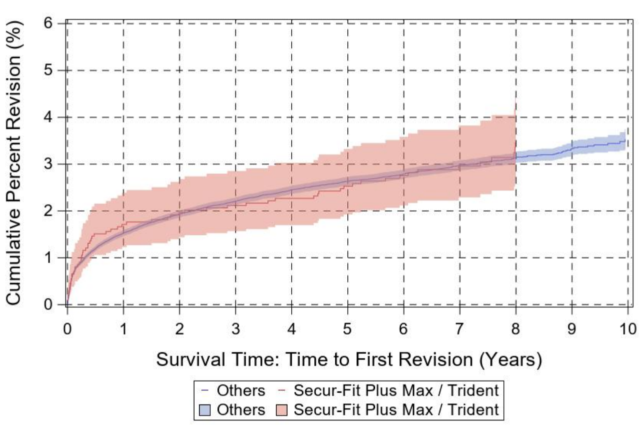

Figure 87: Cumulative percent revision curve for the Secur-Fit Plus Max/Trident combination compared to all other implant combinations in primary THA.

Table 301: Cumulative percent revision and number at risk for Secur-Fit Plus Max/Trident combination in primary THA cases.

Year	Number at risk	CPR
0	1984	0.00 (0.00,0.00)
1	1950	1.71 (1.23,2.39)
2	1943	1.97 (1.44,2.68)
3	1936	2.12 (1.57,2.85)
4	1918	2.27 (1.70,3.03)
5	1823	2.53 (1.92,3.33)
6	1606	2.76 (2.12,3.58)
7	1240	2.96 (2.29,3.82)
8*	882	3.47 (2.69,4.46)
9*	538	3.47 (2.69,4.46)
10*	223	3.47 (2.69,4.46)

* No revision occurred after the termination of the red curve in Figure 87; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.903 (0.664,1.229). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 302: Reasons for revision following primary THA for Secur-Fit Plus Max/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	16	31.4
2	Dislocation/Instability	13	25.5
3	Joint Infection	9	17.6
4	Aseptic Loosening	7	13.7
5	Implant Failure	3	5.9
6	Metal Reaction/Metallosis	1	2.0
7	Pain	1	2.0
8	Malalignment	1	2.0

Table 303: Reasons for revision in first 90 days following primary THA for Secur-Fit Plus Max/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	8	44.4
2	Dislocation/Instability	5	27.8
3	Joint Infection	3	16.7
4	Aseptic Loosening	1	5.6
5	Implant Failure	1	5.6

Table 304: Reasons for revision between 91 and 365 days following primary THA for Secur-Fit Plus Max/Trident combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	3	50.0
2	Joint Infection	2	33.3
3	Aseptic Loosening	1	16.7

Table 305: Distribution of approach used for Secur-Fit Plus Max/Trident combination in primary THA cases.

Approach	N	Percent
Anterior	5	0.2
Anterolateral	137	6.8
Posterior	1867	92.5
Transtrochanteric	4	0.2
Missing/unknown/other	6	0.3

Table 306: Distribution of head size for Secur-Fit Plus Max/Trident combination in primary THA cases.

Size (mm)	N	Percent
28	1	0.1
32	154	7.9
36	1457	74.7
40	289	14.8
44	45	2.3
Missing/unknown/other	5	0.3

Table 307: Distribution of bearing surface for Secur-Fit Plus Max/Trident combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1172	58.0
Ceramic-on-plastic	774	38.3
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	58	2.9
Missing/unknown/other	15	0.7

Table 308: Distribution of polyethylene used for Secur-Fit Plus Max/Trident combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	2008	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	0	0.0

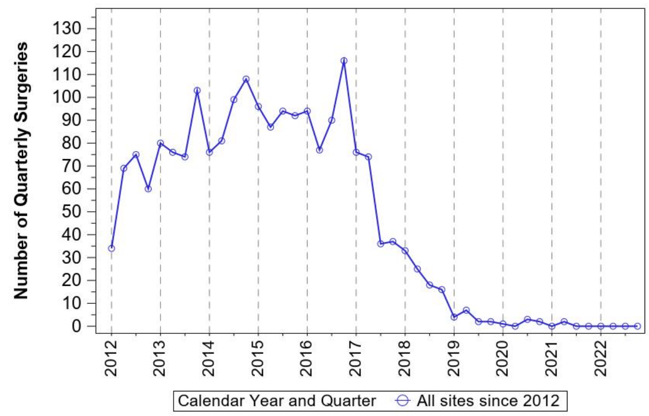

Figure 88: Utilization of the Secur-Fit Plus Max/Trident combination in primary THA cases.

Catalog numbers of stems used in the analysis.

60540913S	60541016S	60540511S
60540812S	S2337HF09	S2337HF12
60541014S	S2337HF10	60540509S
60540711S	60541117S	60540812
60541115S	60540610S	60540915
60540814S	60540612S	60541319S
60540915S	60541216S	S2337HF05
S2337HF08	S2337HF06	
S2337HF07	S2337HF11	
60540713S	60541218S	

Catalog numbers of acetabular cups used in the analysis.

5421154F	5421152E	5020352D
5421150E	5421146D	5021152E
5421158G	5020354E	5020358F
5421156F	5421160G	5020356E

5421148D
5021154E
5020350D
5021150D
5021156F
5021158F
5020360F
5021148D
5020362G
5090254E
5401154F
5401158G
5421162H
5421164H
5020348C
5090256E
5081148D
5401156F
5090260F
5000356E
5000358F
5000360F
5021162G
5090258F
5090262G
5401150E
5401152E
5000352D
5020364G
5020366H
5021146C
5021160G
5081150D
5081152E
5081158F
5090266H
5401160G
5421142B

SROM/Pinnacle
N=1112

Distribution of utilization: 49 surgeons across 27 sites used this implant combination in primary THA.

Table 309: Volume of cases by surgeon and site for the SROM/Pinnacle combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	22 (50)	3 (13)
Cases per site	41 (134)	4 (12)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 310: Descriptive statistics of cases receiving the SROM/Pinnacle combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	572	51.44	
Age (years)	1112	61.21(12.40)	62.00(16.00)
Height (cm)	1112	170.48(11.81)	170.18(17.44)
Weight (kg)	1112	89.50(22.33)	88.45(29.96)
BMI(kg/m^2)	1112	30.65(6.50)	29.96(8.79)
Smoking - never (%)	547	49.19	
Smoking - previous (%)	393	35.34	
Smoking - current (%)	170	15.29	
Smoking - unknown (%)	2	0.18	

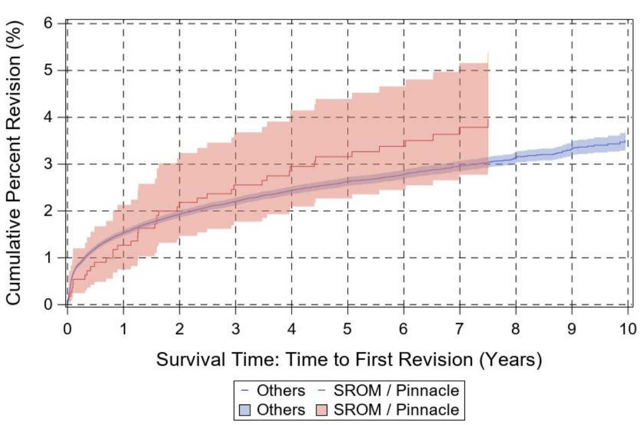

Figure 89: Cumulative percent revision curve for the SROM/Pinnacle combination compared to all other implant combinations in primary THA.

Table 311: Cumulative percent revision and number at risk for SROM/Pinnacle combination in primary THA cases.

Year	Number at risk	CPR
0	1109	0.00 (0.00,0.00)
1	1086	1.27 (0.75,2.13)
2	1062	2.18 (1.47,3.24)
3	1036	2.55 (1.77,3.68)
4	962	2.95 (2.10,4.15)
5	893	3.16 (2.27,4.39)
6	785	3.38 (2.45,4.66)
7	641	3.79 (2.77,5.16)
8*	434	3.96 (2.91,5.39)
9*	202	3.96 (2.91,5.39)
10*	13	3.96 (2.91,5.39)

* No revision occurred after the termination of the red curve in Figure 89; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 312: Reasons for revision following primary THA for SROM/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	13	35.1
2	Aseptic Loosening	8	21.6
3	Dislocation/Instability	6	16.2
4	Implant Failure	6	16.2
5	Peri-prosthetic fracture - Femur	2	5.4
6	Pain	1	2.7
7	Malalignment	1	2.7

Table 313: Reasons for revision in first 90 days following primary THA for SROM/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	50.0
2	Dislocation/Instability	2	33.3
3	Peri-prosthetic fracture - Femur	1	16.7

Table 314: Reasons for revision between 91 and 365 days following primary THA for SROM/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	60.0
2	Dislocation/Instability	1	20.0
3	Implant Failure	1	20.0

Table 315: Distribution of approach used for SROM/Pinnacle combination in primary THA cases.

Approach	N	Percent
Anterior	12	1.1
Anterolateral	589	53.0
Posterior	491	44.1
Transtrochanteric	13	1.2
Missing/unknown/other	7	0.6

Table 316: Distribution of head size for SROM/Pinnacle combination in primary THA cases.

Size (mm)	N	Percent
22	7	0.6
28	35	3.1
32	254	22.9
36	779	70.2
40	26	2.3
44	2	0.2
Missing/unknown/other	7	0.6

Table 317: Distribution of bearing surface for SROM/Pinnacle combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	321	28.9
Ceramic-on-plastic	780	70.1
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	11	1.0

Table 318: Distribution of polyethylene used for SROM/Pinnacle combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	958	86.5
Antioxidant XLPE	0	0.0
Missing/unknown/other	150	13.5

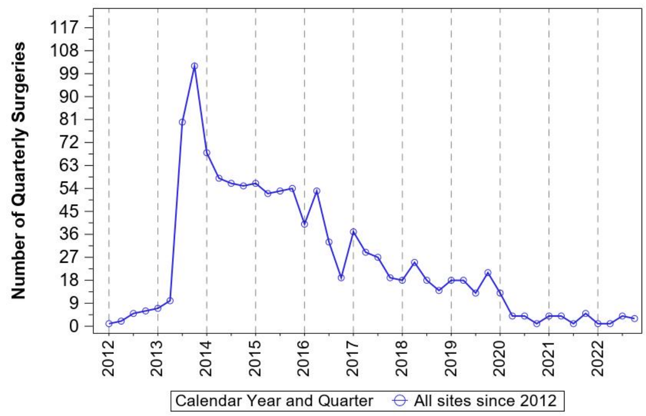

Figure 90: Utilization of the SROM/Pinnacle combination in primary THA cases.

Catalog numbers of stems used in the analysis.

523418	563514	563216L
563618	523191	523197
563517	523291	523251
563620	523394	523396
523420	523393	526516L
523193	523208	526520L
563516	523293	526520R
563518	523395	563118L
563622	563626	563118N
523192	523195	563120N
523194	523424	563122N
523422	563624	563124N
523292	563118R	

Catalog numbers of acetabular cups used in the analysis.

121732052	121701054	121722064
121722052	121701058	121730038
121732054	121722062	121730050
121722054	121701050	121730062
121722056	121730044	121730064
121732050	121732060	121701062
121732048	121730052	121730040
121732056	121732062	121730042
121722058	121730054	121701048
121722050	121730048	121703048
121701056	121730058	121703052
121722048	121730056	121703058
121732058	121732064	121731052
121701052	121730060	121731054
121722060	121701060	121732066
121730046	121703054	

Summit/Pinnacle
N=7542

Distribution of utilization: 78 surgeons across 35 sites used this implant combination in primary THA.

Table 319: Volume of cases by surgeon and site for the Summit/Pinnacle combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	96 (238)	14 (81)
Cases per site	215 (376)	58 (283)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 320: Descriptive statistics of cases receiving the Summit/Pinnacle combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	4411	58.49	
Age (years)	7542	66.48(10.96)	67.00(15.00)
Height (cm)	7439	169.07(10.40)	168.00(17.78)
Weight (kg)	7440	89.12(22.43)	86.72(30.00)
BMI(kg/m^2)	7439	31.03(6.69)	30.12(8.73)
Smoking - never (%)	3460	45.88	
Smoking - previous (%)	3016	39.99	
Smoking - current (%)	1045	13.86	
Smoking - unknown (%)	21	0.28	

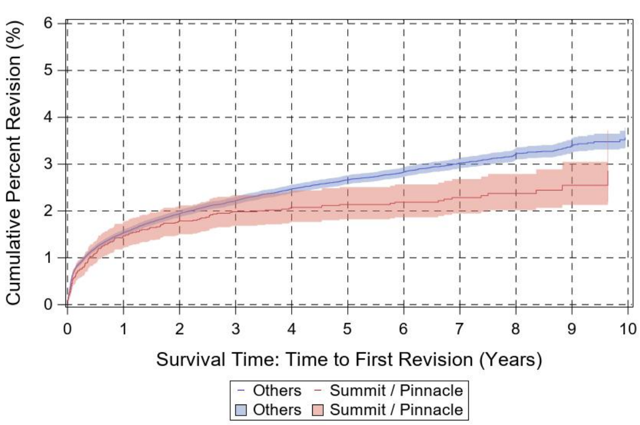

Figure 91: Cumulative percent revision curve for the Summit/Pinnacle combination compared to all other implant combinations in primary THA.

Table 321: Cumulative percent revision and number at risk for Summit/Pinnacle combination in primary THA cases.

Year	Number at risk	CPR
0	7455	0.00 (0.00,0.00)
1	6794	1.47 (1.22,1.77)
2	6232	1.79 (1.50,2.12)
3	5740	1.98 (1.68,2.34)
4	5189	2.08 (1.77,2.44)
5	4532	2.14 (1.82,2.51)
6	3692	2.19 (1.86,2.57)
7	2712	2.29 (1.95,2.68)
8	1675	2.37 (2.02,2.79)
9	760	2.55 (2.13,3.05)
10*	201	2.86 (2.19,3.72)

* No revision occurred after the termination of the red curve in Figure 91; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 322: Reasons for revision following primary THA for Summit/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	43	29.3
2	Peri-prosthetic fracture - Femur	35	23.8
3	Joint Infection	31	21.1
4	Aseptic Loosening	16	10.9
5	Pain	10	6.8
6	Metal Reaction/Metallosis	4	2.7
7	Implant Failure	3	2.0
8	Peri-prosthetic fracture - Acetabulum	3	2.0
9	Osteolysis	1	0.7
10	Malalignment	1	0.7

Table 323: Reasons for revision in first 90 days following primary THA for Summit/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	30	57.7
2	Dislocation/Instability	11	21.1
3	Joint Infection	6	11.5
4	Aseptic Loosening	4	7.7
5	Peri-prosthetic fracture - Acetabulum	1	1.9

Table 324: Reasons for revision between 91 and 365 days following primary THA for Summit/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	17	38.6
2	Dislocation/Instability	15	34.1
3	Aseptic Loosening	7	15.9
4	Pain	3	6.8
5	Peri-prosthetic fracture - Acetabulum	2	4.5

Table 325: Distribution of approach used for Summit/Pinnacle combination in primary THA cases.

Approach	N	Percent
Anterior	209	2.8
Anterolateral	2859	37.9
Posterior	4311	57.2
Transtrochanteric	36	0.5
Missing/unknown/other	127	1.7

Table 326: Distribution of head size for Summit/Pinnacle combination in primary THA cases.

Size (mm)	N	Percent
22	4	0.1
28	86	1.1
32	1826	24.4
36	4920	65.6
40	594	7.9
44	26	0.3
Missing/unknown/other	39	0.5

Table 327: Distribution of bearing surface for Summit/Pinnacle combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	3043	40.4
Ceramic-on-plastic	4362	57.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	8	0.1
Missing/unknown/other	129	1.7

Table 328: Distribution of polyethylene used for Summit/Pinnacle combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	11	0.1
XLPE	6521	87.5
Antioxidant XLPE	0	0.0
Missing/unknown/other	916	12.3

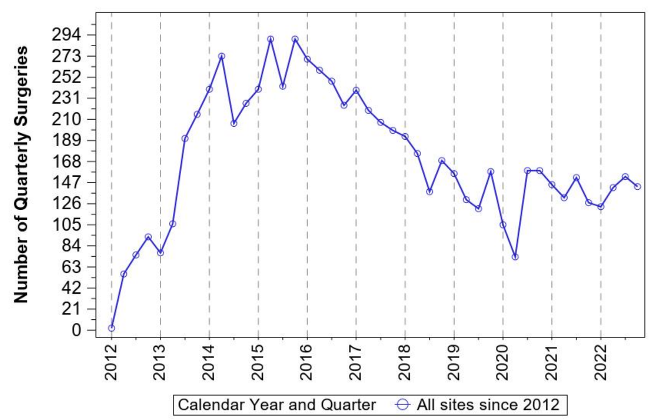

Figure 92: Utilization of the Summit/Pinnacle combination in primary THA cases.

Catalog numbers of stems used in the analysis.

157001110	157011150	157001070
157011110	157001150	157003080
157011120	157001080	157013110
157011135	157011080	157003135
157001100	157011165	157013100
157001120	157001165	157013135
157011100	157003110	157011070
157001135	157003100	157013120
157001090	157003120	157013090
157011090	157003090	157011180

157003150	157013150	
157001180		

Catalog numbers of acetabular cups used in the analysis.

121732052	121701052	121730050
121722052	121731048	121730062
121722054	121722062	121730064
121732054	121730052	121703052
121732056	121701056	121722064
121722050	121701054	121703056
121722056	121731058	121703050
121722048	121730054	121703054
121732058	121701048	121722066
121732050	121701050	121731062
121722058	121730048	121732066
121732048	121732064	121703048
121732060	121730056	121716070
121731052	121701058	121717062
121722060	121730044	121720038
121731054	121730058	121720054
121732062	121731060	121730066
121730046	121720046	
121731056	121730060	
121731050	121701060	

Synergy/Reflection 3
N=1307

Distribution of utilization: 38 surgeons across 27 sites used this implant combination in primary THA.

Table 329: Volume of cases by surgeon and site for the Synergy/Reflection 3 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	34 (61)	3 (17)
Cases per site	48 (89)	7 (62)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 330: Descriptive statistics of cases receiving the Synergy/Reflection 3 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	748	57.23	
Age (years)	1307	68.31(10.64)	69.00(15.00)
Height (cm)	1307	168.45(10.76)	167.64(16.51)
Weight (kg)	1307	88.44(20.94)	87.00(28.21)
BMI(kg/m^2)	1307	31.01(6.04)	30.53(8.31)
Smoking - never (%)	570	43.61	
Smoking - previous (%)	534	40.86	
Smoking - current (%)	200	15.3	
Smoking - unknown (%)	3	0.23	

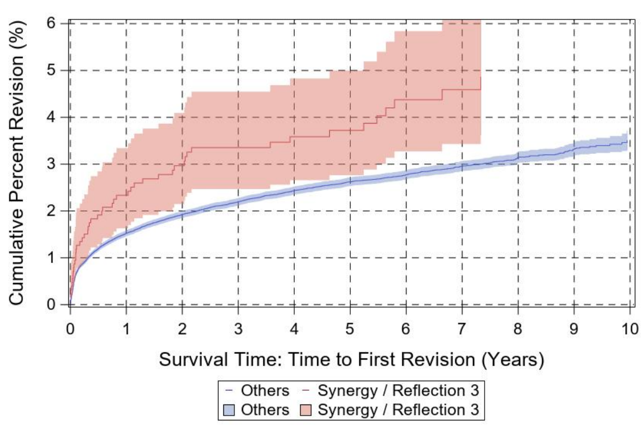

Figure 93: Cumulative percent revision curve for the Synergy/Reflection 3 combination compared to all other implant combinations in primary THA.

Table 331: Cumulative percent revision and number at risk for Synergy/Reflection 3 combination in primary THA cases.

Year	Number at risk	CPR
0	1269	0.00 (0.00,0.00)
1	1124	2.33 (1.63,3.34)
2	1010	2.97 (2.15,4.09)
3	920	3.35 (2.47,4.55)
4	804	3.59 (2.66,4.83)
5	669	3.72 (2.76,5.00)
6	528	4.37 (3.27,5.84)
7	386	4.59 (3.43,6.13)
8*	246	4.87 (3.62,6.53)
9*	92	4.87 (3.62,6.53)
10*	30	4.87 (3.62,6.53)

* No revision occurred after the termination of the red curve in Figure 93; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.333 (0.926,1.919). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 332: Reasons for revision following primary THA for Synergy/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	23	53.5
2	Joint Infection	6	14.0
3	Peri-prosthetic fracture - Femur	6	14.0
4	Aseptic Loosening	3	7.0
5	Pain	2	4.7
6	Implant Failure	1	2.3
7	Metal Reaction/Metallosis	1	2.3
8	Malalignment	1	2.3

Table 333: Reasons for revision in first 90 days following primary THA for Synergy/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	8	50.0
2	Peri-prosthetic fracture - Femur	3	18.8
3	Joint Infection	2	12.5
4	Aseptic Loosening	1	6.2
5	Implant Failure	1	6.2
6	Malalignment	1	6.2

Table 334: Reasons for revision between 91 and 365 days following primary THA for Synergy/Reflection 3 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	7	77.8
2	Aseptic Loosening	1	11.1
3	Joint Infection	1	11.1

Table 335: Distribution of approach used for Synergy/Reflection 3 combination in primary THA cases.

Approach	N	Percent
Anterior	115	8.8
Anterolateral	431	33.0
Posterior	752	57.5
Transtrochanteric	3	0.2
Missing/unknown/other	6	0.5

Table 336: Distribution of head size for Synergy/Reflection 3 combination in primary THA cases.

Size (mm)	N	Percent
22	1	0.1
28	16	1.2
32	324	25.4
36	862	67.5
40	65	5.1
44	4	0.3
Missing/unknown/other	5	0.4

Table 337: Distribution of bearing surface for Synergy/Reflection 3 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	550	42.1
Ceramic-on-plastic	722	55.2
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	28	2.1
Missing/unknown/other	7	0.5

Table 338: Distribution of polyethylene used for Synergy/Reflection 3 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	2	0.1
XLPE	1233	94.5
Antioxidant XLPE	0	0.0
Missing/unknown/other	70	5.4

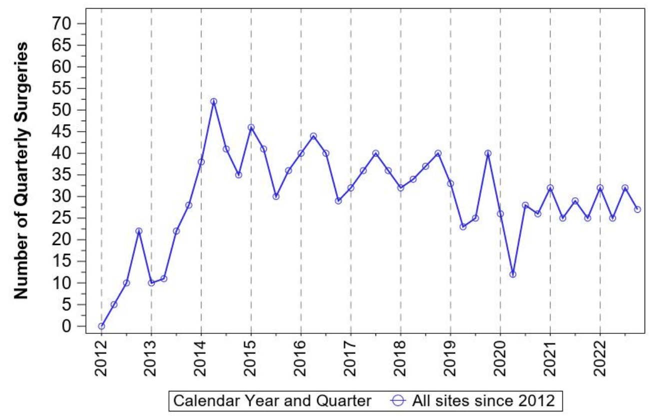

Figure 94: Utilization of the Synergy/Reflection 3 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

71306614	71306617	71306110
71306114	71316011	71306610
71306613	71306118	71306618
71306113	71316012	71316013
71306112	71316010	71926107
71306612	71316211	71316016
71306115	71316210	71306609
71306116	71316212	71316017
71306615	71316009	71316215
71306616	71316014	71316217
71306117	71316015	71306608
71306611	71316216	
71306111	71316213	

Catalog numbers of acetabular cups used in the analysis.

71335552	71331858	71338668
71335554	71335562	71338669
71335556	71331848	71331864
71335550	71331860	71335566
71335558	71331862	71335568
71331854	71335564	71338671
71335548	71338665	71338672
71331850	71335546	71338675
71331852	71338666	
71331856	71331846	
71335560	71338664	

Taperloc 133/Continuum
N=794

Distribution of utilization: 15 surgeons across 11 sites used this implant combination in primary THA.

Table 339: Volume of cases by surgeon and site for the Taperloc 133/Continuum combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	52 (132)	2 (55)
Cases per site	72 (154)	11 (57)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 340: Descriptive statistics of cases receiving the Taperloc 133/Continuum combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	423	53.27	
Age (years)	794	65.17(10.35)	65.00(14.00)
Height (cm)	794	170.29(10.31)	170.18(15.24)
Weight (kg)	794	92.35(22.48)	90.00(30.80)
BMI(kg/m^2)	794	31.75(6.84)	30.72(9.82)
Smoking - never (%)	380	47.86	
Smoking - previous (%)	306	38.54	
Smoking - current (%)	108	13.6	
Smoking - unknown (%)	0	0.0	

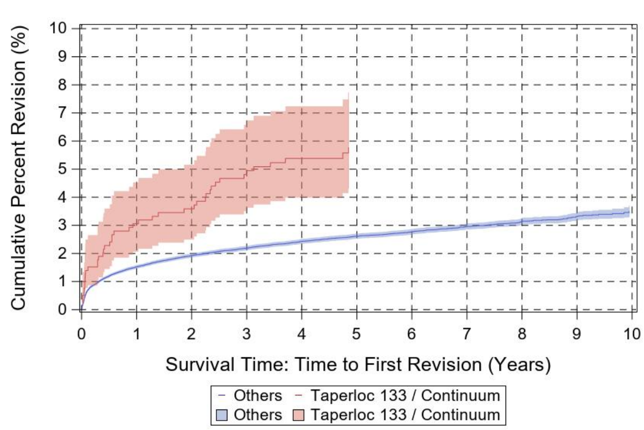

Figure 95: Cumulative percent revision curve for the Taperloc 133/Continuum combination compared to all other implant combinations in primary THA.

Table 341: Cumulative percent revision and number at risk for Taperloc 133/Continuum combination in primary THA cases.

Year	Number at risk	CPR
0	792	0.00 (0.00,0.00)
1	737	3.06 (2.06,4.53)
2	716	3.59 (2.49,5.16)
3	685	4.95 (3.62,6.74)
4	597	5.38 (3.99,7.24)
5*	435	5.78 (4.31,7.73)
6*	230	5.78 (4.31,7.73)
7*	61	5.78 (4.31,7.73)
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 95; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.51 (1.03,2.216). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 342: Reasons for revision following primary THA for Taperloc 133/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	23	53.5
2	Joint Infection	7	16.3
3	Peri-prosthetic fracture - Femur	5	11.6
4	Malalignment	3	7.0
5	Aseptic Loosening	2	4.7
6	Pain	2	4.7
7	Poly liner wear	1	2.3

Table 343: Reasons for revision in first 90 days following primary THA for Taperloc 133/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	6	50.0
2	Peri-prosthetic fracture - Femur	4	33.3
3	Joint Infection	1	8.3
4	Malalignment	1	8.3

Table 344: Reasons for revision between 91 and 365 days following primary THA for Taperloc 133/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	6	50.0
2	Joint Infection	4	33.3
3	Malalignment	2	16.7

Table 345: Distribution of approach used for Taperloc 133/Continuum combination in primary THA cases.

Approach	N	Percent
Anterior	18	2.3
Anterolateral	49	6.2
Posterior	718	90.4
Transtrochanteric	1	0.1
Missing/unknown/other	8	1.0

Table 346: Distribution of head size for Taperloc 133/Continuum combination in primary THA cases.

Size (mm)	N	Percent
28	2	0.2
32	124	15.7
36	652	82.4
40	5	0.6
Missing/unknown/other	8	1.0

Table 347: Distribution of bearing surface for Taperloc 133/Continuum combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	117	14.7
Ceramic-on-plastic	666	83.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	11	1.4

Table 348: Distribution of polyethylene used for Taperloc 133/Continuum combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	362	45.8
Antioxidant XLPE	411	52.0
Missing/unknown/other	18	2.3

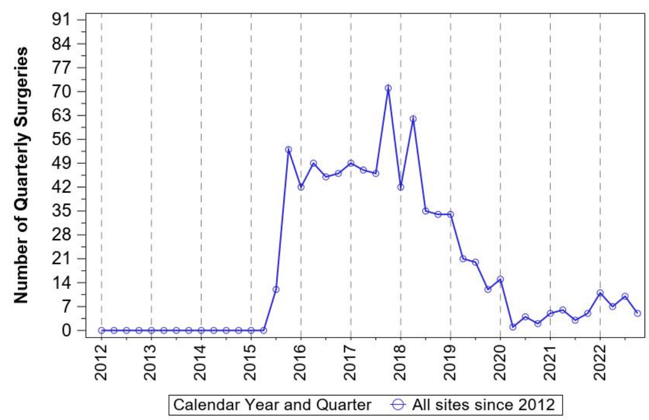

Figure 96: Utilization of the Taperloc 133/Continuum combination in primary THA cases.

Catalog numbers of stems used in the analysis.

51103100	51104160	51103180
51103120	51103150	51104180
51103110	51104100	51104200
51103130	51103140	51101070
51104150	51104170	51101060
51104120	51100060	51101080
51103090	51100070	51103200
51104140	51104090	51101050
51100080	51100050	51100040
51104110	51103160	51103220
51104130	51103170	

Catalog numbers of acetabular cups used in the analysis.

875705401	875704801	875706401
875705201	875705402	875705002
875705601	875706201	875704402
875705801	875705802	875706202
875705001	875705602	875706002
875706001	875705202	

Taperloc 133/G7
N=10327

Distribution of utilization: 93 surgeons across 58 sites used this implant combination in primary THA.

Table 349: Volume of cases by surgeon and site for the Taperloc 133/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	111 (191)	26 (117)
Cases per site	178 (246)	64 (191)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 350: Descriptive statistics of cases receiving the Taperloc 133/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	5462	52.89	
Age (years)	10327	63.94(10.59)	64.00(14.00)
Height (cm)	10327	170.25(10.31)	170.18(15.24)
Weight (kg)	10327	91.09(21.02)	89.80(28.10)
BMI(kg/m^2)	10327	31.33(6.28)	30.72(8.70)
Smoking - never (%)	4919	47.63	
Smoking - previous (%)	3778	36.58	
Smoking - current (%)	1554	15.05	
Smoking - unknown (%)	76	0.74	

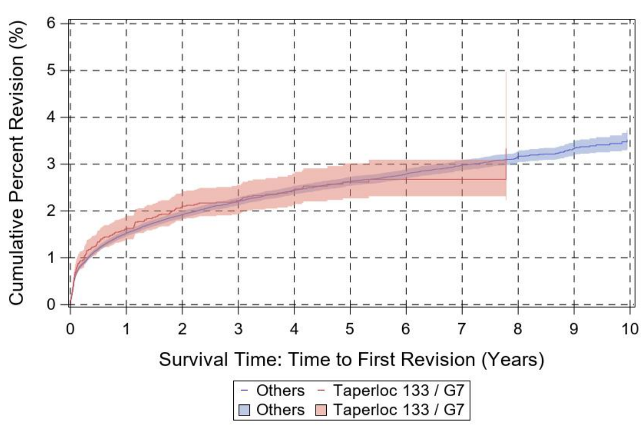

Figure 97: Cumulative percent revision curve for the Taperloc 133/G7 combination compared to all other implant combinations in primary THA.

Table 351: Cumulative percent revision and number at risk for Taperloc 133/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	10292	0.00 (0.00,0.00)
1	8336	1.62 (1.38,1.89)
2	6484	2.11 (1.83,2.42)
3	4952	2.23 (1.94,2.56)
4	3285	2.44 (2.12,2.80)
5	2003	2.62 (2.27,3.02)
6	971	2.68 (2.31,3.09)
7	365	2.68 (2.31,3.09)
8*	110	3.33 (2.23,4.98)
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 97; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.99 (0.834,1.176). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 352: Reasons for revision following primary THA for Taperloc 133/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	59	26.9
2	Peri-prosthetic fracture - Femur	57	26.0
3	Joint Infection	48	21.9
4	Aseptic Loosening	30	13.7
5	Implant Failure	9	4.1
6	Pain	9	4.1
7	Malalignment	4	1.8
8	Peri-prosthetic fracture - Acetabulum	3	1.4

Table 353: Reasons for revision in first 90 days following primary THA for Taperloc 133/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	51	52.0
2	Joint Infection	16	16.3
3	Dislocation/Instability	15	15.3
4	Implant Failure	8	8.2
5	Aseptic Loosening	5	5.1
6	Peri-prosthetic fracture - Acetabulum	2	2.0
7	Malalignment	1	1.0

Table 354: Reasons for revision between 91 and 365 days following primary THA for Taperloc 133/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	21	34.4
2	Joint Infection	20	32.8
3	Aseptic Loosening	10	16.4
4	Pain	5	8.2
5	Peri-prosthetic fracture - Femur	3	4.9
6	Implant Failure	1	1.6
7	Peri-prosthetic fracture - Acetabulum	1	1.6

Table 355: Distribution of approach used for Taperloc 133/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	2257	21.9
Anterolateral	3056	29.6
Posterior	4990	48.3
Transtrochanteric	10	0.1
Missing/unknown/other	14	0.1

Table 356: Distribution of head size for Taperloc 133/G7 combination in primary THA cases.

Size (mm)	N	Percent
28	9	0.1
32	565	6.0
36	5907	62.9
40	2864	30.5
44	3	0.0
Missing/unknown/other	40	0.4

Table 357: Distribution of bearing surface for Taperloc 133/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1903	18.4
Ceramic-on-plastic	7445	72.1
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	839	8.1
Missing/unknown/other	140	1.4

Table 358: Distribution of polyethylene used for Taperloc 133/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	3450	33.8
Antioxidant XLPE	4570	44.7
Missing/unknown/other	2198	21.5

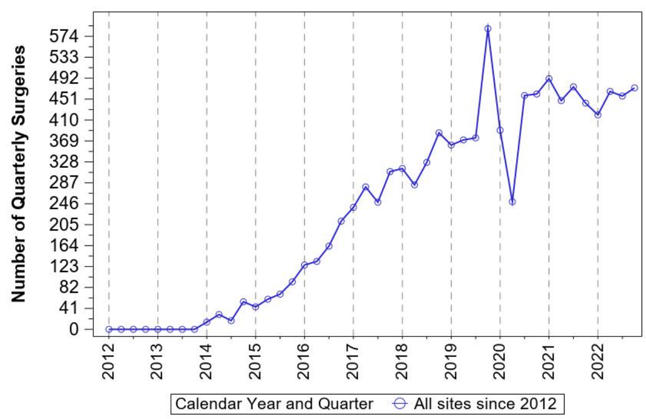

Figure 98: Utilization of the Taperloc 133/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

51104120	51101080	51104170
51104130	51104160	51100070
51104100	51103090	51100060
51104110	51103130	51103160
51104090	51100080	51101050
51104140	51103140	51100050
51104150	51103150	51103180
51103110	51101070	51104200
51103120	51101060	51103170
51103100	51104180	51100040

51103200	51101110	51104240
51104220	51101160	51100100
51101090	51100140	51100160
51101140	51101120	51100170
51101150	51101130	51103240
51103220	51100120	
51100090	51100130	
51100110	51101100	

Catalog numbers of acetabular cups used in the analysis.

10000664	110017106	110010241
110010244	110010242	110010250
110010245	110017101	110017100
10000663	10000661	110010268
10000665	110010249	110010269
110010246	10000668	110017109
10000662	110017107	110010271
110010243	110010263	10000670
110017103	110010266	110010261
110017104	110010265	110010270
110010247	110010264	110010240
10000666	110010267	10000671
110017102	10000660	10000659
110017105	110017108	110010272
110010248	10000669	110017099
10000667	110010262	

Taperloc 133/RingLoc
N=1703

Distribution of utilization: 23 surgeons across 18 sites used this implant combination in primary THA.

Table 359: Volume of cases by surgeon and site for the Taperloc 133/RingLoc combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	74 (93)	17 (156)
Cases per site	94 (122)	26 (137)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 360: Descriptive statistics of cases receiving the Taperloc 133/RingLoc combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	966	56.72	
Age (years)	1703	66.19(10.48)	67.00(14.00)
Height (cm)	1703	169.48(10.39)	170.00(15.24)
Weight (kg)	1703	90.49(22.04)	88.00(28.70)
BMI(kg/m^2)	1703	31.38(6.61)	30.51(9.00)
Smoking - never (%)	798	46.86	
Smoking - previous (%)	665	39.05	
Smoking - current (%)	223	13.09	
Smoking - unknown (%)	17	1	

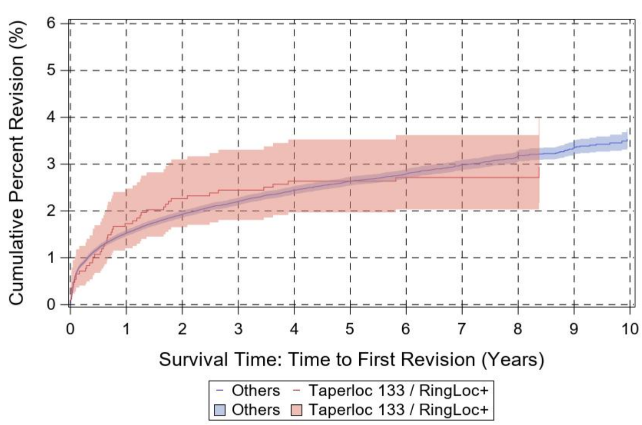

Figure 99: Cumulative percent revision curve for the Taperloc 133/RingLoc combination compared to all other implant combinations in primary THA.

Table 361: Cumulative percent revision and number at risk for Taperloc 133/RingLoc combination in primary THA cases.

Year	Number at risk	CPR
0	1678	0.00 (0.00,0.00)
1	1648	1.73 (1.20,2.48)
2	1633	2.27 (1.65,3.10)
3	1600	2.45 (1.81,3.31)
4	1486	2.64 (1.97,3.53)
5	1349	2.64 (1.97,3.53)
6	1203	2.72 (2.03,3.62)
7	974	2.72 (2.03,3.62)
8	566	2.72 (2.03,3.62)
9*	206	2.94 (2.17,3.99)
10*	18	2.94 (2.17,3.99)

* No revision occurred after the termination of the red curve in Figure 99; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 362: Reasons for revision following primary THA for Taperloc 133/RingLoc combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	13	33.3
2	Joint Infection	9	23.1
3	Aseptic Loosening	5	12.8
4	Peri-prosthetic fracture - Femur	5	12.8
5	Implant Failure	3	7.7
6	Pain	3	7.7
7	Poly liner wear	1	2.6

Table 363: Reasons for revision in first 90 days following primary THA for Taperloc 133/RingLoc combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	5	45.5
2	Dislocation/Instability	2	18.2
3	Aseptic Loosening	1	9.1
4	Joint Infection	1	9.1
5	Implant Failure	1	9.1
6	Pain	1	9.1

Table 364: Reasons for revision between 91 and 365 days following primary THA for Taperloc 133/RingLoc combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	5	45.5
2	Dislocation/Instability	4	36.4
3	Aseptic Loosening	1	9.1
4	Implant Failure	1	9.1

Table 365: Distribution of approach used for Taperloc 133/RingLoc combination in primary THA cases.

Approach	N	Percent
Anterior	93	5.5
Anterolateral	727	42.7
Posterior	870	51.1
Transtrochanteric	7	0.4
Missing/unknown/other	6	0.3

Table 366: Distribution of head size for Taperloc 133/RingLoc combination in primary THA cases.

Size (mm)	N	Percent
32	111	6.5
36	955	56.2
40	543	32.0
44	66	3.9
Missing/unknown/other	23	1.4

Table 367: Distribution of bearing surface for Taperloc 133/RingLoc combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1034	60.7
Ceramic-on-plastic	641	37.6
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	28	1.6

Table 368: Distribution of polyethylene used for Taperloc 133/RingLoc combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	11	0.7
XLPE	172	10.1
Antioxidant XLPE	1515	89.2
Missing/unknown/other	0	0.0

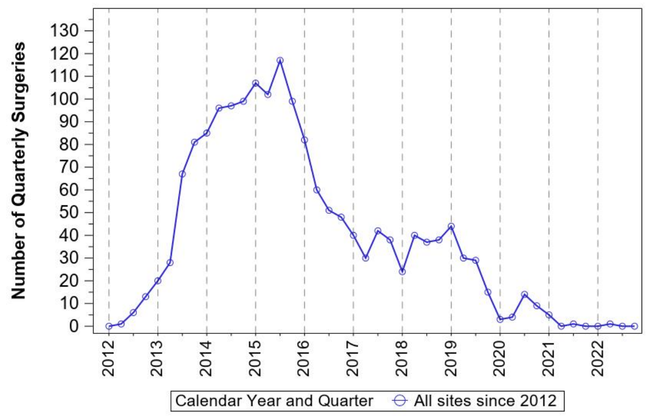

Figure 100: Utilization of the Taperloc 133/RingLoc combination in primary THA cases.

Catalog numbers of stems used in the analysis.

51104120	51103090	51100070
51104130	51103130	51104200
51104110	51104170	51103170
51104100	51101060	51100050
51104140	51101070	51103180
51104150	51100080	51100040
51104090	51103150	51103200
51104160	51104180	51104220
51103100	51103140	51101100
51103110	51101050	51103240
51101080	51103160	51104240
51103120	51100060	

Catalog numbers of acetabular cups used in the analysis.

16104154	14103658	16116060
16104150	16116056	14103650
16104156	14103660	14103552
16104158	14103554	16116046
16104152	14103560	14103664
16104160	14103564	16116062
14103654	14103662	14103566
16116050	16104164	14103666
16116052	14103558	16116064
14103656	14103562	11165208
16116054	16116058	14103668
14103652	14103556	
16104162	16116048	
16104148	16104146	

Taperloc 133 Microplasty/Continuum
N=535

Fewer than ten surgeons used this implant combination at fewer than ten sites in primary THA.

Table 369: Volume of cases by surgeon and site for the Taperloc 133 Microplasty/Continuum combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	89 (193)	1 (47)
Cases per site	89 (193)	1 (47)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 370: Descriptive statistics of cases receiving the Taperloc 133 Microplasty/Continuum combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	290	54.21	
Age (years)	535	66.45(9.73)	68.00(13.00)
Height (cm)	535	170.68(9.97)	170.20(15.20)
Weight (kg)	535	85.10(17.29)	84.37(23.20)
BMI(kg/m^2)	535	29.13(4.90)	29.07(6.88)
Smoking - never (%)	283	52.9	
Smoking - previous (%)	212	39.63	
Smoking - current (%)	40	7.48	
Smoking - unknown (%)	0	0.0	

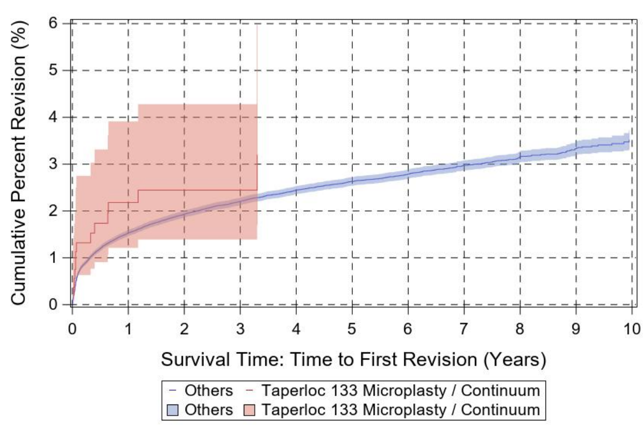

Figure 101: Cumulative percent revision curve for the Taperloc 133 Microplasty/Continuum combination compared to all other implant combinations in primary THA.

Table 371: Cumulative percent revision and number at risk for Taperloc 133 Microplasty/Continuum combination in primary THA cases.

Year	Number at risk	CPR
0	534	0.00 (0.00,0.00)
1	398	2.18 (1.21,3.91)
2	292	2.45 (1.39,4.28)
3	178	2.45 (1.39,4.28)
4*	64	3.20 (1.70,5.98)
5*	20	3.20 (1.70,5.98)
6*	12	3.20 (1.70,5.98)
7*	5	3.20 (1.70,5.98)
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 101; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.653 (0.361,1.184). It was 1.213 (1.132,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 372: Reasons for revision following primary THA for Taperloc 133 Microplasty/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	4	30.8
2	Aseptic Loosening	3	23.1
3	Dislocation/Instability	3	23.1
4	Joint Infection	1	7.7
5	Pain	1	7.7
6	Malalignment	1	7.7

Table 373: Reasons for revision in first 90 days following primary THA for Taperloc 133 Microplasty/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	4	57.1
2	Aseptic Loosening	2	28.6
3	Dislocation/Instability	1	14.3

Table 374: Reasons for revision between 91 and 365 days following primary THA for Taperloc 133 Microplasty/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	50.0
2	Aseptic Loosening	1	25.0
3	Malalignment	1	25.0

Table 375: Distribution of approach used for Taperloc 133 Microplasty/Continuum combination in primary THA cases.

Approach	N	Percent
Anterior	526	98.3
Anterolateral	1	0.2
Posterior	8	1.5
Transtrochanteric	0	0.0
Missing/unknown/other	0	0.0

Table 376: Distribution of head size for Taperloc 133 Microplasty/Continuum combination in primary THA cases.

Size (mm)	N	Percent
28	1	0.2
32	91	17.0
36	439	82.2
40	1	0.2
Missing/unknown/other	2	0.4

Table 377: Distribution of bearing surface for Taperloc 133 Microplasty/Continuum combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	8	1.5
Ceramic-on-plastic	524	97.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	3	0.6

Table 378: Distribution of polyethylene used for Taperloc 133 Microplasty/Continuum combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	40	7.5
Antioxidant XLPE	491	92.0
Missing/unknown/other	3	0.6

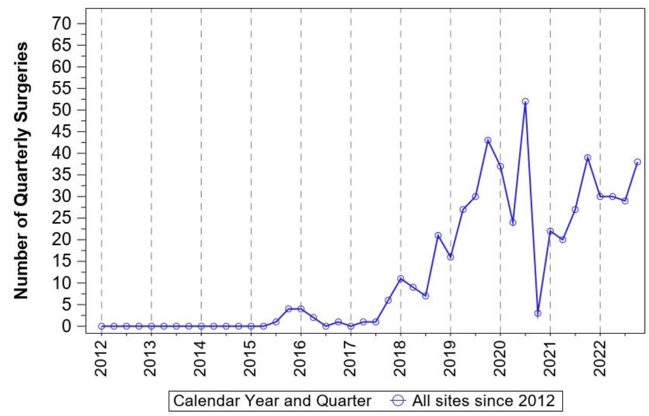

Figure 102: Utilization of the Taperloc 133 Microplasty/Continuum combination in primary THA cases.

Catalog numbers of stems used in the analysis.

51106110	51107130	51106170
51106120	51107100	51106180
51106100	51107120	51109070
51106130	51108070	51109080
51108080	51107160	51107180
51106090	51107150	51107200
51106140	51107090	51106200
51106150	51108050	51109060
51108060	51107170	51109050
51107110	51106160	
51107140	51108040	

Catalog numbers of acetabular cups used in the analysis.

875705201	875705801	875704602
875705401	875704801	875706002
875705601	875706001	875706401
875705001	875706201	

Taperloc 133 Microplasty/G7
N=3493

Distribution of utilization: 55 surgeons across 41 sites used this implant combination in primary THA.

Table 379: Volume of cases by surgeon and site for the Taperloc 133 Microplasty/G7 combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	63 (108)	11 (87)
Cases per site	85 (134)	22 (79)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 380: Descriptive statistics of cases receiving the Taperloc 133 Microplasty/G7 combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1562	44.72	
Age (years)	3493	61.88(10.63)	62.00(13.00)
Height (cm)	3493	171.85(10.26)	172.72(15.30)
Weight (kg)	3493	89.87(20.23)	88.64(27.27)
BMI(kg/m^2)	3493	30.29(5.66)	29.83(7.34)
Smoking - never (%)	1818	52.05	
Smoking - previous (%)	1187	33.98	
Smoking - current (%)	477	13.66	
Smoking - unknown (%)	11	0.31	

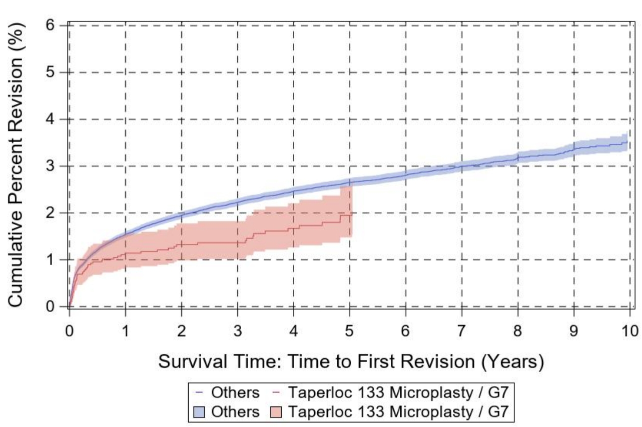

Figure 103: Cumulative percent revision curve for the Taperloc 133 Microplasty/G7 combination compared to all other implant combinations in primary THA.

Table 381: Cumulative percent revision and number at risk for Taperloc 133 Microplasty/G7 combination in primary THA cases.

Year	Number at risk	CPR
0	3487	0.00 (0.00,0.00)
1	3099	1.14 (0.84,1.56)
2	2572	1.32 (0.99,1.78)
3	2139	1.36 (1.02,1.83)
4	1689	1.67 (1.26,2.21)
5	1227	1.95 (1.48,2.57)
6*	747	2.03 (1.54,2.68)
7*	335	2.03 (1.54,2.68)
8*	92	2.03 (1.54,2.68)
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 103; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.694 (0.523,0.922). It was 1.21 (1.13,1.297) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 382: Reasons for revision following primary THA for Taperloc 133 Microplasty/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	14	25.9
2	Joint Infection	11	20.4
3	Peri-prosthetic fracture - Femur	11	20.4
4	Aseptic Loosening	10	18.5
5	Implant Failure	4	7.4
6	Malalignment	3	5.6
7	Pain	1	1.9

Table 383: Reasons for revision in first 90 days following primary THA for Taperloc 133 Microplasty/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	9	37.5
2	Joint Infection	5	20.8
3	Implant Failure	4	16.7
4	Dislocation/Instability	3	12.5
5	Aseptic Loosening	2	8.3
6	Malalignment	1	4.2

Table 384: Reasons for revision between 91 and 365 days following primary THA for Taperloc 133 Microplasty/G7 combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	6	46.1
2	Dislocation/Instability	6	46.1
3	Joint Infection	1	7.7

Table 385: Distribution of approach used for Taperloc 133 Microplasty/G7 combination in primary THA cases.

Approach	N	Percent
Anterior	2276	65.2
Anterolateral	99	2.8
Posterior	1114	31.9
Transtrochanteric	0	0.0
Missing/unknown/other	4	0.1

Table 386: Distribution of head size for Taperloc 133 Microplasty/G7 combination in primary THA cases.

Size (mm)	N	Percent
28	5	0.1
32	544	16.4
36	2534	76.5
40	210	6.3
44	1	0.0
Missing/unknown/other	19	0.6

Table 387: Distribution of bearing surface for Taperloc 133 Microplasty/G7 combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	290	8.3
Ceramic-on-plastic	3004	86.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	157	4.5
Missing/unknown/other	42	1.2

Table 388: Distribution of polyethylene used for Taperloc 133 Microplasty/G7 combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	878	25.3
Antioxidant XLPE	1610	46.5
Missing/unknown/other	977	28.2

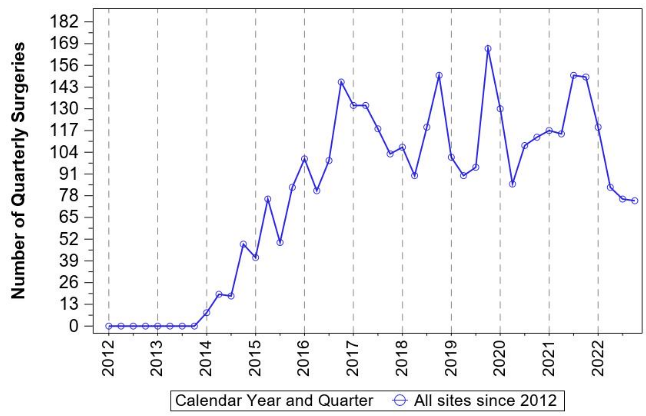

Figure 104: Utilization of the Taperloc 133 Microplasty/G7 combination in primary THA cases.

Catalog numbers of stems used in the analysis.

51107110	51109080	51109050
51107120	51106090	51106180
51107130	51108080	51108050
51106110	51109070	51106170
51107150	51107170	51106200
51107140	51106140	51107200
51107100	51106150	51108040
51106120	51107180	51106220
51106100	51108070	51107220
51106130	51109060	51107240
51107090	51106160	
51107160	51108060	

Catalog numbers of acetabular cups used in the analysis.

110010244	10000667	110010250
10000665	110017103	110010263
10000663	110017102	110010264
10000664	110017107	110010266
110010243	110010248	110010268
110010245	10000668	10000659
10000666	10000661	10000670
110010246	110017108	110010267
110010242	110010249	110017100
10000662	110017101	110017110
110017105	10000669	110010262
110017106	110017109	110010270
110010247	10000660	
110017104	110010265	
110010241	110010240	

Trabecular Metal/Continuum
N=787

Distribution of utilization: 15 surgeons across 14 sites used this implant combination in primary THA.

Table 389: Volume of cases by surgeon and site for the Trabecular Metal/Continuum combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	52 (98)	6 (66)
Cases per site	56 (88)	7 (90)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 390: Descriptive statistics of cases receiving the Trabecular Metal/Continuum combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	417	52.99	
Age (years)	787	65.95(10.87)	66.00(15.00)
Height (cm)	787	170.03(10.75)	170.18(15.24)
Weight (kg)	787	90.27(21.98)	88.20(28.00)
BMI(kg/m^2)	787	31.07(6.36)	29.98(8.49)
Smoking - never (%)	324	41.17	
Smoking - previous (%)	342	43.46	
Smoking - current (%)	120	15.25	
Smoking - unknown (%)	1	0.13	

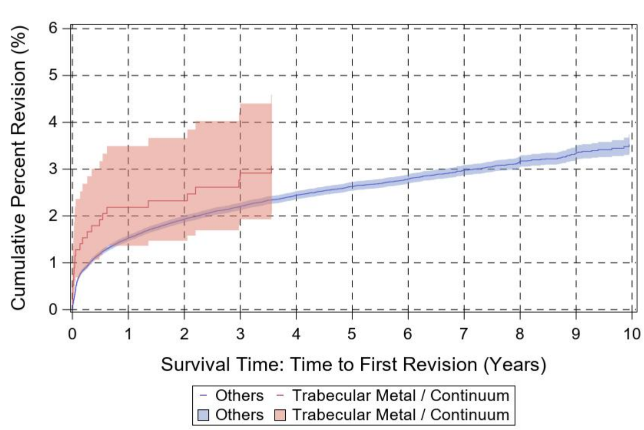

Figure 105: Cumulative percent revision curve for the Trabecular Metal/Continuum combination compared to all other implant combinations in primary THA.

Table 391: Cumulative percent revision and number at risk for Trabecular Metal/Continuum combination in primary THA cases.

Year	Number at risk	CPR
0	782	0.00 (0.00,0.00)
1	723	2.19 (1.36,3.49)
2	677	2.32 (1.47,3.67)
3	644	2.92 (1.93,4.40)
4*	618	3.07 (2.05,4.59)
5*	572	3.07 (2.05,4.59)
6*	502	3.07 (2.05,4.59)
7*	388	3.07 (2.05,4.59)
8*	220	3.07 (2.05,4.59)
9*	73	3.07 (2.05,4.59)
10*	8	3.07 (2.05,4.59)

* No revision occurred after the termination of the red curve in Figure 105; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.118 (0.663,1.887). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 392: Reasons for revision following primary THA for Trabecular Metal/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	10	47.6
2	Pain	5	23.8
3	Peri-prosthetic fracture - Femur	3	14.3
4	Aseptic Loosening	2	9.5
5	Joint Infection	1	4.8

Table 393: Reasons for revision in first 90 days following primary THA for Trabecular Metal/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	5	45.5
2	Pain	4	36.4
3	Peri-prosthetic fracture - Femur	2	18.2

Table 394: Reasons for revision between 91 and 365 days following primary THA for Trabecular Metal/Continuum combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	3	75.0
2	Aseptic Loosening	1	25.0

Table 395: Distribution of approach used for Trabecular Metal/Continuum combination in primary THA cases.

Approach	N	Percent
Anterior	3	0.4
Anterolateral	697	88.6
Posterior	85	10.8
Transtrochanteric	1	0.1
Missing/unknown/other	1	0.1

Table 396: Distribution of head size for Trabecular Metal/Continuum combination in primary THA cases.

Size (mm)	N	Percent
28	6	0.8
32	291	37.1
36	456	58.1
40	25	3.2
Missing/unknown/other	7	0.9

Table 397: Distribution of bearing surface for Trabecular Metal/Continuum combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	464	59.0
Ceramic-on-plastic	314	39.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	9	1.1

Table 398: Distribution of polyethylene used for Trabecular Metal/Continuum combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	637	81.2
Antioxidant XLPE	70	8.9
Missing/unknown/other	78	9.9

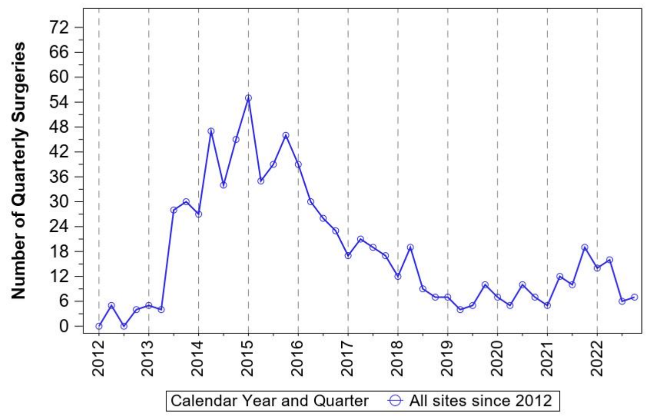

Figure 106: Utilization of the Trabecular Metal/Continuum combination in primary THA cases.

Catalog numbers of stems used in the analysis.

786401420	786401200	786401000
786401320	786401500	786401700
786401220	786401100	786401720
786401300	786401620	786401820
786401400	786401120	
786401520	786401600	

Catalog numbers of acetabular cups used in the analysis.

875705601	875705001	875704601
875705801	875705800	875706002
875705401	875704800	875706402
875706001	875704801	875704802
875705200	875705402	875705002
875705201	875706401	875706602
875705400	875705802	875706200
875705600	875705602	875706601
875705000	875705202	
875706201	875706000	

Tri-Lock BPS/Pinnacle
N=4000

Distribution of utilization: 51 surgeons across 30 sites used this implant combination in primary THA.

Table 399: Volume of cases by surgeon and site for the Tri-Lock BPS/Pinnacle combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	78 (215)	8 (71)
Cases per site	133 (405)	13 (141)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 400: Descriptive statistics of cases receiving the Tri-Lock BPS/Pinnacle combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2080	52	
Age (years)	4000	64.52(10.19)	65.00(13.00)
Height (cm)	3975	170.81(10.23)	170.18(15.00)
Weight (kg)	3976	89.37(19.81)	88.00(27.06)
BMI(kg/m^2)	3975	30.52(5.71)	29.96(7.99)
Smoking - never (%)	1958	48.95	
Smoking - previous (%)	1508	37.7	
Smoking - current (%)	521	13.03	
Smoking - unknown (%)	13	0.33	

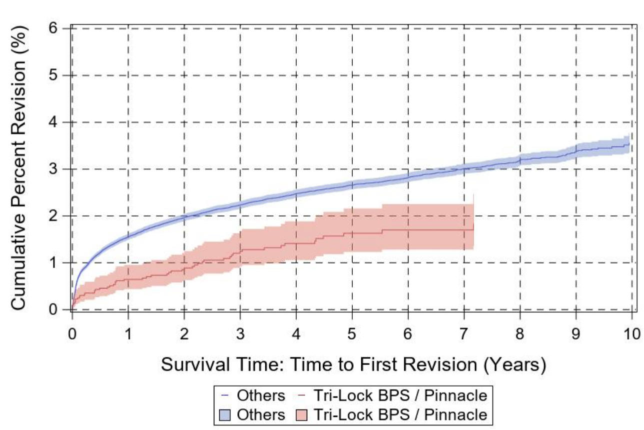

Figure 107: Cumulative percent revision curve for the Tri-Lock BPS/Pinnacle combination compared to all other implant combinations in primary THA.

Table 401: Cumulative percent revision and number at risk for Tri-Lock BPS/Pinnacle combination in primary THA cases.

Year	Number at risk	CPR
0	3978	0.00 (0.00,0.00)
1	3574	0.65 (0.44,0.96)
2	3104	0.89 (0.63,1.25)
3	2565	1.24 (0.92,1.68)
4	2060	1.41 (1.06,1.89)
5	1603	1.63 (1.23,2.16)
6	1187	1.70 (1.28,2.25)
7	810	1.70 (1.28,2.25)
8*	373	1.84 (1.36,2.47)
9*	85	1.84 (1.36,2.47)
10*	8	1.84 (1.36,2.47)

* No revision occurred after the termination of the red curve in Figure 107; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 402: Reasons for revision following primary THA for Tri-Lock BPS/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	15	28.8
2	Dislocation/Instability	12	23.1
3	Joint Infection	10	19.2
4	Peri-prosthetic fracture - Femur	9	17.3
5	Pain	2	3.8
6	Poly liner wear	1	1.9
7	Implant Failure	1	1.9
8	Metal Reaction/Metallosis	1	1.9
9	Malalignment	1	1.9

Table 403: Reasons for revision in first 90 days following primary THA for Tri-Lock BPS/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	8	61.5
2	Dislocation/Instability	3	23.1
3	Aseptic Loosening	1	7.7
4	Joint Infection	1	7.7

Table 404: Reasons for revision between 91 and 365 days following primary THA for Tri-Lock BPS/Pinnacle combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	5	45.5
2	Aseptic Loosening	4	36.4
3	Dislocation/Instability	2	18.2

Table 405: Distribution of approach used for Tri-Lock BPS/Pinnacle combination in primary THA cases.

Approach	N	Percent
Anterior	2051	51.3
Anterolateral	754	18.9
Posterior	1153	28.8
Transtrochanteric	14	0.3
Missing/unknown/other	28	0.7

Table 406: Distribution of head size for Tri-Lock BPS/Pinnacle combination in primary THA cases.

Size (mm)	N	Percent
22	3	0.1
28	23	0.6
32	1274	32.1
36	2396	60.3
40	263	6.6
Missing/unknown/other	13	0.3

Table 407: Distribution of bearing surface for Tri-Lock BPS/Pinnacle combination in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1488	37.2
Ceramic-on-plastic	2420	60.5
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	11	0.3
Missing/unknown/other	81	2.0

Table 408: Distribution of polyethylene used for Tri-Lock BPS/Pinnacle combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	16	0.4
XLPE	3515	89.4
Antioxidant XLPE	0	0.0
Missing/unknown/other	401	10.2

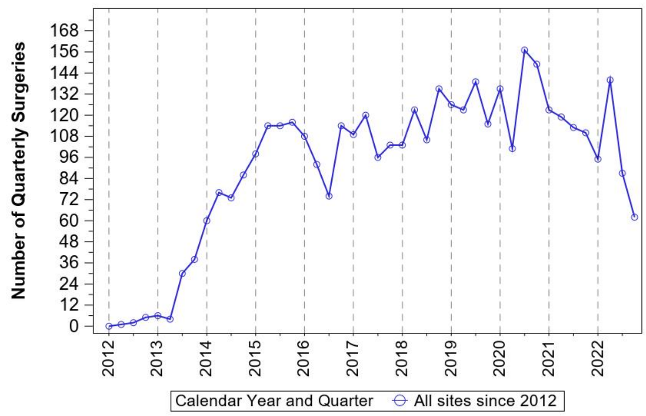

Figure 108: Utilization of the Tri-Lock BPS/Pinnacle combination in primary THA cases.

Catalog numbers of stems used in the analysis.

101204040	101204070	101204005
101204050	101214070	101214100
101204030	101204080	101204100
101204060	101214080	101214005
101214050	101214020	101204110
101214040	101204010	101214110
101204020	101214010	101204120
101214030	101204090	101214120
101214060	101214090	

Catalog numbers of acetabular cups used in the analysis.

121732052	121703048	121730054
121732054	121703050	121730058
121732056	121701050	121731052
121732050	121701056	121731058
121732058	121701048	121701064
121722052	121701054	121703062
121732048	121722062	121730050
121722054	121730056	121730062
121722056	121703058	121730066
121732060	121720046	121730068
121722050	121732064	121731046
121722058	121701058	121731048
121703052	121730052	121731050
121722048	121703060	121731054
121732062	121730046	121731060
121701052	121731056	121732066
121703054	121720044	
121703056	121722064	
121722060	121730048	

2.2.5 Revision risk for commonly used THA stems

Table 409: Summary of cumulative percent revision following primary THA for stems having at least 500 cases, sorted alphabetically.

Stem	N*	1 year	3 years	5 years	7 years	10 years
Accolade II	37562	1.35 (1.23,1.47)	2.03 (1.88,2.18)	2.53 (2.36,2.72)	3.00 (2.79,3.24)	3.76 (3.33,4.24)
Accolade C	850	0.88 (0.42,1.83)	1.47 (0.78,2.76)	1.77 (0.95,3.30)	4.00 (1.30, 11.95)	N/A
Accolade TMZF	893	0.90 (0.45,1.78)	2.02 (1.27,3.18)	2.80 (1.90,4.12)	3.31 (2.31,4.73)	3.90 (2.75,5.51)
Actis DuoFix	5740	0.71 (0.51,0.98)	0.92 (0.68,1.26)	1.09 (0.73,1.61)	N/A	N/A
AML	790	1.27 (0.69,2.36)	2.14 (1.31,3.47)	3.05 (1.99,4.67)	3.35 (2.18,5.11)	3.35 (2.18,5.11)
Anthology	5778	1.86 (1.54,2.26)	2.76 (2.34,3.25)	3.27 (2.78,3.83)	3.72 (3.16,4.38)	3.95 (3.32,4.70)
Avenir (Cemented)	976	0.90 (0.45,1.80)	1.07 (0.55,2.08)	1.52 (0.72,3.18)	1.52 (0.72,3.18)	N/A
Avenir (Cementless)	1220	1.83 (1.21,2.76)	2.21 (1.51,3.23)	2.35 (1.61,3.42)	2.84 (1.92,4.18)	N/A
Avenir Complete	2717	0.91 (0.58,1.43)	0.91 (0.58,1.43)	N/A	N/A	N/A
Corail	3508	1.24 (0.92,1.68)	1.89 (1.46,2.43)	1.94 (1.51,2.49)	2.08 (1.61,2.68)	2.68 (1.94,3.70)
Corail Coxa Vara	759	0.14 (0.02,0.96)	0.78 (0.32,1.87)	0.98 (0.44,2.18)	0.98 (0.44,2.18)	0.98 (0.44,2.18)
Echelon	505	2.61 (1.52,4.45)	3.72 (2.36,5.84)	3.72 (2.36,5.84)	4.35 (2.81,6.71)	N/A
Echo Bi-Metric	1963	2.66 (2.03,3.48)	3.39 (2.67,4.31)	3.68 (2.91,4.64)	3.82 (3.02,4.83)	3.82 (3.02,4.83)
Echo Bi-Metric Microplasty	1838	2.01 (1.45,2.77)	2.64 (1.97,3.52)	3.05 (2.27,4.09)	3.05 (2.27,4.09)	N/A
Fitmore	5875	1.32 (1.06,1.65)	1.94 (1.61,2.34)	2.27 (1.90,2.70)	2.70 (2.26,3.23)	3.09 (2.44,3.91)
Integral X	579	2.62 (1.59,4.31)	3.21 (2.03,5.05)	3.67 (2.38,5.65)	3.67 (2.38,5.65)	6.13 (3.04, 12.17)
M/L Taper**	14953	1.73 (1.53,1.96)	2.50 (2.25,2.77)	2.91 (2.64,3.22)	3.24 (2.94,3.58)	3.70 (3.22,4.25)
M/L Taper Kinectiv	901	2.03 (1.29,3.21)	3.50 (2.46,4.97)	4.27 (3.08,5.92)	4.27 (3.08,5.92)	4.27 (3.08,5.92)
Polarstem	2840	1.63 (1.22,2.19)	1.95 (1.48,2.57)	2.64 (1.99,3.50)	2.64 (1.99,3.50)	N/A
Secur-Fit	1769	3.51 (2.74,4.49)	4.39 (3.51,5.48)	5.13 (4.13,6.35)	5.70 (4.59,7.07)	N/A
Secur-Fit Max	3206	2.11 (1.66,2.67)	2.89 (2.35,3.54)	3.46 (2.86,4.18)	4.03 (3.33,4.87)	4.32 (3.53,5.27)
Secur-Fit Plus Max	2110	1.76 (1.28,2.42)	2.15 (1.61,2.87)	2.56 (1.96,3.33)	2.98 (2.32,3.83)	3.49 (2.72,4.47)
SROM	1153	1.22 (0.72,2.05)	2.63 (1.85,3.74)	3.31 (2.41,4.54)	3.91 (2.90,5.27)	4.08 (3.03,5.49)
Summit	7497	1.48 (1.22,1.78)	2.03 (1.73,2.39)	2.19 (1.87,2.56)	2.33 (1.99,2.73)	2.95 (2.29,3.81)
Synergy	1489	2.26 (1.61,3.17)	3.27 (2.46,4.34)	3.67 (2.78,4.82)	4.48 (3.43,5.84)	4.69 (3.59,6.13)
Taperloc	517	1.55 (0.78,3.07)	2.13 (1.18,3.81)	2.52 (1.47,4.30)	2.79 (1.66,4.68)	2.79 (1.66,4.68)
Taperloc 133	13989	1.71 (1.50,1.94)	2.43 (2.17,2.71)	2.83 (2.54,3.16)	2.91 (2.61,3.25)	3.33 (2.78,3.99)
Taperloc 133 Microplasty	4674	1.29 (1.00,1.67)	1.54 (1.21,1.95)	1.99 (1.59,2.50)	2.05 (1.63,2.57)	N/A
Trabecular Metal	1315	1.84 (1.24,2.74)	2.47 (1.74,3.49)	2.57 (1.82,3.61)	2.57 (1.82,3.61)	2.57 (1.82,3.61)
Tri-Lock BPS	4533	0.66 (0.46,0.94)	1.27 (0.97,1.68)	1.60 (1.23,2.08)	1.75 (1.34,2.29)	1.86 (1.41,2.45)
Versys Advocate	650	2.01 (1.15,3.52)	2.01 (1.15,3.52)	2.40 (1.36,4.22)	2.40 (1.36,4.22)	2.40 (1.36,4.22)
Versys Heritage	514	1.41 (0.67,2.93)	1.64 (0.82,3.27)	2.00 (1.03,3.86)	2.00 (1.03,3.86)	2.00 (1.03,3.86)
Wagner Cone	672	1.50 (0.81,2.77)	3.19 (2.06,4.90)	3.96 (2.63,5.96)	5.23 (3.46,7.87)	6.92 (3.92, 12.08)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.
** M/L Taper does not include M/L Taper Kinectiv.

Table 410: Summary of cumulative percent revision following primary THA for stems having at least 500 cases, sorted by 10-year CPR.

Stem	N*	1 year	3 years	5 years	7 years	10 years
Corail Coxa Vara	759	0.14 (0.02,0.96)	0.78 (0.32,1.87)	0.98 (0.44,2.18)	0.98 (0.44,2.18)	0.98 (0.44,2.18)
Tri-Lock BPS	4533	0.66 (0.46,0.94)	1.27 (0.97,1.68)	1.60 (1.23,2.08)	1.75 (1.34,2.29)	1.86 (1.41,2.45)
Versys Heritage	514	1.41 (0.67,2.93)	1.64 (0.82,3.27)	2.00 (1.03,3.86)	2.00 (1.03,3.86)	2.00 (1.03,3.86)
Versys Advocate	650	2.01 (1.15,3.52)	2.01 (1.15,3.52)	2.40 (1.36,4.22)	2.40 (1.36,4.22)	2.40 (1.36,4.22)
Trabecular Metal	1315	1.84 (1.24,2.74)	2.47 (1.74,3.49)	2.57 (1.82,3.61)	2.57 (1.82,3.61)	2.57 (1.82,3.61)
Corail	3508	1.24 (0.92,1.68)	1.89 (1.46,2.43)	1.94 (1.51,2.49)	2.08 (1.61,2.68)	2.68 (1.94,3.70)
Taperloc	517	1.55 (0.78,3.07)	2.13 (1.18,3.81)	2.52 (1.47,4.30)	2.79 (1.66,4.68)	2.79 (1.66,4.68)
Summit	7497	1.48 (1.22,1.78)	2.03 (1.73,2.39)	2.19 (1.87,2.56)	2.33 (1.99,2.73)	2.95 (2.29,3.81)
Fitmore	5875	1.32 (1.06,1.65)	1.94 (1.61,2.34)	2.27 (1.90,2.70)	2.70 (2.26,3.23)	3.09 (2.44,3.91)
AML	790	1.27 (0.69,2.36)	2.14 (1.31,3.47)	3.05 (1.99,4.67)	3.35 (2.18,5.11)	3.35 (2.18,5.11)
Taperloc 133	13989	1.71 (1.50,1.94)	2.43 (2.17,2.71)	2.83 (2.54,3.16)	2.91 (2.61,3.25)	3.33 (2.78,3.99)
Secur-Fit Plus Max	2110	1.76 (1.28,2.42)	2.15 (1.61,2.87)	2.56 (1.96,3.33)	2.98 (2.32,3.83)	3.49 (2.72,4.47)
M/L Taper**	14953	1.73 (1.53,1.96)	2.50 (2.25,2.77)	2.91 (2.64,3.22)	3.24 (2.94,3.58)	3.70 (3.22,4.25)
Accolade II	37562	1.35 (1.23,1.47)	2.03 (1.88,2.18)	2.53 (2.36,2.72)	3.00 (2.79,3.24)	3.76 (3.33,4.24)
Echo Bi-Metric	1963	2.66 (2.03,3.48)	3.39 (2.67,4.31)	3.68 (2.91,4.64)	3.82 (3.02,4.83)	3.82 (3.02,4.83)
Accolade TMZF	893	0.90 (0.45,1.78)	2.02 (1.27,3.18)	2.80 (1.90,4.12)	3.31 (2.31,4.73)	3.90 (2.75,5.51)
Anthology	5778	1.86 (1.54,2.26)	2.76 (2.34,3.25)	3.27 (2.78,3.83)	3.72 (3.16,4.38)	3.95 (3.32,4.70)
SROM	1153	1.22 (0.72,2.05)	2.63 (1.85,3.74)	3.31 (2.41,4.54)	3.91 (2.90,5.27)	4.08 (3.03,5.49)
M/L Taper Kinectiv	901	2.03 (1.29,3.21)	3.50 (2.46,4.97)	4.27 (3.08,5.92)	4.27 (3.08,5.92)	4.27 (3.08,5.92)
Secur-Fit Max	3206	2.11 (1.66,2.67)	2.89 (2.35,3.54)	3.46 (2.86,4.18)	4.03 (3.33,4.87)	4.32 (3.53,5.27)
Synergy	1489	2.26 (1.61,3.17)	3.27 (2.46,4.34)	3.67 (2.78,4.82)	4.48 (3.43,5.84)	4.69 (3.59,6.13)
Integral X	579	2.62 (1.59,4.31)	3.21 (2.03,5.05)	3.67 (2.38,5.65)	3.67 (2.38,5.65)	6.13 (3.04, 12.17)
Wagner Cone	672	1.50 (0.81,2.77)	3.19 (2.06,4.90)	3.96 (2.63,5.96)	5.23 (3.46,7.87)	6.92 (3.92, 12.08)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.

** M/L Taper does not include M/L Taper Kinectiv.

Accolade II
N=37750

Distribution of utilization: 158 surgeons across 61 sites used this implant in primary THA.

Table 411: Volume of cases by surgeon and site for the Accolade II stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	238 (397)	72 (245)
Cases per site	618 (960)	217 (866)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 412: Descriptive statistics of cases receiving the Accolade II stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	20187	53.48	
Age (years)	37750	64.36(10.85)	65.00(14.00)
Height (cm)	37750	170.28(10.37)	170.18(15.24)
Weight (kg)	37750	88.79(20.89)	87.00(28.50)
BMI(kg/m^2)	37750	30.51(6.24)	29.76(8.16)
Smoking - never (%)	18488	48.97	
Smoking - previous (%)	13859	36.71	
Smoking - current (%)	5279	13.98	
Smoking - unknown (%)	124	0.33	

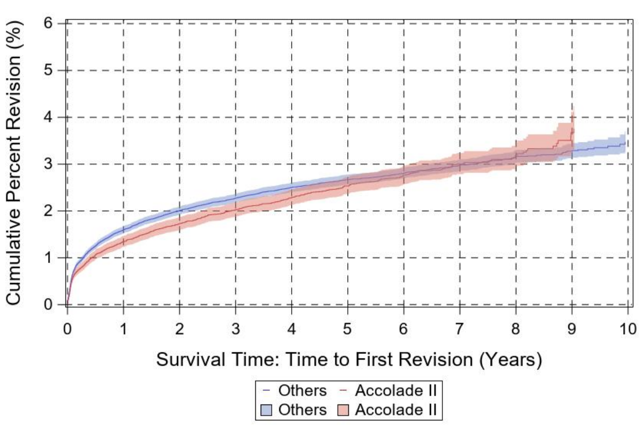

Figure 109: Cumulative percent revision curve for the Accolade II stem compared to all other stems in primary THA.

Table 413: Cumulative percent revision and number at risk for Accolade II stem in primary THA cases.

Year	Number at risk	CPR
0	37562	0.00 (0.00,0.00)
1	32905	1.35 (1.23,1.47)
2	28391	1.73 (1.60,1.87)
3	24252	2.03 (1.88,2.18)
4	19173	2.29 (2.13,2.46)
5	14470	2.53 (2.36,2.72)
6	10072	2.77 (2.57,2.97)
7	6037	3.00 (2.79,3.24)
8	3161	3.19 (2.94,3.47)
9	1146	3.67 (3.27,4.12)
10*	200	3.76 (3.33,4.24)

* No revision occurred after the termination of the red curve in Figure 109; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 414: Reasons for revision following primary THA for Accolade II stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	221	26.4
2	Aseptic Loosening	189	22.6
3	Joint Infection	174	20.8
4	Dislocation/Instability	116	13.8
5	Pain	37	4.4
6	Implant Failure	29	3.5
7	Metal Reaction/Metallosis	25	3.0
8	Malalignment	25	3.0
9	Peri-prosthetic fracture - Acetabulum	18	2.1
10	Osteolysis	2	0.2
11	Poly liner wear	2	0.2

Table 415: Reasons for revision in first 90 days following primary THA for Accolade II stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	163	55.8
2	Joint Infection	46	15.8
3	Dislocation/Instability	30	10.3
4	Aseptic Loosening	17	5.8
5	Implant Failure	14	4.8
6	Peri-prosthetic fracture - Acetabulum	8	2.7
7	Malalignment	8	2.7
8	Pain	5	1.7
9	Metal Reaction/Metallosis	1	0.3

Table 416: Reasons for revision between 91 and 365 days following primary THA for Accolade II stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	59	31.9
2	Dislocation/Instability	42	22.7
3	Aseptic Loosening	34	18.4
4	Peri-prosthetic fracture - Femur	23	12.4
5	Pain	15	8.1
6	Malalignment	4	2.2
7	Implant Failure	3	1.6
8	Peri-prosthetic fracture - Acetabulum	3	1.6
9	Osteolysis	1	0.5
10	Poly liner wear	1	0.5

Table 417: Distribution of approach used for Accolade II stem in primary THA cases.

Approach	N	Percent
Anterior	12343	32.7
Anterolateral	4455	11.8
Posterior	20842	55.2
Transtrochanteric	31	0.1
Missing/unknown/other	79	0.2

Table 418: Distribution of head size for Accolade II stem in primary THA cases.

Size (mm)	N	Percent
22	12	0.0
28	52	0.2
32	5100	15.4
36	25336	76.7
40	2231	6.8
44	220	0.7
Missing/unknown/other	95	0.3

Table 419: Distribution of bearing surface for Accolade II stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	4158	11.0
Ceramic-on-plastic	28781	76.2
Ceramic-on-ceramic	15	0.0
Metal-on-metal	0	0.0
Dual mobility	4492	11.9
Missing/unknown/other	304	0.8

Table 420: Distribution of polyethylene used for Accolade II stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	3	0.0
XLPE	31453	83.9
Antioxidant XLPE	47	0.1
Missing/unknown/other	5983	16.0

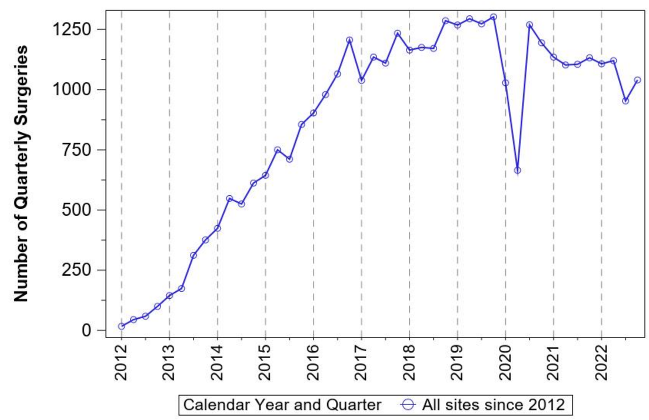

Figure 110: Utilization of the Accolade II stem in primary THA cases.

Catalog numbers of stems used in the analysis.

67210535	67210837	67201040
67210435	67200737	67211140
67210635	67210937	67200127
67210737	67210230	67210027
67200535	67200837	67201140
67200435	67200230	67200027
67210330	67211040	
67200635	67200937	
67200330	67210127	

Accolade C
N=867

Distribution of utilization: 52 surgeons across 29 sites used this implant in primary THA.

Table 421: Volume of cases by surgeon and site for the Accolade C stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	16 (17)	10 (23)
Cases per site	29 (38)	18 (33)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 422: Descriptive statistics of cases receiving the Accolade C stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	741	85.47	
Age (years)	867	77.92(7.98)	79.00(11.00)
Height (cm)	867	162.43(8.90)	162.56(12.64)
Weight (kg)	867	73.57(17.48)	70.31(23.05)
BMI(kg/m^2)	867	27.85(6.18)	26.84(7.87)
Smoking - never (%)	478	55.13	
Smoking - previous (%)	323	37.25	
Smoking - current (%)	60	6.92	
Smoking - unknown (%)	6	0.69	

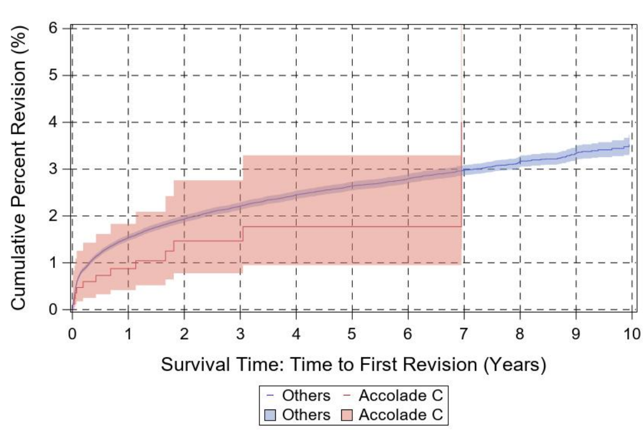

Figure 111: Cumulative percent revision curve for the Accolade C stem compared to all other stems in primary THA.

Table 423: Cumulative percent revision and number at risk for Accolade C stem in primary THA cases.

Year	Number at risk	CPR
0	850	0.00 (0.00,0.00)
1	611	0.88 (0.42,1.83)
2	437	1.47 (0.78,2.76)
3	326	1.47 (0.78,2.76)
4	230	1.77 (0.95,3.30)
5	140	1.77 (0.95,3.30)
6	69	1.77 (0.95,3.30)
7*	43	4.00 (1.30,11.95)
8*	32	4.00 (1.30,11.95)
9*	9	4.00 (1.30,11.95)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 111; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.642 (0.361,1.141). It was 1.215 (1.135,1.302) and 0.999 (0.996,1.003) for sex (female) and age, respectively.

Table 424: Reasons for revision following primary THA for Accolade C stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	33.3
2	Aseptic Loosening	3	25.0
3	Joint Infection	3	25.0
4	Poly liner wear	1	8.3
5	Peri-prosthetic fracture - Acetabulum	1	8.3

Table 425: Reasons for revision in first 90 days following primary THA for Accolade C stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	40.0
2	Aseptic Loosening	1	20.0
3	Joint Infection	1	20.0
4	Peri-prosthetic fracture - Acetabulum	1	20.0

Table 426: Reasons for revision between 91 and 365 days following primary THA for Accolade C stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	50.0
2	Joint Infection	1	50.0

Table 427: Distribution of approach used for Accolade C stem in primary THA cases.

Approach	N	Percent
Anterior	261	30.1
Anterolateral	108	12.5
Posterior	497	57.3
Transtrochanteric	1	0.1
Missing/unknown/other	0	0.0

Table 428: Distribution of head size for Accolade C stem in primary THA cases.

Size (mm)	N	Percent
22	1	0.1
28	5	0.7
32	58	7.8
36	629	84.9
40	39	5.3
44	3	0.4
Missing/unknown/other	6	0.8

Table 429: Distribution of bearing surface for Accolade C stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	179	20.6
Ceramic-on-plastic	562	64.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	116	13.4
Missing/unknown/other	10	1.1

Table 430: Distribution of polyethylene used for Accolade C stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	559	65.0
Antioxidant XLPE	3	0.3
Missing/unknown/other	298	34.6

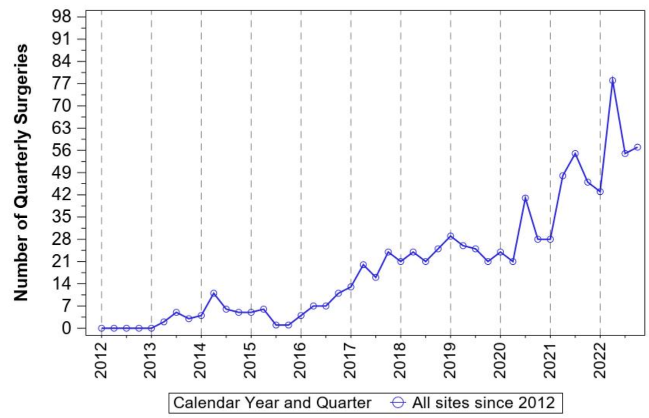

Figure 112: Utilization of the Accolade C stem in primary THA cases.

Catalog numbers of stems used in the analysis.

60570435D	60570637D	60580740D
60570537D	60580335D	60580230D
60570335D	60580637D	
60580537D	60570230D	
60580435D	60570740D	

Accolade TMZF

N=917

Distribution of utilization: 16 surgeons across 13 sites used this implant in primary THA.

Table 431: Volume of cases by surgeon and site for the Accolade TMZF stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	57 (135)	5 (14)
Cases per site	70 (105)	11 (122)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 432: Descriptive statistics of cases receiving the Accolade TMZF stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	509	55.51	
Age (years)	917	63.29(11.19)	63.00(16.00)
Height (cm)	917	169.96(10.56)	170.00(15.24)
Weight (kg)	917	90.31(21.35)	89.55(29.33)
BMI(kg/m^2)	917	31.11(6.18)	30.49(8.30)
Smoking - never (%)	420	45.8	
Smoking - previous (%)	353	38.5	
Smoking - current (%)	128	13.96	
Smoking - unknown (%)	16	1.74	

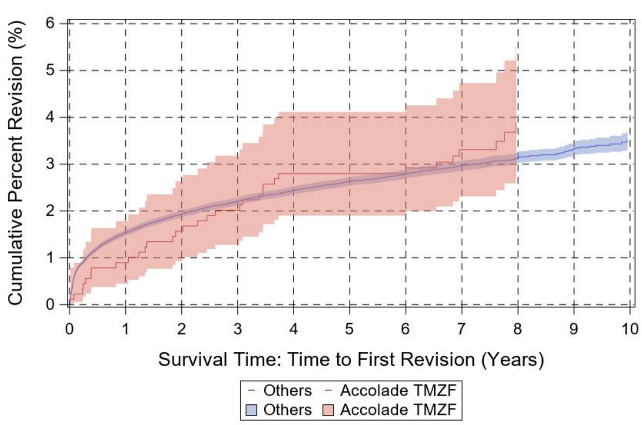

Figure 113: Cumulative percent revision curve for the Accolade TMZF stem compared to all other stems in primary THA.

Table 433: Cumulative percent revision and number at risk for Accolade TMZF stem in primary THA cases.

Year	Number at risk	CPR
0	893	0.00 (0.00,0.00)
1	885	0.90 (0.45,1.78)
2	879	1.57 (0.93,2.63)
3	875	2.02 (1.27,3.18)
4	867	2.80 (1.90,4.12)
5	855	2.80 (1.90,4.12)
6	823	2.80 (1.90,4.12)
7	705	3.31 (2.31,4.73)
8*	432	3.90 (2.75,5.51)
9*	216	3.90 (2.75,5.51)
10*	58	3.90 (2.75,5.51)

* No revision occurred after the termination of the red curve in Figure 113; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 434: Reasons for revision following primary THA for Accolade TMZF stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	10	38.5
2	Metal Reaction/Metallosis	5	19.2
3	Dislocation/Instability	4	15.4
4	Joint Infection	4	15.4
5	Peri-prosthetic fracture - Femur	2	7.7
6	Malalignment	1	3.8

Table 435: Reasons for revision in first 90 days following primary THA for Accolade TMZF stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	50.0
2	Peri-prosthetic fracture - Femur	1	50.0

Table 436: Reasons for revision between 91 and 365 days following primary THA for Accolade TMZF stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	100.0

Table 437: Distribution of approach used for Accolade TMZF stem in primary THA cases.

Approach	N	Percent
Anterior	8	0.9
Anterolateral	138	15.1
Posterior	759	82.8
Transtrochanteric	3	0.3
Missing/unknown/other	9	1.0

Table 438: Distribution of head size for Accolade TMZF stem in primary THA cases.

Size (mm)	N	Percent
28	1	0.1
32	98	10.9
36	695	77.4
40	97	10.8
Missing/unknown/other	7	0.8

Table 439: Distribution of bearing surface for Accolade TMZF stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	499	54.4
Ceramic-on-plastic	389	42.4
Ceramic-on-ceramic	3	0.3
Metal-on-metal	0	0.0
Dual mobility	18	2.0
Missing/unknown/other	8	0.9

Table 440: Distribution of polyethylene used for Accolade TMZF stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	909	99.9
Antioxidant XLPE	1	0.1
Missing/unknown/other	0	0.0

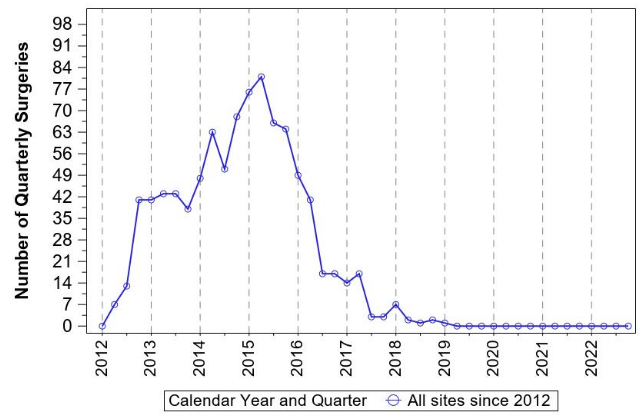

Figure 114: Utilization of the Accolade TMZF stem in primary THA cases.

Catalog numbers of stems used in the analysis.

60200335	60212530	60215537
60202530	60214535	60210130
60203535	60210435	60200637
60210335	60200537	60210637
60200435	60210537	60210740
60200230	60210230	60200030
60204535	60205537	60210030
60213535	60200130	

Actis DuoFix
N=5757

All Actis DuoFix implants included in this analysis are collared version. Distribution of utilization: 55 surgeons across 37 sites used this implant in primary THA.

Table 441: Volume of cases by surgeon and site for the Actis DuoFix stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	104 (178)	12 (137)
Cases per site	155 (254)	23 (223)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 442: Descriptive statistics of cases receiving the Actis DuoFix stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	3391	58.9	
Age (years)	5757	66.08(9.94)	66.00(13.00)
Height (cm)	5757	169.34(10.38)	167.64(15.80)
Weight (kg)	5757	88.60(21.10)	86.70(28.57)
BMI(kg/m^2)	5757	30.76(6.23)	29.99(8.47)
Smoking - never (%)	2872	49.89	
Smoking - previous (%)	2086	36.23	
Smoking - current (%)	787	13.67	
Smoking - unknown (%)	12	0.21	

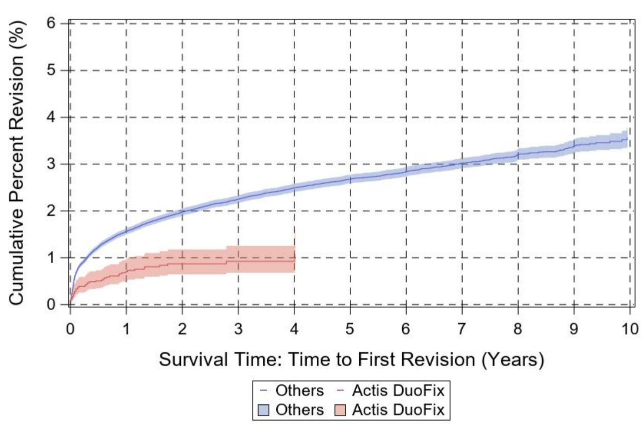

Figure 115: Cumulative percent revision curve for the Actis DuoFix stem compared to all other stems in primary THA.

Table 443: Cumulative percent revision and number at risk for Actis DuoFix stem in primary THA cases.

Year	Number at risk	CPR
0	5740	0.00 (0.00,0.00)
1	4140	0.71 (0.51,0.98)
2	2731	0.87 (0.64,1.18)
3	1623	0.92 (0.68,1.26)
4	608	0.92 (0.68,1.26)
5*	40	1.09 (0.73,1.61)
6	0	N/A
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 115; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.468 (0.34,0.644). It was 1.216 (1.136,1.304) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 444: Reasons for revision following primary THA for Actis DuoFix stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	12	26.7
2	Joint Infection	11	24.4
3	Peri-prosthetic fracture - Femur	6	13.3
4	Pain	6	13.3
5	Aseptic Loosening	3	6.7
6	Peri-prosthetic fracture - Acetabulum	3	6.7
7	Malalignment	2	4.4
8	Implant Failure	1	2.2
9	Metal Reaction/Metallosis	1	2.2

Table 445: Reasons for revision in first 90 days following primary THA for Actis DuoFix stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	9	40.9
2	Joint Infection	4	18.2
3	Peri-prosthetic fracture - Femur	4	18.2
4	Peri-prosthetic fracture - Acetabulum	3	13.6
5	Pain	1	4.5
6	Malalignment	1	4.5

Table 446: Reasons for revision between 91 and 365 days following primary THA for Actis DuoFix stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	4	26.7
2	Pain	4	26.7
3	Dislocation/Instability	2	13.3
4	Peri-prosthetic fracture - Femur	2	13.3
5	Aseptic Loosening	1	6.7
6	Implant Failure	1	6.7
7	Malalignment	1	6.7

Table 447: Distribution of approach used for Actis DuoFix stem in primary THA cases.

Approach	N	Percent
Anterior	3392	58.9
Anterolateral	846	14.7
Posterior	1518	26.4
Transtrochanteric	0	0.0
Missing/unknown/other	1	0.0

Table 448: Distribution of head size for Actis DuoFix stem in primary THA cases.

Size (mm)	N	Percent
22	8	0.1
28	52	0.9
32	1324	23.2
36	3808	66.6
40	520	9.1
Missing/unknown/other	5	0.1

Table 449: Distribution of bearing surface for Actis DuoFix stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	724	12.6
Ceramic-on-plastic	4981	86.5
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	29	0.5
Missing/unknown/other	23	0.4

Table 450: Distribution of polyethylene used for Actis DuoFix stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	31	0.5
XLPE	5020	87.5
Antioxidant XLPE	2	0.0
Missing/unknown/other	686	11.9

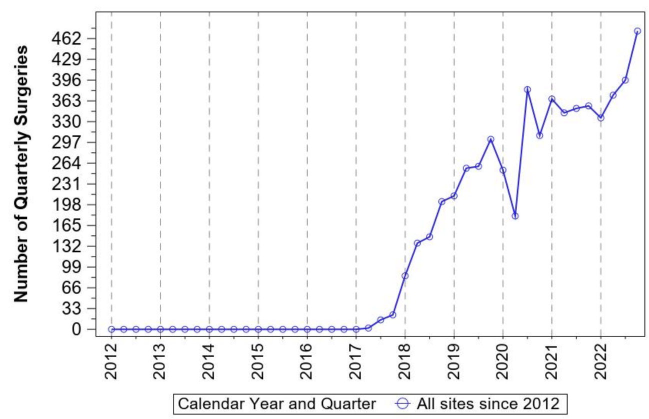

Figure 116: Utilization of the Actis DuoFix stem in primary THA cases.

Catalog numbers of stems used in the analysis.

101011060	101011080	101012100
101011050	101012030	101011010
101011040	101012080	101011110
101011070	101011090	101012110
101011030	101011020	101012120
101012060	101012020	101011120
101012040	101012090	
101012050	101011100	
101012070	101012010	

AML
N=793

Distribution of utilization: 17 surgeons across 14 sites used this implant in primary THA.

Table 451: Volume of cases by surgeon and site for the AML stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	46 (110)	5 (18)
Cases per site	56 (138)	8 (37)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 452: Descriptive statistics of cases receiving the AML stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	435	54.85	
Age (years)	793	66.92(10.48)	67.00(15.00)
Height (cm)	793	169.84(10.47)	170.00(15.24)
Weight (kg)	793	89.84(21.26)	88.00(28.56)
BMI(kg/m^2)	793	31.06(6.49)	30.42(8.45)
Smoking - never (%)	370	46.66	
Smoking - previous (%)	289	36.44	
Smoking - current (%)	134	16.9	
Smoking - unknown (%)	0	0.0	

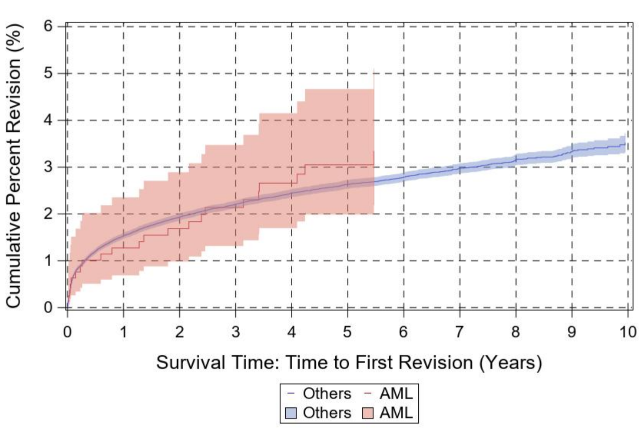

Figure 117: Cumulative percent revision curve for the AML stem compared to all other stems in primary THA.

Table 453: Cumulative percent revision and number at risk for AML stem in primary THA cases.

Year	Number at risk	CPR
0	790	0.00 (0.00,0.00)
1	753	1.27 (0.69,2.36)
2	675	1.69 (0.98,2.89)
3	606	2.14 (1.31,3.47)
4	512	2.66 (1.70,4.15)
5	377	3.05 (1.99,4.67)
6*	273	3.35 (2.18,5.11)
7*	174	3.35 (2.18,5.11)
8*	91	3.35 (2.18,5.11)
9*	25	3.35 (2.18,5.11)
10*	7	3.35 (2.18,5.11)

* No revision occurred after the termination of the red curve in Figure 117; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.844 (0.448,1.592). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 454: Reasons for revision following primary THA for AML stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	8	36.4
2	Dislocation/Instability	7	31.8
3	Aseptic Loosening	2	9.1
4	Pain	2	9.1
5	Poly liner wear	1	4.5
6	Peri-prosthetic fracture - Acetabulum	1	4.5
7	Malalignment	1	4.5

Table 455: Reasons for revision in first 90 days following primary THA for AML stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	57.1
2	Joint Infection	1	14.3
3	Peri-prosthetic fracture - Acetabulum	1	14.3
4	Malalignment	1	14.3

Table 456: Reasons for revision between 91 and 365 days following primary THA for AML stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	2	66.7
2	Dislocation/Instability	1	33.3

Table 457: Distribution of approach used for AML stem in primary THA cases.

Approach	N	Percent
Anterior	9	1.1
Anterolateral	637	80.3
Posterior	145	18.3
Transtrochanteric	0	0.0
Missing/unknown/other	2	0.2

Table 458: Distribution of head size for AML stem in primary THA cases.

Size (mm)	N	Percent
22	1	0.1
28	5	0.6
32	181	23.0
36	493	62.6
40	106	13.5
Missing/unknown/other	1	0.1

Table 459: Distribution of bearing surface for AML stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	700	88.3
Ceramic-on-plastic	86	10.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	7	0.9

Table 460: Distribution of polyethylene used for AML stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	720	91.6
Antioxidant XLPE	0	0.0
Missing/unknown/other	66	8.4

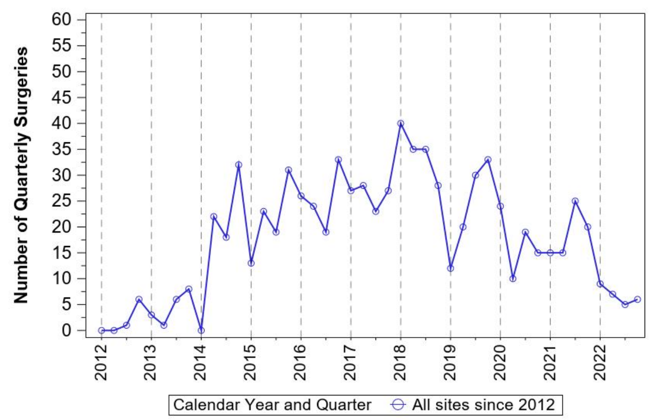

Figure 118: Utilization of the AML stem in primary THA cases.

Catalog numbers of stems used in the analysis.

155402135	155401150	155401195
155402121	155401165	155401210
155401121	155402106	155403150
155402150	155402180	155403165
155401135	155403135	155403180
155402165	155401180	
155401106	155402195	

Anthology
N=5809

Distribution of utilization: 60 surgeons across 38 sites used this implant in primary THA.

Table 461: Volume of cases by surgeon and site for the Anthology stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	96 (180)	14 (79)
Cases per site	152 (212)	52 (227)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 462: Descriptive statistics of cases receiving the Anthology stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	3293	56.69	
Age (years)	5809	64.99(10.68)	65.00(14.00)
Height (cm)	5809	169.40(10.09)	168.00(15.24)
Weight (kg)	5809	90.52(22.26)	88.40(28.80)
BMI(kg/m^2)	5809	31.44(6.84)	30.51(8.84)
Smoking - never (%)	2774	47.75	
Smoking - previous (%)	2221	38.23	
Smoking - current (%)	803	13.82	
Smoking - unknown (%)	11	0.19	

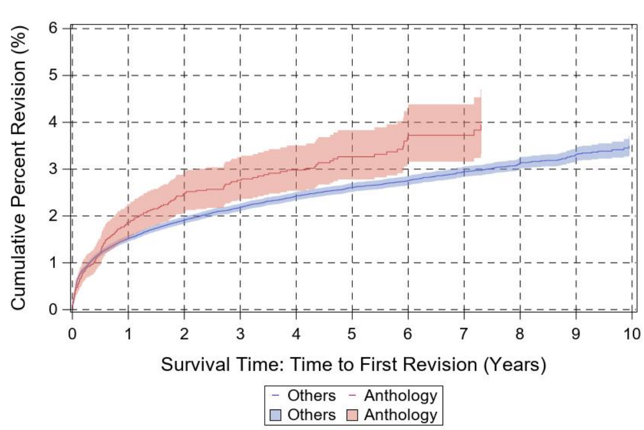

Figure 119: Cumulative percent revision curve for the Anthology stem compared to all other stems in primary THA.

Table 463: Cumulative percent revision and number at risk for Anthology stem in primary THA cases.

Year	Number at risk	CPR
0	5778	0.00 (0.00,0.00)
1	4844	1.86 (1.54,2.26)
2	4138	2.47 (2.08,2.93)
3	3398	2.76 (2.34,3.25)
4	2723	2.98 (2.54,3.50)
5	2113	3.27 (2.78,3.83)
6	1594	3.72 (3.16,4.38)
7	985	3.72 (3.16,4.38)
8*	470	3.95 (3.32,4.70)
9*	134	3.95 (3.32,4.70)
10*	33	3.95 (3.32,4.70)

* No revision occurred after the termination of the red curve in Figure 119; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 464: Reasons for revision following primary THA for Anthology stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	37	23.1
2	Dislocation/Instability	36	22.5
3	Joint Infection	30	18.8
4	Peri-prosthetic fracture - Femur	26	16.2
5	Malalignment	10	6.2
6	Implant Failure	9	5.6
7	Pain	7	4.4
8	Peri-prosthetic fracture - Acetabulum	3	1.9
9	Metal Reaction/Metallosis	2	1.2

Table 465: Reasons for revision in first 90 days following primary THA for Anthology stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	20	41.7
2	Dislocation/Instability	9	18.8
3	Joint Infection	7	14.6
4	Implant Failure	4	8.3
5	Aseptic Loosening	3	6.2
6	Peri-prosthetic fracture - Acetabulum	3	6.2
7	Malalignment	2	4.2

Table 466: Reasons for revision between 91 and 365 days following primary THA for Anthology stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	16	32.6
2	Joint Infection	13	26.5
3	Aseptic Loosening	11	22.4
4	Pain	5	10.2
5	Peri-prosthetic fracture - Femur	2	4.1
6	Implant Failure	1	2.0
7	Malalignment	1	2.0

Table 467: Distribution of approach used for Anthology stem in primary THA cases.

Approach	N	Percent
Anterior	2746	47.3
Anterolateral	2239	38.5
Posterior	736	12.7
Transtrochanteric	84	1.4
Missing/unknown/other	4	0.1

Table 468: Distribution of head size for Anthology stem in primary THA cases.

Size (mm)	N	Percent
22	4	0.1
28	36	0.7
32	1150	22.8
36	3481	68.9
40	344	6.8
44	16	0.3
Missing/unknown/other	22	0.4

Table 469: Distribution of bearing surface for Anthology stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1055	18.2
Ceramic-on-plastic	3975	68.4
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	737	12.7
Missing/unknown/other	42	0.7

Table 470: Distribution of polyethylene used for Anthology stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	4	0.1
XLPE	5071	87.6
Antioxidant XLPE	0	0.0
Missing/unknown/other	711	12.3

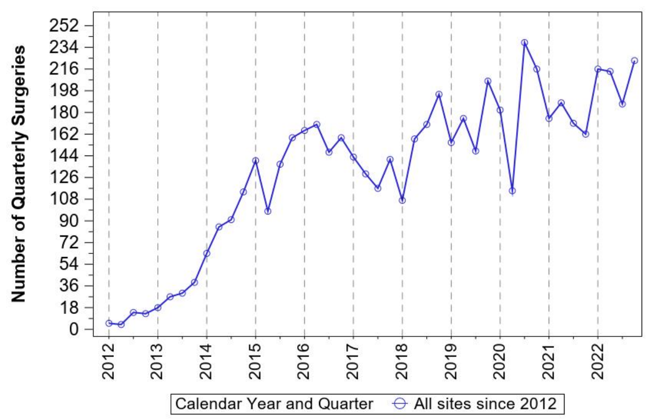

Figure 120: Utilization of the Anthology stem in primary THA cases.

Catalog numbers of stems used in the analysis.

71356006	71356009	71357106
71356005	71356010	71357005
71356007	71356109	71356103
71356008	71356110	71356111
71356106	71356104	71356002
71356107	71357007	71357109
71356004	71357006	71356011
71356108	71357008	71357004
71356105	71357107	71357105
71356003	71357108	71357009

71357110
71357003
71357010
71357111
71356001
71356102
71357104
71356012
71356112
71357103
71357112
71357011
71357002
71357012
71356113
71356013
71356101
71356114
71357102
71357001
71357101
71356014

Avenir (Cemented)
N=980

Distribution of utilization: 43 surgeons across 33 sites used this implant in primary THA.

Table 471: Volume of cases by surgeon and site for the Avenir (Cemented) stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	22 (37)	9 (35)
Cases per site	29 (40)	10 (43)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 472: Descriptive statistics of cases receiving the Avenir (Cemented) stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	745	76.02	
Age (years)	980	76.33(7.94)	77.00(10.00)
Height (cm)	963	165.10(9.44)	165.10(12.70)
Weight (kg)	963	78.29(17.69)	76.90(25.40)
BMI(kg/m^2)	963	28.66(5.73)	28.08(7.81)
Smoking - never (%)	519	52.96	
Smoking - previous (%)	404	41.22	
Smoking - current (%)	52	5.31	
Smoking - unknown (%)	5	0.51	

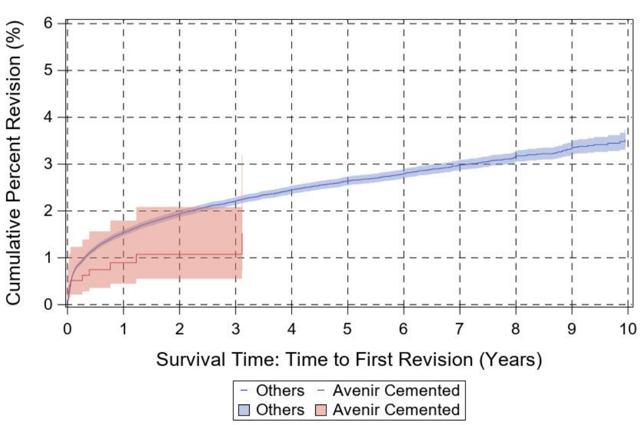

Figure 121: Cumulative percent revision curve for the Avenir (Cemented) stem compared to all other stems in primary THA.

Table 473: Cumulative percent revision and number at risk for Avenir (Cemented) stem in primary THA cases.

Year	Number at risk	CPR
0	976	0.00 (0.00,0.00)
1	606	0.90 (0.45,1.80)
2	365	1.07 (0.55,2.08)
3	238	1.07 (0.55,2.08)
4*	117	1.52 (0.72,3.18)
5*	61	1.52 (0.72,3.18)
6*	19	1.52 (0.72,3.18)
7*	8	1.52 (0.72,3.18)
8*	1	1.52 (0.72,3.18)
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 121; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.56 (0.295,1.062). It was 1.215 (1.134,1.302) and 0.999 (0.996,1.003) for sex (female) and age, respectively.

Table 474: Reasons for revision following primary THA for Avenir (Cemented) stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	40.0
2	Joint Infection	4	40.0
3	Implant Failure	1	10.0
4	Peri-prosthetic fracture - Femur	1	10.0

Table 475: Reasons for revision in first 90 days following primary THA for Avenir (Cemented) stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	60.0
2	Dislocation/Instability	1	20.0
3	Peri-prosthetic fracture - Femur	1	20.0

Table 476: Reasons for revision between 91 and 365 days following primary THA for Avenir (Cemented) stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	66.7
2	Joint Infection	1	33.3

Table 477: Distribution of approach used for Avenir (Cemented) stem in primary THA cases.

Approach	N	Percent
Anterior	591	60.3
Anterolateral	85	8.7
Posterior	284	29.0
Transtrochanteric	1	0.1
Missing/unknown/other	19	1.9

Table 478: Distribution of head size for Avenir (Cemented) stem in primary THA cases.

Size (mm)	N	Percent
28	3	0.4
32	98	13.8
36	550	77.6
40	48	6.8
Missing/unknown/other	10	1.4

Table 479: Distribution of bearing surface for Avenir (Cemented) stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	127	13.0
Ceramic-on-plastic	572	58.4
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	255	26.0
Missing/unknown/other	26	2.6

Table 480: Distribution of polyethylene used for Avenir (Cemented) stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	1	0.1
XLPE	542	56.3
Antioxidant XLPE	326	33.9
Missing/unknown/other	93	9.7

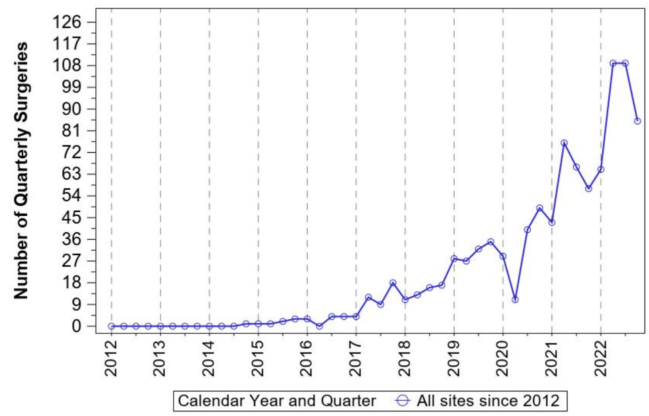

Figure 122: Utilization of the Avenir (Cemented) stem in primary THA cases.

Catalog numbers of stems used in the analysis.

106010205	106010201	106010302
106010204	106010206	106010307
106010203	106010306	106010208
106010202	106010207	106010308
106010304	106010303	
106010305	106010301	

Avenir (Cementless)

N=1227

Distribution of utilization: 35 surgeons across 22 sites used this implant in primary THA.

Table 481: Volume of cases by surgeon and site for the Avenir (Cementless) stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	35 (87)	4 (29)
Cases per site	55 (120)	10 (39)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 482: Descriptive statistics of cases receiving the Avenir (Cementless) stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	713	58.11	
Age (years)	1227	66.11(10.91)	67.00(13.00)
Height (cm)	1049	168.98(10.23)	168.00(15.53)
Weight (kg)	1049	85.12(19.60)	83.40(26.65)
BMI(kg/m^2)	1049	29.64(5.49)	29.15(7.21)
Smoking - never (%)	602	49.06	
Smoking - previous (%)	487	39.69	
Smoking - current (%)	138	11.25	
Smoking - unknown (%)	0	0.0	

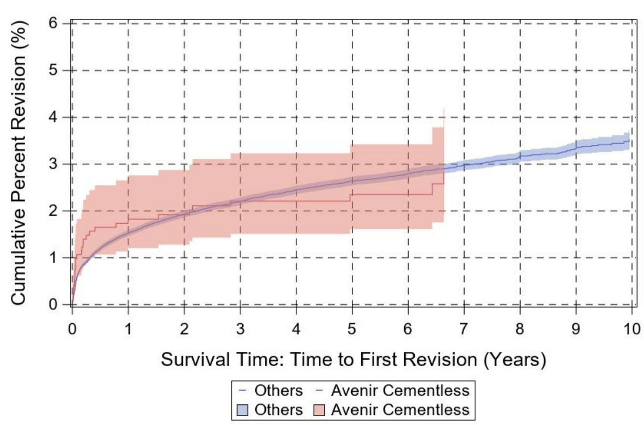

Figure 123: Cumulative percent revision curve for the Avenir (Cementless) stem compared to all other stems in primary THA.

Table 483: Cumulative percent revision and number at risk for Avenir (Cementless) stem in primary THA cases.

Year	Number at risk	CPR
0	1220	0.00 (0.00,0.00)
1	1106	1.83 (1.21,2.76)
2	1028	1.92 (1.28,2.87)
3	962	2.21 (1.51,3.23)
4	816	2.21 (1.51,3.23)
5	684	2.35 (1.61,3.42)
6	510	2.35 (1.61,3.42)
7*	327	2.84 (1.92,4.18)
8*	192	2.84 (1.92,4.18)
9*	30	2.84 (1.92,4.18)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 123; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 484: Reasons for revision following primary THA for Avenir (Cementless) stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	9	33.3
2	Aseptic Loosening	7	25.9
3	Dislocation/Instability	7	25.9
4	Joint Infection	2	7.4
5	Pain	2	7.4

Table 485: Reasons for revision in first 90 days following primary THA for Avenir (Cementless) stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	7	41.2
2	Aseptic Loosening	6	35.3
3	Dislocation/Instability	3	17.6
4	Joint Infection	1	5.9

Table 486: Reasons for revision between 91 and 365 days following primary THA for Avenir (Cementless) stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	33.3
2	Joint Infection	1	33.3
3	Pain	1	33.3

Table 487: Distribution of approach used for Avenir (Cementless) stem in primary THA cases.

Approach	N	Percent
Anterior	355	28.9
Anterolateral	162	13.2
Posterior	532	43.4
Transtrochanteric	0	0.0
Missing/unknown/other	178	14.5

Table 488: Distribution of head size for Avenir (Cementless) stem in primary THA cases.

Size (mm)	N	Percent
28	3	0.3
32	165	14.4
36	885	77.2
40	89	7.8
Missing/unknown/other	4	0.3

Table 489: Distribution of bearing surface for Avenir (Cementless) stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	388	31.6
Ceramic-on-plastic	754	61.5
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	78	6.4
Missing/unknown/other	7	0.6

Table 490: Distribution of polyethylene used for Avenir (Cementless) stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	821	67.2
Antioxidant XLPE	319	26.1
Missing/unknown/other	82	6.7

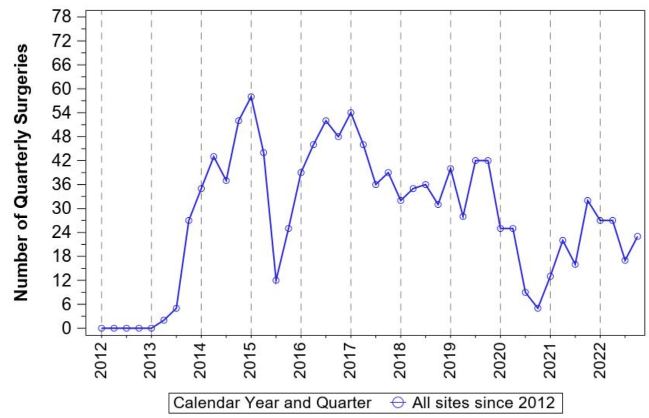

Figure 124: Utilization of the Avenir (Cementless) stem in primary THA cases.

Catalog numbers of stems used in the analysis.

106010004	106010106	106010101
106010005	106010103	106010108
106010002	106010007	106010109
106010003	106010001	106010009
106010006	106010107	
106010104	106010102	
106010105	106010008	

Avenir Complete
N=2724

Distribution of utilization: 56 surgeons across 41 sites used this implant in primary THA.

Table 491: Volume of cases by surgeon and site for the Avenir Complete stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	48 (94)	13 (50)
Cases per site	66 (79)	30 (75)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 492: Descriptive statistics of cases receiving the Avenir Complete stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1651	60.61	
Age (years)	2724	66.53(10.97)	68.00(14.00)
Height (cm)	2724	168.77(10.20)	167.64(14.01)
Weight (kg)	2724	85.33(20.40)	83.30(27.50)
BMI(kg/m^2)	2724	29.82(6.03)	29.18(7.91)
Smoking - never (%)	1403	51.51	
Smoking - previous (%)	942	34.58	
Smoking - current (%)	371	13.62	
Smoking - unknown (%)	8	0.29	

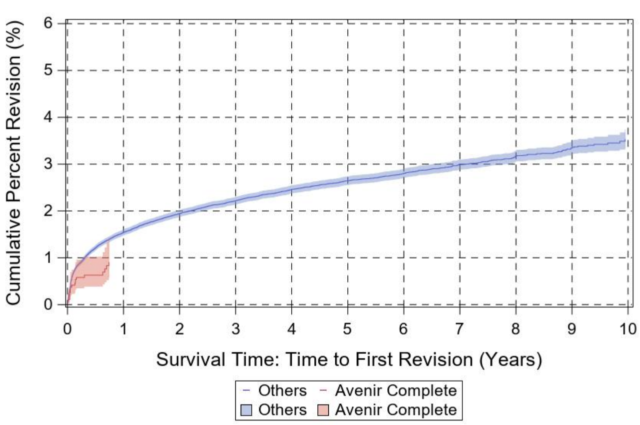

Figure 125: Cumulative percent revision curve for the Avenir Complete stem compared to all other stems in primary THA.

Table 493: Cumulative percent revision and number at risk for Avenir Complete stem in primary THA cases.

Year	Number at risk	CPR
0	2717	0.00 (0.00,0.00)
1*	960	0.91 (0.58,1.43)
2*	177	0.91 (0.58,1.43)
3*	11	0.91 (0.58,1.43)
4	0	N/A
5	0	N/A
6	0	N/A
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 125; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.556 (0.352,0.88). It was 1.214 (1.134,1.301) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 494: Reasons for revision following primary THA for Avenir Complete stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	7	35.0
2	Aseptic Loosening	6	30.0
3	Joint Infection	4	20.0
4	Dislocation/Instability	2	10.0
5	Poly liner wear	1	5.0

Table 495: Reasons for revision in first 90 days following primary THA for Avenir Complete stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	7	46.7
2	Aseptic Loosening	5	33.3
3	Joint Infection	3	20.0

Table 496: Reasons for revision between 91 and 365 days following primary THA for Avenir Complete stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	40.0
2	Aseptic Loosening	1	20.0
3	Joint Infection	1	20.0
4	Poly liner wear	1	20.0

Table 497: Distribution of approach used for Avenir Complete stem in primary THA cases.

Approach	N	Percent
Anterior	2078	76.3
Anterolateral	125	4.6
Posterior	508	18.6
Transtrochanteric	2	0.1
Missing/unknown/other	11	0.4

Table 498: Distribution of head size for Avenir Complete stem in primary THA cases.

Size (mm)	N	Percent
28	3	0.1
32	362	14.7
36	1872	76.2
40	208	8.5
Missing/unknown/other	12	0.5

Table 499: Distribution of bearing surface for Avenir Complete stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	269	9.9
Ceramic-on-plastic	2176	79.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	237	8.7
Missing/unknown/other	42	1.5

Table 500: Distribution of polyethylene used for Avenir Complete stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	922	34.4
Antioxidant XLPE	1430	53.4
Missing/unknown/other	326	12.2

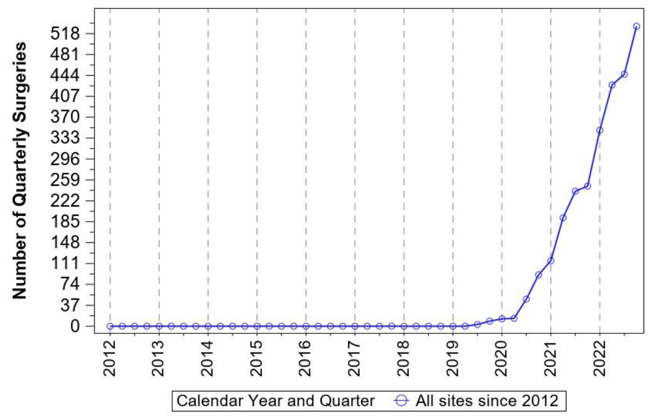

Figure 126: Utilization of the Avenir Complete stem in primary THA cases.

Catalog numbers of stems used in the analysis.

574202050	574101040	574101010
574202040	574101050	574201000
574202060	574102030	574203070
574201040	574203060	574102010
574202030	574101030	574103020
574201030	574102020	574103030
574201020	574202075	574101000
574201050	574102065	574101065
574203050	574201010	574102000
574203030	574101060	574102075
574202065	574202010	574101070
574102040	574201065	574201075
574202020	574203010	574102080
574203040	574103040	574201080
574102050	574102070	574102085
574102060	574201070	574101075
574203020	574203065	574101085
574201060	574103050	574101080
574202070	574203000	574101090
574101020	574202080	

Corail
N=3557

Distribution of utilization: 46 surgeons across 31 sites used this implant in primary THA.

Table 501: Volume of cases by surgeon and site for the Corail stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	77 (118)	8 (111)
Cases per site	114 (199)	22 (134)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 502: Descriptive statistics of cases receiving the Corail stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2109	59.29	
Age (years)	3557	65.93(10.19)	66.00(14.00)
Height (cm)	3401	169.22(10.42)	168.00(15.30)
Weight (kg)	3401	88.18(20.56)	86.18(27.96)
BMI(kg/m^2)	3401	30.71(6.84)	29.92(8.02)
Smoking - never (%)	1663	46.75	
Smoking - previous (%)	1349	37.93	
Smoking - current (%)	539	15.15	
Smoking - unknown (%)	6	0.17	

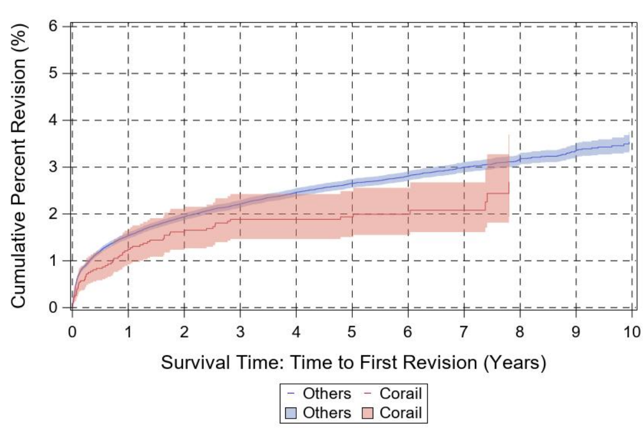

Figure 127: Cumulative percent revision curve for the Corail stem compared to all other stems in primary THA.

Table 503: Cumulative percent revision and number at risk for Corail stem in primary THA cases.

Year	Number at risk	CPR
0	3508	0.00 (0.00,0.00)
1	3081	1.24 (0.92,1.68)
2	2695	1.62 (1.24,2.11)
3	2455	1.89 (1.46,2.43)
4	2188	1.89 (1.46,2.43)
5	1757	1.94 (1.51,2.49)
6	1162	1.99 (1.55,2.56)
7	687	2.08 (1.61,2.68)
8*	348	2.68 (1.94,3.70)
9*	65	2.68 (1.94,3.70)
10*	2	2.68 (1.94,3.70)

* No revision occurred after the termination of the red curve in Figure 127; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.903 (0.676,1.207). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 504: Reasons for revision following primary THA for Corail stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	18	27.3
2	Aseptic Loosening	15	22.7
3	Joint Infection	15	22.7
4	Peri-prosthetic fracture - Femur	10	15.2
5	Implant Failure	4	6.1
6	Malalignment	3	4.5
7	Pain	1	1.5

Table 505: Reasons for revision in first 90 days following primary THA for Corail stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	8	33.3
2	Dislocation/Instability	7	29.2
3	Joint Infection	4	16.7
4	Aseptic Loosening	3	12.5
5	Implant Failure	2	8.3

Table 506: Reasons for revision between 91 and 365 days following primary THA for Corail stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	8	44.4
2	Joint Infection	4	22.2
3	Aseptic Loosening	3	16.7
4	Implant Failure	1	5.6
5	Pain	1	5.6
6	Malalignment	1	5.6

Table 507: Distribution of approach used for Corail stem in primary THA cases.

Approach	N	Percent
Anterior	2178	61.2
Anterolateral	669	18.8
Posterior	542	15.2
Transtrochanteric	7	0.2
Missing/unknown/other	161	4.5

Table 508: Distribution of head size for Corail stem in primary THA cases.

Size (mm)	N	Percent
22	4	0.1
28	11	0.3
32	738	20.9
36	2479	70.2
40	278	7.9
44	16	0.5
Missing/unknown/other	7	0.2

Table 509: Distribution of bearing surface for Corail stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1259	35.4
Ceramic-on-plastic	2259	63.5
Ceramic-on-ceramic	0	0.0
Metal-on-metal	1	0.0
Dual mobility	6	0.2
Missing/unknown/other	32	0.9

Table 510: Distribution of polyethylene used for Corail stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	5	0.1
XLPE	3220	91.2
Antioxidant XLPE	1	0.0
Missing/unknown/other	304	8.6

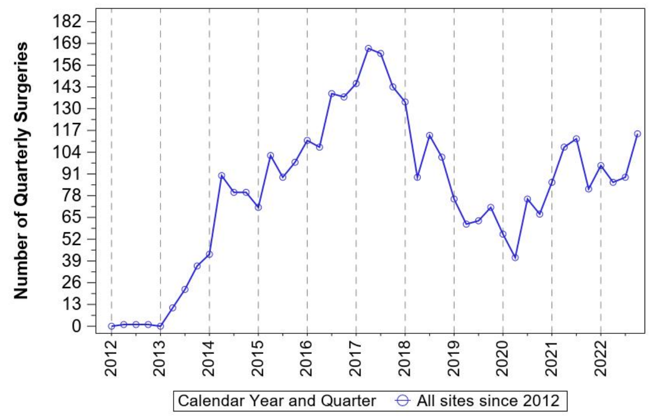

Figure 128: Utilization of the Corail stem in primary THA cases.

Catalog numbers of stems used in the analysis.

3L92502	L20311	L971118
3L92501	L971110	L971209
3L92503	L971114	L98014
3L92500	3L92498	L98013
3L92504	L20315	L971310
3L92505	3L92514	L20309
3L92499	L971115	L971208
3L92512	3L92515	L98011
L971112	L20316	3L92521
3L92511	3L92508	L98012
3L92513	L971109	L98115
L971111	3L92509	L98120
L20312	L971116	L98018
L20313	L971210	L98112
L971113	L20310	3L92518
3L92506	3L92507	L20320
L20314	3L92516	L971308
3L92510	L20318	L98010

L98015
L98016
L98020
L98113
L98114
L98116

Corail Coxa Vara
N=763

Distribution of utilization: 30 surgeons across 25 sites used this implant in primary THA.

Table 511: Volume of cases by surgeon and site for the Corail Coxa Vara stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	25 (31)	11 (39)
Cases per site	30 (41)	9 (45)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 512: Descriptive statistics of cases receiving the Corail Coxa Vara stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	441	57.8	
Age (years)	763	65.18(10.09)	66.00(13.00)
Height (cm)	760	169.89(10.40)	170.18(15.24)
Weight (kg)	760	88.35(20.11)	87.14(24.90)
BMI(kg/m^2)	760	30.49(5.77)	29.72(7.81)
Smoking - never (%)	355	46.53	
Smoking - previous (%)	300	39.32	
Smoking - current (%)	107	14.02	
Smoking - unknown (%)	1	0.13	

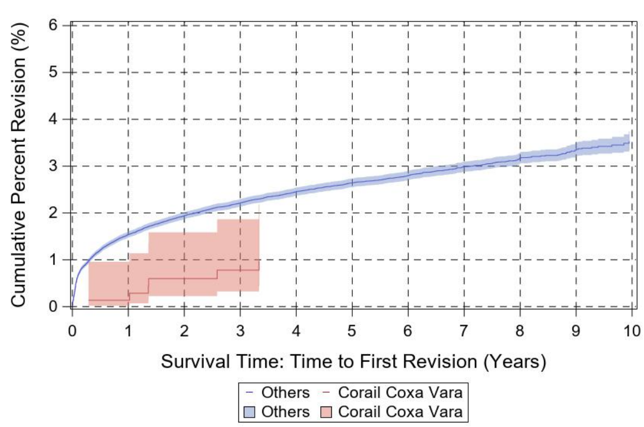

Figure 129: Cumulative percent revision curve for the Corail Coxa Vara stem compared to all other stems in primary THA.

Table 513: Cumulative percent revision and number at risk for Corail Coxa Vara stem in primary THA cases.

Year	Number at risk	CPR
0	759	0.00 (0.00,0.00)
1	666	0.14 (0.02,0.96)
2	592	0.60 (0.22,1.59)
3	528	0.78 (0.32,1.87)
4*	434	0.98 (0.44,2.18)
5*	344	0.98 (0.44,2.18)
6*	225	0.98 (0.44,2.18)
7*	134	0.98 (0.44,2.18)
8*	63	0.98 (0.44,2.18)
9*	22	0.98 (0.44,2.18)
10*	1	0.98 (0.44,2.18)

* No revision occurred after the termination of the red curve in Figure 129; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.39 (0.173,0.882). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 514: Reasons for revision following primary THA for Corail Coxa Vara stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	5	83.3
2	Dislocation/Instability	1	16.7

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 515: Reasons for revision between 91 and 365 days following primary THA for Corail Coxa Vara stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 516: Distribution of approach used for Corail Coxa Vara stem in primary THA cases.

Approach	N	Percent
Anterior	507	66.5
Anterolateral	131	17.2
Posterior	120	15.7
Transtrochanteric	0	0.0
Missing/unknown/other	5	0.7

Table 517: Distribution of head size for Corail Coxa Vara stem in primary THA cases.

Size (mm)	N	Percent
28	12	1.6
32	193	25.5
36	523	69.1
40	23	3.0
44	1	0.1
Missing/unknown/other	5	0.7

Table 518: Distribution of bearing surface for Corail Coxa Vara stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	208	27.3
Ceramic-on-plastic	541	70.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	4	0.5
Missing/unknown/other	10	1.3

Table 519: Distribution of polyethylene used for Corail Coxa Vara stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	3	0.4
XLPE	694	91.6
Antioxidant XLPE	3	0.4
Missing/unknown/other	58	7.7

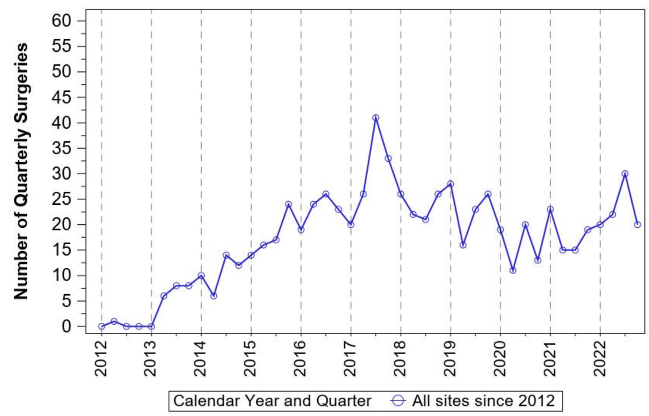

Figure 130: Utilization of the Corail Coxa Vara stem in primary THA cases.

Catalog numbers of stems used in the analysis.

3L93712	3L93714	3L93718
3L93711	3L93715	
3L93713	3L93709	
3L93710	3L93716	

Echelon
N=507

Distribution of utilization: 16 surgeons across 12 sites used this implant in primary THA.

Table 520: Volume of cases by surgeon and site for the Echelon stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	31 (53)	1 (41)
Cases per site	42 (80)	1 (41)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 521: Descriptive statistics of cases receiving the Echelon stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	292	57.59	
Age (years)	507	67.65(10.68)	68.00(15.00)
Height (cm)	507	169.03(10.84)	167.64(17.78)
Weight (kg)	507	90.62(22.79)	88.00(32.20)
BMI(kg/m^2)	507	31.57(6.76)	30.81(8.79)
Smoking - never (%)	264	52.07	
Smoking - previous (%)	187	36.88	
Smoking - current (%)	54	10.65	
Smoking - unknown (%)	2	0.39	

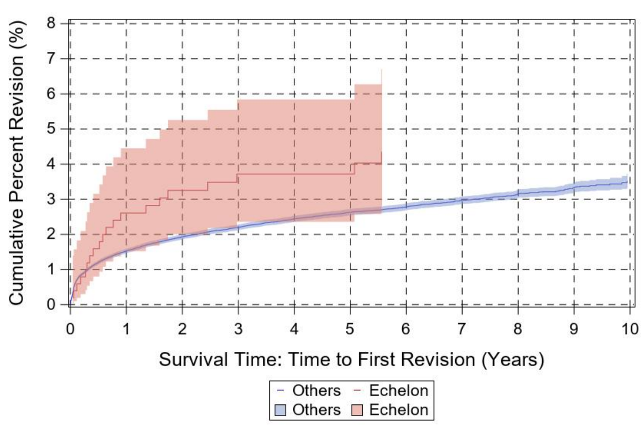

Figure 131: Cumulative percent revision curve for the Echelon stem compared to all other stems in primary THA.

Table 522: Cumulative percent revision and number at risk for Echelon stem in primary THA cases.

Year	Number at risk	CPR
0	505	0.00 (0.00,0.00)
1	471	2.61 (1.52,4.45)
2	440	3.25 (2.00,5.26)
3	408	3.72 (2.36,5.84)
4	354	3.72 (2.36,5.84)
5	308	3.72 (2.36,5.84)
6*	281	4.35 (2.81,6.71)
7*	198	4.35 (2.81,6.71)
8*	112	4.35 (2.81,6.71)
9*	39	4.35 (2.81,6.71)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 131; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.293 (0.729,2.294). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 523: Reasons for revision following primary THA for Echelon stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	7	36.8
2	Pain	4	21.1
3	Joint Infection	3	15.8
4	Aseptic Loosening	2	10.5
5	Implant Failure	1	5.3
6	Metal Reaction/Metallosis	1	5.3
7	Malalignment	1	5.3

Table 524: Reasons for revision in first 90 days following primary THA for Echelon stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	50.0
2	Implant Failure	1	25.0
3	Malalignment	1	25.0

Table 525: Reasons for revision between 91 and 365 days following primary THA for Echelon stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	50.0
2	Joint Infection	2	25.0
3	Pain	2	25.0

Table 526: Distribution of approach used for Echelon stem in primary THA cases.

Approach	N	Percent
Anterior	3	0.6
Anterolateral	24	4.7
Posterior	478	94.3
Transtrochanteric	0	0.0
Missing/unknown/other	2	0.4

Table 527: Distribution of head size for Echelon stem in primary THA cases.

Size (mm)	N	Percent
28	16	3.2
32	237	47.5
36	237	47.5
40	2	0.4
Missing/unknown/other	7	1.4

Table 528: Distribution of bearing surface for Echelon stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	247	48.7
Ceramic-on-plastic	245	48.3
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	2	0.4
Missing/unknown/other	13	2.6

Table 529: Distribution of polyethylene used for Echelon stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	384	76.7
Antioxidant XLPE	0	0.0
Missing/unknown/other	117	23.4

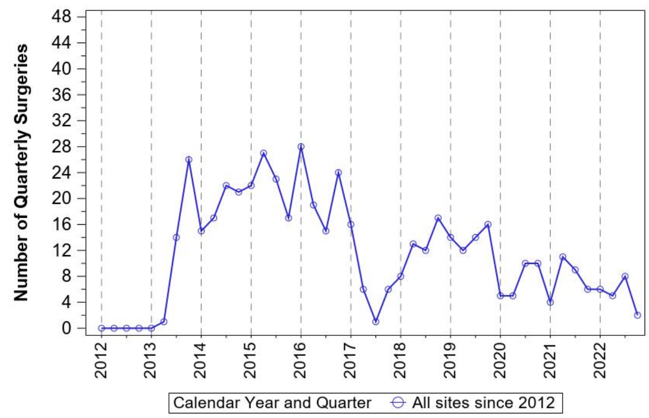

Figure 132: Utilization of the Echelon stem in primary THA cases.

Catalog numbers of stems used in the analysis.

71341012	71341011	71310414
71341013	71341025	71340114
71341014	71341026	71340612
71341015	71341017	71341018
71341023	71341027	71341029
71341022	71340115	
71341024	71341028	
71341016	71310116	

Echo Bi-Metric
N=1971

Distribution of utilization: 38 surgeons across 32 sites used this implant in primary THA.

Table 530: Volume of cases by surgeon and site for the Echo Bi-Metric stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	51 (130)	5 (66)
Cases per site	61 (151)	12 (53)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 531: Descriptive statistics of cases receiving the Echo Bi-Metric stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1105	56.06	
Age (years)	1971	66.46(10.97)	67.00(15.00)
Height (cm)	1971	169.58(10.47)	169.00(15.30)
Weight (kg)	1971	89.31(22.35)	87.15(29.67)
BMI(kg/m^2)	1971	30.93(6.74)	29.95(8.89)
Smoking - never (%)	915	46.42	
Smoking - previous (%)	735	37.29	
Smoking - current (%)	316	16.03	
Smoking - unknown (%)	5	0.25	

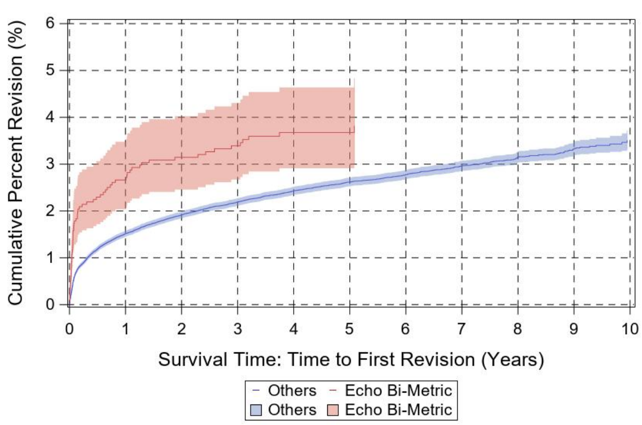

Figure 133: Cumulative percent revision curve for the Echo Bi-Metric stem compared to all other stems in primary THA.

Table 532: Cumulative percent revision and number at risk for Echo Bi-Metric stem in primary THA cases.

Year	Number at risk	CPR
0	1963	0.00 (0.00,0.00)
1	1833	2.66 (2.03,3.48)
2	1686	3.15 (2.46,4.02)
3	1465	3.39 (2.67,4.31)
4	1072	3.68 (2.91,4.64)
5	689	3.68 (2.91,4.64)
6*	469	3.82 (3.02,4.83)
7*	224	3.82 (3.02,4.83)
8*	70	3.82 (3.02,4.83)
9*	37	3.82 (3.02,4.83)
10*	14	3.82 (3.02,4.83)

* No revision occurred after the termination of the red curve in Figure 133; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 533: Reasons for revision following primary THA for Echo Bi-Metric stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	25	35.7
2	Dislocation/Instability	14	20.0
3	Joint Infection	14	20.0
4	Aseptic Loosening	10	14.3
5	Implant Failure	3	4.3
6	Malalignment	2	2.9
7	Peri-prosthetic fracture - Acetabulum	1	1.4
8	Pain	1	1.4

Table 534: Reasons for revision in first 90 days following primary THA for Echo Bi-Metric stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	23	54.8
2	Aseptic Loosening	6	14.3
3	Dislocation/Instability	5	11.9
4	Joint Infection	4	9.5
5	Malalignment	2	4.8
6	Implant Failure	1	2.4
7	Peri-prosthetic fracture - Acetabulum	1	2.4

Table 535: Reasons for revision between 91 and 365 days following primary THA for Echo Bi-Metric stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	3	30.0
2	Dislocation/Instability	3	30.0
3	Joint Infection	2	20.0
4	Implant Failure	1	10.0
5	Peri-prosthetic fracture - Femur	1	10.0

Table 536: Distribution of approach used for Echo Bi-Metric stem in primary THA cases.

Approach	N	Percent
Anterior	134	6.8
Anterolateral	63	3.2
Posterior	1768	89.7
Transtrochanteric	1	0.1
Missing/unknown/other	5	0.2

Table 537: Distribution of head size for Echo Bi-Metric stem in primary THA cases.

Size (mm)	N	Percent
28	8	0.5
32	282	15.9
36	927	52.4
40	540	30.5
Missing/unknown/other	11	0.6

Table 538: Distribution of bearing surface for Echo Bi-Metric stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	319	16.2
Ceramic-on-plastic	1438	73.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	198	10.1
Missing/unknown/other	16	0.8

Table 539: Distribution of polyethylene used for Echo Bi-Metric stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	6	0.3
XLPE	756	38.5
Antioxidant XLPE	590	30.0
Missing/unknown/other	612	31.2

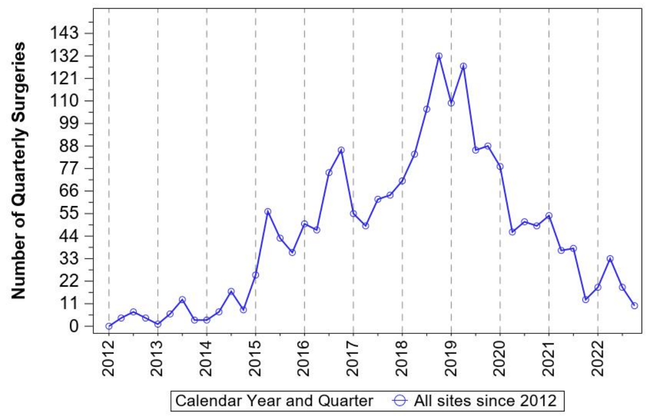

Figure 134: Utilization of the Echo Bi-Metric stem in primary THA cases.

Catalog numbers of stems used in the analysis.

192010	192412	192514
192012	192509	192017
192011	192413	192007
192113	192008	192107
192112	192512	192118
192111	192016	192515
192110	192116	192018
192013	192414	192416
192114	192108	192417
192014	192510	192516
192009	192513	192019
192411	192408	192020
192015	192511	192119
192115	192508	192517
192109	192407	192518
192410	192415	
192409	192117	

Echo Bi-Metric Microplasty
N=1841

Distribution of utilization: 26 surgeons across 26 sites used this implant in primary THA.

Table 540: Volume of cases by surgeon and site for the Echo Bi-Metric Microplasty stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	70 (109)	7 (106)
Cases per site	70 (115)	16 (86)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 541: Descriptive statistics of cases receiving the Echo Bi-Metric Microplasty stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	974	52.91	
Age (years)	1841	65.20(10.39)	66.00(15.00)
Height (cm)	1841	170.22(10.77)	170.18(15.24)
Weight (kg)	1841	88.06(20.03)	87.54(26.00)
BMI(kg/m^2)	1841	30.39(7.56)	29.76(7.92)
Smoking - never (%)	911	49.48	
Smoking - previous (%)	650	35.31	
Smoking - current (%)	275	14.94	
Smoking - unknown (%)	5	0.27	

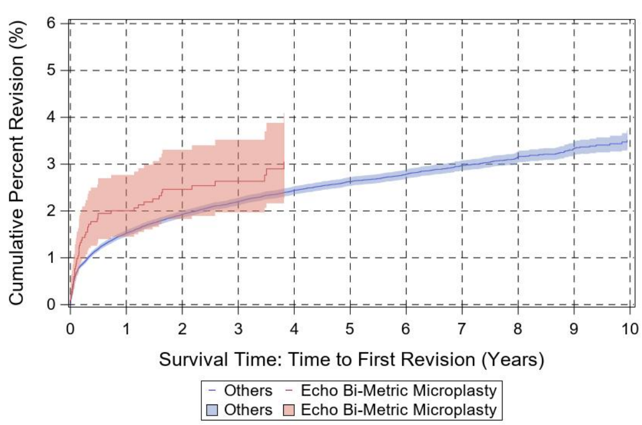

Figure 135: Cumulative percent revision curve for the Echo Bi-Metric Microplasty stem compared to all other stems in primary THA.

Table 542: Cumulative percent revision and number at risk for Echo Bi-Metric Microplasty stem in primary THA cases.

Year	Number at risk	CPR
0	1838	0.00 (0.00,0.00)
1	1618	2.01 (1.45,2.77)
2	1307	2.46 (1.83,3.31)
3	921	2.64 (1.97,3.52)
4*	581	3.05 (2.27,4.09)
5*	329	3.05 (2.27,4.09)
6*	85	3.05 (2.27,4.09)
7*	3	3.05 (2.27,4.09)
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 135; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.355 (0.974,1.887). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 543: Reasons for revision following primary THA for Echo Bi-Metric Microplasty stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	19	39.6
2	Aseptic Loosening	8	16.7
3	Dislocation/Instability	8	16.7
4	Joint Infection	5	10.4
5	Pain	3	6.2
6	Malalignment	3	6.2
7	Implant Failure	2	4.2

Table 544: Reasons for revision in first 90 days following primary THA for Echo Bi-Metric Microplasty stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	18	69.2
2	Aseptic Loosening	3	11.5
3	Dislocation/Instability	3	11.5
4	Pain	1	3.9
5	Malalignment	1	3.9

Table 545: Reasons for revision between 91 and 365 days following primary THA for Echo Bi-Metric Microplasty stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	3	30.0
2	Aseptic Loosening	2	20.0
3	Joint Infection	2	20.0
4	Implant Failure	2	20.0
5	Pain	1	10.0

Table 546: Distribution of approach used for Echo Bi-Metric Microplasty stem in primary THA cases.

Approach	N	Percent
Anterior	1367	74.2
Anterolateral	26	1.4
Posterior	444	24.1
Transtrochanteric	3	0.2
Missing/unknown/other	1	0.1

Table 547: Distribution of head size for Echo Bi-Metric Microplasty stem in primary THA cases.

Size (mm)	N	Percent
28	1	0.1
32	260	16.1
36	1142	70.6
40	207	12.8
Missing/unknown/other	8	0.5

Table 548: Distribution of bearing surface for Echo Bi-Metric Microplasty stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	255	13.8
Ceramic-on-plastic	1355	73.6
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	169	9.2
Missing/unknown/other	62	3.4

Table 549: Distribution of polyethylene used for Echo Bi-Metric Microplasty stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	845	47.3
Antioxidant XLPE	469	26.3
Missing/unknown/other	472	26.4

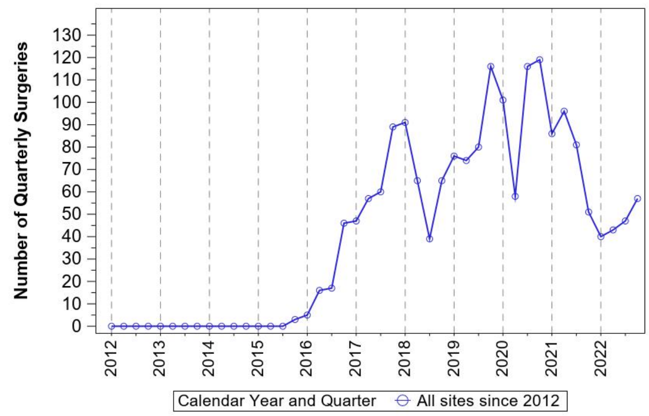

Figure 136: Utilization of the Echo Bi-Metric Microplasty stem in primary THA cases.

Catalog numbers of stems used in the analysis.

193112	193009	193007
193012	193109	192807
193111	193115	193107
193113	193015	193118
193010	193108	193018
193013	193008	193019
193011	193116	193119
193110	193016	
193014	193017	
193114	193117	

Fitmore
N=5903

Distribution of utilization: 53 surgeons across 31 sites used this implant in primary THA.

Table 550: Volume of cases by surgeon and site for the Fitmore stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	111 (369)	8 (38)
Cases per site	190 (411)	12 (140)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 551: Descriptive statistics of cases receiving the Fitmore stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2786	47.2	
Age (years)	5903	63.81(10.10)	64.00(14.00)
Height (cm)	5773	171.38(10.36)	170.20(15.40)
Weight (kg)	5773	89.55(20.76)	88.00(27.86)
BMI(kg/m^2)	5773	30.36(6.00)	29.53(7.85)
Smoking - never (%)	2910	49.3	
Smoking - previous (%)	2267	38.4	
Smoking - current (%)	716	12.13	
Smoking - unknown (%)	10	0.17	

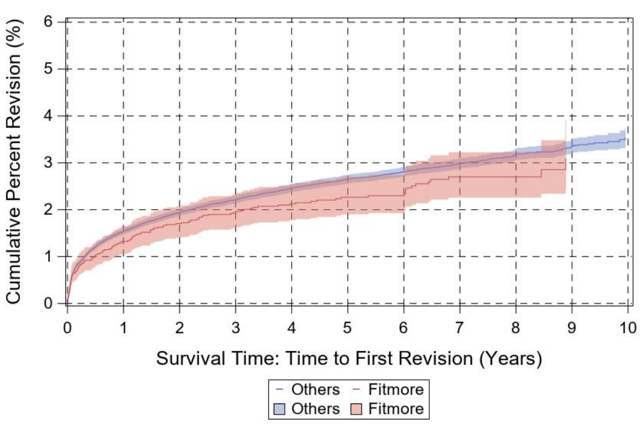

Figure 137: Cumulative percent revision curve for the Fitmore stem compared to all other stems in primary THA.

Table 552: Cumulative percent revision and number at risk for Fitmore stem in primary THA cases.

Year	Number at risk	CPR
0	5875	0.00 (0.00,0.00)
1	5575	1.32 (1.06,1.65)
2	5200	1.70 (1.40,2.07)
3	4563	1.94 (1.61,2.34)
4	3810	2.12 (1.78,2.54)
5	3143	2.27 (1.90,2.70)
6	2393	2.30 (1.93,2.74)
7	1644	2.70 (2.26,3.23)
8	920	2.70 (2.26,3.23)
9*	366	3.09 (2.44,3.91)
10*	89	3.09 (2.44,3.91)

* No revision occurred after the termination of the red curve in Figure 137; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.194 (0.938,1.521). It was 1.215 (1.134,1.302) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 553: Reasons for revision following primary THA for Fitmore stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	36	27.5
2	Dislocation/Instability	28	21.4
3	Aseptic Loosening	23	17.6
4	Joint Infection	20	15.3
5	Implant Failure	9	6.9
6	Pain	9	6.9
7	Malalignment	5	3.8
8	Peri-prosthetic fracture - Acetabulum	1	0.8

Table 554: Reasons for revision in first 90 days following primary THA for Fitmore stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	25	52.1
2	Dislocation/Instability	14	29.2
3	Implant Failure	5	10.4
4	Joint Infection	2	4.2
5	Peri-prosthetic fracture - Acetabulum	1	2.1
6	Malalignment	1	2.1

Table 555: Reasons for revision between 91 and 365 days following primary THA for Fitmore stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	6	21.4
2	Dislocation/Instability	6	21.4
3	Pain	5	17.9
4	Joint Infection	3	10.7
5	Implant Failure	3	10.7
6	Peri-prosthetic fracture - Femur	3	10.7
7	Malalignment	2	7.1

Table 556: Distribution of approach used for Fitmore stem in primary THA cases.

Approach	N	Percent
Anterior	4719	79.9
Anterolateral	47	0.8
Posterior	1001	17.0
Transtrochanteric	4	0.1
Missing/unknown/other	132	2.2

Table 557: Distribution of head size for Fitmore stem in primary THA cases.

Size (mm)	N	Percent
22	1	0.0
28	7	0.1
32	798	13.9
36	4161	72.5
40	725	12.6
Missing/unknown/other	48	0.8

Table 558: Distribution of bearing surface for Fitmore stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1143	19.4
Ceramic-on-plastic	4549	77.1
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	127	2.1
Missing/unknown/other	84	1.4

Table 559: Distribution of polyethylene used for Fitmore stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	2	0.0
XLPE	1665	28.4
Antioxidant XLPE	3389	57.8
Missing/unknown/other	807	13.8

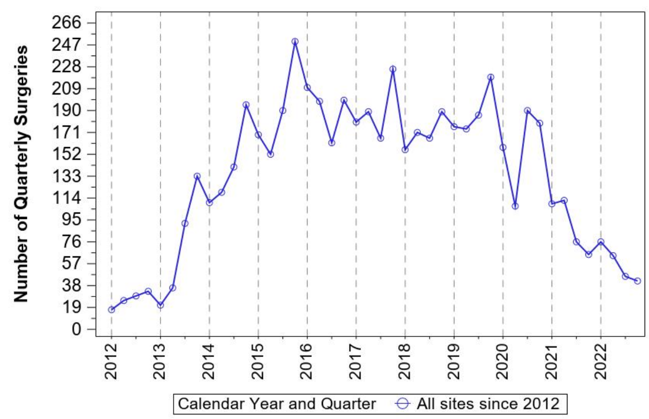

Figure 138: Utilization of the Fitmore stem in primary THA cases.

Catalog numbers of stems used in the analysis.

100551306	100551302	100551403
100551305	100551206	100551203
100551304	100551310	100551208
100551307	100551408	100551311
100551308	100551205	100551401
100551303	100551404	100551201
100551309	100551207	100551402
100551407	100551204	100551202
100551405	100551301	100551410
100551406	100551409	100551210

100551209
100551312
100551411
100551211
100551102
100551106
100551313
100551212
100551412
100551104
100551108
100551103
100551314
100551105
100551107
100551110
100551109
100551213

Integral X
N=583

Distribution of utilization: 10 surgeons used this implant at fewer than 10 sites in primary THA.

Table 560: Volume of cases by surgeon and site for the Integral X stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	58 (149)	4 (16)
Cases per site	83 (177)	12 (57)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 561: Descriptive statistics of cases receiving the Integral X stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	333	57.12	
Age (years)	583	66.34(10.55)	66.00(15.00)
Height (cm)	583	169.32(10.91)	170.18(17.78)
Weight (kg)	583	87.17(18.60)	86.40(24.65)
BMI(kg/m^2)	583	30.33(5.54)	30.06(7.25)
Smoking - never (%)	232	39.79	
Smoking - previous (%)	245	42.02	
Smoking - current (%)	106	18.18	
Smoking - unknown (%)	0	0.0	

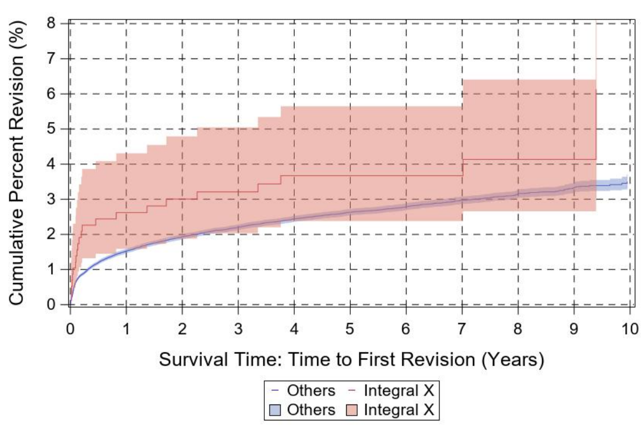

Figure 139: Cumulative percent revision curve for the Integral X stem compared to all other stems in primary THA.

Table 562: Cumulative percent revision and number at risk for Integral X stem in primary THA cases.

Year	Number at risk	CPR
0	579	0.00 (0.00,0.00)
1	532	2.62 (1.59,4.31)
2	487	3.01 (1.88,4.79)
3	447	3.21 (2.03,5.05)
4	394	3.67 (2.38,5.65)
5	321	3.67 (2.38,5.65)
6	253	3.67 (2.38,5.65)
7	208	3.67 (2.38,5.65)
8	137	4.13 (2.66,6.41)
9	59	4.13 (2.66,6.41)
10*	24	6.13 (3.04,12.17)

* No revision occurred after the termination of the red curve in Figure 139; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.34 (0.638,2.815). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 563: Reasons for revision following primary THA for Integral X stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	7	33.3
2	Peri-prosthetic fracture - Femur	7	33.3
3	Pain	3	14.3
4	Aseptic Loosening	2	9.5
5	Joint Infection	1	4.8
6	Implant Failure	1	4.8

Table 564: Reasons for revision in first 90 days following primary THA for Integral X stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	6	50.0
2	Dislocation/Instability	4	33.3
3	Pain	2	16.7

Table 565: Reasons for revision between 91 and 365 days following primary THA for Integral X stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	50.0
2	Pain	1	50.0

Table 566: Distribution of approach used for Integral X stem in primary THA cases.

Approach	N	Percent
Anterior	3	0.5
Anterolateral	67	11.5
Posterior	509	87.3
Transtrochanteric	2	0.3
Missing/unknown/other	2	0.3

Table 567: Distribution of head size for Integral X stem in primary THA cases.

Size (mm)	N	Percent
28	4	0.7
32	57	9.9
36	463	80.5
40	49	8.5
Missing/unknown/other	2	0.3

Table 568: Distribution of bearing surface for Integral X stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	312	53.5
Ceramic-on-plastic	261	44.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	6	1.0
Missing/unknown/other	4	0.7

Table 569: Distribution of polyethylene used for Integral X stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	2	0.3
XLPE	44	7.6
Antioxidant XLPE	447	76.9
Missing/unknown/other	88	15.2

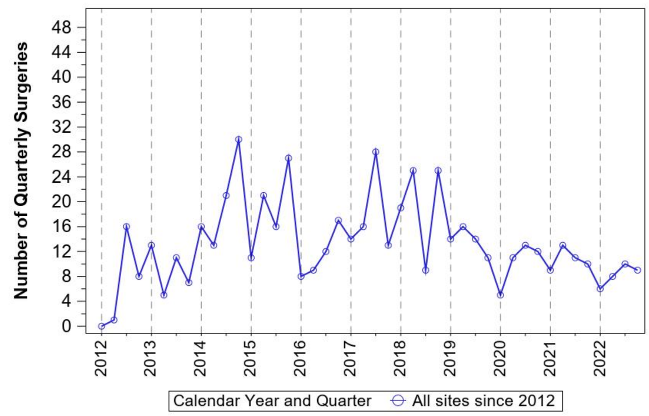

Figure 140: Utilization of the Integral X stem in primary THA cases.

Catalog numbers of stems used in the analysis.

X11170310	X170311	X12171313
X11170311	X170312	X170314
X11170312	X12171309	X170308
X11170309	X12171312	X170315
X11170308	X11170314	X12171307
X11170313	X12171308	X11170315
X170307	X12171311	X170316
X12171310	X170313	X170317
X170310	X170309	

M/L Taper
N=15064

This analysis excludes M/L Taper Kinectiv. Distribution of utilization: 81 surgeons across 42 sites used this implant in primary THA.

Table 570: Volume of cases by surgeon and site for the M/L Taper stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	186 (326)	40 (201)
Cases per site	358 (701)	92 (304)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 571: Descriptive statistics of cases receiving the M/L Taper stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	7942	52.72	
Age (years)	15064	64.88(10.42)	65.00(14.00)
Height (cm)	15055	170.26(10.40)	170.18(15.20)
Weight (kg)	15053	88.27(20.13)	86.60(27.60)
BMI(kg/m^2)	15053	30.35(6.07)	29.67(7.90)
Smoking - never (%)	7372	48.94	
Smoking - previous (%)	5773	38.32	
Smoking - current (%)	1895	12.58	
Smoking - unknown (%)	24	0.16	

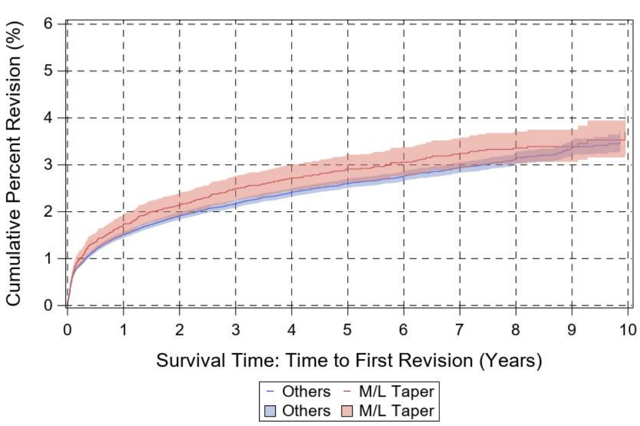

Figure 141: Cumulative percent revision curve for the M/L Taper stem compared to all other stems in primary THA.

Table 572: Cumulative percent revision and number at risk for M/L Taper stem in primary THA cases.

Year	Number at risk	CPR
0	14953	0.00 (0.00,0.00)
1	13303	1.73 (1.53,1.96)
2	11920	2.13 (1.91,2.38)
3	10667	2.50 (2.25,2.77)
4	9368	2.71 (2.45,3.00)
5	8097	2.91 (2.64,3.22)
6	6693	3.06 (2.77,3.38)
7	4976	3.24 (2.94,3.58)
8	3357	3.36 (3.04,3.71)
9	1686	3.39 (3.06,3.75)
10*	521	3.70 (3.22,4.25)

* No revision occurred after the termination of the red curve in Figure 141; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.001 (0.862,1.164). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 573: Reasons for revision following primary THA for M/L Taper stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	105	27.4
2	Dislocation/Instability	97	25.3
3	Aseptic Loosening	64	16.7
4	Joint Infection	57	14.9
5	Implant Failure	19	5.0
6	Malalignment	13	3.4
7	Pain	12	3.1
8	Metal Reaction/Metallosis	9	2.3
9	Peri-prosthetic fracture - Acetabulum	6	1.6
10	Poly liner wear	1	0.3

Table 574: Reasons for revision in first 90 days following primary THA for M/L Taper stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	78	53.4
2	Dislocation/Instability	36	24.7
3	Aseptic Loosening	10	6.8
4	Joint Infection	9	6.2
5	Implant Failure	6	4.1
6	Peri-prosthetic fracture - Acetabulum	4	2.7
7	Malalignment	3	2.0

Table 575: Reasons for revision between 91 and 365 days following primary THA for M/L Taper stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	22	28.2
2	Joint Infection	20	25.6
3	Aseptic Loosening	14	17.9
4	Peri-prosthetic fracture - Femur	9	11.5
5	Implant Failure	6	7.7
6	Pain	5	6.4
7	Peri-prosthetic fracture - Acetabulum	1	1.3
8	Malalignment	1	1.3

Table 576: Distribution of approach used for M/L Taper stem in primary THA cases.

Approach	N	Percent
Anterior	2820	18.7
Anterolateral	2999	19.9
Posterior	9081	60.3
Transtrochanteric	117	0.8
Missing/unknown/other	47	0.3

Table 577: Distribution of head size for M/L Taper stem in primary THA cases.

Size (mm)	N	Percent
28	71	0.5
32	3394	22.9
36	9794	66.2
40	1379	9.3
44	1	0.0
Missing/unknown/other	167	1.1

Table 578: Distribution of bearing surface for M/L Taper stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	4188	27.8
Ceramic-on-plastic	10479	69.6
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	173	1.1
Missing/unknown/other	224	1.5

Table 579: Distribution of polyethylene used for M/L Taper stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	8862	59.3
Antioxidant XLPE	4413	29.5
Missing/unknown/other	1665	11.1

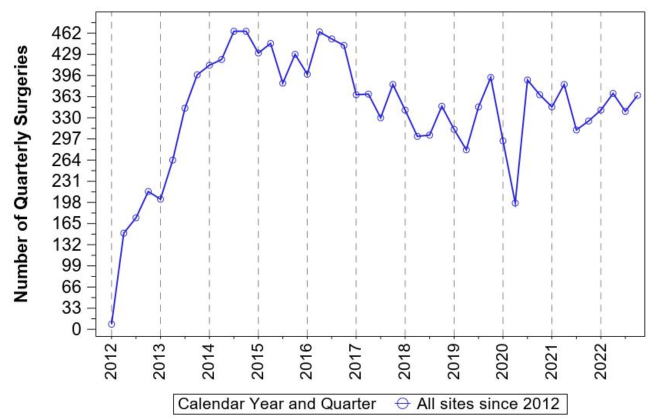

Figure 142: Utilization of the M/L Taper stem in primary THA cases.

Catalog numbers of stems used in the analysis.

771100900	771101520	771101010
771101320	771101040	771100640
771101220	771101240	771100600
771101200	771101140	771101500
771100940	771101020	771101620
771101100	771100920	771101110
771100700	771101300	771101210
771101000	771100910	771100610
771101120	771100710	771100440
771100740	771100720	771100500

771100540
771101720
771100620
771100410
771101600
771100510
771100520
771101700
771102020
771102000
771102220
771102200

M/L Taper Kinectiv
N=906

Distribution of utilization: 13 surgeons across 12 sites used this implant in primary THA.

Table 580: Volume of cases by surgeon and site for the M/L Taper Kinectiv stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	69 (99)	11 (91)
Cases per site	75 (129)	9 (96)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 581: Descriptive statistics of cases receiving the M/L Taper Kinectiv stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	517	57.06	
Age (years)	906	67.67(10.23)	68.00(15.00)
Height (cm)	906	168.70(10.56)	167.64(17.80)
Weight (kg)	906	88.08(20.27)	86.36(26.60)
BMI(kg/m^2)	906	30.83(6.01)	30.18(8.15)
Smoking - never (%)	384	42.38	
Smoking - previous (%)	395	43.6	
Smoking - current (%)	126	13.91	
Smoking - unknown (%)	1	0.11	

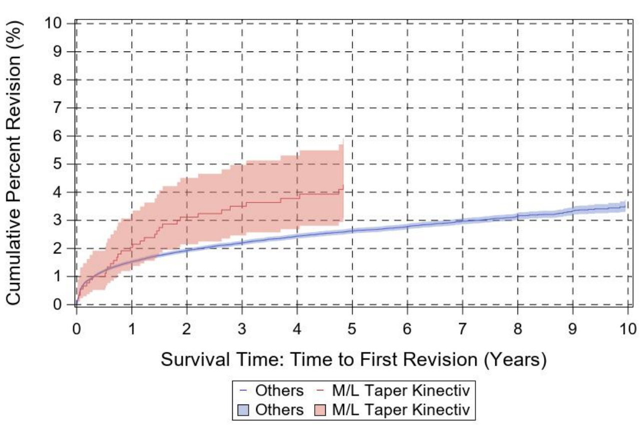

Figure 143: Cumulative percent revision curve for the M/L Taper Kinectiv stem compared to all other stems in primary THA.

Table 582: Cumulative percent revision and number at risk for M/L Taper Kinectiv stem in primary THA cases.

Year	Number at risk	CPR
0	901	0.00 (0.00,0.00)
1	842	2.03 (1.29,3.21)
2	784	3.11 (2.15,4.51)
3	724	3.50 (2.46,4.97)
4	637	3.78 (2.68,5.31)
5*	547	4.27 (3.08,5.92)
6*	469	4.27 (3.08,5.92)
7*	383	4.27 (3.08,5.92)
8*	276	4.27 (3.08,5.92)
9*	162	4.27 (3.08,5.92)
10*	54	4.27 (3.08,5.92)

* No revision occurred after the termination of the red curve in Figure 143; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.182 (0.727,1.923). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 583: Reasons for revision following primary THA for M/L Taper Kinectiv stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	8	25.0
2	Aseptic Loosening	6	18.8
3	Peri-prosthetic fracture - Femur	5	15.6
4	Malalignment	4	12.5
5	Dislocation/Instability	3	9.4
6	Pain	3	9.4
7	Osteolysis	1	3.1
8	Implant Failure	1	3.1
9	Metal Reaction/Metallosis	1	3.1

Table 584: Reasons for revision in first 90 days following primary THA for M/L Taper Kinectiv stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	3	42.9
2	Joint Infection	2	28.6
3	Aseptic Loosening	1	14.3
4	Implant Failure	1	14.3

Table 585: Reasons for revision between 91 and 365 days following primary THA for M/L Taper Kinectiv stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	4	44.4
2	Aseptic Loosening	2	22.2
3	Malalignment	2	22.2
4	Peri-prosthetic fracture - Femur	1	11.1

Table 586: Distribution of approach used for M/L Taper Kinectiv stem in primary THA cases.

Approach	N	Percent
Anterior	22	2.4
Anterolateral	801	88.4
Posterior	21	2.3
Transtrochanteric	53	5.8
Missing/unknown/other	9	1.0

Table 587: Distribution of head size for M/L Taper Kinectiv stem in primary THA cases.

Size (mm)	N	Percent
28	2	0.2
32	207	23.3
36	322	36.2
40	329	37.0
Missing/unknown/other	29	3.3

Table 588: Distribution of bearing surface for M/L Taper Kinectiv stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	357	39.4
Ceramic-on-plastic	523	57.7
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	2	0.2
Missing/unknown/other	24	2.6

Table 589: Distribution of polyethylene used for M/L Taper Kinectiv stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	487	54.7
Antioxidant XLPE	377	42.3
Missing/unknown/other	27	3.0

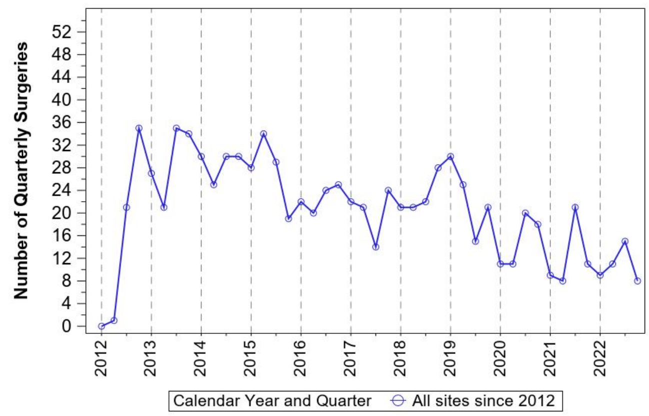

Figure 144: Utilization of the M/L Taper Kinectiv stem in primary THA cases.

Catalog numbers of stems used in the analysis.

771301000	771301300	771301700
771301100	771301500	771302000
771301200	771300600	
771300900	771301600	
771300700	771300500	

Polarstem
N=2854

Distribution of utilization: 43 surgeons across 30 sites used this implant in primary THA.

Table 590: Volume of cases by surgeon and site for the Polarstem stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	66 (174)	12 (48)
Cases per site	95 (201)	20 (63)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 591: Descriptive statistics of cases receiving the Polarstem stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1241	43.48	
Age (years)	2854	64.53(10.96)	65.00(14.00)
Height (cm)	2854	171.62(10.70)	172.70(17.70)
Weight (kg)	2854	91.70(22.04)	89.80(27.75)
BMI(kg/m^2)	2854	31.02(6.45)	30.28(8.28)
Smoking - never (%)	1258	44.08	
Smoking - previous (%)	1079	37.81	
Smoking - current (%)	505	17.69	
Smoking - unknown (%)	12	0.42	

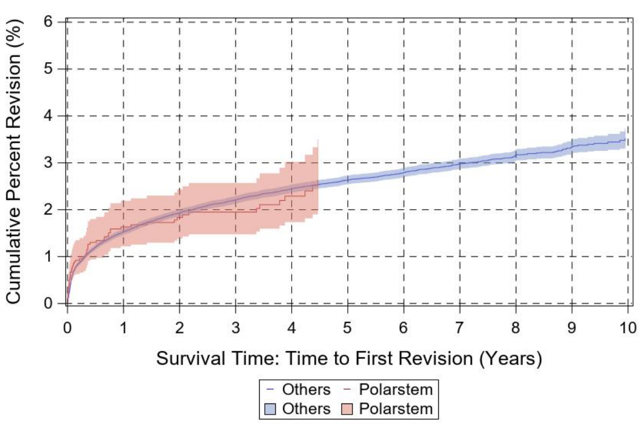

Figure 145: Cumulative percent revision curve for the Polarstem stem compared to all other stems in primary THA.

Table 592: Cumulative percent revision and number at risk for Polarstem stem in primary THA cases.

Year	Number at risk	CPR
0	2840	0.00 (0.00,0.00)
1	2244	1.63 (1.22,2.19)
2	1789	1.83 (1.38,2.43)
3	1433	1.95 (1.48,2.57)
4	984	2.29 (1.74,3.02)
5*	609	2.64 (1.99,3.50)
6*	323	2.64 (1.99,3.50)
7*	53	2.64 (1.99,3.50)
8*	6	2.64 (1.99,3.50)
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 145; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.014 (0.74,1.389). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 593: Reasons for revision following primary THA for Polarstem stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	21	36.8
2	Joint Infection	13	22.8
3	Aseptic Loosening	9	15.8
4	Dislocation/Instability	9	15.8
5	Pain	3	5.3
6	Implant Failure	1	1.8
7	Malalignment	1	1.8

Table 594: Reasons for revision in first 90 days following primary THA for Polarstem stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	18	66.7
2	Dislocation/Instability	5	18.5
3	Joint Infection	3	11.1
4	Aseptic Loosening	1	3.7

Table 595: Reasons for revision between 91 and 365 days following primary THA for Polarstem stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	7	41.2
2	Aseptic Loosening	4	23.5
3	Dislocation/Instability	2	11.8
4	Peri-prosthetic fracture - Femur	2	11.8
5	Pain	1	5.9
6	Malalignment	1	5.9

Table 596: Distribution of approach used for Polarstem stem in primary THA cases.

Approach	N	Percent
Anterior	2251	78.9
Anterolateral	238	8.3
Posterior	362	12.7
Transtrochanteric	2	0.1
Missing/unknown/other	1	0.0

Table 597: Distribution of head size for Polarstem stem in primary THA cases.

Size (mm)	N	Percent
22	1	0.0
28	7	0.3
32	474	17.8
36	2048	76.8
40	127	4.8
Missing/unknown/other	9	0.3

Table 598: Distribution of bearing surface for Polarstem stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	101	3.5
Ceramic-on-plastic	2557	89.6
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	182	6.4
Missing/unknown/other	14	0.5

Table 599: Distribution of polyethylene used for Polarstem stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	1	0.0
XLPE	2556	89.7
Antioxidant XLPE	6	0.2
Missing/unknown/other	286	10.0

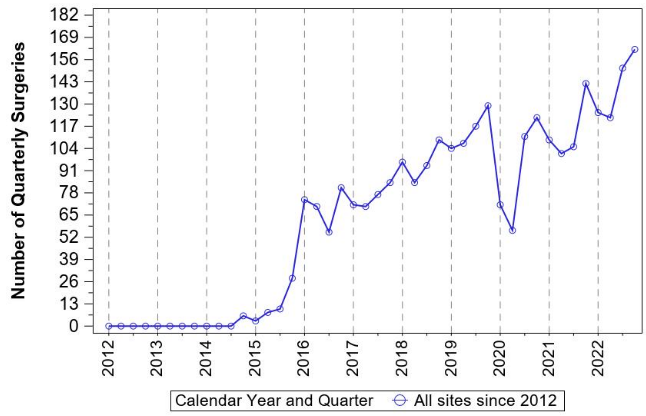

Figure 146: Utilization of the Polarstem stem in primary THA cases.

Catalog numbers of stems used in the analysis.

75100466	75100476	75100482
75100467	75100480	75102210
75100465	75018401	75102246
75100468	75018406	75102251
75100464	75100471	75102211
75100469	75018419	75102244
75018402	75102209	75102255
75018403	75100475	75102256
75018417	75100481	75100483
75100463	75018413	75102245
75018404	75018400	75102257
75018416	75018407	75102258
75100470	75100472	75102248
75018415	75100474	75100473
75100477	75102253	75102074
75018405	75102254	75102249
75100478	75102250	75102076
75018418	75102252	75102259
75100479	75018408	
75018414	75018409	

Secur-Fit
N=1785

Distribution of utilization: 46 surgeons across 27 sites used this implant in primary THA.

Table 600: Volume of cases by surgeon and site for the Secur-Fit stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	38 (97)	4 (20)
Cases per site	66 (122)	15 (58)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 601: Descriptive statistics of cases receiving the Secur-Fit stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1007	56.41	
Age (years)	1785	64.66(10.57)	65.00(13.00)
Height (cm)	1785	169.88(10.31)	170.10(15.30)
Weight (kg)	1785	91.57(22.22)	89.36(28.87)
BMI(kg/m^2)	1785	31.64(6.82)	30.74(9.09)
Smoking - never (%)	821	45.99	
Smoking - previous (%)	619	34.68	
Smoking - current (%)	334	18.71	
Smoking - unknown (%)	11	0.62	

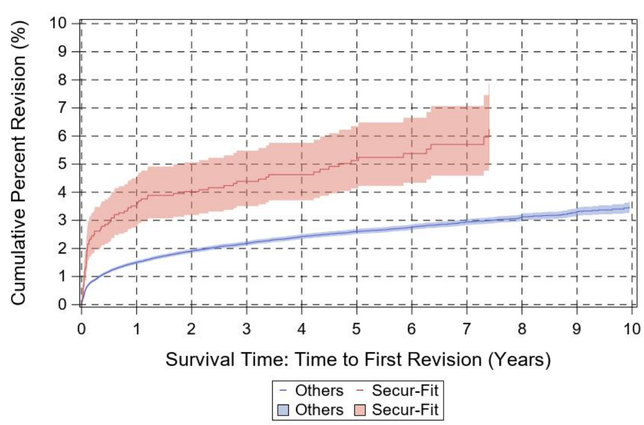

Figure 147: Cumulative percent revision curve for the Secur-Fit stem compared to all other stems in primary THA.

Table 602: Cumulative percent revision and number at risk for Secur-Fit stem in primary THA cases.

Year	Number at risk	CPR
0	1769	0.00 (0.00,0.00)
1	1551	3.51 (2.74,4.49)
2	1390	4.02 (3.19,5.07)
3	1258	4.39 (3.51,5.48)
4	1061	4.63 (3.71,5.76)
5	859	5.13 (4.13,6.35)
6	658	5.37 (4.34,6.65)
7	416	5.70 (4.59,7.07)
8*	214	6.25 (4.96,7.87)
9*	45	6.25 (4.96,7.87)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 147; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 603: Reasons for revision following primary THA for Secur-Fit stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	28	32.9
2	Aseptic Loosening	18	21.2
3	Joint Infection	14	16.5
4	Dislocation/Instability	12	14.1
5	Implant Failure	8	9.4
6	Malalignment	3	3.5
7	Peri-prosthetic fracture - Acetabulum	1	1.2
8	Metal Reaction/Metallosis	1	1.2

Table 604: Reasons for revision in first 90 days following primary THA for Secur-Fit stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	25	55.6
2	Dislocation/Instability	9	20.0
3	Joint Infection	4	8.9
4	Aseptic Loosening	3	6.7
5	Implant Failure	3	6.7
6	Malalignment	1	2.2

Table 605: Reasons for revision between 91 and 365 days following primary THA for Secur-Fit stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	6	46.1
2	Implant Failure	3	23.1
3	Aseptic Loosening	2	15.4
4	Dislocation/Instability	1	7.7
5	Malalignment	1	7.7

Table 606: Distribution of approach used for Secur-Fit stem in primary THA cases.

Approach	N	Percent
Anterior	5	0.3
Anterolateral	1026	57.5
Posterior	744	41.7
Transtrochanteric	1	0.1
Missing/unknown/other	9	0.5

Table 607: Distribution of head size for Secur-Fit stem in primary THA cases.

Size (mm)	N	Percent
28	3	0.2
32	221	15.4
36	843	58.8
40	356	24.8
Missing/unknown/other	12	0.8

Table 608: Distribution of bearing surface for Secur-Fit stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	277	15.5
Ceramic-on-plastic	1146	64.2
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	342	19.2
Missing/unknown/other	20	1.1

Table 609: Distribution of polyethylene used for Secur-Fit stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	1580	88.9
Antioxidant XLPE	0	0.0
Missing/unknown/other	197	11.1

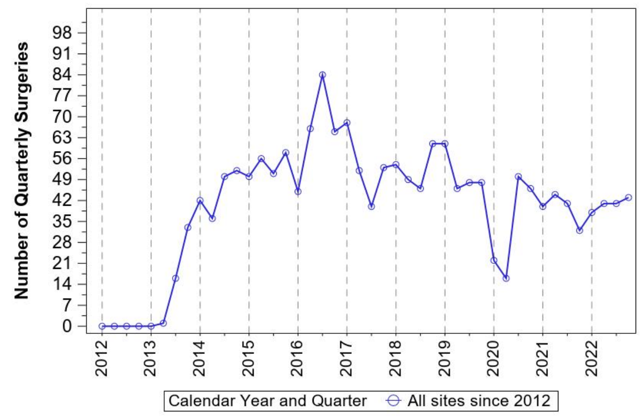

Figure 148: Utilization of the Secur-Fit stem in primary THA cases.

Catalog numbers of stems used in the analysis.

160108132	160110127	160111127
160108127	160110132	160112132
160107132	160106127	160112127
160109132	160106132	
160107127	160111132	
160109127	160105132	

Secur-Fit Max
N=3225

Distribution of utilization: 59 surgeons across 26 sites used this implant in primary THA.

Table 610: Volume of cases by surgeon and site for the Secur-Fit Max stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	54 (165)	8 (43)
Cases per site	124 (239)	23 (144)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 611: Descriptive statistics of cases receiving the Secur-Fit Max stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1625	50.39	
Age (years)	3225	63.70(11.23)	65.00(14.00)
Height (cm)	3225	170.51(10.24)	170.18(15.20)
Weight (kg)	3225	91.67(21.85)	89.40(27.95)
BMI(kg/m^2)	3225	31.42(6.53)	30.74(8.52)
Smoking - never (%)	1526	47.32	
Smoking - previous (%)	1236	38.33	
Smoking - current (%)	454	14.08	
Smoking - unknown (%)	9	0.28	

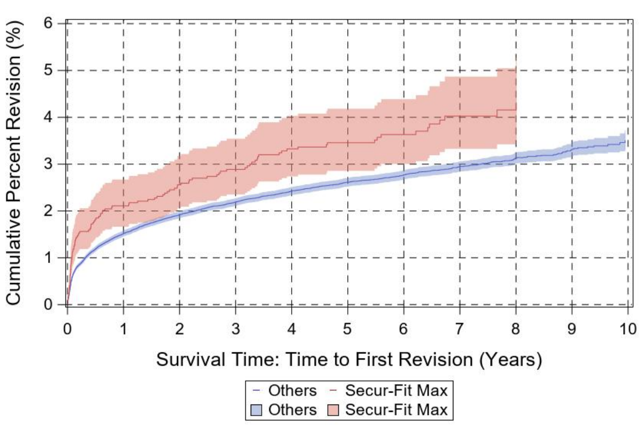

Figure 149: Cumulative percent revision curve for the Secur-Fit Max stem compared to all other stems in primary THA.

Table 612: Cumulative percent revision and number at risk for Secur-Fit Max stem in primary THA cases.

Year	Number at risk	CPR
0	3206	0.00 (0.00,0.00)
1	2956	2.11 (1.66,2.67)
2	2760	2.56 (2.06,3.18)
3	2552	2.89 (2.35,3.54)
4	2317	3.32 (2.74,4.03)
5	1913	3.46 (2.86,4.18)
6	1446	3.63 (3.01,4.39)
7	1002	4.03 (3.33,4.87)
8	610	4.16 (3.42,5.05)
9*	344	4.32 (3.53,5.27)
10*	129	4.32 (3.53,5.27)

* No revision occurred after the termination of the red curve in Figure 149; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.15 (0.877,1.509). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 613: Reasons for revision following primary THA for Secur-Fit Max stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	44	40.4
2	Aseptic Loosening	20	18.3
3	Joint Infection	14	12.8
4	Dislocation/Instability	12	11.0
5	Malalignment	7	6.4
6	Implant Failure	4	3.7
7	Peri-prosthetic fracture - Acetabulum	4	3.7
8	Metal Reaction/Metallosis	2	1.8
9	Pain	2	1.8

Table 614: Reasons for revision in first 90 days following primary THA for Secur-Fit Max stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	31	63.3
2	Joint Infection	5	10.2
3	Dislocation/Instability	4	8.2
4	Aseptic Loosening	3	6.1
5	Implant Failure	2	4.1
6	Peri-prosthetic fracture - Acetabulum	2	4.1
7	Pain	1	2.0
8	Malalignment	1	2.0

Table 615: Reasons for revision between 91 and 365 days following primary THA for Secur-Fit Max stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	4	26.7
2	Peri-prosthetic fracture - Femur	4	26.7
3	Aseptic Loosening	3	20.0
4	Dislocation/Instability	3	20.0
5	Peri-prosthetic fracture - Acetabulum	1	6.7

Table 616: Distribution of approach used for Secur-Fit Max stem in primary THA cases.

Approach	N	Percent
Anterior	28	0.9
Anterolateral	1815	56.3
Posterior	1331	41.3
Transtrochanteric	23	0.7
Missing/unknown/other	28	0.9

Table 617: Distribution of head size for Secur-Fit Max stem in primary THA cases.

Size (mm)	N	Percent
22	3	0.1
28	36	1.2
32	992	34.5
36	1667	57.9
40	162	5.6
44	2	0.1
Missing/unknown/other	16	0.6

Table 618: Distribution of bearing surface for Secur-Fit Max stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1057	32.8
Ceramic-on-plastic	636	19.7
Ceramic-on-ceramic	1169	36.2
Metal-on-metal	0	0.0
Dual mobility	306	9.5
Missing/unknown/other	57	1.8

Table 619: Distribution of polyethylene used for Secur-Fit Max stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	1957	97.7
Antioxidant XLPE	1	0.1
Missing/unknown/other	46	2.3

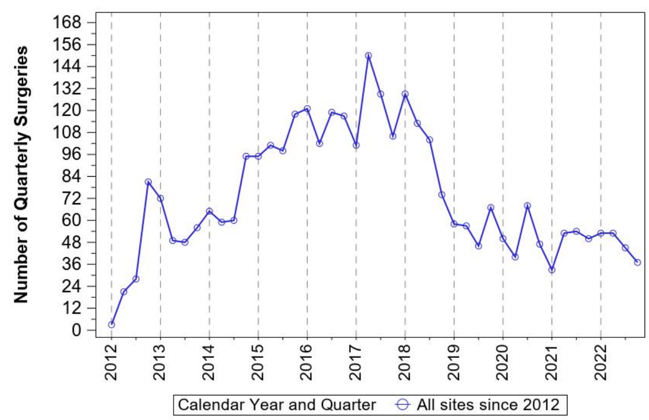

Figure 150: Utilization of the Secur-Fit Max stem in primary THA cases.

Catalog numbers of stems used in the analysis.

60510935S	60521035S	60510525S
60510830S	60520730S	60521340S
60511035S	60510625S	60511340S
60510730S	60511240S	60511440S
60520830S	60521140S	60510425S
60520935S	60520625S	
60511140S	60521240S	

Secur-Fit Plus Max
N=2145

Distribution of utilization: 35 surgeons across 21 sites used this implant in primary THA.

Table 620: Volume of cases by surgeon and site for the Secur-Fit Plus Max stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	61 (183)	7 (45)
Cases per site	102 (252)	30 (70)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 621: Descriptive statistics of cases receiving the Secur-Fit Plus Max stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1080	50.35	
Age (years)	2145	62.39(13.05)	63.00(16.00)
Height (cm)	2145	169.82(10.69)	170.00(15.24)
Weight (kg)	2145	87.32(19.85)	86.20(26.79)
BMI(kg/m^2)	2145	30.19(6.24)	29.62(7.36)
Smoking - never (%)	1003	46.76	
Smoking - previous (%)	798	37.2	
Smoking - current (%)	303	14.13	
Smoking - unknown (%)	41	1.91	

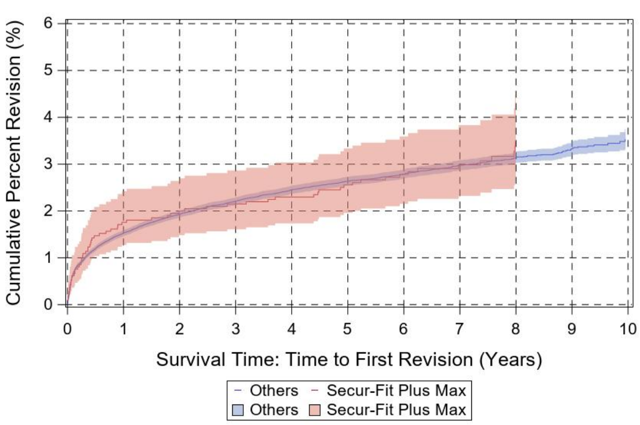

Figure 151: Cumulative percent revision curve for the Secur-Fit Plus Max stem compared to all other stems in primary THA.

Table 622: Cumulative percent revision and number at risk for Secur-Fit Plus Max stem in primary THA cases.

Year	Number at risk	CPR
0	2110	0.00 (0.00,0.00)
1	2049	1.76 (1.28,2.42)
2	2010	2.00 (1.48,2.70)
3	1983	2.15 (1.61,2.87)
4	1942	2.30 (1.74,3.04)
5	1829	2.56 (1.96,3.33)
6	1612	2.78 (2.15,3.59)
7	1245	2.98 (2.32,3.83)
8*	886	3.49 (2.72,4.47)
9*	540	3.49 (2.72,4.47)
10*	225	3.49 (2.72,4.47)

* No revision occurred after the termination of the red curve in Figure 151; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.908 (0.672,1.23). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 623: Reasons for revision following primary THA for Secur-Fit Plus Max stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	16	29.6
2	Dislocation/Instability	13	24.1
3	Joint Infection	12	22.2
4	Aseptic Loosening	7	13.0
5	Implant Failure	3	5.6
6	Metal Reaction/Metallosis	1	1.9
7	Pain	1	1.9
8	Malalignment	1	1.9

Table 624: Reasons for revision in first 90 days following primary THA for Secur-Fit Plus Max stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	8	44.4
2	Dislocation/Instability	5	27.8
3	Joint Infection	3	16.7
4	Aseptic Loosening	1	5.6
5	Implant Failure	1	5.6

Table 625: Reasons for revision between 91 and 365 days following primary THA for Secur-Fit Plus Max stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	5	55.6
2	Dislocation/Instability	3	33.3
3	Aseptic Loosening	1	11.1

Table 626: Distribution of approach used for Secur-Fit Plus Max stem in primary THA cases.

Approach	N	Percent
Anterior	8	0.4
Anterolateral	181	8.4
Posterior	1936	90.3
Transtrochanteric	4	0.2
Missing/unknown/other	16	0.8

Table 627: Distribution of head size for Secur-Fit Plus Max stem in primary THA cases.

Size (mm)	N	Percent
28	1	0.1
32	162	7.9
36	1537	74.9
40	298	14.5
44	47	2.3
Missing/unknown/other	7	0.3

Table 628: Distribution of bearing surface for Secur-Fit Plus Max stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1192	55.6
Ceramic-on-plastic	853	39.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	79	3.7
Missing/unknown/other	21	1.0

Table 629: Distribution of polyethylene used for Secur-Fit Plus Max stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	2100	98.6
Antioxidant XLPE	1	0.1
Missing/unknown/other	29	1.4

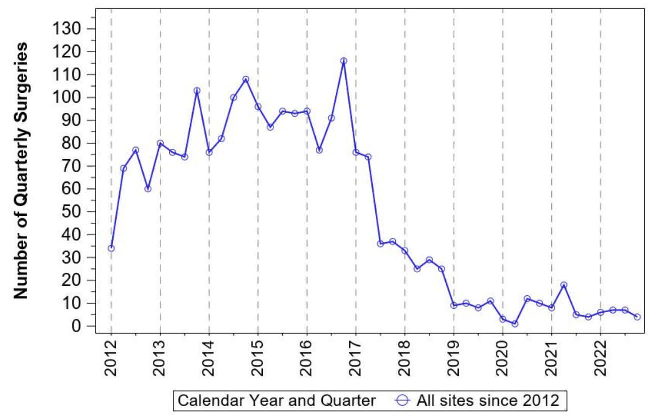

Figure 152: Utilization of the Secur-Fit Plus Max stem in primary THA cases.

Catalog numbers of stems used in the analysis.

60540913S	60540713S	S2337HF12
60540812S	60541016S	60540511S
60541014S	S2337HF10	60540509S
60540711S	60541117S	60540812
60541115S	60540610S	60540915
S2337HF08	S2337HF11	60541319S
60540814S	60540612S	S2337HF05
60540915S	S2337HF06	S2337HF13
S2337HF07	60541216S	
S2337HF09	60541218S	

SROM
N=1157

Distribution of utilization: 61 surgeons across 35 sites used this implant in primary THA.

Table 630: Volume of cases by surgeon and site for the SROM stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	19 (46)	3 (5)
Cases per site	33 (120)	3 (8)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 631: Descriptive statistics of cases receiving the SROM stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	604	52.2	
Age (years)	1157	60.95(12.58)	62.00(16.00)
Height (cm)	1156	170.25(11.82)	170.18(17.44)
Weight (kg)	1156	89.28(22.40)	88.23(29.58)
BMI(kg/m^2)	1156	30.66(6.58)	29.90(8.82)
Smoking - never (%)	574	49.61	
Smoking - previous (%)	404	34.92	
Smoking - current (%)	176	15.21	
Smoking - unknown (%)	3	0.26	

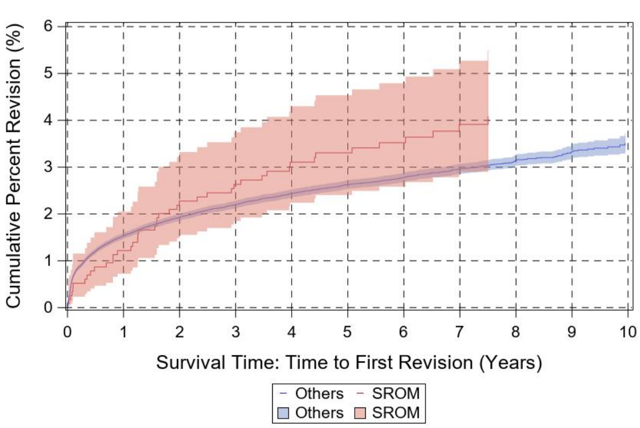

Figure 153: Cumulative percent revision curve for the SROM stem compared to all other stems in primary THA.

Table 632: Cumulative percent revision and number at risk for SROM stem in primary THA cases.

Year	Number at risk	CPR
0	1153	0.00 (0.00,0.00)
1	1130	1.22 (0.72,2.05)
2	1103	2.27 (1.55,3.32)
3	1073	2.63 (1.85,3.74)
4	996	3.11 (2.24,4.30)
5	923	3.31 (2.41,4.54)
6	812	3.52 (2.58,4.79)
7	662	3.91 (2.90,5.27)
8*	445	4.08 (3.03,5.49)
9*	208	4.08 (3.03,5.49)
10*	15	4.08 (3.03,5.49)

* No revision occurred after the termination of the red curve in Figure 153; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 633: Reasons for revision following primary THA for SROM stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	13	33.3
2	Aseptic Loosening	8	20.5
3	Dislocation/Instability	6	15.4
4	Implant Failure	6	15.4
5	Malalignment	3	7.7
6	Peri-prosthetic fracture - Femur	2	5.1
7	Pain	1	2.6

Table 634: Reasons for revision in first 90 days following primary THA for SROM stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	50.0
2	Dislocation/Instability	2	33.3
3	Peri-prosthetic fracture - Femur	1	16.7

Table 635: Reasons for revision between 91 and 365 days following primary THA for SROM stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	60.0
2	Dislocation/Instability	1	20.0
3	Implant Failure	1	20.0

Table 636: Distribution of approach used for SROM stem in primary THA cases.

Approach	N	Percent
Anterior	13	1.1
Anterolateral	604	52.2
Posterior	518	44.8
Transtrochanteric	14	1.2
Missing/unknown/other	8	0.7

Table 637: Distribution of head size for SROM stem in primary THA cases.

Size (mm)	N	Percent
22	8	0.7
28	38	3.3
32	264	23.0
36	804	69.9
40	26	2.3
44	2	0.2
Missing/unknown/other	8	0.7

Table 638: Distribution of bearing surface for SROM stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	338	29.2
Ceramic-on-plastic	802	69.3
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	3	0.3
Missing/unknown/other	14	1.2

Table 639: Distribution of polyethylene used for SROM stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	990	86.0
Antioxidant XLPE	6	0.5
Missing/unknown/other	155	13.5

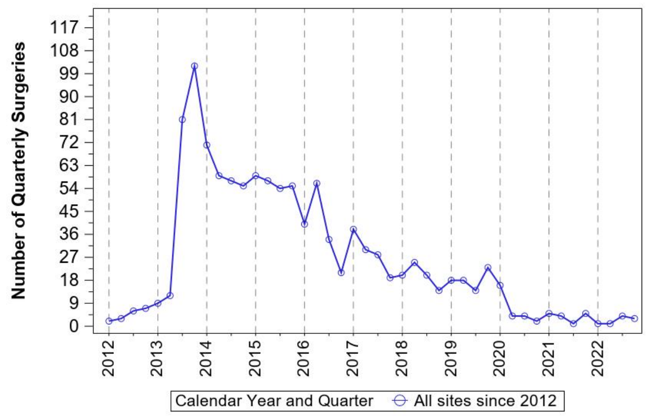

Figure 154: Utilization of the SROM stem in primary THA cases.

Catalog numbers of stems used in the analysis.

523418	523291	563216L
563618	523191	523197
563517	523394	523251
563620	523393	523396
523420	523208	526516L
563516	523293	526520L
523193	523395	526520R
563518	563626	563118L
523192	523195	563118N
563622	523424	563120L
523194	563624	563124N
523422	563118R	
523292	563120N	
563514	563122N	

Summit
N=7584

Distribution of utilization: 79 surgeons across 35 sites used this implant in primary THA.

Table 640: Volume of cases by surgeon and site for the Summit stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	96 (237)	14 (81)
Cases per site	216 (376)	58 (283)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 641: Descriptive statistics of cases receiving the Summit stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	4433	58.45	
Age (years)	7584	66.49(10.97)	67.00(15.00)
Height (cm)	7481	169.07(10.41)	168.00(17.78)
Weight (kg)	7482	89.13(22.47)	86.70(30.00)
BMI(kg/m^2)	7481	31.03(6.70)	30.12(8.72)
Smoking - never (%)	3481	45.9	
Smoking - previous (%)	3030	39.95	
Smoking - current (%)	1051	13.86	
Smoking - unknown (%)	22	0.29	

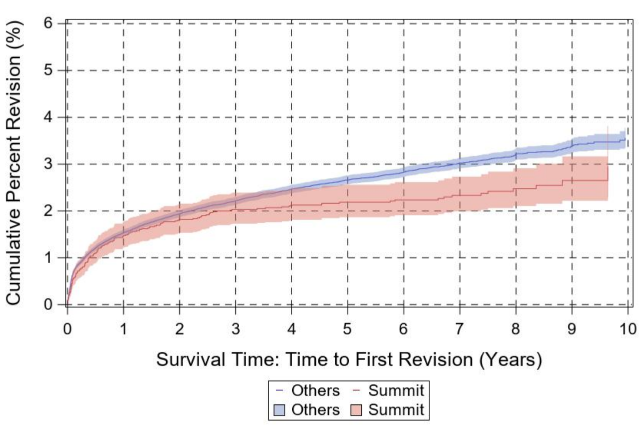

Figure 155: Cumulative percent revision curve for the Summit stem compared to all other stems in primary THA.

Table 642: Cumulative percent revision and number at risk for Summit stem in primary THA cases.

Year	Number at risk	CPR
0	7497	0.00 (0.00,0.00)
1	6827	1.48 (1.22,1.78)
2	6262	1.82 (1.54,2.16)
3	5765	2.03 (1.73,2.39)
4	5211	2.13 (1.81,2.49)
5	4554	2.19 (1.87,2.56)
6	3714	2.24 (1.91,2.62)
7	2730	2.33 (1.99,2.73)
8	1688	2.48 (2.10,2.91)
9	766	2.65 (2.22,3.17)
10*	203	2.95 (2.29,3.81)

* No revision occurred after the termination of the red curve in Figure 155; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 643: Reasons for revision following primary THA for Summit stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	44	28.9
2	Peri-prosthetic fracture - Femur	35	23.0
3	Joint Infection	32	21.1
4	Aseptic Loosening	17	11.2
5	Pain	11	7.2
6	Implant Failure	4	2.6
7	Metal Reaction/Metallosis	4	2.6
8	Peri-prosthetic fracture - Acetabulum	3	2.0
9	Osteolysis	1	0.7
10	Malalignment	1	0.7

Table 644: Reasons for revision in first 90 days following primary THA for Summit stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	30	56.6
2	Dislocation/Instability	11	20.8
3	Joint Infection	7	13.2
4	Aseptic Loosening	4	7.5
5	Peri-prosthetic fracture - Acetabulum	1	1.9

Table 645: Reasons for revision between 91 and 365 days following primary THA for Summit stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	17	38.6
2	Dislocation/Instability	15	34.1
3	Aseptic Loosening	7	15.9
4	Pain	3	6.8
5	Peri-prosthetic fracture - Acetabulum	2	4.5

Table 646: Distribution of approach used for Summit stem in primary THA cases.

Approach	N	Percent
Anterior	212	2.8
Anterolateral	2867	37.8
Posterior	4342	57.2
Transtrochanteric	36	0.5
Missing/unknown/other	127	1.7

Table 647: Distribution of head size for Summit stem in primary THA cases.

Size (mm)	N	Percent
22	4	0.1
28	89	1.2
32	1838	24.4
36	4942	65.6
40	595	7.9
44	26	0.3
Missing/unknown/other	40	0.5

Table 648: Distribution of bearing surface for Summit stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	3069	40.5
Ceramic-on-plastic	4375	57.7
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	9	0.1
Missing/unknown/other	131	1.7

Table 649: Distribution of polyethylene used for Summit stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	13	0.2
XLPE	6553	87.5
Antioxidant XLPE	1	0.0
Missing/unknown/other	922	12.3

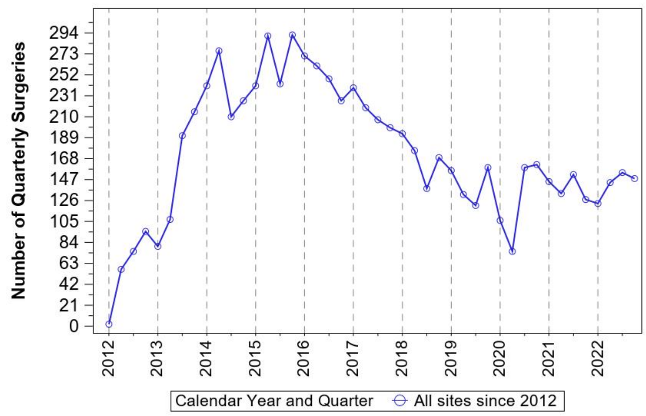

Figure 156: Utilization of the Summit stem in primary THA cases.

Catalog numbers of stems used in the analysis.

157001110	157001080	157013100
157011110	157011080	157013135
157011120	157011165	157013120
157011135	157001165	157011070
157001100	157003110	157013090
157001120	157003100	157011180
157011100	157003120	157003150
157001135	157003090	157001180
157001090	157003080	157013150
157011090	157001070	
157011150	157003135	
157001150	157013110	

Synergy
N=1527

Distribution of utilization: 44 surgeons across 31 sites used this implant in primary THA.

Table 650: Volume of cases by surgeon and site for the Synergy stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	34 (59)	5 (28)
Cases per site	49 (87)	8 (72)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 651: Descriptive statistics of cases receiving the Synergy stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	861	56.39	
Age (years)	1527	67.85(10.78)	68.00(16.00)
Height (cm)	1527	168.68(10.69)	167.64(17.78)
Weight (kg)	1527	88.50(21.17)	87.00(28.00)
BMI(kg/m^2)	1527	30.95(6.14)	30.43(8.36)
Smoking - never (%)	670	43.88	
Smoking - previous (%)	614	40.21	
Smoking - current (%)	240	15.72	
Smoking - unknown (%)	3	0.2	

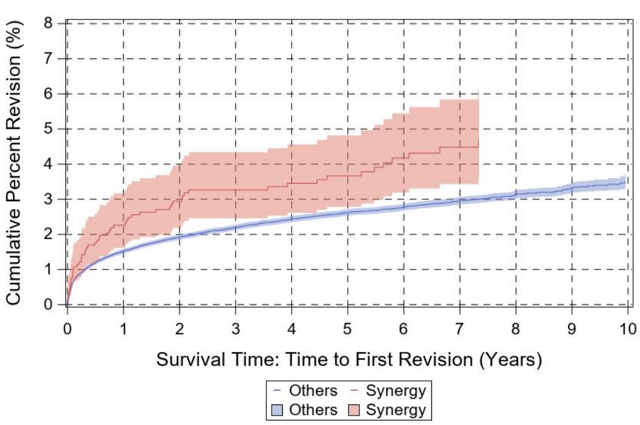

Figure 157: Cumulative percent revision curve for the Synergy stem compared to all other stems in primary THA.

Table 652: Cumulative percent revision and number at risk for Synergy stem in primary THA cases.

Year	Number at risk	CPR
0	1489	0.00 (0.00,0.00)
1	1334	2.26 (1.61,3.17)
2	1213	2.94 (2.18,3.97)
3	1120	3.27 (2.46,4.34)
4	1000	3.45 (2.61,4.56)
5	851	3.67 (2.78,4.82)
6	687	4.17 (3.19,5.45)
7	507	4.48 (3.43,5.84)
8*	324	4.69 (3.59,6.13)
9*	133	4.69 (3.59,6.13)
10*	43	4.69 (3.59,6.13)

* No revision occurred after the termination of the red curve in Figure 157; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.305 (0.933,1.826). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 653: Reasons for revision following primary THA for Synergy stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	23	46.9
2	Aseptic Loosening	7	14.3
3	Joint Infection	7	14.3
4	Peri-prosthetic fracture - Femur	7	14.3
5	Pain	2	4.1
6	Implant Failure	1	2.0
7	Metal Reaction/Metallosis	1	2.0
8	Malalignment	1	2.0

Table 654: Reasons for revision in first 90 days following primary THA for Synergy stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	8	50.0
2	Peri-prosthetic fracture - Femur	3	18.8
3	Joint Infection	2	12.5
4	Aseptic Loosening	1	6.2
5	Implant Failure	1	6.2
6	Malalignment	1	6.2

Table 655: Reasons for revision between 91 and 365 days following primary THA for Synergy stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	7	58.3
2	Aseptic Loosening	4	33.3
3	Joint Infection	1	8.3

Table 656: Distribution of approach used for Synergy stem in primary THA cases.

Approach	N	Percent
Anterior	124	8.1
Anterolateral	462	30.3
Posterior	927	60.7
Transtrochanteric	8	0.5
Missing/unknown/other	6	0.4

Table 657: Distribution of head size for Synergy stem in primary THA cases.

Size (mm)	N	Percent
22	1	0.1
28	22	1.5
32	456	31.2
36	909	62.1
40	65	4.4
44	4	0.3
Missing/unknown/other	6	0.4

Table 658: Distribution of bearing surface for Synergy stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	670	43.9
Ceramic-on-plastic	793	51.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	51	3.3
Missing/unknown/other	13	0.8

Table 659: Distribution of polyethylene used for Synergy stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	9	0.6
XLPE	1409	92.6
Antioxidant XLPE	0	0.0
Missing/unknown/other	103	6.8

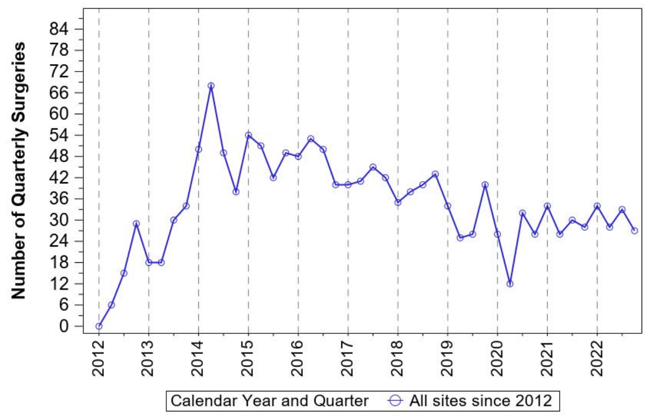

Figure 158: Utilization of the Synergy stem in primary THA cases.

Catalog numbers of stems used in the analysis.

71306614	71306617	71316009
71306114	71316011	71316216
71306613	71306118	71316214
71306113	71316012	71316215
71306612	71316212	71306110
71306615	71316010	71306610
71306112	71316211	71316016
71306115	71316213	71926107
71306116	71316014	71316017
71306616	71316015	71316217
71306117	71316210	71306609
71306611	71306618	71306608
71306111	71316013	

Taperloc
N=521

Distribution of utilization: 20 surgeons across 10 sites used this implant in primary THA.

Table 660: Volume of cases by surgeon and site for the Taperloc stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	26 (41)	6 (21)
Cases per site	52 (79)	10 (93)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 661: Descriptive statistics of cases receiving the Taperloc stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	284	54.51	
Age (years)	521	67.16(10.42)	67.00(15.00)
Height (cm)	521	169.94(10.69)	170.00(15.30)
Weight (kg)	521	88.33(20.50)	86.20(27.40)
BMI(kg/m^2)	521	30.42(5.75)	29.65(7.49)
Smoking - never (%)	235	45.11	
Smoking - previous (%)	219	42.03	
Smoking - current (%)	65	12.48	
Smoking - unknown (%)	2	0.38	

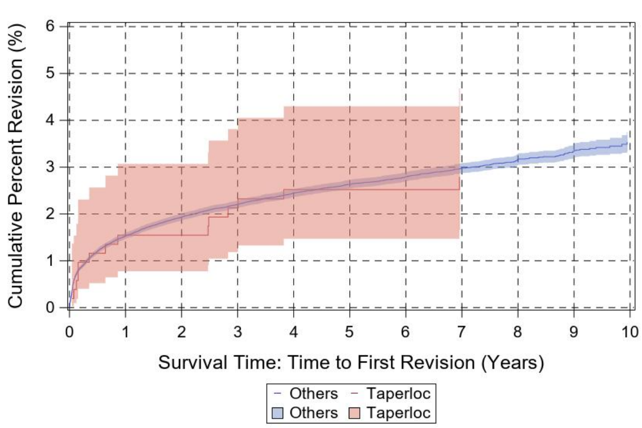

Figure 159: Cumulative percent revision curve for the Taperloc stem compared to all other stems in primary THA.

Table 662: Cumulative percent revision and number at risk for Taperloc stem in primary THA cases.

Year	Number at risk	CPR
0	517	0.00 (0.00,0.00)
1	509	1.55 (0.78,3.07)
2	508	1.55 (0.78,3.07)
3	504	2.13 (1.18,3.81)
4	491	2.52 (1.47,4.30)
5	456	2.52 (1.47,4.30)
6	420	2.52 (1.47,4.30)
7*	353	2.79 (1.66,4.68)
8*	274	2.79 (1.66,4.68)
9*	177	2.79 (1.66,4.68)
10*	109	2.79 (1.66,4.68)

* No revision occurred after the termination of the red curve in Figure 159; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.911 (0.502,1.654). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 663: Reasons for revision following primary THA for Taperloc stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	16.7
2	Dislocation/Instability	2	16.7
3	Joint Infection	2	16.7
4	Implant Failure	2	16.7
5	Peri-prosthetic fracture - Femur	2	16.7
6	Metal Reaction/Metallosis	1	8.3
7	Malalignment	1	8.3

Table 664: Reasons for revision in first 90 days following primary THA for Taperloc stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	25.0
2	Dislocation/Instability	1	25.0
3	Joint Infection	1	25.0
4	Implant Failure	1	25.0

Table 665: Reasons for revision between 91 and 365 days following primary THA for Taperloc stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	50.0
2	Implant Failure	1	50.0

Table 666: Distribution of approach used for Taperloc stem in primary THA cases.

Approach	N	Percent
Anterior	4	0.8
Anterolateral	239	45.9
Posterior	276	53.0
Transtrochanteric	0	0.0
Missing/unknown/other	2	0.4

Table 667: Distribution of head size for Taperloc stem in primary THA cases.

Size (mm)	N	Percent
28	6	1.4
32	93	21.8
36	219	51.3
40	81	19.0
44	26	6.1
Missing/unknown/other	2	0.5

Table 668: Distribution of bearing surface for Taperloc stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	293	56.2
Ceramic-on-plastic	131	25.1
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	76	14.6
Missing/unknown/other	21	4.0

Table 669: Distribution of polyethylene used for Taperloc stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	3	0.6
XLPE	169	33.6
Antioxidant XLPE	321	63.8
Missing/unknown/other	10	2.0

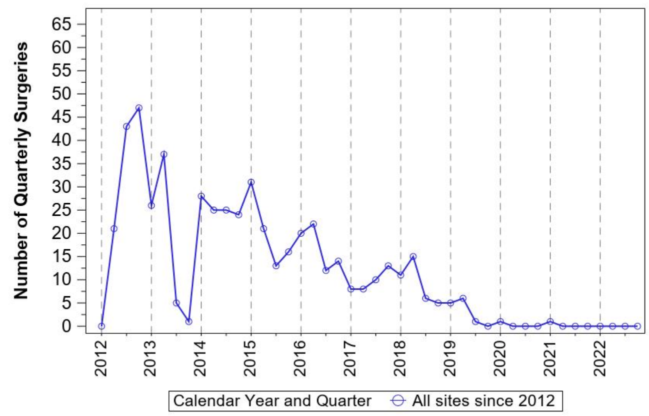

Figure 160: Utilization of the Taperloc stem in primary THA cases.

Catalog numbers of stems used in the analysis.

11103205	103207	103209
11103203	13103207	12103210
11103204	13103206	11103200
11103206	11103201	12103206
11103208	103201	12103207
11103207	13103208	12103208
103203	13103215	13103209
103205	103208	11103210
103206	13103210	12103211
11103202	11103215	13103211
103204	103200	
103202	11103209	

Taperloc 133
N=14068

Distribution of utilization: 111 surgeons across 63 sites used this implant in primary THA.

Table 670: Volume of cases by surgeon and site for the Taperloc 133 stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	126 (209)	26 (149)
Cases per site	223 (315)	62 (304)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 671: Descriptive statistics of cases receiving the Taperloc 133 stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	7515	53.42	
Age (years)	14068	64.31(10.66)	65.00(13.00)
Height (cm)	14068	170.13(10.34)	170.18(15.24)
Weight (kg)	14068	90.95(21.23)	89.40(28.40)
BMI(kg/m^2)	14068	31.32(6.37)	30.63(8.78)
Smoking - never (%)	6690	47.55	
Smoking - previous (%)	5169	36.74	
Smoking - current (%)	2110	15	
Smoking - unknown (%)	99	0.7	

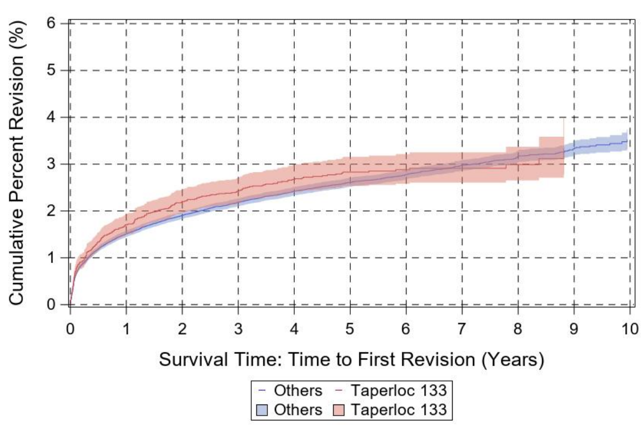

Figure 161: Cumulative percent revision curve for the Taperloc 133 stem compared to all other stems in primary THA.

Table 672: Cumulative percent revision and number at risk for Taperloc 133 stem in primary THA cases.

Year	Number at risk	CPR
0	13989	0.00 (0.00,0.00)
1	11930	1.71 (1.50,1.94)
2	10035	2.20 (1.96,2.47)
3	8420	2.43 (2.17,2.71)
4	6460	2.67 (2.40,2.98)
5	4767	2.83 (2.54,3.16)
6	3206	2.88 (2.58,3.22)
7	2014	2.91 (2.61,3.25)
8	1049	2.99 (2.65,3.37)
9*	345	3.33 (2.78,3.99)
10*	25	3.33 (2.78,3.99)

* No revision occurred after the termination of the red curve in Figure 161; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.012 (0.872,1.175). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 673: Reasons for revision following primary THA for Taperloc 133 stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	101	30.3
2	Joint Infection	74	22.2
3	Peri-prosthetic fracture - Femur	70	21.0
4	Aseptic Loosening	44	13.2
5	Pain	16	4.8
6	Implant Failure	13	3.9
7	Malalignment	9	2.7
8	Poly liner wear	3	0.9
9	Peri-prosthetic fracture - Acetabulum	3	0.9

Table 674: Reasons for revision in first 90 days following primary THA for Taperloc 133 stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	63	48.8
2	Dislocation/Instability	24	18.6
3	Joint Infection	19	14.7
4	Implant Failure	10	7.8
5	Aseptic Loosening	7	5.4
6	Malalignment	3	2.3
7	Peri-prosthetic fracture - Acetabulum	2	1.6
8	Pain	1	0.8

Table 675: Reasons for revision between 91 and 365 days following primary THA for Taperloc 133 stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	34	36.6
2	Dislocation/Instability	33	35.5
3	Aseptic Loosening	12	12.9
4	Pain	6	6.5
5	Peri-prosthetic fracture - Femur	3	3.2
6	Implant Failure	2	2.1
7	Malalignment	2	2.1
8	Peri-prosthetic fracture - Acetabulum	1	1.1

Table 676: Distribution of approach used for Taperloc 133 stem in primary THA cases.

Approach	N	Percent
Anterior	2481	17.6
Anterolateral	4476	31.8
Posterior	7056	50.2
Transtrochanteric	20	0.1
Missing/unknown/other	35	0.2

Table 677: Distribution of head size for Taperloc 133 stem in primary THA cases.

Size (mm)	N	Percent
28	14	0.1
32	998	7.8
36	8046	62.5
40	3674	28.5
44	69	0.5
Missing/unknown/other	81	0.6

Table 678: Distribution of bearing surface for Taperloc 133 stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	3593	25.5
Ceramic-on-plastic	9208	65.5
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	1059	7.5
Missing/unknown/other	208	1.5

Table 679: Distribution of polyethylene used for Taperloc 133 stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	20	0.1
XLPE	4398	31.6
Antioxidant XLPE	7289	52.3
Missing/unknown/other	2225	16.0

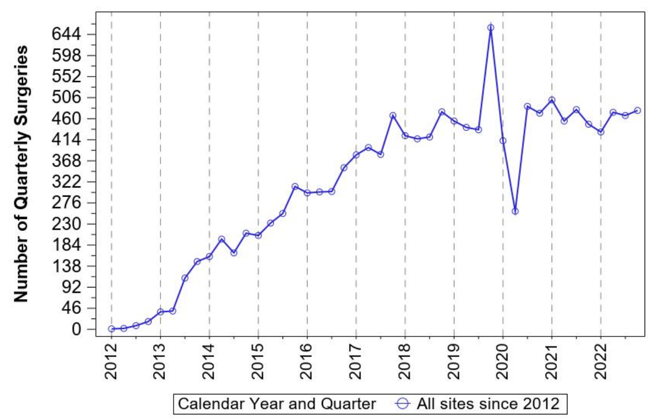

Figure 162: Utilization of the Taperloc 133 stem in primary THA cases.

Catalog numbers of stems used in the analysis.

51104120	51104160	51104180
51104130	51101080	51100070
51104110	51103090	51100060
51104100	51103130	51103160
51104140	51100080	51101050
51104090	51103150	51100050
51104150	51103140	51103180
51103110	51104170	51103170
51103100	51101070	51104200
51103120	51101060	51100040

51103200	51104220	51104240
51101150	51101160	51100120
51101130	51103220	51100130
51101120	51100090	51100160
51101090	51100110	51103240
51101110	51101170	51100100
51101140	51101180	51100170
51101100	51100140	

Taperloc 133 Microplasty
N=4687

Distribution of utilization: 61 surgeons across 42 sites used this implant in primary THA.

Table 680: Volume of cases by surgeon and site for the Taperloc 133 Microplasty stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	76 (136)	11 (89)
Cases per site	111 (165)	27 (146)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 681: Descriptive statistics of cases receiving the Taperloc 133 Microplasty stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2138	45.62	
Age (years)	4687	62.68(10.55)	63.00(14.00)
Height (cm)	4687	171.71(10.20)	172.70(15.00)
Weight (kg)	4687	89.18(19.95)	88.00(26.76)
BMI(kg/m^2)	4687	30.11(5.57)	29.65(7.30)
Smoking - never (%)	2447	52.21	
Smoking - previous (%)	1646	35.12	
Smoking - current (%)	576	12.29	
Smoking - unknown (%)	18	0.38	

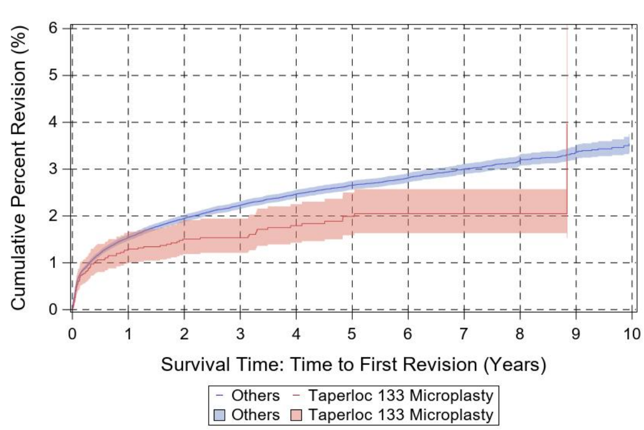

Figure 163: Cumulative percent revision curve for the Taperloc 133 Microplasty stem compared to all other stems in primary THA.

Table 682: Cumulative percent revision and number at risk for Taperloc 133 Microplasty stem in primary THA cases.

Year	Number at risk	CPR
0	4674	0.00 (0.00,0.00)
1	4140	1.29 (1.00,1.67)
2	3502	1.51 (1.19,1.91)
3	2950	1.54 (1.21,1.95)
4	2318	1.79 (1.43,2.25)
5	1739	1.99 (1.59,2.50)
6	1146	2.05 (1.63,2.57)
7	631	2.05 (1.63,2.57)
8	246	2.05 (1.63,2.57)
9*	36	3.97 (1.53,10.09)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 163; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.677 (0.532,0.862). It was 1.208 (1.128,1.295) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 683: Reasons for revision following primary THA for Taperloc 133 Microplasty stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	18	22.8
2	Peri-prosthetic fracture - Femur	18	22.8
3	Joint Infection	17	21.5
4	Aseptic Loosening	16	20.3
5	Implant Failure	4	5.1
6	Malalignment	4	5.1
7	Pain	2	2.5

Table 684: Reasons for revision in first 90 days following primary THA for Taperloc 133 Microplasty stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	16	44.4
2	Joint Infection	6	16.7
3	Aseptic Loosening	5	13.9
4	Dislocation/Instability	4	11.1
5	Implant Failure	4	11.1
6	Malalignment	1	2.8

Table 685: Reasons for revision between 91 and 365 days following primary THA for Taperloc 133 Microplasty stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	9	42.9
2	Aseptic Loosening	7	33.3
3	Joint Infection	4	19.1
4	Malalignment	1	4.8

Table 686: Distribution of approach used for Taperloc 133 Microplasty stem in primary THA cases.

Approach	N	Percent
Anterior	3296	70.3
Anterolateral	135	2.9
Posterior	1248	26.6
Transtrochanteric	0	0.0
Missing/unknown/other	8	0.2

Table 687: Distribution of head size for Taperloc 133 Microplasty stem in primary THA cases.

Size (mm)	N	Percent
28	10	0.2
32	775	17.3
36	3388	75.6
40	278	6.2
44	3	0.1
Missing/unknown/other	27	0.6

Table 688: Distribution of bearing surface for Taperloc 133 Microplasty stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	550	11.7
Ceramic-on-plastic	3904	83.3
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	178	3.8
Missing/unknown/other	55	1.2

Table 689: Distribution of polyethylene used for Taperloc 133 Microplasty stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	9	0.2
XLPE	969	20.8
Antioxidant XLPE	2696	57.9
Missing/unknown/other	980	21.1

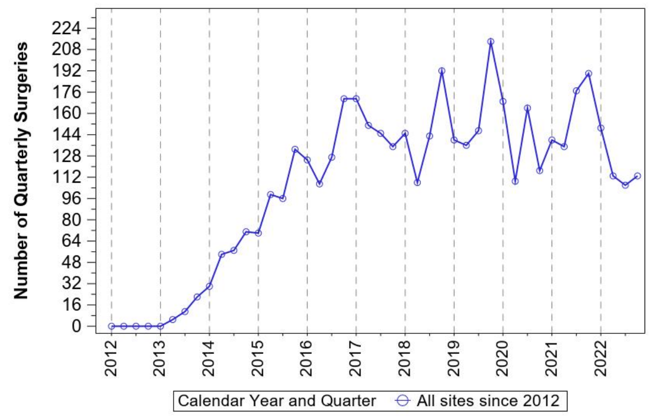

Figure 164: Utilization of the Taperloc 133 Microplasty stem in primary THA cases.

Catalog numbers of stems used in the analysis.

51107110	51106090	51109050
51107120	51109080	51108050
51107130	51108080	51106180
51106110	51106140	51106170
51107150	51107170	51106200
51107100	51109070	51107200
51107140	51106150	51108040
51106120	51107180	51106220
51106100	51108070	51107220
51106130	51108060	51107240
51107160	51106160	
51107090	51109060	

Trabecular Metal

N=1321

Distribution of utilization: 27 surgeons across 17 sites used this implant in primary THA.

Table 690: Volume of cases by surgeon and site for the Trabecular Metal stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	48 (114)	3 (17)
Cases per site	77 (158)	7 (65)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 691: Descriptive statistics of cases receiving the Trabecular Metal stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	726	54.96	
Age (years)	1321	67.11(10.81)	67.00(15.00)
Height (cm)	1321	169.41(10.55)	170.00(17.78)
Weight (kg)	1321	88.12(21.78)	86.18(29.20)
BMI(kg/m^2)	1321	30.51(6.22)	29.53(8.15)
Smoking - never (%)	573	43.38	
Smoking - previous (%)	586	44.36	
Smoking - current (%)	160	12.11	
Smoking - unknown (%)	2	0.15	

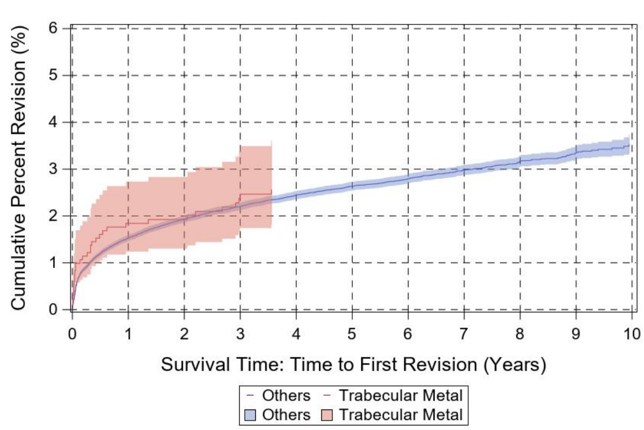

Figure 165: Cumulative percent revision curve for the Trabecular Metal stem compared to all other stems in primary THA.

Table 692: Cumulative percent revision and number at risk for Trabecular Metal stem in primary THA cases.

Year	Number at risk	CPR
0	1315	0.00 (0.00,0.00)
1	1232	1.84 (1.24,2.74)
2	1147	1.92 (1.30,2.83)
3	1047	2.47 (1.74,3.49)
4*	944	2.57 (1.82,3.61)
5*	816	2.57 (1.82,3.61)
6*	657	2.57 (1.82,3.61)
7*	446	2.57 (1.82,3.61)
8*	237	2.57 (1.82,3.61)
9*	80	2.57 (1.82,3.61)
10*	9	2.57 (1.82,3.61)

* No revision occurred after the termination of the red curve in Figure 165; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 693: Reasons for revision following primary THA for Trabecular Metal stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	13	44.8
2	Peri-prosthetic fracture - Femur	5	17.2
3	Pain	5	17.2
4	Aseptic Loosening	3	10.3
5	Joint Infection	2	6.9
6	Implant Failure	1	3.4

Table 694: Reasons for revision in first 90 days following primary THA for Trabecular Metal stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	6	42.9
2	Pain	4	28.6
3	Peri-prosthetic fracture - Femur	3	21.4
4	Implant Failure	1	7.1

Table 695: Reasons for revision between 91 and 365 days following primary THA for Trabecular Metal stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	5	71.4
2	Aseptic Loosening	1	14.3
3	Joint Infection	1	14.3

Table 696: Distribution of approach used for Trabecular Metal stem in primary THA cases.

Approach	N	Percent
Anterior	11	0.8
Anterolateral	1186	89.8
Posterior	116	8.8
Transtrochanteric	7	0.5
Missing/unknown/other	1	0.1

Table 697: Distribution of head size for Trabecular Metal stem in primary THA cases.

Size (mm)	N	Percent
28	7	0.5
32	477	36.6
36	699	53.7
40	83	6.4
Missing/unknown/other	36	2.8

Table 698: Distribution of bearing surface for Trabecular Metal stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	539	40.8
Ceramic-on-plastic	753	57.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	14	1.1
Missing/unknown/other	15	1.1

Table 699: Distribution of polyethylene used for Trabecular Metal stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	1035	78.7
Antioxidant XLPE	137	10.4
Missing/unknown/other	144	10.9

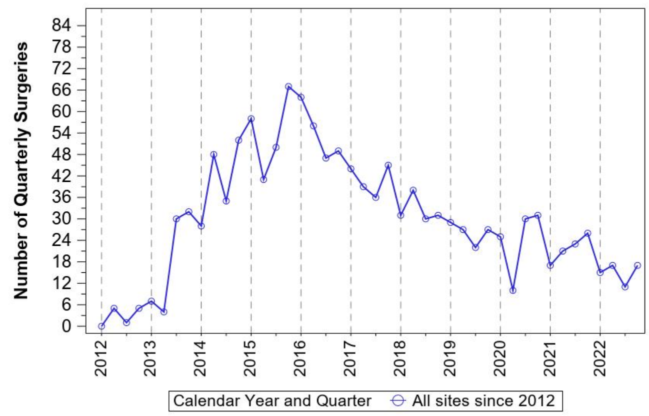

Figure 166: Utilization of the Trabecular Metal stem in primary THA cases.

Catalog numbers of stems used in the analysis.

786401320	786401520	786401000
786401420	786401500	786401700
786401220	786401100	786401720
786401300	786401120	786401820
786401200	786401620	
786401400	786401600	

Tri-Lock BPS
N=4557

Distribution of utilization: 52 surgeons across 30 sites used this implant in primary THA.

Table 700: Volume of cases by surgeon and site for the Tri-Lock BPS stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	87 (232)	9 (72)
Cases per site	151 (423)	14 (141)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 701: Descriptive statistics of cases receiving the Tri-Lock BPS stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2533	55.58	
Age (years)	4557	65.09(10.28)	65.00(13.00)
Height (cm)	4532	169.89(10.35)	170.00(15.44)
Weight (kg)	4533	88.22(20.03)	87.00(27.20)
BMI(kg/m^2)	4532	30.45(5.84)	29.84(8.23)
Smoking - never (%)	2240	49.16	
Smoking - previous (%)	1705	37.41	
Smoking - current (%)	586	12.86	
Smoking - unknown (%)	26	0.57	

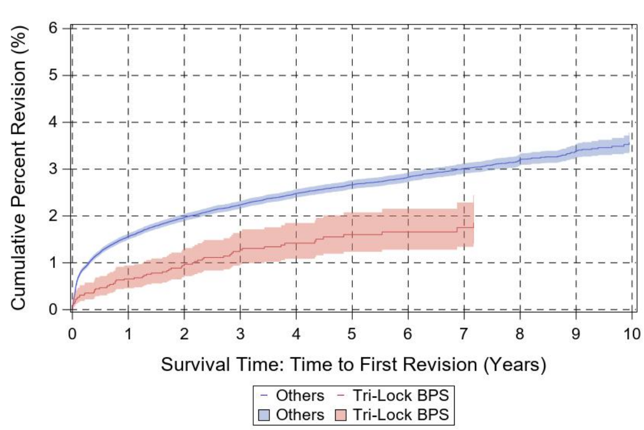

Figure 167: Cumulative percent revision curve for the Tri-Lock BPS stem compared to all other stems in primary THA.

Table 702: Cumulative percent revision and number at risk for Tri-Lock BPS stem in primary THA cases.

Year	Number at risk	CPR
0	4533	0.00 (0.00,0.00)
1	4102	0.66 (0.46,0.94)
2	3592	0.97 (0.71,1.32)
3	3002	1.27 (0.97,1.68)
4	2429	1.42 (1.09,1.85)
5	1916	1.60 (1.23,2.08)
6	1452	1.66 (1.28,2.15)
7	1004	1.75 (1.34,2.29)
8*	488	1.86 (1.41,2.45)
9*	136	1.86 (1.41,2.45)
10*	19	1.86 (1.41,2.45)

* No revision occurred after the termination of the red curve in Figure 167; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 703: Reasons for revision following primary THA for Tri-Lock BPS stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	17	27.9
2	Dislocation/Instability	17	27.9
3	Joint Infection	10	16.4
4	Peri-prosthetic fracture - Femur	10	16.4
5	Metal Reaction/Metallosis	2	3.3
6	Pain	2	3.3
7	Poly liner wear	1	1.6
8	Implant Failure	1	1.6
9	Malalignment	1	1.6

Table 704: Reasons for revision in first 90 days following primary THA for Tri-Lock BPS stem cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	9	60.0
2	Dislocation/Instability	4	26.7
3	Aseptic Loosening	1	6.7
4	Joint Infection	1	6.7

Table 705: Reasons for revision between 91 and 365 days following primary THA for Tri-Lock BPS stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	5	38.5
2	Joint Infection	5	38.5
3	Dislocation/Instability	3	23.1

Table 706: Distribution of approach used for Tri-Lock BPS stem in primary THA cases.

Approach	N	Percent
Anterior	2067	45.4
Anterolateral	768	16.9
Posterior	1679	36.8
Transtrochanteric	14	0.3
Missing/unknown/other	29	0.6

Table 707: Distribution of head size for Tri-Lock BPS stem in primary THA cases.

Size (mm)	N	Percent
22	3	0.1
28	24	0.5
32	1677	37.3
36	2511	55.8
40	269	6.0
Missing/unknown/other	15	0.3

Table 708: Distribution of bearing surface for Tri-Lock BPS stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1796	39.4
Ceramic-on-plastic	2637	57.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	39	0.9
Missing/unknown/other	85	1.9

Table 709: Distribution of polyethylene used for Tri-Lock BPS stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	25	0.6
XLPE	4037	90.0
Antioxidant XLPE	2	0.0
Missing/unknown/other	423	9.4

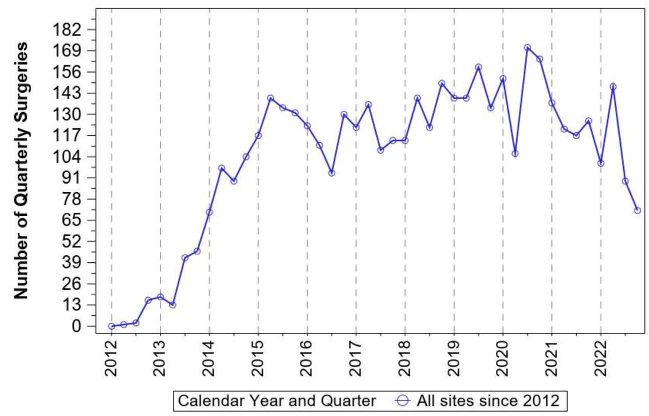

Figure 168: Utilization of the Tri-Lock BPS stem in primary THA cases.

Catalog numbers of stems used in the analysis.

101204040	101214060	101204005
101204050	101214070	101214100
101204030	101204080	101204100
101204060	101214020	101214005
101214050	101204010	101204110
101214040	101214080	101214110
101204020	101214010	101204120
101214030	101204090	101214120
101204070	101214090	

Versys Advocate
N=654

Distribution of utilization: 51 surgeons across 25 sites used this implant in primary THA.

Table 710: Volume of cases by surgeon and site for the Versys Advocate stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	12 (28)	3 (8)
Cases per site	26 (49)	5 (25)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 711: Descriptive statistics of cases receiving the Versys Advocate stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	517	79.05	
Age (years)	654	78.76(8.58)	80.00(11.00)
Height (cm)	654	164.16(9.59)	162.60(12.68)
Weight (kg)	654	72.72(15.93)	71.00(21.30)
BMI(kg/m^2)	654	26.94(5.23)	26.33(6.77)
Smoking - never (%)	364	55.66	
Smoking - previous (%)	260	39.76	
Smoking - current (%)	30	4.59	
Smoking - unknown (%)	0	0.0	

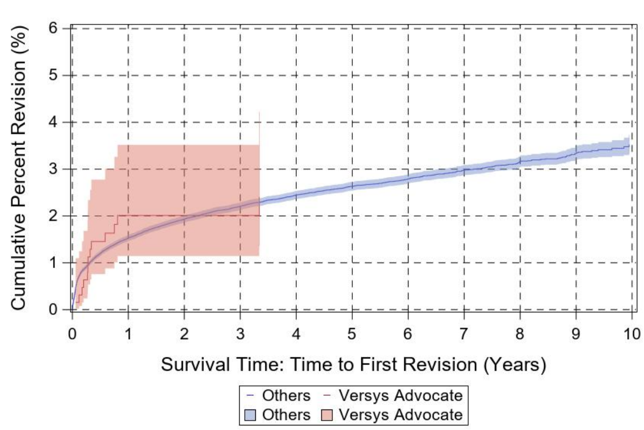

Figure 169: Cumulative percent revision curve for the Versys Advocate stem compared to all other stems in primary THA.

Table 712: Cumulative percent revision and number at risk for Versys Advocate stem in primary THA cases.

Year	Number at risk	CPR
0	650	0.00 (0.00,0.00)
1	495	2.01 (1.15,3.52)
2	395	2.01 (1.15,3.52)
3	276	2.01 (1.15,3.52)
4*	204	2.40 (1.36,4.22)
5*	154	2.40 (1.36,4.22)
6*	124	2.40 (1.36,4.22)
7*	94	2.40 (1.36,4.22)
8*	59	2.40 (1.36,4.22)
9*	31	2.40 (1.36,4.22)
10*	11	2.40 (1.36,4.22)

* No revision occurred after the termination of the red curve in Figure 169; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.864 (0.493,1.513). It was 1.213 (1.133,1.301) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 713: Reasons for revision following primary THA for Versys Advocate stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	33.3
2	Joint Infection	4	33.3
3	Aseptic Loosening	3	25.0
4	Peri-prosthetic fracture - Femur	1	8.3

Table 714: Reasons for revision in first 90 days following primary THA for Versys Advocate stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	50.0
2	Dislocation/Instability	1	25.0
3	Peri-prosthetic fracture - Femur	1	25.0

Table 715: Reasons for revision between 91 and 365 days following primary THA for Versys Advocate stem cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	4	57.1
2	Dislocation/Instability	3	42.9

Table 716: Distribution of approach used for Versys Advocate stem in primary THA cases.

Approach	N	Percent
Anterior	181	27.7
Anterolateral	66	10.1
Posterior	400	61.2
Transtrochanteric	6	0.9
Missing/unknown/other	1	0.1

Table 717: Distribution of head size for Versys Advocate stem in primary THA cases.

Size (mm)	N	Percent
28	1	0.2
32	109	17.1
36	426	66.7
40	72	11.3
Missing/unknown/other	31	4.8

Table 718: Distribution of bearing surface for Versys Advocate stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	347	53.1
Ceramic-on-plastic	261	39.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	10	1.5
Missing/unknown/other	36	5.5

Table 719: Distribution of polyethylene used for Versys Advocate stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	398	61.3
Antioxidant XLPE	164	25.3
Missing/unknown/other	87	13.4

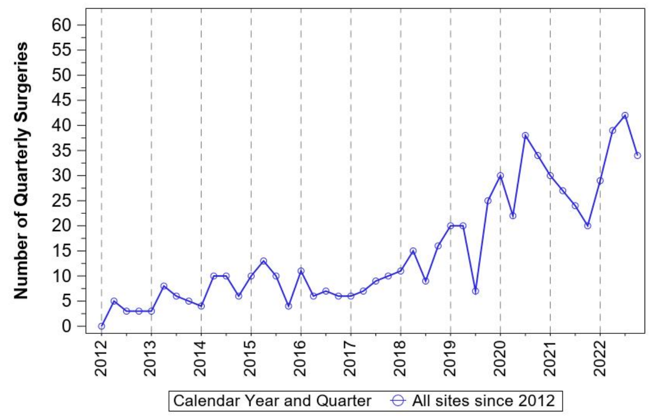

Figure 170: Utilization of the Versys Advocate stem in primary THA cases.

Catalog numbers of stems used in the analysis.

785001220	785001300	785001620
785001320	785001400	785001620
785001100	785001520	785016
785001420	785001500	785001700
785001200	785001600	

Versys Heritage

N=519

Distribution of utilization: 24 surgeons across 14 sites used this implant in primary THA.

Table 720: Volume of cases by surgeon and site for the Versys Heritage stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	21 (45)	2 (24)
Cases per site	37 (55)	10 (58)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 721: Descriptive statistics of cases receiving the Versys Heritage stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	428	82.47	
Age (years)	519	77.50(9.67)	79.00(12.00)
Height (cm)	518	163.10(9.45)	162.56(10.16)
Weight (kg)	518	73.70(16.15)	71.80(22.00)
BMI(kg/m^2)	518	27.64(5.31)	26.84(6.85)
Smoking - never (%)	279	53.76	
Smoking - previous (%)	223	42.97	
Smoking - current (%)	17	3.28	
Smoking - unknown (%)	0	0.0	

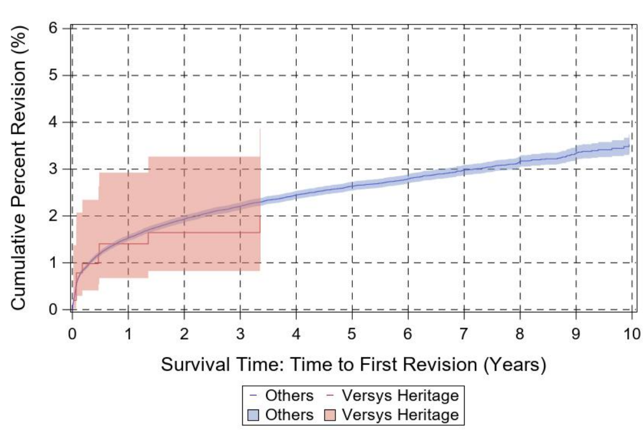

Figure 171: Cumulative percent revision curve for the Versys Heritage stem compared to all other stems in primary THA.

Table 722: Cumulative percent revision and number at risk for Versys Heritage stem in primary THA cases.

Year	Number at risk	CPR
0	514	0.00 (0.00,0.00)
1	436	1.41 (0.67,2.93)
2	367	1.64 (0.82,3.27)
3	308	1.64 (0.82,3.27)
4*	223	2.00 (1.03,3.86)
5*	149	2.00 (1.03,3.86)
6*	101	2.00 (1.03,3.86)
7*	70	2.00 (1.03,3.86)
8*	46	2.00 (1.03,3.86)
9*	33	2.00 (1.03,3.86)
10*	14	2.00 (1.03,3.86)

* No revision occurred after the termination of the red curve in Figure 171; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.723 (0.366,1.43). It was 1.214 (1.133,1.301) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 723: Reasons for revision following primary THA for Versys Heritage stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	44.4
2	Joint Infection	3	33.3
3	Aseptic Loosening	1	11.1
4	Peri-prosthetic fracture - Acetabulum	1	11.1

Table 724: Reasons for revision in first 90 days following primary THA for Versys Heritage stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	40.0
2	Joint Infection	2	40.0
3	Peri-prosthetic fracture - Acetabulum	1	20.0

Table 725: Reasons for revision between 91 and 365 days following primary THA for Versys Heritage stem cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	50.0
2	Dislocation/Instability	1	50.0

Table 726: Distribution of approach used for Versys Heritage stem in primary THA cases.

Approach	N	Percent
Anterior	76	14.6
Anterolateral	18	3.5
Posterior	420	80.9
Transtrochanteric	0	0.0
Missing/unknown/other	5	1.0

Table 727: Distribution of head size for Versys Heritage stem in primary THA cases.

Size (mm)	N	Percent
32	107	25.6
36	297	71.0
40	8	1.9
Missing/unknown/other	6	1.4

Table 728: Distribution of bearing surface for Versys Heritage stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	250	48.2
Ceramic-on-plastic	164	31.6
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	94	18.1
Missing/unknown/other	11	2.1

Table 729: Distribution of polyethylene used for Versys Heritage stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	395	77.0
Antioxidant XLPE	83	16.2
Missing/unknown/other	35	6.8

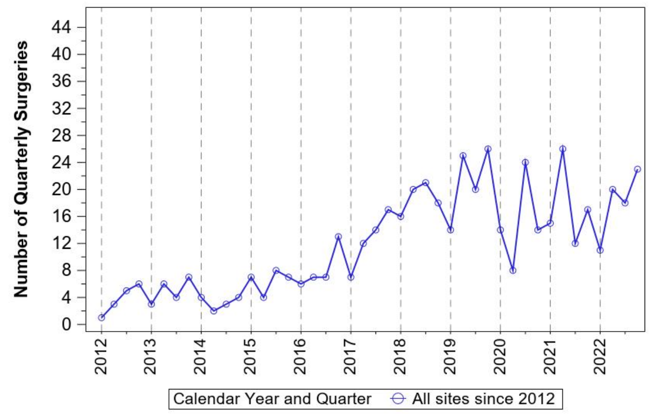

Figure 172: Utilization of the Versys Heritage stem in primary THA cases.

Catalog numbers of stems used in the analysis.

785701200	785701500	785701600
785701320	785701420	785701600
785701100	785701520	78571400
785701300	785701620	
785701400	785701700	

Wagner Cone
N=677

Distribution of utilization: 58 surgeons across 34 sites used this implant in primary THA.

Table 730: Volume of cases by surgeon and site for the Wagner Cone stem in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	11 (23)	3 (9)
Cases per site	19 (41)	4 (7)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 731: Descriptive statistics of cases receiving the Wagner Cone stem in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	506	74.74	
Age (years)	677	58.07(15.43)	59.00(20.00)
Height (cm)	646	163.79(11.34)	162.60(12.70)
Weight (kg)	646	81.70(21.62)	80.00(28.25)
BMI(kg/m^2)	646	30.36(7.12)	29.94(10.27)
Smoking - never (%)	404	59.68	
Smoking - previous (%)	189	27.92	
Smoking - current (%)	84	12.41	
Smoking - unknown (%)	0	0.0	

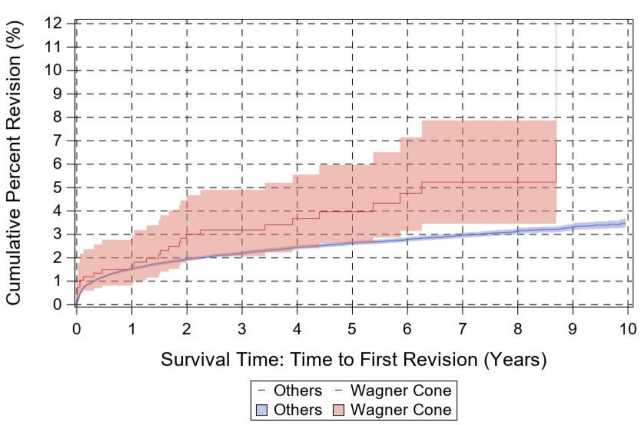

Figure 173: Cumulative percent revision curve for the Wagner Cone stem compared to all other stems in primary THA.

Table 732: Cumulative percent revision and number at risk for Wagner Cone stem in primary THA cases.

Year	Number at risk	CPR
0	672	0.00 (0.00,0.00)
1	621	1.50 (0.81,2.77)
2	552	3.00 (1.92,4.67)
3	476	3.19 (2.06,4.90)
4	358	3.67 (2.42,5.55)
5	291	3.96 (2.63,5.96)
6	217	4.76 (3.15,7.15)
7	138	5.23 (3.46,7.87)
8	87	5.23 (3.46,7.87)
9*	45	6.92 (3.92,12.08)
10*	18	6.92 (3.92,12.08)

* No revision occurred after the termination of the red curve in Figure 173; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.703 (1.148,2.527). It was 1.21 (1.129,1.297) and 0.999 (0.996,1.003) for sex (female) and age, respectively.

Table 733: Reasons for revision following primary THA for Wagner Cone stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	7	26.9
2	Aseptic Loosening	6	23.1
3	Peri-prosthetic fracture - Femur	3	11.5
4	Metal Reaction/Metallosis	3	11.5
5	Joint Infection	2	7.7
6	Malalignment	2	7.7
7	Implant Failure	1	3.8
8	Peri-prosthetic fracture - Acetabulum	1	3.8
9	Pain	1	3.8

Table 734: Reasons for revision in first 90 days following primary THA for Wagner Cone stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	2	28.6
2	Aseptic Loosening	1	14.3
3	Implant Failure	1	14.3
4	Peri-prosthetic fracture - Acetabulum	1	14.3
5	Peri-prosthetic fracture - Femur	1	14.3
6	Malalignment	1	14.3

Table 735: Reasons for revision between 91 and 365 days following primary THA for Wagner Cone stem cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	50.0
2	Peri-prosthetic fracture - Femur	1	50.0

Table 736: Distribution of approach used for Wagner Cone stem in primary THA cases.

Approach	N	Percent
Anterior	20	3.0
Anterolateral	58	8.6
Posterior	562	83.0
Transtrochanteric	1	0.1
Missing/unknown/other	36	5.3

Table 737: Distribution of head size for Wagner Cone stem in primary THA cases.

Size (mm)	N	Percent
22	1	0.2
28	11	1.9
32	129	22.1
36	369	63.3
40	67	11.5
Missing/unknown/other	6	1.0

Table 738: Distribution of bearing surface for Wagner Cone stem in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	187	27.6
Ceramic-on-plastic	391	57.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	86	12.7
Missing/unknown/other	13	1.9

Table 739: Distribution of polyethylene used for Wagner Cone stem cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	373	56.3
Antioxidant XLPE	239	36.1
Missing/unknown/other	50	7.5

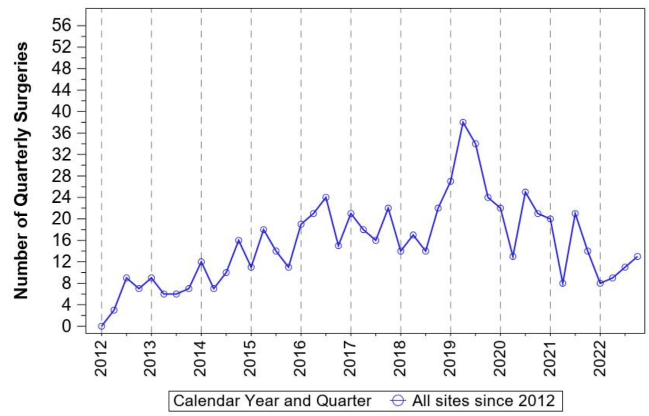

Figure 174: Utilization of the Wagner Cone stem in primary THA cases.

Catalog numbers of stems used in the analysis.

100561218	100561215	100561314
100561221	100561222	100561214
100561217	100561319	100561323
100561219	100561216	100561324
100561318	100561316	100561213
100561317	100561223	100561313
100561220	100561322	
100561320	100561315	
100561321	100561224	

2.2.6 Revision risk for commonly used cups

Table 740: Summary of cumulative percent revision following primary THA for cups having at least 500 cases, sorted alphabetically.

Cup	N*	1 year	3 years	5 years	7 years	10 years
Continuum	15628	1.80 (1.60,2.02)	2.59 (2.35,2.86)	3.03 (2.76,3.32)	3.31 (3.02,3.62)	3.83 (3.36,4.36)
Converge	514	0.78 (0.29,2.06)	1.36 (0.65,2.84)	1.56 (0.78,3.09)	1.75 (0.92,3.34)	2.27 (1.16,4.42)
G7	31158	1.62 (1.49,1.77)	2.17 (2.00,2.35)	2.54 (2.34,2.76)	2.65 (2.42,2.91)	N/A
Pinnacle	23739	1.04 (0.91,1.18)	1.61 (1.45,1.79)	1.86 (1.68,2.06)	2.05 (1.85,2.28)	2.59 (2.06,3.26)
PolarCup	585	0.86 (0.36,2.06)	1.76 (0.95,3.25)	2.25 (1.28,3.95)	2.25 (1.28,3.95)	2.25 (1.28,3.95)
Procotyl Prime	708	1.76 (1.00,3.08)	1.97 (1.15,3.39)	2.98 (1.66,5.35)	N/A	N/A
Reflection	547	1.65 (0.86,3.14)	2.56 (1.52,4.29)	2.94 (1.81,4.75)	3.55 (2.28,5.51)	3.55 (2.28,5.51)
Reflection 3	10335	2.01 (1.75,2.31)	2.84 (2.52,3.21)	3.29 (2.92,3.70)	3.74 (3.31,4.23)	3.97 (3.47,4.52)
Regenerex RingLoc+	1004	1.69 (1.06,2.71)	2.19 (1.45,3.31)	2.59 (1.77,3.78)	2.69 (1.86,3.90)	2.86 (1.98,4.12)
Restoration ADM	519	0.58 (0.19,1.78)	1.36 (0.65,2.83)	2.17 (1.21,3.89)	2.46 (1.40,4.32)	2.46 (1.40,4.32)
RingLoc	2597	1.73 (1.30,2.31)	2.39 (1.87,3.06)	2.59 (2.05,3.28)	2.71 (2.15,3.42)	3.67 (2.52,5.33)
Trabecular Metal	1923	2.04 (1.49,2.78)	3.19 (2.49,4.09)	3.97 (3.16,4.98)	4.25 (3.40,5.32)	4.65 (3.67,5.88)
Trident	30364	1.43 (1.30,1.57)	2.18 (2.02,2.35)	2.70 (2.52,2.89)	3.21 (3.00,3.44)	3.84 (3.54,4.17)
Trident II	18528	1.62 (1.44,1.82)	2.15 (1.92,2.41)	2.65 (2.05,3.43)	N/A	N/A
Trilogy	1589	1.76 (1.22,2.54)	3.05 (2.31,4.03)	3.64 (2.81,4.71)	4.48 (3.52,5.70)	4.60 (3.62,5.84)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.

We remind readers to be cautious in interpreting CPR values when the number at risk is low.

Table 741: Summary of cumulative percent revision following primary THA for cups having at least 500 cases, sorted by 10-year CPR.

Cup	N*	1 year	3 years	5 years	7 years	10 years
PolarCup	585	0.86 (0.36,2.06)	1.76 (0.95,3.25)	2.25 (1.28,3.95)	2.25 (1.28,3.95)	2.25 (1.28,3.95)
Converge	514	0.78 (0.29,2.06)	1.36 (0.65,2.84)	1.56 (0.78,3.09)	1.75 (0.92,3.34)	2.27 (1.16,4.42)
Restoration ADM	519	0.58 (0.19,1.78)	1.36 (0.65,2.83)	2.17 (1.21,3.89)	2.46 (1.40,4.32)	2.46 (1.40,4.32)
Pinnacle	23739	1.04 (0.91,1.18)	1.61 (1.45,1.79)	1.86 (1.68,2.06)	2.05 (1.85,2.28)	2.59 (2.06,3.26)
Regenerex RingLoc+	1004	1.69 (1.06,2.71)	2.19 (1.45,3.31)	2.59 (1.77,3.78)	2.69 (1.86,3.90)	2.86 (1.98,4.12)
Reflection	547	1.65 (0.86,3.14)	2.56 (1.52,4.29)	2.94 (1.81,4.75)	3.55 (2.28,5.51)	3.55 (2.28,5.51)
RingLoc	2597	1.73 (1.30,2.31)	2.39 (1.87,3.06)	2.59 (2.05,3.28)	2.71 (2.15,3.42)	3.67 (2.52,5.33)
Continuum	15628	1.80 (1.60,2.02)	2.59 (2.35,2.86)	3.03 (2.76,3.32)	3.31 (3.02,3.62)	3.83 (3.36,4.36)
Trident	30364	1.43 (1.30,1.57)	2.18 (2.02,2.35)	2.70 (2.52,2.89)	3.21 (3.00,3.44)	3.84 (3.54,4.17)
Reflection 3	10335	2.01 (1.75,2.31)	2.84 (2.52,3.21)	3.29 (2.92,3.70)	3.74 (3.31,4.23)	3.97 (3.47,4.52)
Trilogy	1589	1.76 (1.22,2.54)	3.05 (2.31,4.03)	3.64 (2.81,4.71)	4.48 (3.52,5.70)	4.60 (3.62,5.84)
Trabecular Metal	1923	2.04 (1.49,2.78)	3.19 (2.49,4.09)	3.97 (3.16,4.98)	4.25 (3.40,5.32)	4.65 (3.67,5.88)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.

We remind readers to be cautious in interpreting CPR values when the number at risk is low.

Continuum

N=15740

Distribution of utilization: 118 surgeons across 42 sites used this implant in primary THA.

Table 742: Volume of cases by surgeon and site for the Continuum cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	133 (306)	24 (87)
Cases per site	374 (709)	79 (397)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 743: Descriptive statistics of cases receiving the Continuum cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	8399	53.36	
Age (years)	15740	65.16(10.96)	65.00(15.00)
Height (cm)	15619	170.09(10.46)	170.18(15.24)
Weight (kg)	15618	87.64(20.65)	86.00(27.54)
BMI(kg/m^2)	15618	30.15(6.00)	29.42(7.84)
Smoking - never (%)	7829	49.74	
Smoking - previous (%)	6032	38.32	
Smoking - current (%)	1851	11.76	
Smoking - unknown (%)	28	0.18	

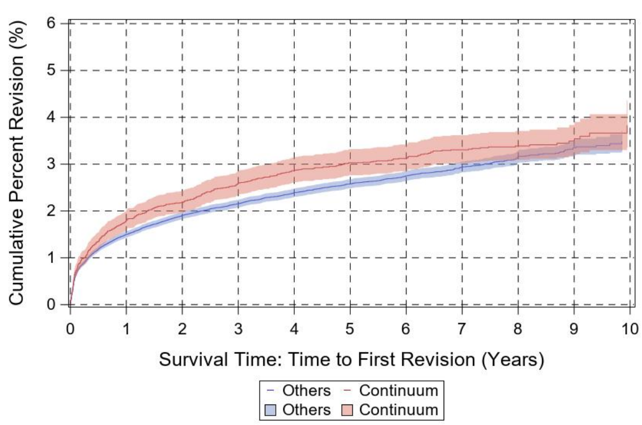

Figure 175: Cumulative percent revision curve for the Continuum cup compared to all other cups in primary THA.

Table 744: Cumulative percent revision and number at risk for Continuum cup in primary THA cases.

Year	Number at risk	CPR
0	15628	0.00 (0.00,0.00)
1	14675	1.80 (1.60,2.02)
2	13831	2.18 (1.96,2.42)
3	12972	2.59 (2.35,2.86)
4	11938	2.87 (2.61,3.15)
5	10665	3.03 (2.76,3.32)
6	8973	3.12 (2.85,3.42)
7	6962	3.31 (3.02,3.62)
8	4498	3.39 (3.09,3.71)
9	1998	3.49 (3.18,3.84)
10*	534	3.83 (3.36,4.36)

* No revision occurred after the termination of the red curve in Figure 175; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.166 (1.009,1.349). It was 1.214 (1.134,1.301) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 745: Reasons for revision following primary THA for Continuum cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	120	27.3
2	Peri-prosthetic fracture - Femur	97	22.1
3	Aseptic Loosening	75	17.1
4	Joint Infection	69	15.7
5	Pain	31	7.1
6	Malalignment	18	4.1
7	Implant Failure	16	3.6
8	Metal Reaction/Metallosis	7	1.6
9	Peri-prosthetic fracture - Acetabulum	5	1.1
10	Poly liner wear	1	0.2

Table 746: Reasons for revision in first 90 days following primary THA for Continuum cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	65	45.5
2	Dislocation/Instability	40	28.0
3	Joint Infection	12	8.4
4	Aseptic Loosening	9	6.3
5	Implant Failure	5	3.5
6	Peri-prosthetic fracture - Acetabulum	4	2.8
7	Pain	4	2.8
8	Malalignment	4	2.8

Table 747: Reasons for revision between 91 and 365 days following primary THA for Continuum cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	28	28.3
2	Joint Infection	25	25.2
3	Aseptic Loosening	17	17.2
4	Pain	10	10.1
5	Peri-prosthetic fracture - Femur	8	8.1
6	Malalignment	6	6.1
7	Implant Failure	5	5.0

Table 748: Distribution of approach used for Continuum cup in primary THA cases.

Approach	N	Percent
Anterior	4974	31.6
Anterolateral	2781	17.7
Posterior	7712	49.0
Transtrochanteric	95	0.6
Missing/unknown/other	178	1.1

Table 749: Distribution of head size for Continuum cup in primary THA cases.

Size (mm)	N	Percent
28	48	0.3
32	3416	21.8
36	10713	68.5
40	1315	8.4
Missing/unknown/other	158	1.0

Table 750: Distribution of bearing surface for Continuum cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	4789	30.4
Ceramic-on-plastic	10700	68.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	251	1.6

Table 751: Distribution of polyethylene used for Continuum cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	1	0.0
XLPE	9135	58.4
Antioxidant XLPE	5690	36.4
Missing/unknown/other	821	5.2

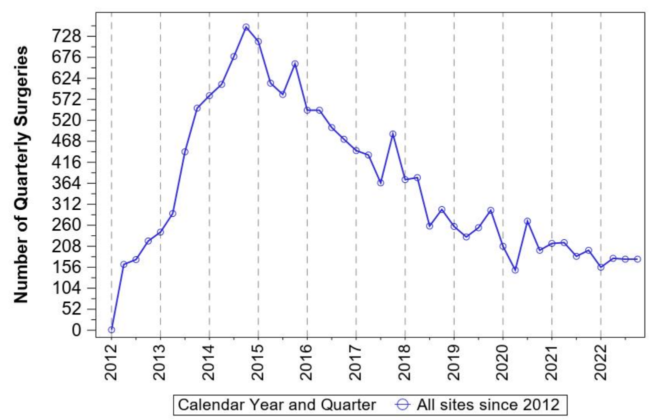

Figure 176: Utilization of the Continuum cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

875705201	875705402	875704800
875705401	875705202	875706002
875705601	875705400	875706601
875705801	875705002	875704601
875706001	875705600	875704602
875705001	875704802	875706000
875704801	875705602	875706202
875706201	875705802	875706402
875706401	875705000	875706801
875705200	875705800	875704402

875706200
875706602
875704401
875704002
875706400
875706802
875707001

Converge
N=518

Distribution of utilization: 10 surgeons used this implant at fewer than 10 sites in primary THA.

Table 752: Volume of cases by surgeon and site for the Converge cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	51 (92)	31 (43)
Cases per site	64 (82)	32 (120)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 753: Descriptive statistics of cases receiving the Converge cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	303	58.49	
Age (years)	518	67.58(11.23)	67.00(16.00)
Height (cm)	518	168.66(10.32)	167.64(16.51)
Weight (kg)	518	86.63(21.02)	83.91(29.23)
BMI(kg/m^2)	518	30.29(6.10)	29.57(8.57)
Smoking - never (%)	241	46.53	
Smoking - previous (%)	223	43.05	
Smoking - current (%)	54	10.42	
Smoking - unknown (%)	0	0.0	

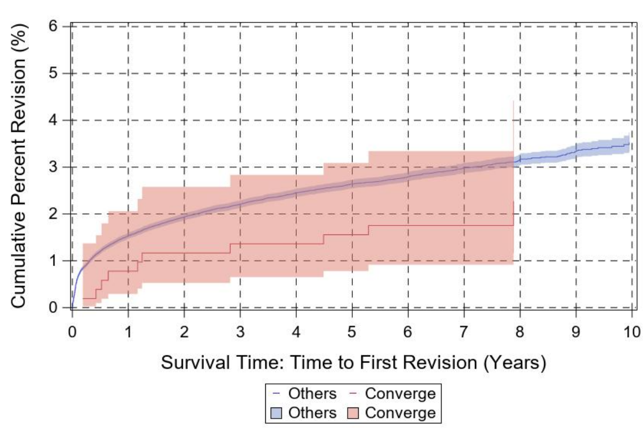

Figure 177: Cumulative percent revision curve for the Converge cup compared to all other cups in primary THA.

Table 754: Cumulative percent revision and number at risk for Converge cup in primary THA cases.

Year	Number at risk	CPR
0	514	0.00 (0.00,0.00)
1	510	0.78 (0.29,2.06)
2	508	1.17 (0.53,2.58)
3	507	1.36 (0.65,2.84)
4	507	1.36 (0.65,2.84)
5	506	1.56 (0.78,3.09)
6	442	1.75 (0.92,3.34)
7	320	1.75 (0.92,3.34)
8*	179	2.27 (1.16,4.42)
9*	92	2.27 (1.16,4.42)
10*	16	2.27 (1.16,4.42)

* No revision occurred after the termination of the red curve in Figure 177; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.645 (0.32,1.304). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 755: Reasons for revision following primary THA for Converge cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	44.4
2	Joint Infection	3	33.3
3	Aseptic Loosening	2	22.2

Table 756: Reasons for revision in first 90 days following primary THA for Converge cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	100.0

Table 757: Reasons for revision between 91 and 365 days following primary THA for Converge cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	50.0
2	Joint Infection	1	50.0

Table 758: Distribution of approach used for Converge cup in primary THA cases.

Approach	N	Percent
Anterior	4	0.8
Anterolateral	387	74.7
Posterior	119	23.0
Transtrochanteric	5	1.0
Missing/unknown/other	3	0.6

Table 759: Distribution of head size for Converge cup in primary THA cases.

Size (mm)	N	Percent
28	3	0.6
32	379	73.5
44	2	0.4
Missing/unknown/other	132	25.6

Table 760: Distribution of bearing surface for Converge cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	228	44.0
Ceramic-on-plastic	273	52.7
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	17	3.3

Table 761: Distribution of polyethylene used for Converge cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	516	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	0	0.0

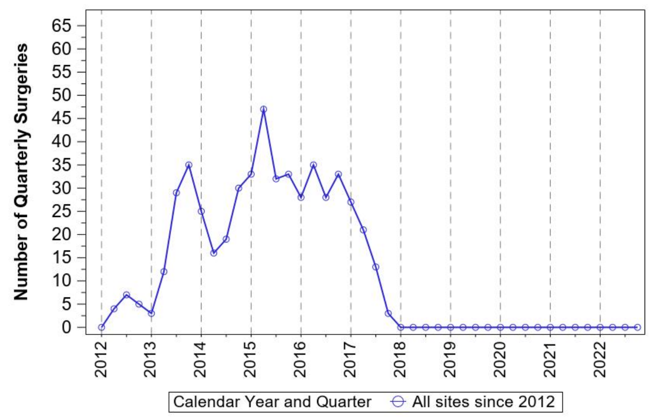

Figure 178: Utilization of the Converge cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

536100051	536000055	636100051
536100055	536100059	536000063
536100053	536000049	536000047
536100049	536000059	536100063
536100057	536100061	636100049
536000051	536000053	536000065
536000057	536000061	

G7

N=31266

Distribution of utilization: 180 surgeons across 80 sites used this implant in primary THA.

Table 762: Volume of cases by surgeon and site for the G7 cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	173 (285)	42 (203)
Cases per site	390 (505)	154 (582)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 763: Descriptive statistics of cases receiving the G7 cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	16927	54.14	
Age (years)	31266	65.22(11.04)	66.00(15.00)
Height (cm)	31023	169.89(10.50)	170.18(15.24)
Weight (kg)	31023	88.52(20.80)	87.00(28.10)
BMI(kg/m^2)	31023	30.55(6.22)	29.87(8.26)
Smoking - never (%)	15439	49.38	
Smoking - previous (%)	11575	37.02	
Smoking - current (%)	4138	13.23	
Smoking - unknown (%)	114	0.36	

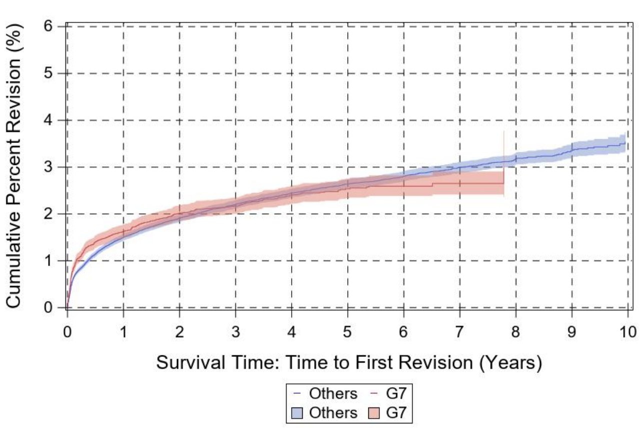

Figure 179: Cumulative percent revision curve for the G7 cup compared to all other cups in primary THA.

Table 764: Cumulative percent revision and number at risk for G7 cup in primary THA cases.

Year	Number at risk	CPR
0	31158	0.00 (0.00,0.00)
1	24460	1.62 (1.49,1.77)
2	19151	2.02 (1.86,2.19)
3	14816	2.17 (2.00,2.35)
4	9971	2.40 (2.21,2.60)
5	6079	2.54 (2.34,2.76)
6	2938	2.59 (2.38,2.82)
7	914	2.65 (2.42,2.91)
8*	219	2.99 (2.36,3.78)
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 179; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 765: Reasons for revision following primary THA for G7 cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	182	28.3
2	Dislocation/Instability	166	25.9
3	Joint Infection	117	18.2
4	Aseptic Loosening	97	15.1
5	Implant Failure	31	4.8
6	Pain	22	3.4
7	Malalignment	19	3.0
8	Peri-prosthetic fracture - Acetabulum	6	0.9
9	Poly liner wear	1	0.2
10	Metal Reaction/Metallosis	1	0.2

Table 766: Reasons for revision in first 90 days following primary THA for G7 cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	164	48.7
2	Dislocation/Instability	62	18.4
3	Joint Infection	39	11.6
4	Aseptic Loosening	32	9.5
5	Implant Failure	24	7.1
6	Malalignment	7	2.1
7	Peri-prosthetic fracture - Acetabulum	5	1.5
8	Pain	4	1.2

Table 767: Reasons for revision between 91 and 365 days following primary THA for G7 cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	56	38.6
2	Joint Infection	37	25.5
3	Aseptic Loosening	25	17.2
4	Peri-prosthetic fracture - Femur	8	5.5
5	Pain	8	5.5
6	Implant Failure	6	4.1
7	Malalignment	3	2.1
8	Poly liner wear	1	0.7
9	Peri-prosthetic fracture - Acetabulum	1	0.7

Table 768: Distribution of approach used for G7 cup in primary THA cases.

Approach	N	Percent
Anterior	12628	40.4
Anterolateral	4856	15.5
Posterior	13462	43.1
Transtrochanteric	29	0.1
Missing/unknown/other	291	0.9

Table 769: Distribution of head size for G7 cup in primary THA cases.

Size (mm)	N	Percent
28	38	0.1
32	2787	9.9
36	19825	70.3
40	5404	19.1
44	5	0.0
Missing/unknown/other	157	0.6

Table 770: Distribution of bearing surface for G7 cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	4406	14.1
Ceramic-on-plastic	23654	75.7
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	2760	8.8
Missing/unknown/other	446	1.4

Table 771: Distribution of polyethylene used for G7 cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	10096	32.7
Antioxidant XLPE	14139	45.8
Missing/unknown/other	6648	21.5

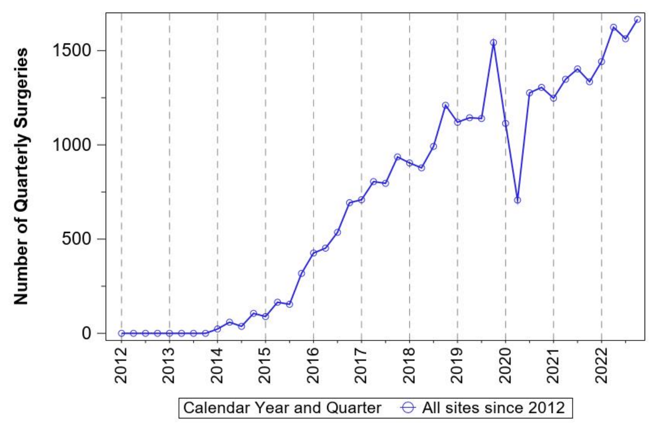

Figure 180: Utilization of the G7 cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

110010244	110017103	110017101
110010245	110010242	10000668
10000664	110017102	110010249
110010243	110017104	110017107
10000663	110017105	110010264
110010246	10000667	110010263
10000665	110010248	110010265
10000662	110017106	110010266
110010247	10000661	110010267
10000666	110010241	10000660

110017108	110010240	110017099
10000669	110017109	10000671
110010262	110010261	110010239
110017100	110010270	110010272
110010268	10000670	110010251
110010250	110010271	110017110
110010269	10000659	

Pinnacle
N=23931

Distribution of utilization: 155 surgeons across 57 sites used this implant in primary THA.

Table 772: Volume of cases by surgeon and site for the Pinnacle cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	154 (309)	18 (172)
Cases per site	419 (730)	104 (322)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 773: Descriptive statistics of cases receiving the Pinnacle cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	13779	57.58	
Age (years)	23931	65.87(10.68)	66.00(14.00)
Height (cm)	23644	169.48(10.47)	168.00(15.24)
Weight (kg)	23646	88.64(21.30)	86.64(28.90)
BMI(kg/m^2)	23644	30.73(6.40)	29.97(8.36)
Smoking - never (%)	11417	47.71	
Smoking - previous (%)	9121	38.11	
Smoking - current (%)	3338	13.95	
Smoking - unknown (%)	55	0.23	

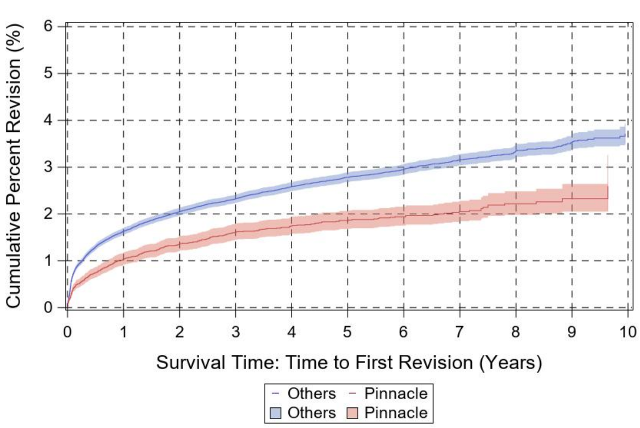

Figure 181: Cumulative percent revision curve for the Pinnacle cup compared to all other cups in primary THA.

Table 774: Cumulative percent revision and number at risk for Pinnacle cup in primary THA cases.

Year	Number at risk	CPR
0	23739	0.00 (0.00,0.00)
1	20383	1.04 (0.91,1.18)
2	17339	1.36 (1.22,1.53)
3	14780	1.61 (1.45,1.79)
4	12152	1.74 (1.57,1.94)
5	9699	1.86 (1.68,2.06)
6	7421	1.94 (1.75,2.15)
7	5209	2.05 (1.85,2.28)
8	3008	2.22 (1.98,2.48)
9	1168	2.33 (2.05,2.64)
10*	232	2.59 (2.06,3.26)

* No revision occurred after the termination of the red curve in Figure 181; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.649 (0.561,0.752). It was 1.219 (1.138,1.307) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 775: Reasons for revision following primary THA for Pinnacle cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	99	26.2
2	Joint Infection	88	23.3
3	Aseptic Loosening	66	17.5
4	Peri-prosthetic fracture - Femur	63	16.7
5	Pain	22	5.8
6	Implant Failure	16	4.2
7	Malalignment	9	2.4
8	Peri-prosthetic fracture - Acetabulum	6	1.6
9	Metal Reaction/Metallosis	6	1.6
10	Poly liner wear	2	0.5
11	Osteolysis	1	0.3

Table 776: Reasons for revision in first 90 days following primary THA for Pinnacle cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	51	41.1
2	Dislocation/Instability	35	28.2
3	Joint Infection	19	15.3
4	Aseptic Loosening	8	6.5
5	Peri-prosthetic fracture - Acetabulum	4	3.2
6	Implant Failure	3	2.4
7	Malalignment	3	2.4
8	Pain	1	0.8

Table 777: Reasons for revision between 91 and 365 days following primary THA for Pinnacle cup cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	35	36.1
2	Dislocation/Instability	31	32.0
3	Aseptic Loosening	15	15.5
4	Pain	8	8.2
5	Implant Failure	3	3.1
6	Peri-prosthetic fracture - Acetabulum	2	2.1
7	Peri-prosthetic fracture - Femur	2	2.1
8	Malalignment	1	1.0

Table 778: Distribution of approach used for Pinnacle cup in primary THA cases.

Approach	N	Percent
Anterior	8658	36.2
Anterolateral	6624	27.7
Posterior	8244	34.5
Transtrochanteric	73	0.3
Missing/unknown/other	332	1.4

Table 779: Distribution of head size for Pinnacle cup in primary THA cases.

Size (mm)	N	Percent
22	29	0.1
28	231	1.0
32	6070	25.5
36	15514	65.2
40	1812	7.6
44	46	0.2
Missing/unknown/other	89	0.4

Table 780: Distribution of bearing surface for Pinnacle cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	8083	33.8
Ceramic-on-plastic	15498	64.8
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	42	0.2
Missing/unknown/other	308	1.3

Table 781: Distribution of polyethylene used for Pinnacle cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	63	0.3
XLPE	21088	89.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	2556	10.8

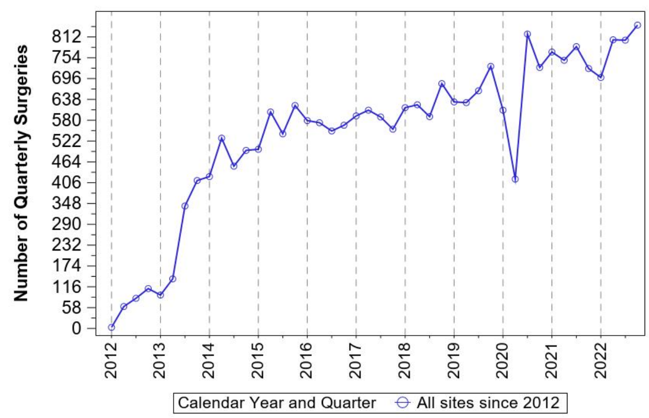

Figure 182: Utilization of the Pinnacle cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

121732052	121732060	121701054
121732054	121722048	121730054
121732056	121722058	121703054
121722052	121732062	121701056
121732058	121701052	121731056
121732050	121730052	121730056
121722054	121703052	121730046
121732048	121731052	121701050
121722050	121731054	121703056
121722056	121722060	121701048

121731050
121732064
121730058
121731048
121731058
121703048
121722062
121703050
121730050
121701058
121730048
121703058
121730060
121731060
121720046
121730044
121730062
121703060
121701060
121732066
121730064
121722064
121720044
121701062
121703062
121730066
121730068
121730038
121703064
121722066
121730040
121730042
121731046
121731062
121701064
121716070
121717062
121720038
121720052
121720054

PolarCup
N=586

Distribution of utilization: 12 surgeons used this implant at fewer than 10 sites in primary THA.

Table 782: Volume of cases by surgeon and site for the PolarCup cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	48 (155)	1 (4)
Cases per site	73 (190)	1 (17)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 783: Descriptive statistics of cases receiving the PolarCup cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	429	73.21	
Age (years)	586	62.74(11.88)	64.00(16.00)
Height (cm)	586	167.16(9.06)	167.55(12.98)
Weight (kg)	586	87.65(24.48)	83.85(29.40)
BMI(kg/m^2)	586	31.27(8.01)	29.91(9.19)
Smoking - never (%)	301	51.37	
Smoking - previous (%)	221	37.71	
Smoking - current (%)	64	10.92	
Smoking - unknown (%)	0	0.0	

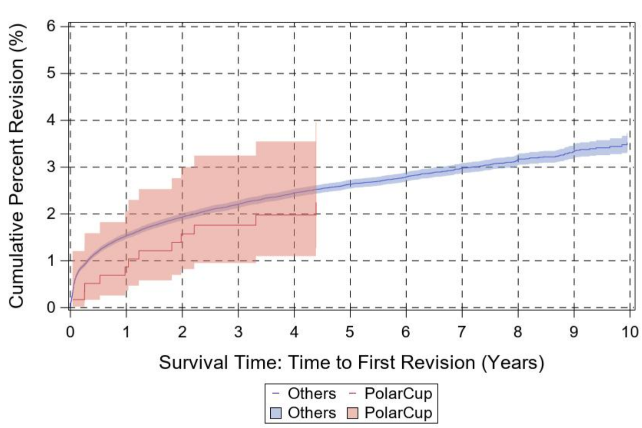

Figure 183: Cumulative percent revision curve for the PolarCup cup compared to all other cups in primary THA.

Table 784: Cumulative percent revision and number at risk for PolarCup cup in primary THA cases.

Year	Number at risk	CPR
0	585	0.00 (0.00,0.00)
1	566	0.86 (0.36,2.06)
2	545	1.57 (0.82,3.00)
3	480	1.76 (0.95,3.25)
4	400	1.98 (1.10,3.55)
5*	305	2.25 (1.28,3.95)
6*	190	2.25 (1.28,3.95)
7*	77	2.25 (1.28,3.95)
8*	1	2.25 (1.28,3.95)
9*	1	2.25 (1.28,3.95)
10*	1	2.25 (1.28,3.95)

* No revision occurred after the termination of the red curve in Figure 183; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.539 (0.217,1.342). It was 1.214 (1.133,1.301) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 785: Reasons for revision following primary THA for PolarCup cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	6	50.0
2	Malalignment	2	16.7
3	Joint Infection	1	8.3
4	Peri-prosthetic fracture - Acetabulum	1	8.3
5	Peri-prosthetic fracture - Femur	1	8.3
6	Metal Reaction/Metallosis	1	8.3

Table 786: Reasons for revision in first 90 days following primary THA for PolarCup cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Acetabulum	1	100.0

Table 787: Reasons for revision between 91 and 365 days following primary THA for PolarCup cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	3	75.0
2	Joint Infection	1	25.0

Table 788: Distribution of approach used for PolarCup cup in primary THA cases.

Approach	N	Percent
Anterior	6	1.0
Anterolateral	498	85.0
Posterior	11	1.9
Transtrochanteric	71	12.1
Missing/unknown/other	0	0.0

Table 789: Distribution of bearing surface for PolarCup cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1	0.2
Ceramic-on-plastic	0	0.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	578	98.6
Missing/unknown/other	7	1.2

Table 790: Distribution of polyethylene used for PolarCup cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	579	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	0	0.0

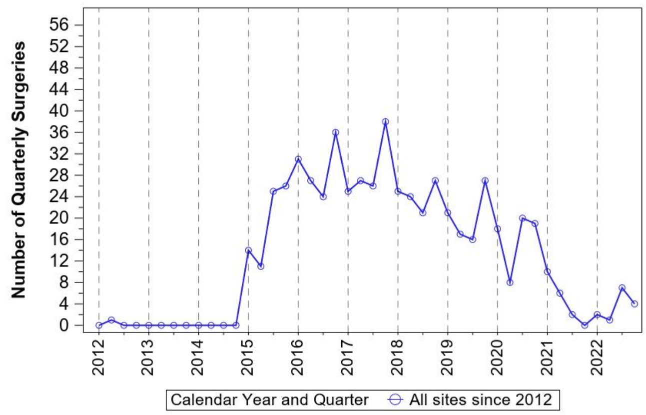

Figure 184: Utilization of the PolarCup cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

75100409	75100413	75100406
75100410	75100414	75100415
75100411	75100407	75100455
75100408	75100451	75100457
75100412	75100453	

Procotyl Prime
N=711

Fewer than ten surgeons across 10 sites used this implant in primary THA.

Table 791: Volume of cases by surgeon and site for the Procotyl Prime cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	101 (149)	58 (111)
Cases per site	71 (74)	61 (89)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 792: Descriptive statistics of cases receiving the Procotyl Prime cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	407	57.24	
Age (years)	711	64.90(10.23)	66.00(13.00)
Height (cm)	711	169.71(9.96)	168.00(15.24)
Weight (kg)	711	90.78(21.18)	89.09(26.52)
BMI(kg/m^2)	711	31.46(6.66)	30.54(9.15)
Smoking - never (%)	328	46.13	
Smoking - previous (%)	283	39.8	
Smoking - current (%)	96	13.5	
Smoking - unknown (%)	4	0.56	

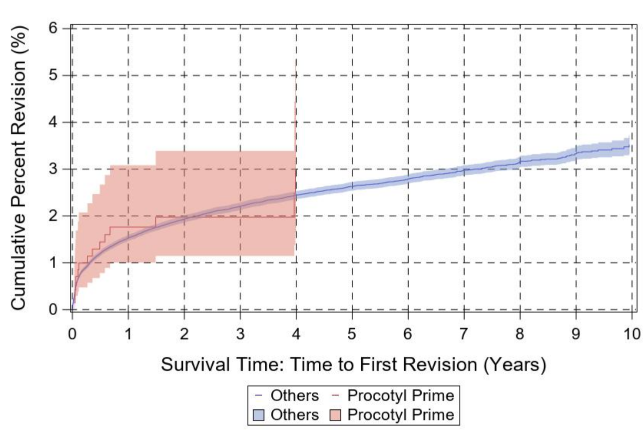

Figure 185: Cumulative percent revision curve for the Procotyl Prime cup compared to all other cups in primary THA.

Table 793: Cumulative percent revision and number at risk for Procotyl Prime cup in primary THA cases.

Year	Number at risk	CPR
0	708	0.00 (0.00,0.00)
1	572	1.76 (1.00,3.08)
2	374	1.97 (1.15,3.39)
3	270	1.97 (1.15,3.39)
4*	192	2.98 (1.66,5.35)
5*	53	2.98 (1.66,5.35)
6	0	N/A
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 185; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.96 (0.546,1.69). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 794: Reasons for revision following primary THA for Procotyl Prime cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	7	46.7
2	Joint Infection	3	20.0
3	Peri-prosthetic fracture - Femur	3	20.0
4	Dislocation/Instability	2	13.3

Table 795: Reasons for revision in first 90 days following primary THA for Procotyl Prime cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	3	42.9
2	Dislocation/Instability	2	28.6
3	Joint Infection	2	28.6

Table 796: Reasons for revision between 91 and 365 days following primary THA for Procotyl Prime cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	4	80.0
2	Joint Infection	1	20.0

Table 797: Distribution of approach used for Procotyl Prime cup in primary THA cases.

Approach	N	Percent
Anterior	602	84.7
Anterolateral	47	6.6
Posterior	60	8.4
Transtrochanteric	0	0.0
Missing/unknown/other	2	0.3

Table 798: Distribution of head size for Procotyl Prime cup in primary THA cases.

Size (mm)	N	Percent
32	28	4.0
36	522	74.8
40	132	18.9
Missing/unknown/other	16	2.3

Table 799: Distribution of bearing surface for Procotyl Prime cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	11	1.6
Ceramic-on-plastic	671	94.4
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	29	4.1

Table 800: Distribution of polyethylene used for Procotyl Prime cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	351	50.3
Antioxidant XLPE	347	49.7
Missing/unknown/other	0	0.0

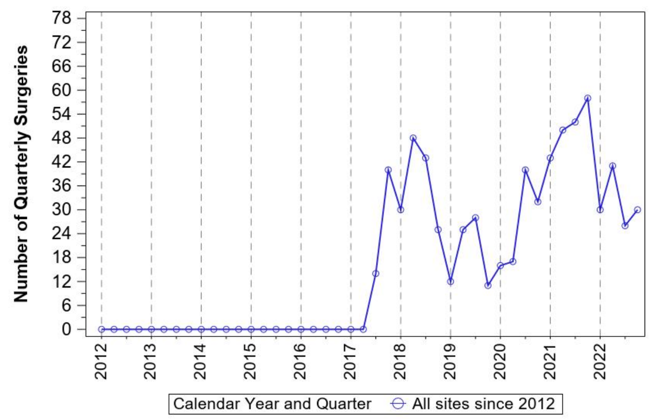

Figure 186: Utilization of the Procotyl Prime cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

P3SBQC50	P3SBQD56	P3SBQB46
P3SBQC52	P3SBQE60	P3SBQF64
P3SBQD54	P3SBQB48	P3SBQG66
P3SBQE58	P3SBQF62	

Reflection
N=550

Distribution of utilization: 10 surgeons used this implant at fewer than 10 sites in primary THA.

Table 801: Volume of cases by surgeon and site for the Reflection cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	55 (67)	18 (105)
Cases per site	78 (131)	7 (188)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 802: Descriptive statistics of cases receiving the Reflection cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	325	59.09	
Age (years)	550	68.64(10.87)	69.00(17.00)
Height (cm)	550	168.58(10.41)	167.64(15.24)
Weight (kg)	550	86.88(21.51)	84.60(27.79)
BMI(kg/m^2)	550	30.43(6.43)	29.87(7.81)
Smoking - never (%)	271	49.27	
Smoking - previous (%)	212	38.55	
Smoking - current (%)	65	11.82	
Smoking - unknown (%)	2	0.36	

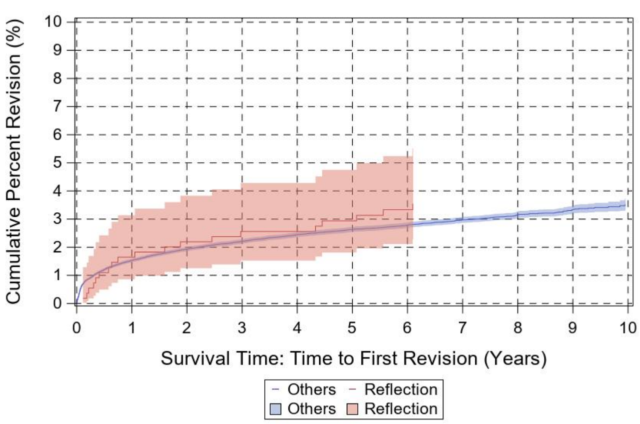

Figure 187: Cumulative percent revision curve for the Reflection cup compared to all other cups in primary THA.

Table 803: Cumulative percent revision and number at risk for Reflection cup in primary THA cases.

Year	Number at risk	CPR
0	547	0.00 (0.00,0.00)
1	538	1.65 (0.86,3.14)
2	534	2.19 (1.25,3.83)
3	531	2.56 (1.52,4.29)
4	524	2.56 (1.52,4.29)
5	501	2.94 (1.81,4.75)
6	453	3.33 (2.11,5.24)
7*	351	3.55 (2.28,5.51)
8*	223	3.55 (2.28,5.51)
9*	107	3.55 (2.28,5.51)
10*	20	3.55 (2.28,5.51)

* No revision occurred after the termination of the red curve in Figure 187; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.035 (0.575,1.864). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 804: Reasons for revision following primary THA for Reflection cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	6	35.3
2	Aseptic Loosening	4	23.5
3	Joint Infection	3	17.6
4	Pain	2	11.8
5	Peri-prosthetic fracture - Femur	1	5.9
6	Metal Reaction/Metallosis	1	5.9

Table 805: Reasons for revision in first 90 days following primary THA for Reflection cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	3	100.0

Table 806: Reasons for revision between 91 and 365 days following primary THA for Reflection cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	3	60.0
2	Joint Infection	1	20.0
3	Pain	1	20.0

Table 807: Distribution of approach used for Reflection cup in primary THA cases.

Approach	N	Percent
Anterior	12	2.2
Anterolateral	11	2.0
Posterior	524	95.3
Transtrochanteric	1	0.2
Missing/unknown/other	2	0.4

Table 808: Distribution of head size for Reflection cup in primary THA cases.

Size (mm)	N	Percent
28	18	3.4
32	357	66.5
36	155	28.9
Missing/unknown/other	7	1.3

Table 809: Distribution of bearing surface for Reflection cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	332	60.4
Ceramic-on-plastic	205	37.3
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	13	2.4

Table 810: Distribution of polyethylene used for Reflection cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	48	8.8
XLPE	346	63.5
Antioxidant XLPE	0	0.0
Missing/unknown/other	151	27.7

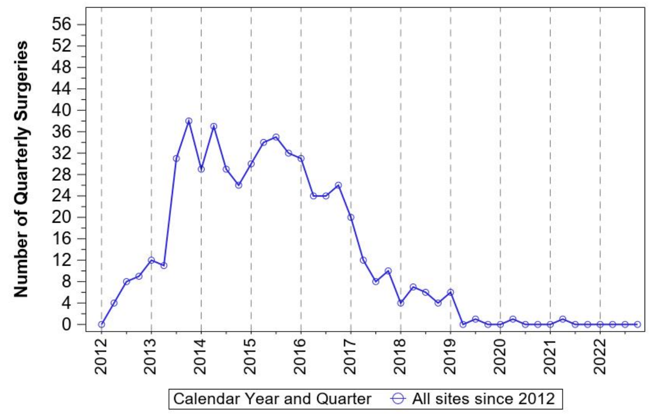

Figure 188: Utilization of the Reflection cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

71336450	71336458	71335056
71334154	71334160	71336462
71334152	71334162	71358007
71336452	71336446	71358026
71336454	71336460	71358068
71334156	71336448	743066
71334150	71334164	
71336456	71358065	
71334158	71358066	

Reflection 3

N=10422

Distribution of utilization: 90 surgeons across 50 sites used this implant in primary THA.

Table 811: Volume of cases by surgeon and site for the Reflection 3 cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	115 (196)	36 (106)
Cases per site	208 (292)	76 (274)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 812: Descriptive statistics of cases receiving the Reflection 3 cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	5422	52.02	
Age (years)	10422	65.45(10.80)	66.00(14.00)
Height (cm)	10421	169.99(10.47)	170.18(15.24)
Weight (kg)	10421	90.76(21.99)	88.68(29.00)
BMI(kg/m^2)	10421	31.29(6.55)	30.49(8.64)
Smoking - never (%)	4812	46.17	
Smoking - previous (%)	4000	38.38	
Smoking - current (%)	1580	15.16	
Smoking - unknown (%)	30	0.29	

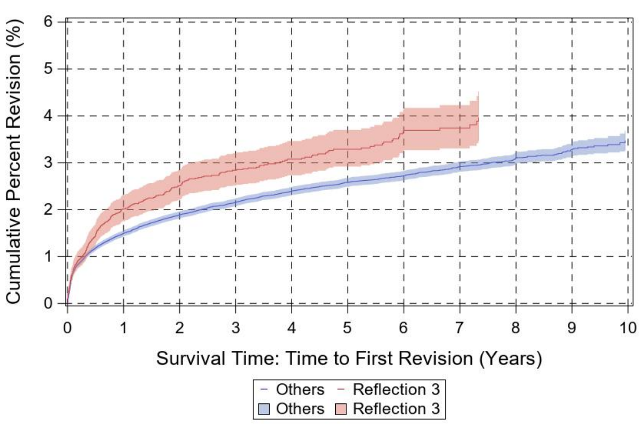

Figure 189: Cumulative percent revision curve for the Reflection 3 cup compared to all other cups in primary THA.

Table 813: Cumulative percent revision and number at risk for Reflection 3 cup in primary THA cases.

Year	Number at risk	CPR
0	10335	0.00 (0.00,0.00)
1	8584	2.01 (1.75,2.31)
2	7247	2.51 (2.21,2.85)
3	6061	2.84 (2.52,3.21)
4	4746	3.08 (2.73,3.47)
5	3576	3.29 (2.92,3.70)
6	2617	3.69 (3.27,4.17)
7	1525	3.74 (3.31,4.23)
8*	805	3.97 (3.47,4.52)
9*	262	3.97 (3.47,4.52)
10*	77	3.97 (3.47,4.52)

* No revision occurred after the termination of the red curve in Figure 189; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.286 (1.094,1.513). It was 1.215 (1.135,1.302) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 814: Reasons for revision following primary THA for Reflection 3 cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	78	27.5
2	Peri-prosthetic fracture - Femur	57	20.1
3	Joint Infection	53	18.7
4	Aseptic Loosening	49	17.3
5	Pain	15	5.3
6	Implant Failure	14	4.9
7	Malalignment	13	4.6
8	Peri-prosthetic fracture - Acetabulum	3	1.1
9	Metal Reaction/Metallosis	2	0.7

Table 815: Reasons for revision in first 90 days following primary THA for Reflection 3 cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	46	47.9
2	Dislocation/Instability	21	21.9
3	Joint Infection	12	12.5
4	Implant Failure	6	6.2
5	Aseptic Loosening	5	5.2
6	Malalignment	4	4.2
7	Peri-prosthetic fracture - Acetabulum	2	2.1

Table 816: Reasons for revision between 91 and 365 days following primary THA for Reflection 3 cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	32	35.6
2	Joint Infection	24	26.7
3	Aseptic Loosening	18	20.0
4	Pain	8	8.9
5	Peri-prosthetic fracture - Femur	4	4.4
6	Implant Failure	2	2.2
7	Malalignment	2	2.2

Table 817: Distribution of approach used for Reflection 3 cup in primary THA cases.

Approach	N	Percent
Anterior	5344	51.3
Anterolateral	2761	26.5
Posterior	2280	21.9
Transtrochanteric	21	0.2
Missing/unknown/other	16	0.1

Table 818: Distribution of head size for Reflection 3 cup in primary THA cases.

Size (mm)	N	Percent
22	9	0.1
28	99	1.0
32	2240	22.4
36	7027	70.2
40	566	5.7
44	20	0.2
Missing/unknown/other	47	0.5

Table 819: Distribution of bearing surface for Reflection 3 cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	2016	19.3
Ceramic-on-plastic	7945	76.2
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	391	3.8
Missing/unknown/other	70	0.7

Table 820: Distribution of polyethylene used for Reflection 3 cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	8	0.1
XLPE	9238	88.9
Antioxidant XLPE	0	0.0
Missing/unknown/other	1149	11.1

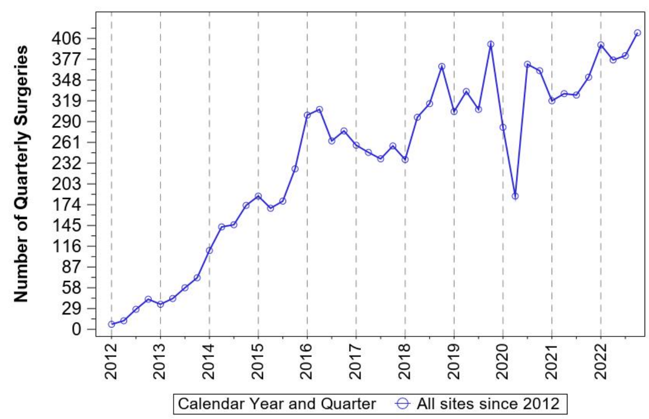

Figure 190: Utilization of the Reflection 3 cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

71335552	71331850	71335564
71335554	71335562	71338668
71335556	71338665	71338669
71335550	71331858	71331846
71335558	71338666	71338663
71335548	71338667	71331862
71335560	71335546	71338671
71331854	71331860	71335566
71331852	71331848	71331864
71331856	71338664	71335544

71335568	71338675
71338672	

Regenerex RingLoc+
N=1020

Distribution of utilization: 30 surgeons across 21 sites used this implant in primary THA.

Table 821: Volume of cases by surgeon and site for the Regenerex RingLoc+ cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	34 (56)	5 (40)
Cases per site	48 (78)	16 (26)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 822: Descriptive statistics of cases receiving the Regenerex RingLoc+ cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	545	53.43	
Age (years)	1020	64.35(11.45)	64.00(15.00)
Height (cm)	1020	169.94(10.57)	170.18(15.37)
Weight (kg)	1020	90.41(22.53)	88.48(29.60)
BMI(kg/m^2)	1020	31.22(7.05)	30.38(9.18)
Smoking - never (%)	394	38.63	
Smoking - previous (%)	385	37.75	
Smoking - current (%)	237	23.24	
Smoking - unknown (%)	4	0.39	

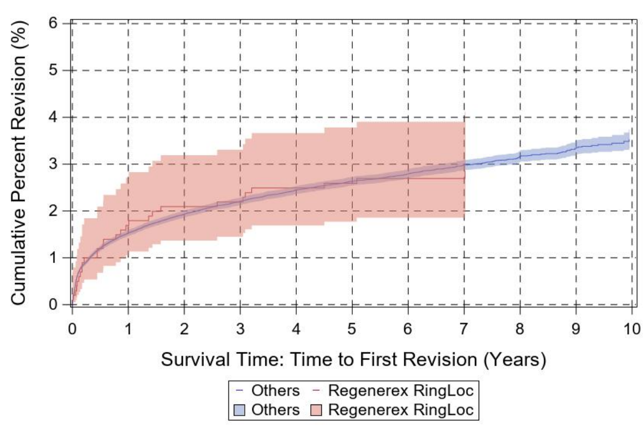

Figure 191: Cumulative percent revision curve for the Regenerex RingLoc+ cup compared to all other cups in primary THA.

Table 823: Cumulative percent revision and number at risk for Regenerex RingLoc+ cup in primary THA cases.

Year	Number at risk	CPR
0	1004	0.00 (0.00,0.00)
1	987	1.69 (1.06,2.71)
2	983	2.09 (1.37,3.19)
3	982	2.19 (1.45,3.31)
4	974	2.49 (1.69,3.66)
5	946	2.59 (1.77,3.78)
6	841	2.69 (1.86,3.90)
7	605	2.69 (1.86,3.90)
8*	299	2.86 (1.98,4.12)
9*	71	2.86 (1.98,4.12)
10*	9	2.86 (1.98,4.12)

* No revision occurred after the termination of the red curve in Figure 191; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.805 (0.526,1.232). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 824: Reasons for revision following primary THA for Regenerex RingLoc+ cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	7	25.0
2	Dislocation/Instability	6	21.4
3	Peri-prosthetic fracture - Femur	6	21.4
4	Joint Infection	4	14.3
5	Pain	2	7.1
6	Malalignment	2	7.1
7	Implant Failure	1	3.6

Table 825: Reasons for revision in first 90 days following primary THA for Regenerex RingLoc+ cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	6	60.0
2	Aseptic Loosening	2	20.0
3	Dislocation/Instability	1	10.0
4	Malalignment	1	10.0

Table 826: Reasons for revision between 91 and 365 days following primary THA for Regenerex RingLoc+ cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	28.6
2	Dislocation/Instability	2	28.6
3	Joint Infection	2	28.6
4	Pain	1	14.3

Table 827: Distribution of approach used for Regenerex RingLoc+ cup in primary THA cases.

Approach	N	Percent
Anterior	101	9.9
Anterolateral	449	44.0
Posterior	463	45.4
Transtrochanteric	2	0.2
Missing/unknown/other	5	0.5

Table 828: Distribution of head size for Regenerex RingLoc+ cup in primary THA cases.

Size (mm)	N	Percent
28	7	0.7
32	107	10.6
36	593	58.8
40	290	28.7
44	1	0.1
Missing/unknown/other	11	1.1

Table 829: Distribution of bearing surface for Regenerex RingLoc+ cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	642	62.9
Ceramic-on-plastic	356	34.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	22	2.2

Table 830: Distribution of polyethylene used for Regenerex RingLoc+ cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	6	0.6
XLPE	279	27.6
Antioxidant XLPE	724	71.8
Missing/unknown/other	0	0.0

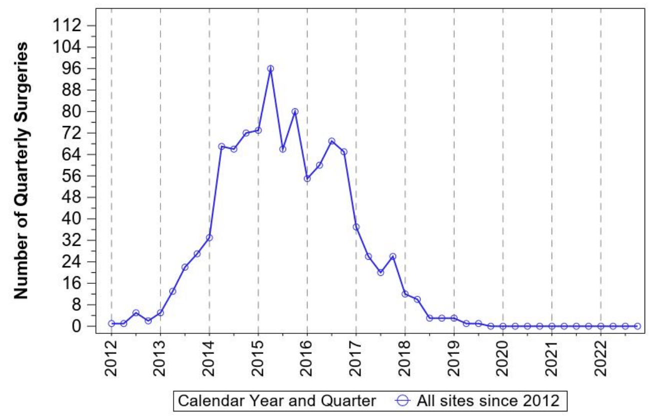

Figure 192: Utilization of the Regenerex RingLoc+ cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

PT116052	PT106058	PT106052
PT116056	PT104050	PT106068
PT116054	PT106060	PT116066
PT116058	PT104054	PT104062
PT116060	PT106064	PT104066
PT116050	PT104052	PT106070
PT106054	PT104058	PT106072
PT106056	PT106062	PT116064
PT116048	PT104060	
PT116062	PT106066	
PT104056	PT104048	

Restoration ADM

N=524

Fewer than ten surgeons used this implant at fewer than ten sites in primary THA.

Table 831: Volume of cases by surgeon and site for the Restoration ADM cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	104 (174)	39 (70)
Cases per site	131 (166)	80 (241)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 832: Descriptive statistics of cases receiving the Restoration ADM cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	272	51.91	
Age (years)	524	63.47(11.61)	64.00(15.00)
Height (cm)	524	169.68(10.42)	170.18(15.24)
Weight (kg)	524	90.56(23.43)	88.33(29.58)
BMI(kg/m^2)	524	31.29(6.84)	30.41(8.10)
Smoking - never (%)	239	45.61	
Smoking - previous (%)	233	44.47	
Smoking - current (%)	52	9.92	
Smoking - unknown (%)	0	0.0	

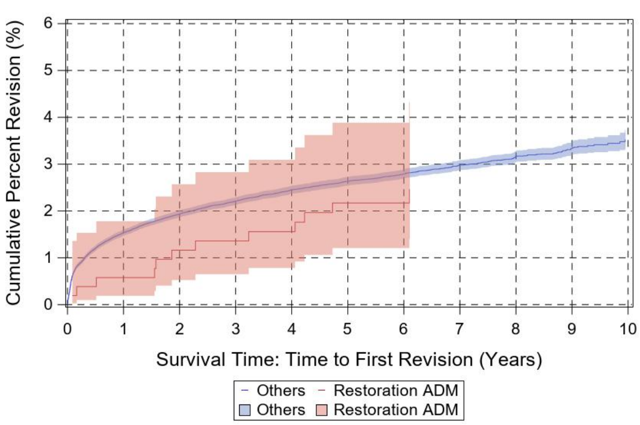

Figure 193: Cumulative percent revision curve for the Restoration ADM cup compared to all other cups in primary THA.

Table 833: Cumulative percent revision and number at risk for Restoration ADM cup in primary THA cases.

Year	Number at risk	CPR
0	519	0.00 (0.00,0.00)
1	516	0.58 (0.19,1.78)
2	505	1.16 (0.52,2.57)
3	496	1.36 (0.65,2.83)
4	488	1.56 (0.78,3.09)
5	441	2.17 (1.21,3.89)
6	343	2.17 (1.21,3.89)
7*	239	2.46 (1.40,4.32)
8*	135	2.46 (1.40,4.32)
9*	33	2.46 (1.40,4.32)
10*	7	2.46 (1.40,4.32)

* No revision occurred after the termination of the red curve in Figure 193; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.961 (0.472,1.956). It was 1.213 (1.133,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 834: Reasons for revision following primary THA for Restoration ADM cup cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	27.3
2	Aseptic Loosening	2	18.2
3	Dislocation/Instability	2	18.2
4	Malalignment	2	18.2
5	Poly liner wear	1	9.1
6	Peri-prosthetic fracture - Femur	1	9.1

Table 835: Reasons for revision in first 90 days following primary THA for Restoration ADM cup cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	2	100.0

There were no reasons for revision recorded between day 91 and day 365 so no table of reasons for revisions during this time period is included.

Table 836: Distribution of approach used for Restoration ADM cup in primary THA cases.

Approach	N	Percent
Anterior	1	0.2
Anterolateral	74	14.1
Posterior	449	85.7
Transtrochanteric	0	0.0
Missing/unknown/other	0	0.0

Table 837: Distribution of bearing surface for Restoration ADM cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	0	0.0
Ceramic-on-plastic	0	0.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	524	100.0
Missing/unknown/other	0	0.0

Table 838: Distribution of polyethylene used for Restoration ADM cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	524	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	0	0.0

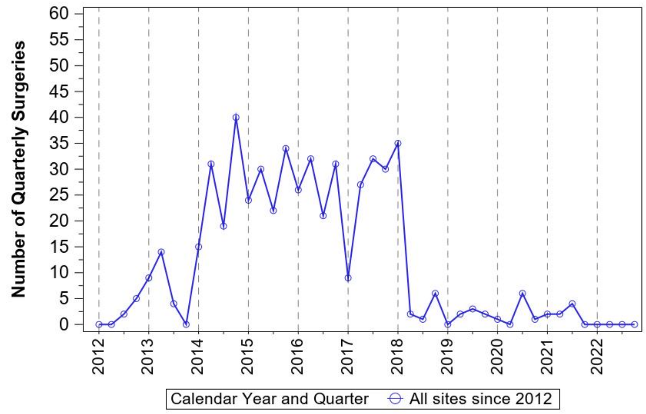

Figure 194: Utilization of the Restoration ADM cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

12352501	12352561	12352602
12352541	12352482	12352601
12352521	12352562	12352621
12352522	12352461	12352622
12352542	12352462	12352641
12352481	12352581	12352642
12352502	12352582	

RingLoc
N=2635

Distribution of utilization: 42 surgeons across 24 sites used this implant in primary THA.

Table 839: Volume of cases by surgeon and site for the RingLoc cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	62 (106)	7 (93)
Cases per site	109 (144)	30 (162)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 840: Descriptive statistics of cases receiving the RingLoc cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1409	53.47	
Age (years)	2635	65.94(10.52)	66.00(14.00)
Height (cm)	2635	170.09(10.40)	170.00(15.24)
Weight (kg)	2635	89.79(21.48)	87.70(27.40)
BMI(kg/m^2)	2635	30.91(6.35)	30.12(8.44)
Smoking - never (%)	1241	47.1	
Smoking - previous (%)	1034	39.24	
Smoking - current (%)	329	12.49	
Smoking - unknown (%)	31	1.18	

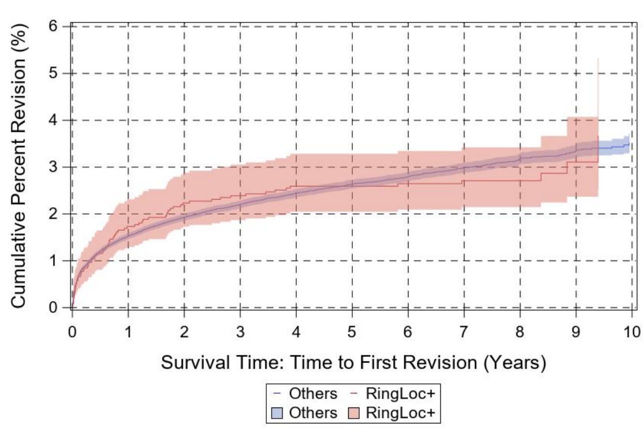

Figure 195: Cumulative percent revision curve for the RingLoc cup compared to all other cups in primary THA.

Table 841: Cumulative percent revision and number at risk for RingLoc cup in primary THA cases.

Year	Number at risk	CPR
0	2597	0.00 (0.00,0.00)
1	2550	1.73 (1.30,2.31)
2	2527	2.23 (1.73,2.88)
3	2484	2.39 (1.87,3.06)
4	2292	2.59 (2.05,3.28)
5	2075	2.59 (2.05,3.28)
6	1819	2.65 (2.09,3.35)
7	1478	2.71 (2.15,3.42)
8	817	2.71 (2.15,3.42)
9	328	3.11 (2.37,4.07)
10*	58	3.67 (2.52,5.33)

* No revision occurred after the termination of the red curve in Figure 195; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 842: Reasons for revision following primary THA for RingLoc cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	17	27.0
2	Joint Infection	16	25.4
3	Peri-prosthetic fracture - Femur	12	19.0
4	Aseptic Loosening	8	12.7
5	Implant Failure	4	6.3
6	Pain	4	6.3
7	Poly liner wear	1	1.6
8	Malalignment	1	1.6

Table 843: Reasons for revision in first 90 days following primary THA for RingLoc cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	9	47.4
2	Dislocation/Instability	4	21.1
3	Aseptic Loosening	2	10.5
4	Joint Infection	2	10.5
5	Implant Failure	1	5.3
6	Pain	1	5.3

Table 844: Reasons for revision between 91 and 365 days following primary THA for RingLoc cup cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	9	52.9
2	Dislocation/Instability	4	23.5
3	Implant Failure	2	11.8
4	Aseptic Loosening	1	5.9
5	Pain	1	5.9

Table 845: Distribution of approach used for RingLoc cup in primary THA cases.

Approach	N	Percent
Anterior	521	19.8
Anterolateral	824	31.3
Posterior	1268	48.1
Transtrochanteric	10	0.4
Missing/unknown/other	12	0.5

Table 846: Distribution of head size for RingLoc cup in primary THA cases.

Size (mm)	N	Percent
32	261	10.0
36	1556	59.5
40	666	25.5
44	97	3.7
Missing/unknown/other	35	1.3

Table 847: Distribution of bearing surface for RingLoc cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1472	55.9
Ceramic-on-plastic	1107	42.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	56	2.1

Table 848: Distribution of polyethylene used for RingLoc cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	29	1.1
XLPE	223	8.5
Antioxidant XLPE	2363	90.4
Missing/unknown/other	0	0.0

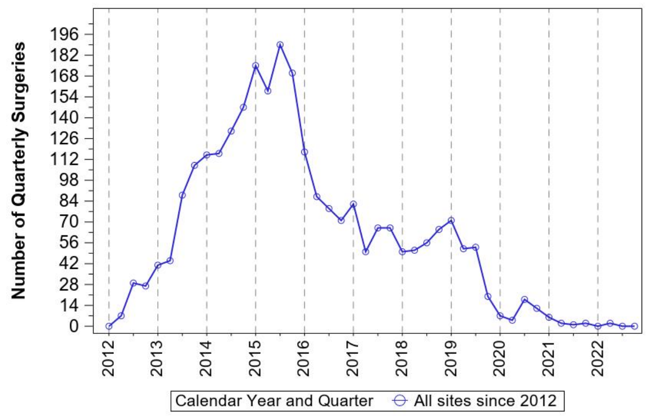

Figure 196: Utilization of the RingLoc cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

16104154	16116056	11165214
16104150	16104164	11165216
16104156	14103660	14103664
16104152	14103662	16116062
16104158	16104146	11165208
14103654	16116058	11165212
16104160	14103554	11165218
14103656	14103560	14103566
14103652	14103564	14103666
16116050	14103558	16116064
14103650	14103562	11165224
16116052	14103556	11165228
16116054	16116048	14103668
16104162	16116060	
14103658	14103552	
16104148	16116046	

Trabecular Metal
N=1947

Distribution of utilization: 53 surgeons across 24 sites used this implant in primary THA.

Table 849: Volume of cases by surgeon and site for the Trabecular Metal cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	36 (105)	3 (14)
Cases per site	81 (149)	12 (70)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 850: Descriptive statistics of cases receiving the Trabecular Metal cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1102	56.6	
Age (years)	1947	64.64(11.27)	65.00(14.00)
Height (cm)	1942	169.04(10.81)	168.00(17.78)
Weight (kg)	1941	88.76(21.96)	87.00(30.24)
BMI(kg/m^2)	1941	31.06(7.78)	30.04(9.15)
Smoking - never (%)	795	40.83	
Smoking - previous (%)	712	36.57	
Smoking - current (%)	435	22.34	
Smoking - unknown (%)	5	0.26	

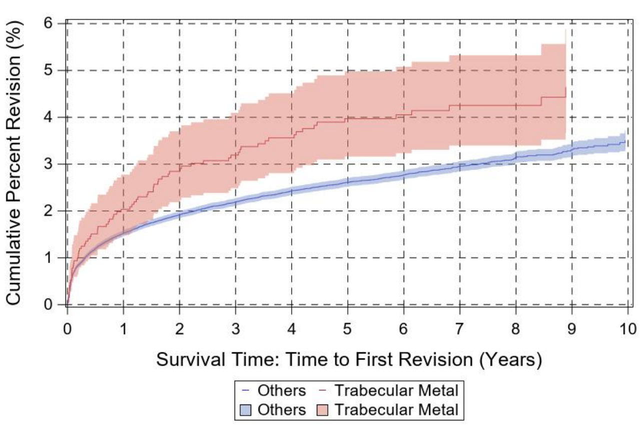

Figure 197: Cumulative percent revision curve for the Trabecular Metal cup compared to all other cups in primary THA.

Table 851: Cumulative percent revision and number at risk for Trabecular Metal cup in primary THA cases.

Year	Number at risk	CPR
0	1923	0.00 (0.00,0.00)
1	1854	2.04 (1.49,2.78)
2	1729	2.85 (2.19,3.70)
3	1614	3.19 (2.49,4.09)
4	1473	3.56 (2.81,4.51)
5	1315	3.97 (3.16,4.98)
6	1123	4.05 (3.23,5.08)
7	825	4.25 (3.40,5.32)
8	646	4.25 (3.40,5.32)
9*	406	4.65 (3.67,5.88)
10*	170	4.65 (3.67,5.88)

* No revision occurred after the termination of the red curve in Figure 197; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.443 (1.043,1.996). It was 1.212 (1.132,1.3) and 0.999 (0.996,1.002) for sex (female) and age, respectively.

Table 852: Reasons for revision following primary THA for Trabecular Metal cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	17	24.3
2	Peri-prosthetic fracture - Femur	15	21.4
3	Dislocation/Instability	14	20.0
4	Joint Infection	9	12.9
5	Implant Failure	6	8.6
6	Pain	4	5.7
7	Malalignment	3	4.3
8	Osteolysis	1	1.4
9	Metal Reaction/Metallosis	1	1.4

Table 853: Reasons for revision in first 90 days following primary THA for Trabecular Metal cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	10	43.5
2	Dislocation/Instability	7	30.4
3	Aseptic Loosening	6	26.1

Table 854: Reasons for revision between 91 and 365 days following primary THA for Trabecular Metal cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	4	33.3
2	Implant Failure	3	25.0
3	Joint Infection	2	16.7
4	Peri-prosthetic fracture - Femur	1	8.3
5	Pain	1	8.3
6	Malalignment	1	8.3

Table 855: Distribution of approach used for Trabecular Metal cup in primary THA cases.

Approach	N	Percent
Anterior	32	1.6
Anterolateral	707	36.3
Posterior	1119	57.5
Transtrochanteric	68	3.5
Missing/unknown/other	21	1.1

Table 856: Distribution of head size for Trabecular Metal cup in primary THA cases.

Size (mm)	N	Percent
22	2	0.1
28	38	2.0
32	783	40.7
36	972	50.5
40	87	4.5
Missing/unknown/other	43	2.2

Table 857: Distribution of bearing surface for Trabecular Metal cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1008	51.8
Ceramic-on-plastic	874	44.9
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	65	3.3

Table 858: Distribution of polyethylene used for Trabecular Metal cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	2	0.1
XLPE	1669	86.7
Antioxidant XLPE	3	0.2
Missing/unknown/other	251	13.0

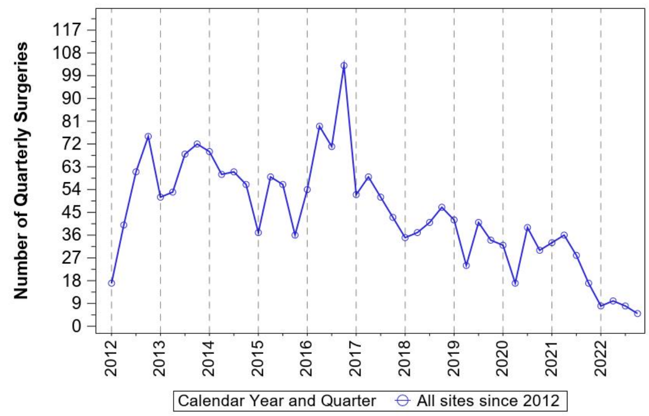

Figure 198: Utilization of the Trabecular Metal cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

620205222	620204622	620207022
620205022	620205220	620206221
620204822	620205821	620206820
620205422	620204821	620207020
620205622	620205420	700005620
620205822	620206222	712305648
620205021	620206220	620203822
620206022	620204820	620204020
620205221	620206020	620206620
620205421	620206422	620206622
620205020	620206021	712306254
620205621	620204621	
620205820	620206420	
620205620	620204422	

Trident
N=30643

Distribution of utilization: 171 surgeons across 56 sites used this implant in primary THA.

Table 859: Volume of cases by surgeon and site for the Trident cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	179 (342)	33 (176)
Cases per site	547 (814)	162 (702)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 860: Descriptive statistics of cases receiving the Trident cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	16840	54.96	
Age (years)	30643	64.53(11.44)	65.00(14.00)
Height (cm)	30643	169.72(10.42)	170.00(15.24)
Weight (kg)	30643	88.13(21.17)	86.19(28.27)
BMI(kg/m^2)	30643	30.47(6.37)	29.76(8.30)
Smoking - never (%)	14719	48.03	
Smoking - previous (%)	11634	37.97	
Smoking - current (%)	4095	13.36	
Smoking - unknown (%)	195	0.64	

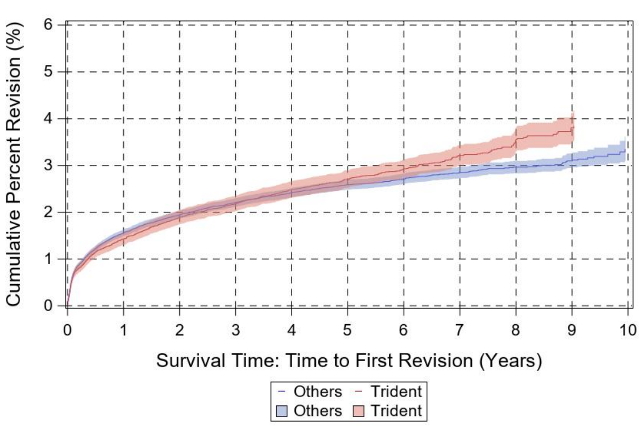

Figure 199: Cumulative percent revision curve for the Trident cup compared to all other cups in primary THA.

Table 861: Cumulative percent revision and number at risk for Trident cup in primary THA cases.

Year	Number at risk	CPR
0	30364	0.00 (0.00,0.00)
1	29500	1.43 (1.30,1.57)
2	28816	1.89 (1.74,2.05)
3	27839	2.18 (2.02,2.35)
4	25044	2.48 (2.31,2.66)
5	20514	2.70 (2.52,2.89)
6	15210	2.92 (2.73,3.13)
7	9862	3.21 (3.00,3.44)
8	5568	3.54 (3.29,3.81)
9	2432	3.80 (3.51,4.12)
10*	635	3.84 (3.54,4.17)

* No revision occurred after the termination of the red curve in Figure 199; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 862: Reasons for revision following primary THA for Trident cup cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	218	25.4
2	Peri-prosthetic fracture - Femur	204	23.8
3	Joint Infection	153	17.9
4	Dislocation/Instability	133	15.5
5	Pain	36	4.2
6	Metal Reaction/Metallosis	34	4.0
7	Implant Failure	32	3.7
8	Malalignment	28	3.3
9	Peri-prosthetic fracture - Acetabulum	17	2.0
10	Osteolysis	1	0.1
11	Poly liner wear	1	0.1

Table 863: Reasons for revision in first 90 days following primary THA for Trident cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	136	54.8
2	Dislocation/Instability	40	16.1
3	Joint Infection	26	10.5
4	Aseptic Loosening	18	7.3
5	Implant Failure	12	4.8
6	Peri-prosthetic fracture - Acetabulum	7	2.8
7	Malalignment	5	2.0
8	Pain	4	1.6

Table 864: Reasons for revision between 91 and 365 days following primary THA for Trident cup cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	47	31.1
2	Dislocation/Instability	35	23.2
3	Aseptic Loosening	28	18.5
4	Peri-prosthetic fracture - Femur	16	10.6
5	Pain	14	9.3
6	Implant Failure	4	2.6
7	Malalignment	4	2.6
8	Peri-prosthetic fracture - Acetabulum	3	2.0

Table 865: Distribution of approach used for Trident cup in primary THA cases.

Approach	N	Percent
Anterior	6699	21.9
Anterolateral	6309	20.6
Posterior	17495	57.1
Transtrochanteric	50	0.2
Missing/unknown/other	90	0.3

Table 866: Distribution of head size for Trident cup in primary THA cases.

Size (mm)	N	Percent
22	17	0.1
28	79	0.3
32	5567	19.7
36	20148	71.4
40	2120	7.5
44	162	0.6
Missing/unknown/other	110	0.4

Table 867: Distribution of bearing surface for Trident cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	7585	24.8
Ceramic-on-plastic	19365	63.2
Ceramic-on-ceramic	1187	3.9
Metal-on-metal	0	0.0
Dual mobility	2278	7.4
Missing/unknown/other	228	0.7

Table 868: Distribution of polyethylene used for Trident cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	1	0.0
XLPE	28794	98.2
Antioxidant XLPE	0	0.0
Missing/unknown/other	514	1.8

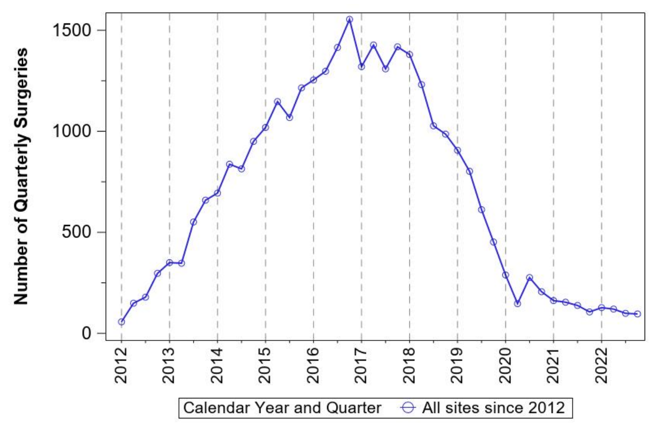

Figure 200: Utilization of the Trident cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

5421150E	5421152E	5000354E
5021152E	5020358F	5401150E
5020354E	5021158F	5020362G
5421154F	5421158G	5020348C
5021154E	5421156F	5021162G
5021156F	5421146D	5401152E
5021150D	5021148D	5421160G
5020350D	5020360F	5401154F
5020352D	5021160G	5000356E
5020356E	5421148D	5000358F

5020152E	5000158F	5401162H
5421144C	5421162H	5000160G
5000152E	5020346B	5090266H
5401156F	5081148D	65C3256
5020156F	5421164H	5001148D
5000154E	5090260F	5020162G
5000360F	5090262G	5081146C
5401158G	5000362G	5090270I
5090254E	5020150D	5401164H
5000352D	5081154E	5421142B
5000150D	5020160G	65C3248
5090256E	5090264G	5081162G
5000350D	5020154E	5401144C
5000148D	5020366H	5000162G
5020364G	5081156F	5001158F
5021146C	5090268H	5020344A
5000156F	5081158F	5021168I
5081152E	5021144B	5090272I
5001152E	65C3252	5421168I
5020158F	65C3254	5000146C
5021164H	5000348C	5000164H
5401160G	5000364G	5021142A
5090258F	5021166H	5090276J
5020148D	5081160G	5401166I
5081150D	5401146D	65C3258
5401148D	65C3250	

Trident II
N=18578

Distribution of utilization: 139 surgeons across 58 sites used this implant in primary THA.

Table 869: Volume of cases by surgeon and site for the Trident II cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	133 (196)	57 (149)
Cases per site	320 (424)	166 (365)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 870: Descriptive statistics of cases receiving the Trident II cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	10117	54.46	
Age (years)	18578	65.13(10.83)	66.00(13.00)
Height (cm)	18578	170.14(10.48)	170.18(15.24)
Weight (kg)	18578	88.45(20.86)	86.57(28.60)
BMI(kg/m^2)	18578	30.44(6.16)	29.70(8.19)
Smoking - never (%)	9355	50.36	
Smoking - previous (%)	6458	34.76	
Smoking - current (%)	2731	14.7	
Smoking - unknown (%)	34	0.18	

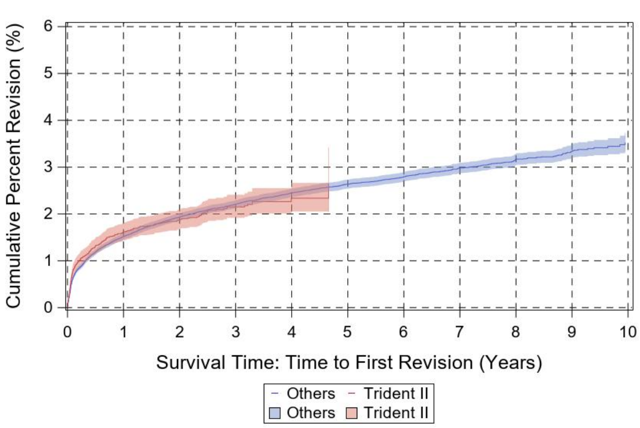

Figure 201: Cumulative percent revision curve for the Trident II cup compared to all other cups in primary THA.

Table 871: Cumulative percent revision and number at risk for Trident II cup in primary THA cases.

Year	Number at risk	CPR
0	18528	0.00 (0.00,0.00)
1	13181	1.62 (1.44,1.82)
2	8465	1.88 (1.68,2.10)
3	4439	2.15 (1.92,2.41)
4	1344	2.34 (2.05,2.66)
5*	183	2.65 (2.05,3.43)
6*	13	2.65 (2.05,3.43)
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 201; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 872: Reasons for revision following primary THA for Trident II cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	119	35.8
2	Joint Infection	78	23.5
3	Dislocation/Instability	43	13.0
4	Aseptic Loosening	42	12.7
5	Implant Failure	15	4.5
6	Malalignment	12	3.6
7	Peri-prosthetic fracture - Acetabulum	11	3.3
8	Pain	8	2.4
9	Metal Reaction/Metallosis	2	0.6
10	Osteolysis	1	0.3
11	Poly liner wear	1	0.3

Table 873: Reasons for revision in first 90 days following primary THA for Trident II cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	103	53.6
2	Joint Infection	34	17.7
3	Dislocation/Instability	18	9.4
4	Implant Failure	10	5.2
5	Aseptic Loosening	9	4.7
6	Peri-prosthetic fracture - Acetabulum	8	4.2
7	Malalignment	7	3.6
8	Pain	2	1.0
9	Metal Reaction/Metallosis	1	0.5

Table 874: Reasons for revision between 91 and 365 days following primary THA for Trident II cup cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	32	36.8
2	Dislocation/Instability	19	21.8
3	Aseptic Loosening	14	16.1
4	Peri-prosthetic fracture - Femur	11	12.6
5	Pain	3	3.5
6	Malalignment	3	3.5
7	Implant Failure	2	2.3
8	Osteolysis	1	1.1
9	Poly liner wear	1	1.1
10	Peri-prosthetic fracture - Acetabulum	1	1.1

Table 875: Distribution of approach used for Trident II cup in primary THA cases.

Approach	N	Percent
Anterior	6415	34.5
Anterolateral	1951	10.5
Posterior	10136	54.6
Transtrochanteric	15	0.1
Missing/unknown/other	61	0.3

Table 876: Distribution of head size for Trident II cup in primary THA cases.

Size (mm)	N	Percent
22	1	0.0
28	19	0.1
32	1628	10.5
36	12396	79.8
40	1297	8.3
44	122	0.8
Missing/unknown/other	71	0.5

Table 877: Distribution of bearing surface for Trident II cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	817	4.4
Ceramic-on-plastic	14645	78.8
Ceramic-on-ceramic	1	0.0
Metal-on-metal	0	0.0
Dual mobility	2863	15.4
Missing/unknown/other	252	1.4

Table 878: Distribution of polyethylene used for Trident II cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	11501	62.7
Antioxidant XLPE	0	0.0
Missing/unknown/other	6855	37.3

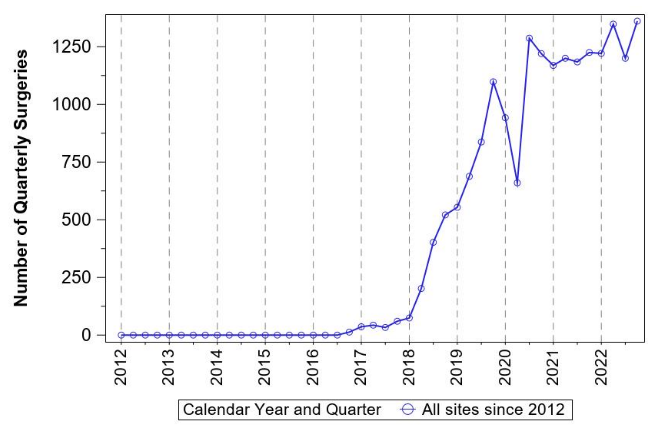

Figure 202: Utilization of the Trident II cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

7020452E	7020460G	7090452E
7020454E	7021148D	7000450D
7020456F	7000452E	7000448D
7020450D	7021158F	7090448D
7020448D	7020446C	7421152E
7020458F	7000454E	7090454E
7021152E	7000456F	7021146C
7021150D	7020462G	7090456F
7021154E	7021160G	7090450D
7021156F	7000458F	7421154E

7000460G	7000446C	7421146C
7421148D	7421158F	7421162G
7021162G	7090462G	7021166H
7421150D	7090464H	7090466H
7421156F	7000462G	7090468I
7020444B	7090446C	7021144B
7020464H	7021164H	7090470I
7090458F	7421160G	
7090460G	7020466H	

Trilogy
N=1603

Distribution of utilization: 24 surgeons across 12 sites used this implant in primary THA.

Table 879: Volume of cases by surgeon and site for the Trilogy cup in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	66 (126)	11 (67)
Cases per site	133 (204)	32 (202)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 880: Descriptive statistics of cases receiving the Trilogy cup in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	897	55.96	
Age (years)	1603	67.94(9.66)	68.00(14.00)
Height (cm)	1603	168.99(10.40)	167.64(16.80)
Weight (kg)	1603	86.48(19.64)	85.00(27.60)
BMI(kg/m^2)	1603	30.15(5.74)	29.52(7.53)
Smoking - never (%)	722	45.04	
Smoking - previous (%)	669	41.73	
Smoking - current (%)	209	13.04	
Smoking - unknown (%)	3	0.19	

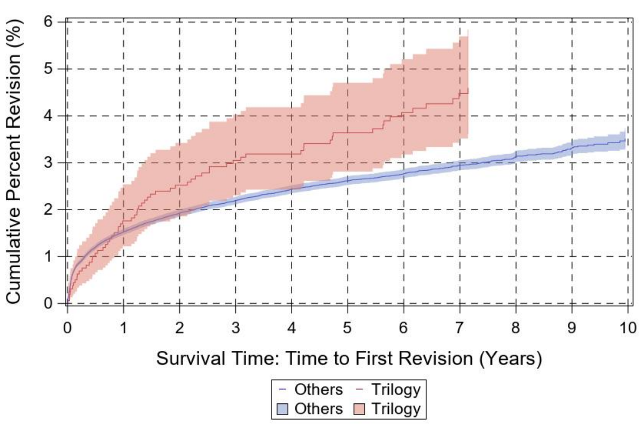

Figure 203: Cumulative percent revision curve for the Trilogy cup compared to all other cups in primary THA.

Table 881: Cumulative percent revision and number at risk for Trilogy cup in primary THA cases.

Year	Number at risk	CPR
0	1589	0.00 (0.00,0.00)
1	1561	1.76 (1.22,2.54)
2	1517	2.52 (1.86,3.43)
3	1429	3.05 (2.31,4.03)
4	1330	3.19 (2.43,4.19)
5	1212	3.64 (2.81,4.71)
6	1075	4.07 (3.18,5.21)
7	853	4.48 (3.52,5.70)
8*	615	4.60 (3.62,5.84)
9*	388	4.60 (3.62,5.84)
10*	168	4.60 (3.62,5.84)

* No revision occurred after the termination of the red curve in Figure 203; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 882: Reasons for revision following primary THA for Trilogy cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	13	21.7
2	Aseptic Loosening	10	16.7
3	Joint Infection	10	16.7
4	Peri-prosthetic fracture - Femur	10	16.7
5	Metal Reaction/Metallosis	5	8.3
6	Malalignment	5	8.3
7	Implant Failure	3	5.0
8	Peri-prosthetic fracture - Acetabulum	2	3.3
9	Poly liner wear	1	1.7
10	Pain	1	1.7

Table 883: Reasons for revision in first 90 days following primary THA for Trilogy cup cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	6	66.7
2	Dislocation/Instability	2	22.2
3	Peri-prosthetic fracture - Acetabulum	1	11.1

Table 884: Reasons for revision between 91 and 365 days following primary THA for Trilogy cup cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	5	35.7
2	Joint Infection	4	28.6
3	Aseptic Loosening	2	14.3
4	Implant Failure	1	7.1
5	Peri-prosthetic fracture - Acetabulum	1	7.1
6	Peri-prosthetic fracture - Femur	1	7.1

Table 885: Distribution of approach used for Trilogy cup in primary THA cases.

Approach	N	Percent
Anterior	7	0.4
Anterolateral	1148	71.6
Posterior	422	26.3
Transtrochanteric	23	1.4
Missing/unknown/other	3	0.2

Table 886: Distribution of head size for Trilogy cup in primary THA cases.

Size (mm)	N	Percent
28	15	0.9
32	979	61.3
36	551	34.5
40	17	1.1
Missing/unknown/other	36	2.2

Table 887: Distribution of bearing surface for Trilogy cup in primary THA cases.

Bearing	N	Percent
Metal-on-plastic	1193	74.4
Ceramic-on-plastic	369	23.0
Ceramic-on-ceramic	0	0.0
Metal-on-metal	0	0.0
Dual mobility	0	0.0
Missing/unknown/other	41	2.6

Table 888: Distribution of polyethylene used for Trilogy cup cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	1506	94.2
Antioxidant XLPE	0	0.0
Missing/unknown/other	92	5.8

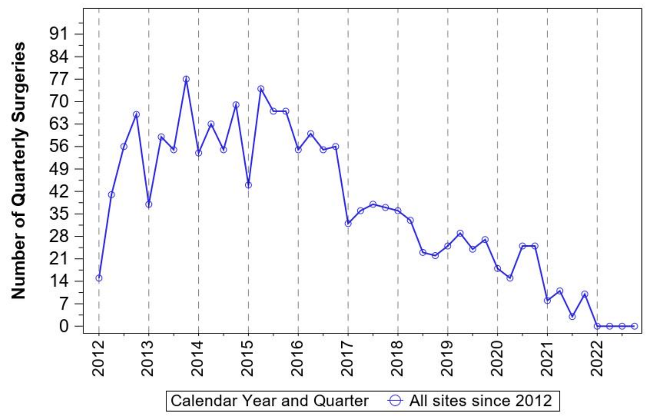

Figure 204: Utilization of the Trilogy cup in primary THA cases.

Catalog numbers of acetabular cups used in the analysis.

620005222	620004822	620005824
620005422	620005020	620006024
620005822	620006422	620006622
620005022	620006224	620006624
620005622	620005024	
620006022	620005424	
620006222	620005624	

2.3 Resurfacing THA cases

2.3.1 VTE prophylaxis

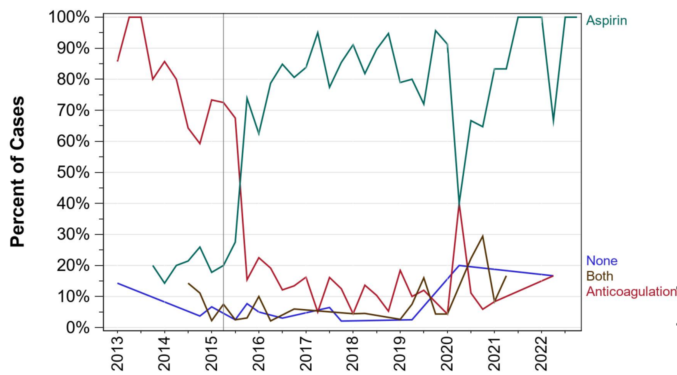

Figure 205: Percent of primary resurfacing THA patients (first case) by thrombosis prophylaxis.

2.3.2 Most commonly used resurfacing THA implants

The following three tables provide utilization data of implants used in primary resurfacing THA.

Table 889: Most commonly used femoral components in primary resurfacing THA.

Rank	Stem	N	Percent
1	BHR	1211	100.0

Table 890: Most commonly used acetabular components in primary resurfacing THA.

Rank	Cup	N	Percent
1	BHR	1211	100.0

Table 891: Most commonly used femoral/acetabular component combinations used in primary resurfacing THA.

Rank	Stem/cup combination	N	Percent
1	BHR / BHR	1211	100.0

2.3.3 Resurfacing THA revision risk summary

Table 892: Reasons for revision following primary resurfacing THA.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	12	33.3
2	Metal Reaction/Metallosis	9	25.0
3	Aseptic Loosening	8	22.2
4	Implant Failure	3	8.3
5	Dislocation/Instability	2	5.6
6	Pain	1	2.8
7	Malalignment	1	2.8

Table 893: Reasons for revision following primary resurfacing THA in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	10	66.7
2	Dislocation/Instability	2	13.3
3	Implant Failure	2	13.3
4	Aseptic Loosening	1	6.7

Table 894: Reasons for revision following primary resurfacing THA in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Metal Reaction/Metallosis	2	50.0
2	Implant Failure	1	25.0
3	Malalignment	1	25.0

Table 895: Reasons for revision following primary resurfacing THA in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	25.0
2	Peri-prosthetic fracture - Femur	1	25.0
3	Metal Reaction/Metallosis	1	25.0
4	Pain	1	25.0

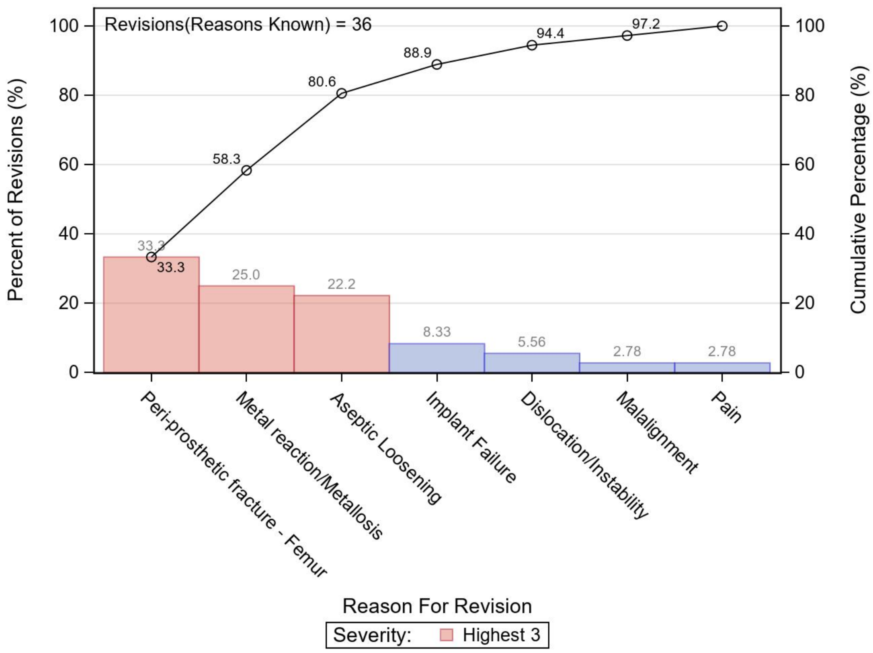

Figure 206: Reasons for revision following primary resurfacing THA (Pareto chart). Solid line is cumulative percent.

2.3.4 Revision risk for resurfacing THA implant combinations

Table 896: Summary of cumulative percent revision following primary THA for stem/cup combinations having at least 500 cases, sorted alphabetically.

Implant	N*	1 year	3 years	5 years	7 years	10 years
BHR / BHR	1209	1.25 (0.76,2.07)	2.06 (1.39,3.06)	2.79 (1.97,3.95)	3.72 (2.64,5.24)	4.08 (2.86,5.81)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.

BHR/BHR
N=1211

Distribution of utilization: 25 surgeons across 24 sites used this implant combination in primary THA.

Table 897: Volume of cases by surgeon and site for the BHR/BHR combination in primary THA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	48 (134)	8 (25)
Cases per site	50 (136)	9 (25)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 898: Descriptive statistics of cases receiving the BHR/BHR combination in primary THA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	47	3.88	
Age (years)	1211	54.59(8.83)	55.00(11.00)
Height (cm)	1211	179.09(7.44)	180.00(8.00)
Weight (kg)	1211	99.29(19.78)	96.20(24.70)
BMI(kg/m^2)	1211	30.87(5.40)	29.94(6.65)
Smoking - never (%)	754	62.26	
Smoking - previous (%)	298	24.61	
Smoking - current (%)	158	13.05	
Smoking - unknown (%)	1	0.08	

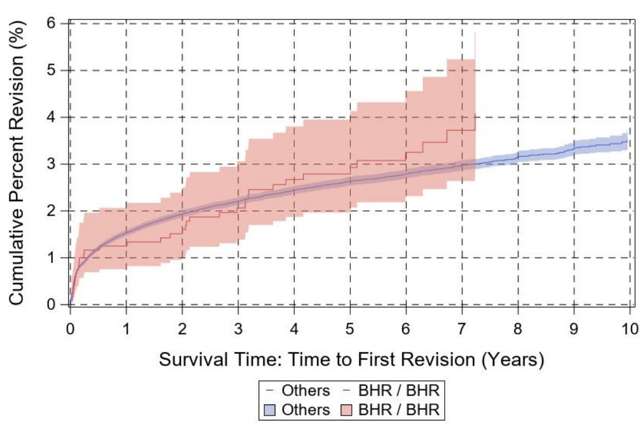

Figure 207: Cumulative percent revision curve for the BHR/BHR combination compared to all other implant combinations in primary THA.

Table 899: Cumulative percent revision and number at risk for BHR/BHR combination in primary THA cases.

Year	Number at risk	CPR
0	1209	0.00 (0.00,0.00)
1	1154	1.25 (0.76,2.07)
2	1100	1.60 (1.02,2.50)
3	1017	2.06 (1.39,3.06)
4	857	2.67 (1.87,3.81)
5	698	2.79 (1.97,3.95)
6	539	3.25 (2.32,4.56)
7	333	3.72 (2.64,5.24)
8*	132	4.08 (2.86,5.81)
9*	61	4.08 (2.86,5.81)
10*	17	4.08 (2.86,5.81)

* No revision occurred after the termination of the red curve in Figure 207; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 900: Reasons for revision following primary THA for BHR/BHR combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	12	33.3
2	Metal Reaction/Metallosis	9	25.0
3	Aseptic Loosening	8	22.2
4	Implant Failure	3	8.3
5	Dislocation/Instability	2	5.6
6	Pain	1	2.8
7	Malalignment	1	2.8

Table 901: Reasons for revision in first 90 days following primary THA for BHR/BHR combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	9	69.2
2	Dislocation/Instability	2	15.4
3	Implant Failure	2	15.4

Table 902: Reasons for revision between 91 and 365 days following primary THA for BHR/BHR combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	50.0
2	Peri-prosthetic fracture - Femur	1	50.0

Table 903: Distribution of approach used for BHR/BHR combination in primary THA cases.

Approach	N	Percent
Anterior	18	1.5
Anterolateral	723	59.7
Posterior	351	29.0
Transtrochanteric	117	9.7
Missing/unknown/other	2	0.2

Table 904: Distribution of polyethylene used for BHR/BHR combination cases in which polyethylene liners were used in primary THA cases.

Polyethylene type	N	Percent
UHMWPE	0	0.0
XLPE	1	100.0
Antioxidant XLPE	0	0.0
Missing/unknown/other	0	0.0

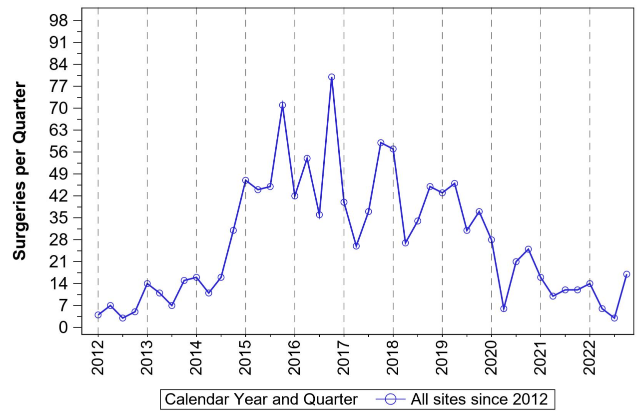

Figure 208: Utilization of the BHR/BHR combination in primary THA cases.

Catalog numbers of femoral components used in the analysis.

74123148	74121146	74121158
74121150	74123156	74123140
74123152	74121142	
74121154	74123144	

Catalog numbers of acetabular cups used in the analysis.

74122154	74122162	74122160
74120156	74120148	74120154
74122158	74122156	74120164
74120160	74122150	74122148
74120152	74120158	

Chapter 3

Total knee arthroplasty statistics, devices, and revisions

The data reported in this chapter is based on primary knee cases performed from 2/15/2012 to 12/31/2022.

3.1 All total knee arthroplasty cases

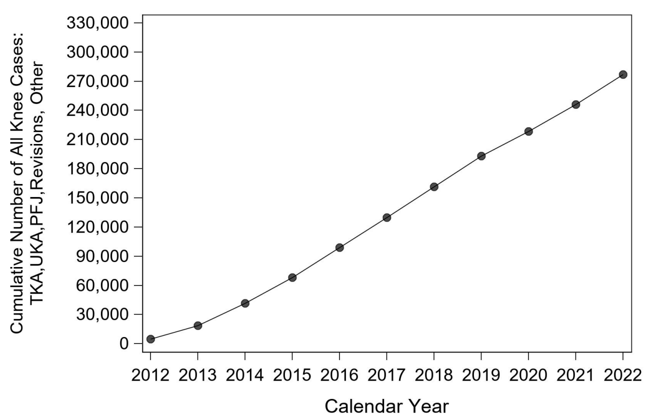

Figure 209: All knee cases over time. These cases were performed in a total of 213,727 patients.

Table 905: All knee cases over time (numerical values)

Year	Annual cases	Cumulative cases
2012	4994	4994
2013	13778	18772
2014	22701	41473
2015	26805	68278
2016	30562	98840
2017	31089	129929
2018	31555	161484
2019	31639	193123
2020	25212	218335
2021	27964	246299
2022	30794	277093

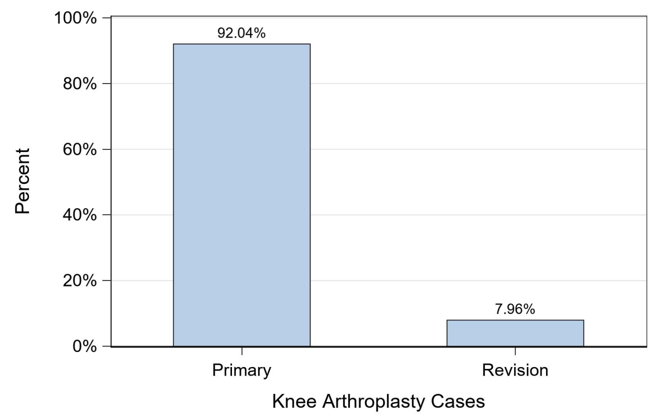

Figure 210: Percent of knee arthroplasty cases by primary or revision.

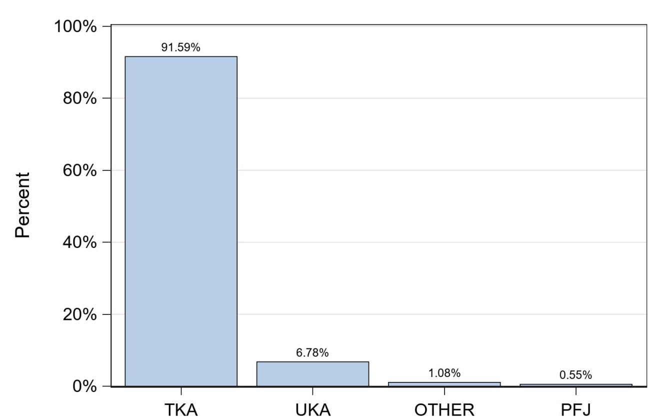

Figure 211: Percent of primary knee arthroplasty cases performed as TKA, UKA, and PFJ.

3.2 Primary TKA cases

3.2.1 Descriptive statistics

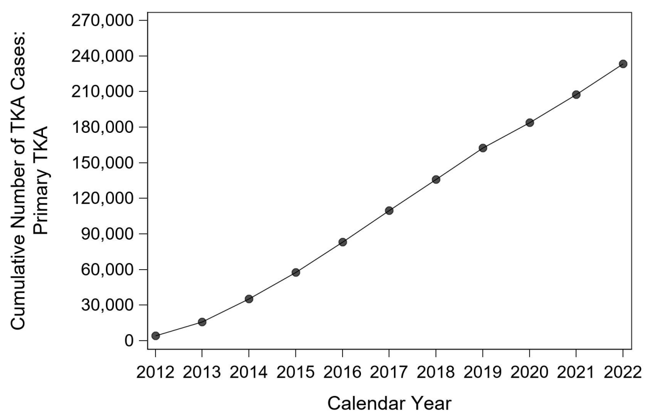

Figure 212: Primary TKA cases over time. These cases were performed in a total of 187,442 patients.

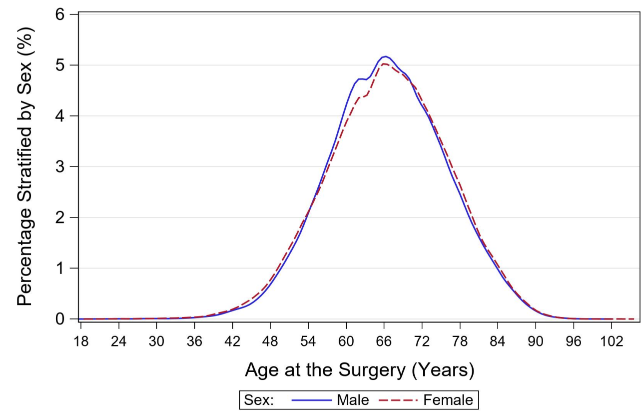

Figure 214: Age distribution of primary TKA cases by sex.

Table 906: TKA cases over time (numerical values)

Year	Annual cases	Cumulative cases
2012	4166	4166
2013	11672	15838
2014	19475	35313
2015	22375	57688
2016	25687	83375
2017	26248	109623
2018	26239	135862
2019	26599	162461
2020	21276	183737
2021	23757	207494
2022	26082	233576

Table 907: Descriptive statistics of primary TKA cases.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	144899	62	
Age (years)	233575	66.5(9.4)	67(13)
Height (cm)	232442	168.5(10.5)	167.6(16.5)
Weight (kg)	232442	94.6(21.5)	92.9(28.6)
BMI(kg/m^2)	232440	33.2(6.8)	32.5(9.1)
Smoking - never (%)	123147	52.7	
Smoking - previous (%)	88173	37.8	
Smoking - current (%)	21200	9.1	
Smoking - unknown (%)	1056	0.5	

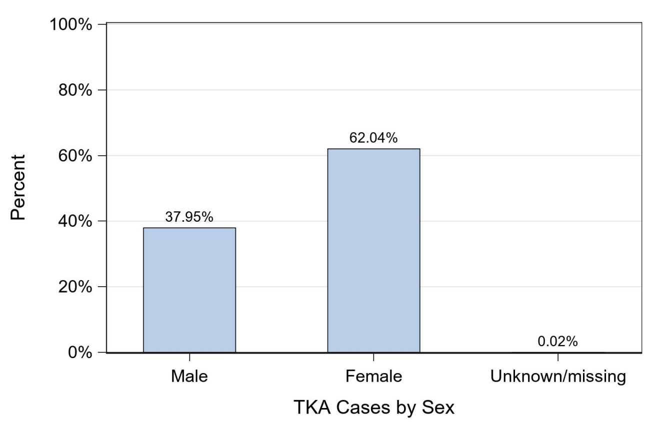

Figure 213: Percent of primary TKA cases by sex.

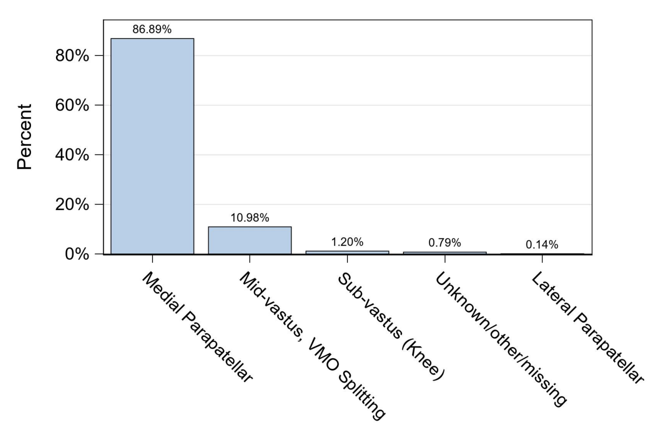

Figure 215: Percent of primary TKA cases by approach.

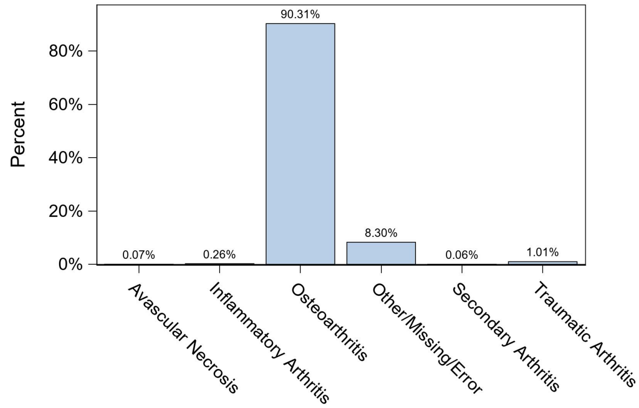

Figure 216: Percent of primary TKA cases by diagnosis.

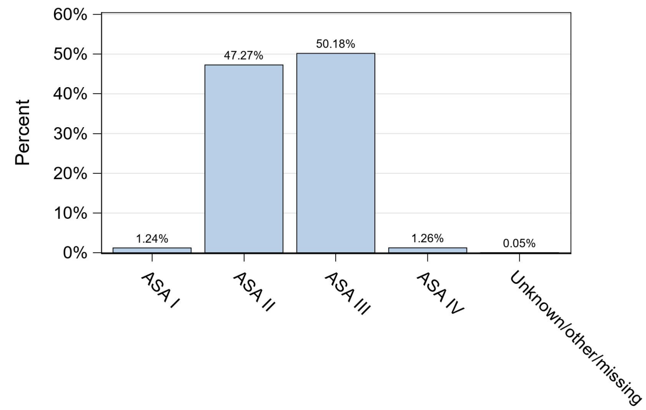

Figure 217: Percent of primary TKA cases by ASA class.

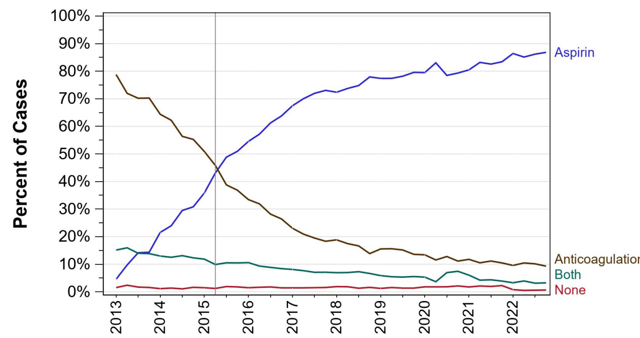

Figure 218: Percent of primary TKA patients (first case) by thrombosis prophylaxis.

3.2.2 Most commonly used TKA implants

The following three tables provide utilization data of implants used in primary TKA.

Table 908: Ten most commonly used femoral components in primary TKA.

Rank	Stem	N	Percent
1	Triathlon	69600	29.8
2	Persona	66101	28.3
3	Vanguard	24481	10.5
4	Attune	14937	6.4
5	Legion	13121	5.6
6	Journey II BCS	6485	2.8
7	Evolution MP	4994	2.1
8	Sigma PFC	4739	2.0
9	NK II GS	3965	1.7
10	Sigma	2702	1.2
11	Others	22451	9.6

Table 909: Ten most commonly used tibial components in primary TKA.

Rank	Cup	N	Percent
1	Persona	65364	28.0
2	Triathlon	39963	17.1
3	Triathlon TS	29894	12.8
4	Maxim	22835	9.8
5	Attune	14803	6.3
6	Genesis II	14260	6.1
7	Journey	7851	3.4
8	Sigma	5484	2.4
9	NK II	4934	2.1
10	Evolution MP	4724	2.0
11	Others	23464	10.0

Table 910: Ten most commonly used femoral/tibial component combinations in primary TKA.

Rank	Stem/cup combination	N	Percent
1	Persona / Persona	65352	28.0
2	Triathlon / Triathlon	39939	17.1
3	Triathlon / Triathlon TS	29527	12.6
4	Vanguard / Maxim	22808	9.8
5	Attune / Attune	14803	6.3
6	Legion / Genesis II	12828	5.5
7	Journey II BCS / Journey	6438	2.8
8	Evolution MP / Evolution MP	4702	2.0
9	NK II GS / NK II	3939	1.7
10	Sigma PFC / Sigma	3787	1.6
11	Others	29453	12.6

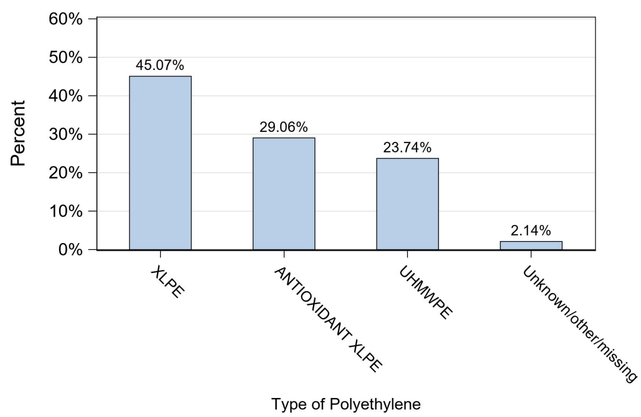

Figure 219: Percent of polyethylene inserts by type of polyethylene in primary TKA.

3.2.3 TKA revision risk summary

Reason for revision is of central importance to quality improvement because it helps focus attention on specific causes that may be addressed. Therefore, the data are presented in two formats below: tabular and Pareto chart. The tabular format is consistent with how other arthroplasty registries report cause of revision. The Pareto chart figure presents the same data in a format commonly used in quality improvement. The Pareto chart sorts the reasons for revision by frequency (bar chart on bottom, from left to right) and presents a cumulative percent using a line graph above.

In addition to an overall summary of reason for revision, tables showing reason for revision for the first, second, and third year post-operatively are provided because the reasons change over this time horizon. It is important to note that the time window for the cases reported in reasons for revision tables and figures differ from the time window used for other figures because reason for revision was added to the database on 1/1/2015. While these data capture revisions for primaries performed back to 2/15/2012, only revisions occurring on or after 1/1/2015 are included in the reasons for revision figure and tables. Also note that for knees instability/dislocation should be interpreted as instability.

Table 911: Reasons for first revision following primary TKA.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1627	27.8
2	Joint Infection	1387	23.7
3	Aseptic Loosening	1199	20.5
4	Arthrofibrosis	464	7.9
5	Pain	390	6.7
6	Implant Failure	243	4.2
7	Malalignment	132	2.3
8	Peri-prosthetic fracture - Femur	119	2.0
9	Poly liner wear	84	1.4
10	Metal Reaction/Metallosis	57	1.0
11	Peri-prosthetic fracture - Tibia	43	0.7
12	Extensor mechanism failure	41	0.7
13	Patellofemoral Joint	38	0.7
14	Osteolysis	20	0.3

Table 912: Reasons for first revision following primary TKA in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Joint Infection	573	33.1
2	Dislocation/Instability	419	24.2
3	Arthrofibrosis	180	10.4
4	Aseptic Loosening	166	9.6
5	Pain	130	7.5
6	Peri-prosthetic fracture - Femur	69	4.0
7	Implant Failure	60	3.5
8	Malalignment	45	2.6
9	Peri-prosthetic fracture - Tibia	29	1.7
10	Extensor mechanism failure	28	1.6
11	Metal Reaction/Metallosis	13	0.8
12	Poly liner wear	10	0.6
13	Patellofemoral Joint	9	0.5
14	Osteolysis	2	0.1

Table 913: Reasons for first revision following primary TKA in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	523	31.9
2	Aseptic Loosening	338	20.6
3	Joint Infection	325	19.8
4	Pain	140	8.5
5	Arthrofibrosis	127	7.7
6	Implant Failure	68	4.1
7	Malalignment	37	2.3
8	Poly liner wear	25	1.5
9	Metal Reaction/Metallosis	14	0.9
10	Patellofemoral Joint	13	0.8
11	Extensor mechanism failure	10	0.6
12	Peri-prosthetic fracture - Femur	9	0.5
13	Osteolysis	8	0.5
14	Peri-prosthetic fracture - Tibia	4	0.2

Table 914: Reasons for first revision following primary TKA in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	293	31.2
2	Aseptic Loosening	225	23.9
3	Joint Infection	207	22.0
4	Arthrofibrosis	63	6.7
5	Pain	59	6.3
6	Implant Failure	41	4.4
7	Malalignment	20	2.1
8	Metal Reaction/Metallosis	11	1.2
9	Poly liner wear	8	0.9
10	Patellofemoral Joint	6	0.6
11	Peri-prosthetic fracture - Femur	4	0.4
12	Osteolysis	2	0.2
13	Peri-prosthetic fracture - Tibia	1	0.1

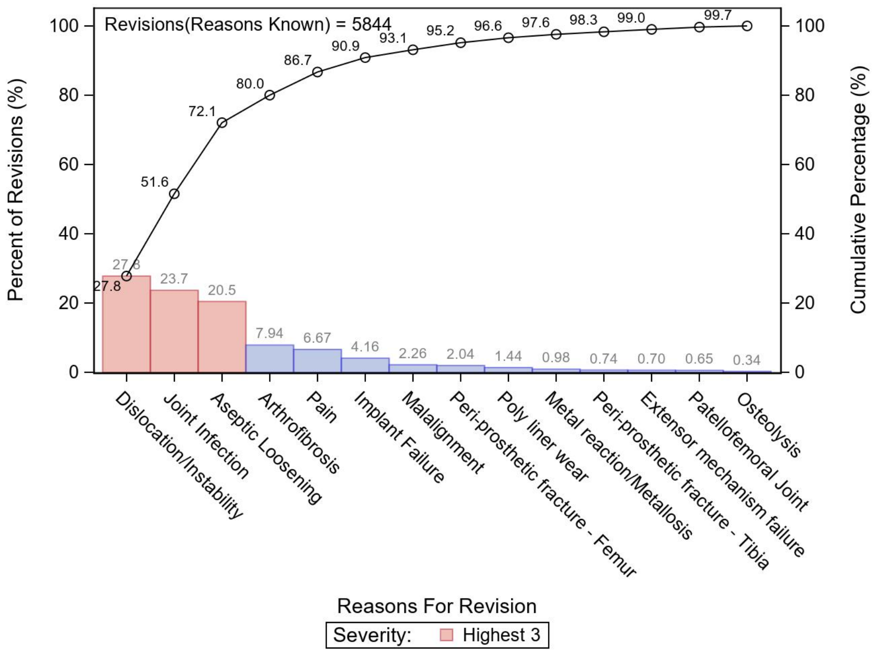

Figure 220: Most common reasons for first revision following primary TKA (Pareto chart). Solid line is cumulative percent.

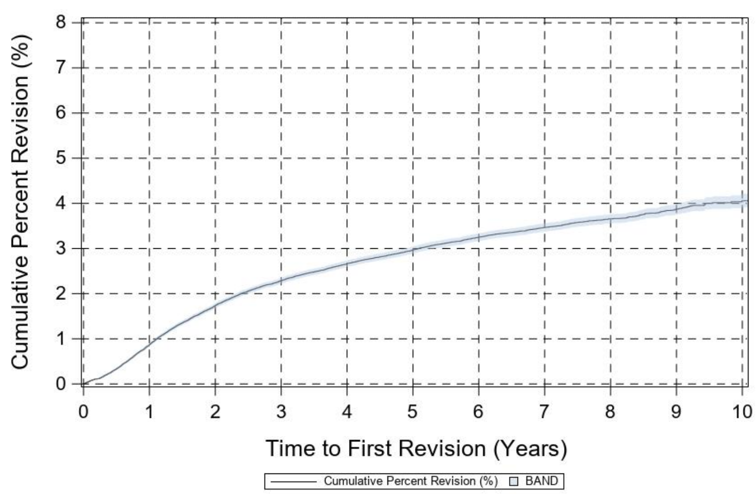

Figure 221: Cumulative percent revision for primary TKA.

Table 915: Cumulative percent revision for primary TKA (numerical values).

	1 year	3 years	5 years	7 years	10 years
CPR	0.87 (0.83,0.91)	2.28 (2.22,2.35)	2.97 (2.89,3.05)	3.47 (3.38,3.56)	4.06 (3.91,4.21)
Number at risk	204169	157380	105113	54740	3848

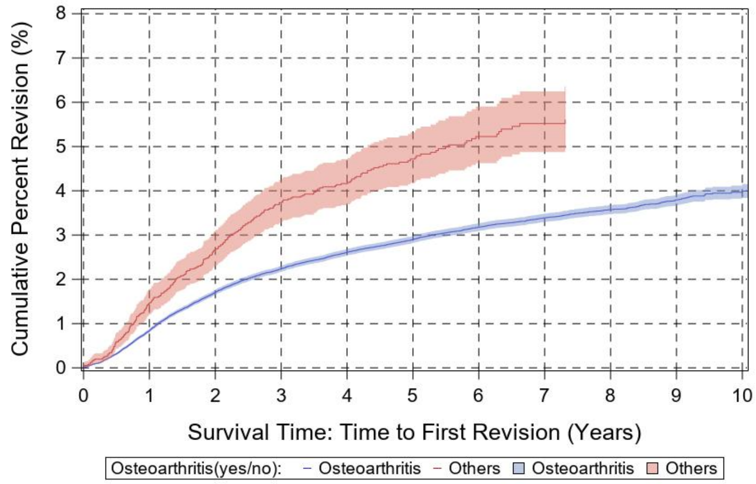

Figure 222: Cumulative percent revision for primary TKA by diagnosis.

Table 916: Cumulative percent revision for primary TKA by diagnosis (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Osteoarthritis	209460	0.84 (0.80,0.88)	2.24 (2.17,2.31)	2.90 (2.82,2.99)	3.39 (3.30,3.48)	3.99 (3.84,4.15)
Others	7248	1.47 (1.21,1.78)	3.73 (3.28,4.24)	4.72 (4.18,5.32)	5.52 (4.87,6.25)	5.61 (4.94,6.36)
Unknown/Missing	15261					

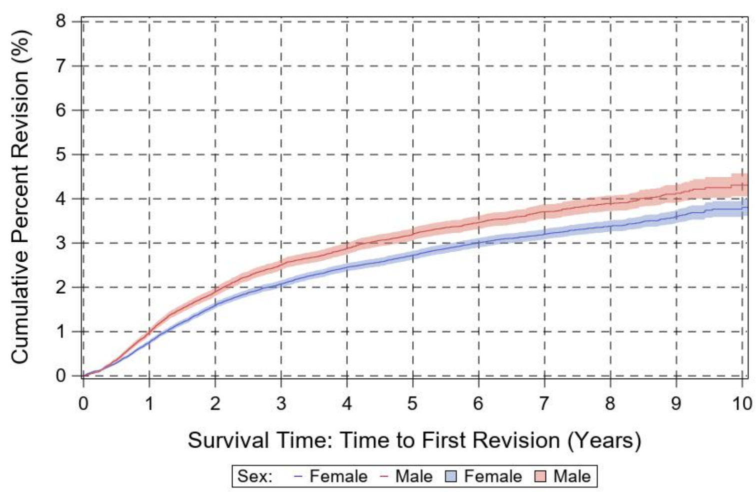

Figure 223: Cumulative percent revision for primary TKA by sex for osteoarthritis diagnosis.

Table 917: Cumulative percent revision for primary TKA by sex for osteoarthritis diagnosis (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Female	131320	0.76 (0.71,0.81)	2.08 (1.99,2.16)	2.73 (2.63,2.83)	3.20 (3.08,3.32)	3.81 (3.61,4.01)
Male	78104	0.99 (0.92,1.06)	2.50 (2.39,2.62)	3.20 (3.06,3.34)	3.71 (3.55,3.87)	4.31 (4.06,4.58)
Unknown/Missing	36					

3.2.4 Analysis of the effect of patella resurfacing on revision risk

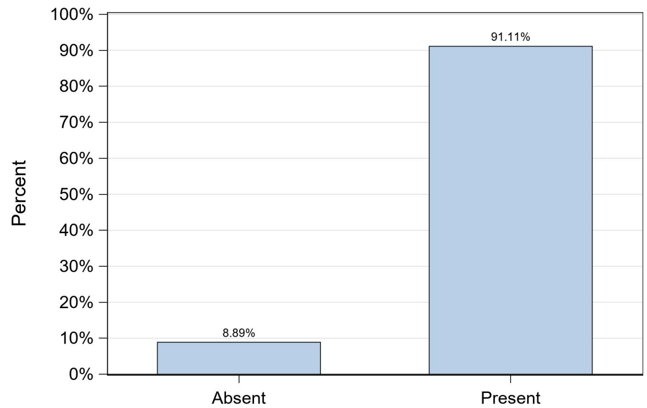

Figure 224: Percent of primary TKA cases performed with (present) and without (absent) patella resurfacing.

Table 918: Descriptive statistics of primary TKA cases having TKA with and without patella resurfacing.

Quantity	Resurfaced N	Resurfaced Mean (SD)	Resurfaced Median (IQR)	Without patella resurfaced N	Without patella resurfaced Mean (SD)	Without patella resurfaced Median (IQR)
Female (%)	132640	62.3		12252	59	
Age (years)	212812	66.6(9.4)	67(13)	20756	66.3(9.6)	66(13)
Height (cm)	211682	168.5(10.5)	167.6(16)	20753	168.6(10.7)	167.6(17.8)
Weight (kg)	211682	94.5(21.4)	92.9(28.5)	20753	94.8(21.9)	93(28.8)
BMI(kg/m^2)	211680	33.2(6.8)	32.5(9.1)	20753	33.3(6.9)	32.5(9.2)
Smoking - never (%)	112328	52.8		10815	52.1	
Smoking - previous (%)	80169	37.7		8001	38.6	
Smoking - current (%)	19301	9.1		1899	9.2	
Smoking - unknown (%)	1015	0.5		41	0.2	

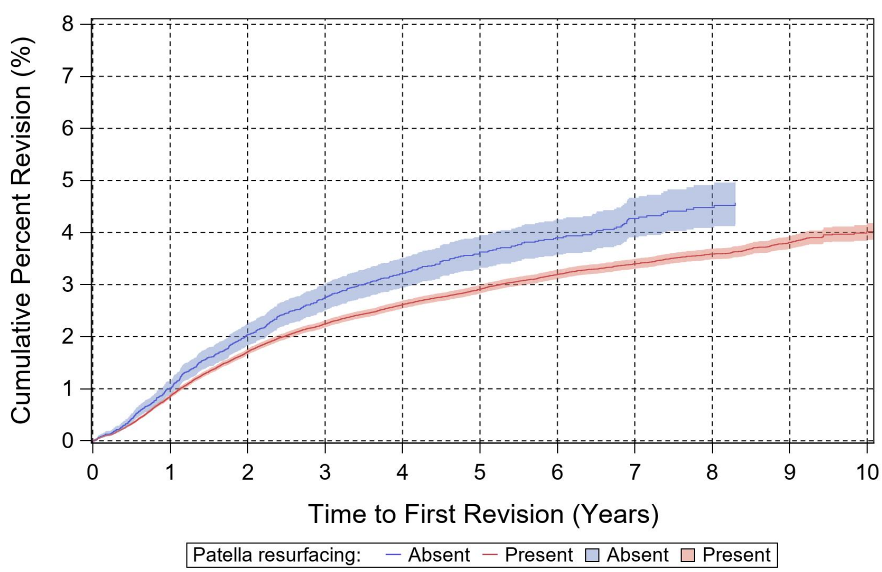

Figure 225: Cumulative percent revision curve for primary TKA cases performed with (present) and without (absent) patella resurfacing.

Table 919: Cumulative percent revision curve for primary TKA cases performed with and without patella resurfacing (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Patella not resurfaced	20634	1.01 (0.88,1.17)	2.75 (2.50,3.02)	3.63 (3.32,3.95)	4.27 (3.91, 4.67)	4.57 (4.16, 5.02)
Patella resurfaced	211328	0.86 (0.82,0.90)	2.24 (2.18,2.31)	2.91 (2.83,3.00)	3.40 (3.31, 3.50)	4.02 (3.86, 4.18)
Unknown/missing	0					

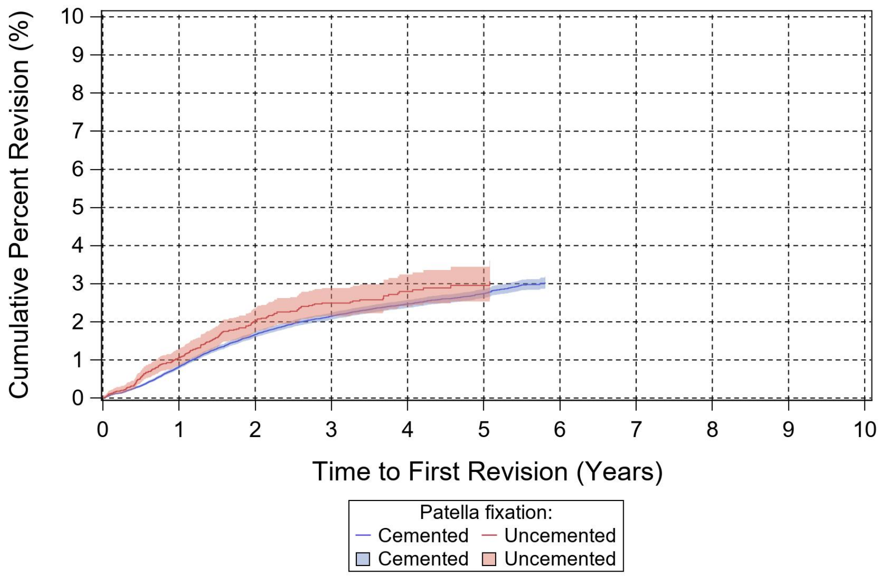

Figure 226: Cumulative percent revision curve for primary TKA cases performed with patella resurfacing by fixation.

Table 920: Cumulative percent revision curve for primary TKA cases performed with patella resurfacing by fixation (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Cemented	124802	0.82 (0.77,0.87)	2.14 (2.05,2.24)	2.74 (2.63,2.86)	N/A	N/A
Uncemented	9518	1.06 (0.86,1.29)	2.49 (2.15,2.89)	2.96 (2.54,3.45)	N/A	N/A
Unknown/missing	445					

3.2.5 Revision risk for TKA implant combinations

As with hip implants, there is substantial variation in revision risk across TKA implants. The same caveats about interpreting CPR data provided in chapter two also apply to the interpretation of CPR data for knees. Specifically, the reader should be cautious in interpreting CPR values when the number at risk is low. While the reader is encouraged to read the details of each femur/tibia implant combination, the following table summarizes the 10-year CPR values.

Table 921: Summary of cumulative percent revision for femoral/tibial combinations in primary TKA having at least 500 cases, sorted alphabetically (A-P).

Femoral/tibial combination	N	1 year	3 years	5 years	7 years	10 years
Attune / Attune	14701	0.68 (0.55,0.83)	2.25 (2.00,2.53)	3.32 (2.99,3.68)	3.90 (3.52,4.32)	4.68 (3.81,5.74)
Evolution MP / Evolution MP	4692	1.28 (0.98,1.67)	3.50 (2.95,4.16)	4.56 (3.86,5.39)	5.42 (4.47,6.56)	5.72 (4.64,7.04)
Genesis II / Genesis II	1401	1.21 (0.76,1.94)	2.44 (1.75,3.40)	3.69 (2.81,4.84)	4.37 (3.38,5.64)	5.05 (3.88,6.56)
Genesis II (CoCr) / Genesis II	712	0.84 (0.38,1.87)	1.86 (1.08,3.18)	2.82 (1.81,4.39)	3.36 (2.22, 5.08)	3.36 (2.22, 5.08)
Genesis II (Oxinium) / Genesis II	689	1.60 (0.89,2.86)	3.05 (2.00,4.65)	4.56 (3.23,6.43)	5.35 (3.86,7.39)	6.71 (4.79,9.36)
iBalance / iBalance	626	2.66 (1.61,4.37)	8.38 (6.21,11.25)	10.80 (7.99,14.52)	11.70 (8.54,15.92)	N/A
iTotal	749	1.20 (0.63,2.30)	2.97 (1.97,4.48)	4.06 (2.84,5.80)	4.82 (3.40,6.81)	6.25 (4.12,9.41)
iTotal G2+	728	1.24 (0.65,2.36)	2.92 (1.91,4.44)	3.94 (2.71,5.71)	4.70 (3.27,6.72)	N/A
Journey II / Journey	1384	1.43 (0.90,2.26)	4.08 (3.07,5.43)	4.77 (3.60,6.33)	6.09 (4.33,8.54)	N/A
Journey II (Oxinium) / Journey	1376	1.44 (0.91,2.28)	4.11 (3.09,5.47)	4.81 (3.62,6.37)	6.12 (4.36,8.57)	N/A
Journey II BCS / Journey	6413	1.33 (1.07,1.65)	3.55 (3.08,4.08)	4.39 (3.83,5.01)	4.89 (4.25,5.63)	6.19 (4.53,8.44)
Journey II BCS (CoCr) / Journey	866	0.37 (0.12,1.15)	1.15 (0.57,2.30)	1.51 (0.75,3.05)	N/A	N/A
Journey II BCS (Oxinium) / Journey	5547	1.48 (1.18,1.84)	3.89 (3.37,4.49)	4.77 (4.16,5.47)	5.29 (4.60,6.09)	6.59 (4.90,8.83)
LCS Complete / M.B.T.	1806	1.20 (0.77,1.85)	3.55 (2.73,4.62)	4.83 (3.81,6.11)	5.06 (3.97,6.44)	5.06 (3.97,6.44)
Legion / Genesis II	12735	1.06 (0.89,1.26)	3.00 (2.70,3.33)	3.64 (3.29,4.02)	4.37 (3.95,4.83)	5.16 (4.57,5.83)
NexGen GS / NexGen Pegged	675	1.04 (0.50,2.16)	2.07 (1.23,3.48)	2.69 (1.70,4.24)	3.13 (2.02,4.84)	4.67 (2.30,9.35)
NexGen GS / NexGen Precoat	641	0.33 (0.08,1.30)	1.37 (0.68,2.71)	1.78 (0.96,3.30)	1.78 (0.96,3.30)	1.78 (0.96,3.30)
NexGen LPS GS / NexGen Precoat	528	0.38 (0.09,1.51)	1.89 (1.02,3.49)	2.28 (1.30,3.98)	2.89 (1.75,4.75)	2.89 (1.75,4.75)
NexGen LPS Option / NexGen Precoat	726	0.69 (0.29,1.65)	1.52 (0.85,2.73)	2.40 (1.50,3.83)	3.46 (2.30,5.17)	4.01 (2.70,5.95)
NexGen LPS Option / NexGen TM	1332	0.47 (0.21,1.04)	0.96 (0.55,1.68)	1.33 (0.82,2.17)	1.43 (0.89,2.30)	1.70 (1.03,2.82)
NexGen Option / NexGen Option	1313	0.31 (0.12,0.83)	0.97 (0.55,1.71)	1.16 (0.69,1.95)	1.41 (0.86,2.31)	1.41 (0.86,2.31)
NexGen Option / NexGen Pegged	616	0.81 (0.34,1.94)	2.44 (1.48,4.01)	2.92 (1.85,4.60)	3.10 (1.99,4.81)	3.45 (2.21,5.36)
NexGen Precoat / NexGen Precoat	557	0.92 (0.38,2.19)	1.92 (1.04,3.55)	2.43 (1.38,4.26)	2.97 (1.66,5.29)	2.97 (1.66,5.29)
NK II / NK II	990	0.20 (0.05,0.81)	1.11 (0.62,2.00)	1.62 (1.00,2.63)	1.97 (1.26,3.07)	2.52 (1.58,4.00)
NK II GS / NK II	3924	0.37 (0.22,0.62)	0.91 (0.64,1.28)	1.34 (0.99,1.81)	1.83 (1.36,2.47)	2.13 (1.54,2.96)
Persona / Persona	64991	0.72 (0.65,0.79)	2.07 (1.95,2.20)	2.73 (2.58,2.88)	3.19 (3.02,3.38)	3.77 (3.46,4.10)

Table 922: Summary of cumulative percent revision for femoral/tibial combinations in primary TKA having at least 500 cases, sorted alphabetically (S-Z).

Femoral/tibial combination	N	1 year	3 years	5 years	7 years	10 years
Scorpio / Series 7000	650	1.38 (0.72,2.64)	4.00 (2.74,5.82)	4.98 (3.55,6.97)	5.39 (3.87,7.47)	7.41 (4.93,11.07)
Sigma / M.B.T.	973	1.47 (0.87,2.46)	3.65 (2.62,5.08)	4.38 (3.23,5.92)	4.86 (3.62,6.51)	7.24 (4.44,11.70)
Sigma / Sigma	1663	1.49 (1.00,2.22)	2.94 (2.21,3.90)	3.72 (2.88,4.79)	4.13 (3.23,5.27)	4.69 (3.62,6.05)
Sigma PFC / Sigma	3702	0.67 (0.45,0.99)	1.93 (1.52,2.45)	2.50 (2.02,3.09)	2.84 (2.32,3.48)	3.33 (2.69,4.11)
Sigma PFC / Sigma PFC All-Poly	547	0.73 (0.28,1.94)	1.29 (0.62,2.70)	1.29 (0.62,2.70)	1.29 (0.62,2.70)	1.29 (0.62,2.70)
Triathlon / Triathlon	39654	0.88 (0.79,0.98)	1.95 (1.81,2.11)	2.49 (2.32,2.68)	2.86 (2.65,3.08)	3.59 (3.08,4.18)
Triathlon / Triathlon TS	29312	0.91 (0.81,1.03)	2.22 (2.05,2.41)	2.84 (2.64,3.07)	3.38 (3.13,3.65)	4.08 (3.70,4.51)
Vanguard / Maxim	22671	0.81 (0.70,0.93)	2.07 (1.88,2.27)	2.67 (2.46,2.90)	3.23 (2.98,3.50)	3.54 (3.23,3.87)
Vanguard / Maxim Mono-Lock	1260	0.57 (0.27,1.19)	2.03 (1.36,3.01)	3.05 (2.17,4.28)	3.69 (2.66,5.11)	5.49 (3.62,8.29)
Vanguard XP / Vanguard XP	547	2.56 (1.52,4.28)	9.87 (7.65,12.69)	11.64 (9.21,14.66)	12.15 (9.65,15.25)	N/A

Table 923: Summary of cumulative percent revision for femoral/tibial combinations in primary TKA having at least 500 cases, sorted by 10-year CPR.

Femoral/tibial combination	N	1 year	3 years	5 years	7 years	10 years
Sigma PFC / Sigma PFC All-Poly	547	0.73 (0.28,1.94)	1.29 (0.62,2.70)	1.29 (0.62,2.70)	1.29 (0.62,2.70)	1.29 (0.62,2.70)
NexGen Option / NexGen Option	1313	0.31 (0.12,0.83)	0.97 (0.55,1.71)	1.16 (0.69,1.95)	1.41 (0.86,2.31)	1.41 (0.86,2.31)
NexGen LPS Option / NexGen TM	1332	0.47 (0.21,1.04)	0.96 (0.55,1.68)	1.33 (0.82,2.17)	1.43 (0.89,2.30)	1.70 (1.03,2.82)
NexGen GS / NexGen Precoat	641	0.33 (0.08,1.30)	1.37 (0.68,2.71)	1.78 (0.96,3.30)	1.78 (0.96,3.30)	1.78 (0.96,3.30)
NK II GS / NK II	3924	0.37 (0.22,0.62)	0.91 (0.64,1.28)	1.34 (0.99,1.81)	1.83 (1.36,2.47)	2.13 (1.54,2.96)
NK II / NK II	990	0.20 (0.05,0.81)	1.11 (0.62,2.00)	1.62 (1.00,2.63)	1.97 (1.26,3.07)	2.52 (1.58,4.00)
NexGen LPS GS / NexGen Precoat	528	0.38 (0.09,1.51)	1.89 (1.02,3.49)	2.28 (1.30,3.98)	2.89 (1.75,4.75)	2.89 (1.75,4.75)
NexGen Precoat / NexGen Precoat	557	0.92 (0.38,2.19)	1.92 (1.04,3.55)	2.43 (1.38,4.26)	2.97 (1.66,5.29)	2.97 (1.66,5.29)
Sigma PFC / Sigma	3702	0.67 (0.45,0.99)	1.93 (1.52,2.45)	2.50 (2.02,3.09)	2.84 (2.32,3.48)	3.33 (2.69,4.11)
Genesis II (CoCr) / Genesis II	712	0.84 (0.38,1.87)	1.86 (1.08,3.18)	2.82 (1.81,4.39)	3.36 (2.22, 5.08)	3.36 (2.22,5.08)
NexGen Option / NexGen Pegged	616	0.81 (0.34,1.94)	2.44 (1.48,4.01)	2.92 (1.85,4.60)	3.10 (1.99,4.81)	3.45 (2.21,5.36)
Vanguard / Maxim	22671	0.81 (0.70,0.93)	2.07 (1.88,2.27)	2.67 (2.46,2.90)	3.23 (2.98,3.50)	3.54 (3.23,3.87)
Triathlon / Triathlon	39654	0.88 (0.79,0.98)	1.95 (1.81,2.11)	2.49 (2.32,2.68)	2.86 (2.65,3.08)	3.59 (3.08,4.18)
Persona / Persona	64991	0.72 (0.65,0.79)	2.07 (1.95,2.20)	2.73 (2.58,2.88)	3.19 (3.02,3.38)	3.77 (3.46,4.10)
NexGen LPS Option / NexGen Precoat	726	0.69 (0.29,1.65)	1.52 (0.85,2.73)	2.40 (1.50,3.83)	3.46 (2.30,5.17)	4.01 (2.70,5.95)
Triathlon / Triathlon TS	29312	0.91 (0.81,1.03)	2.22 (2.05,2.41)	2.84 (2.64,3.07)	3.38 (3.13,3.65)	4.08 (3.70,4.51)
NexGen GS / NexGen Pegged	675	1.04 (0.50,2.16)	2.07 (1.23,3.48)	2.69 (1.70,4.24)	3.13 (2.02,4.84)	4.67 (2.30,9.35)
Attune / Attune	14701	0.68 (0.55,0.83)	2.25 (2.00,2.53)	3.32 (2.99,3.68)	3.90 (3.52,4.32)	4.68 (3.81,5.74)
Sigma / Sigma	1663	1.49 (1.00,2.22)	2.94 (2.21,3.90)	3.72 (2.88,4.79)	4.13 (3.23,5.27)	4.69 (3.62,6.05)
Genesis II / Genesis II	1401	1.21 (0.76,1.94)	2.44 (1.75,3.40)	3.69 (2.81,4.84)	4.37 (3.38,5.64)	5.05 (3.88,6.56)
LCS Complete / M.B.T.	1806	1.20 (0.77,1.85)	3.55 (2.73,4.62)	4.83 (3.81,6.11)	5.06 (3.97,6.44)	5.06 (3.97,6.44)
Legion / Genesis II	12735	1.06 (0.89,1.26)	3.00 (2.70,3.33)	3.64 (3.29,4.02)	4.37 (3.95,4.83)	5.16 (4.57,5.83)
Vanguard / Maxim Mono-Lock	1260	0.57 (0.27,1.19)	2.03 (1.36,3.01)	3.05 (2.17,4.28)	3.69 (2.66,5.11)	5.49 (3.62,8.29)
Evolution MP / Evolution MP	4692	1.28 (0.98,1.67)	3.50 (2.95,4.16)	4.56 (3.86,5.39)	5.42 (4.47,6.56)	5.72 (4.64,7.04)
Journey II BCS / Journey	6413	1.33 (1.07,1.65)	3.55 (3.08,4.08)	4.39 (3.83,5.01)	4.89 (4.25,5.63)	6.19 (4.53,8.44)
iTotal	749	1.20 (0.63,2.30)	2.97 (1.97,4.48)	4.06 (2.84,5.80)	4.82 (3.40,6.81)	6.25 (4.12,9.41)
Journey II BCS (Oxinium) / Journey	5547	1.48 (1.18,1.84)	3.89 (3.37,4.49)	4.77 (4.16,5.47)	5.29 (4.60,6.09)	6.59 (4.90,8.83)
Genesis II (Oxinium) / Genesis II	689	1.60 (0.89,2.86)	3.05 (2.00,4.65)	4.56 (3.23,6.43)	5.35 (3.86,7.39)	6.71 (4.79,9.36)
Sigma / M.B.T.	973	1.47 (0.87,2.46)	3.65 (2.62,5.08)	4.38 (3.23,5.92)	4.86 (3.62,6.51)	7.24 (4.44,11.70)
Scorpio / Series 7000	650	1.38 (0.72,2.64)	4.00 (2.74,5.82)	4.98 (3.55,6.97)	5.39 (3.87,7.47)	7.41 (4.93,11.07)

Attune/Attune

N=14803

Distribution of utilization: 101 surgeons across 46 sites used this implant combination in primary TKA.

Table 924: Volume of cases by surgeon and site for the Attune/Attune combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	146 (275)	17 (221)
Cases per site	321 (581)	55 (377)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 925: Descriptive statistics of cases receiving the Attune/Attune combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	8868	59.9	
Age (years)	14803	66.2(9.2)	66(13)
Height (cm)	14402	169(10.6)	167.6(17.8)
Weight (kg)	14402	95.7(21)	94.4(27.9)
BMI(kg/m^2)	14402	33.5(6.5)	32.9(8.9)
Smoking - never (%)	7683	51.9	
Smoking - previous (%)	5611	37.9	
Smoking - current (%)	1459	9.9	
Smoking - unknown (%)	50	0.3	

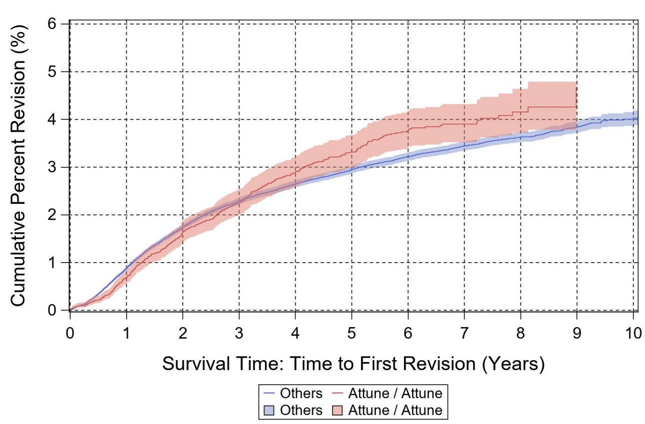

Figure 227: Cumulative percent revision curve for the Attune/Attune combination compared to all other implant combinations in primary TKA.

Table 926: Cumulative percent revision and number at risk for Attune/Attune combination in primary TKA cases.

Year	Number at risk	CPR
0	14701	0.00 (0.00,0.00)
1	12789	0.68 (0.55,0.83)
2	10906	1.64 (1.44,1.88)
3	9356	2.25 (2.00,2.53)
4	7906	2.90 (2.60,3.23)
5	6318	3.32 (2.99,3.68)
6	4620	3.76 (3.40,4.16)
7	2820	3.90 (3.52,4.32)
8	1079	4.16 (3.72,4.64)
9*	227	4.68 (3.81,5.74)
10*	2	4.68 (3.81,5.74)

* No revision occurred after the termination of the red curve in Figure 227; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 927: Reasons for revision following primary TKA for Attune/Attune combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	140	35.3
2	Dislocation/Instability	93	23.4
3	Joint Infection	75	18.9
4	Arthrofibrosis	32	8.1
5	Implant Failure	15	3.8
6	Pain	15	3.8
7	Malalignment	12	3.0
8	Peri-prosthetic fracture - Femur	4	1.0
9	Extensor mechanism failure	3	0.8
10	Poly liner wear	3	0.8
11	Metal Reaction/Metallosis	2	0.5
12	Osteolysis	2	0.5
13	Patellofemoral Joint	1	0.3

Table 928: Reasons for revision in first 90 days following primary TKA for Attune/Attune combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	5	41.7
2	Joint Infection	4	33.3
3	Aseptic Loosening	2	16.7
4	Peri-prosthetic fracture - Femur	1	8.3

Table 929: Reasons for revision between 91 and 365 days following primary TKA for Attune/Attune combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	22	28.2
2	Joint Infection	21	26.9
3	Aseptic Loosening	11	14.1
4	Arthrofibrosis	8	10.3
5	Pain	6	7.7
6	Implant Failure	4	5.1
7	Malalignment	2	2.6
8	Peri-prosthetic fracture - Femur	1	1.3
9	Metal Reaction/Metallosis	1	1.3
10	Extensor mechanism failure	1	1.3
11	Patellofemoral Joint	1	1.3

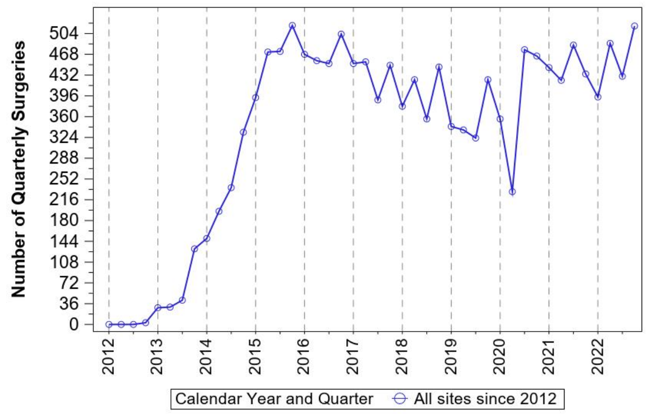

Figure 228: Utilization of the Attune/Attune combination in primary TKA cases.

Table 930: Distribution of approach used for Attune/Attune combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	13549	91.5
Mid-vastus	813	5.5
Sub-vastus	9	0.1
Lateral parapatellar	11	0.1
Missing/unknown/other	421	2.8

Catalog numbers of femoral components used in the analysis.

150400207	150400104	150401208
150410207	150410104	150401105
150400107	150400209	150410110
150410107	150410209	150401125
150400206	150410204	150440106
150400106	150410109	150401205
150400205	150400109	150410223
150410226	150400224	150440105
150400208	150410124	150440206
150410206	150400124	150401106
150400105	150410224	150410123
150400226	150400203	150440107
150410208	150401207	150401109
150400108	150400103	150440207
150410106	150401107	150440205
150410108	150410210	150400123
150400126	150410203	150400223
150410126	150400110	150440108
150410205	150401126	150440208
150400125	150400210	150400202
150410105	150401225	150410102
150400225	150401226	150411207
150410225	150410103	150440204
150410125	150401206	150401209
150400204	150401108	150411107

150411108	150411125	150440209
150440109	150411205	150411106
150440104	150400102	150411126
150401124	150401224	150440210
150401203	150410202	

Catalog numbers of tibial components used in the analysis.

150600005	150680008	150660003
150670005	150680003	150640008
150600004	150670009	150660007
150670004	150610008	150680002
150600006	150610003	150600002
150670007	150611005	150670002
150670006	150611006	150610002
150600007	150640005	150611009
150600008	150611007	150640003
150670008	150640004	150660008
150680005	150600010	150611003
150610005	150670010	150680010
150680004	150660004	150610010
150670003	150611004	150660002
150680006	150640006	150680001
150600003	150660005	150600001
150610004	150660006	150670001
150680007	150611008	150640009
150610006	150680009	150640010
150610007	150640007	
150600009	150610009	

Evolution MP/Evolution MP
N=4702

Distribution of utilization: 36 surgeons across 21 sites used this implant combination in primary TKA.

Table 931: Volume of cases by surgeon and site for the Evolution MP/Evolution MP combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	130 (195)	37 (166)
Cases per site	223 (251)	147 (225)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 932: Descriptive statistics of cases receiving the Evolution MP/Evolution MP combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2778	59.1	
Age (years)	4702	66.2(9.2)	66(12)
Height (cm)	4702	169.2(10.7)	167.6(16.5)
Weight (kg)	4702	95.6(21.9)	93(28.9)
BMI(kg/m^2)	4702	33.3(6.8)	32.5(9.1)
Smoking - never (%)	2537	54	
Smoking - previous (%)	1770	37.6	
Smoking - current (%)	371	7.9	
Smoking - unknown (%)	24	0.5	

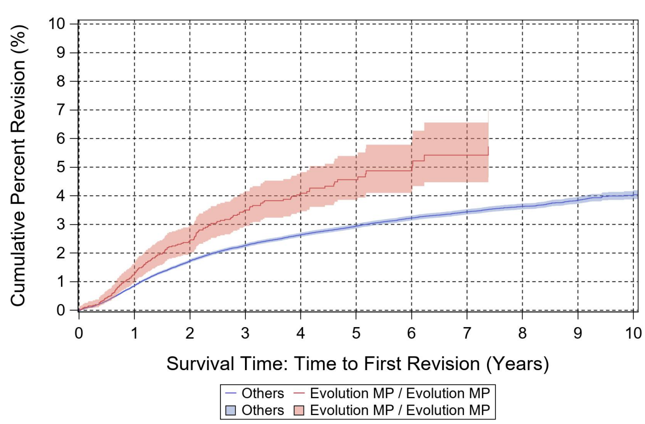

Figure 229: Cumulative percent revision curve for the Evolution MP/Evolution MP combination compared to all other implant combinations in primary TKA.

Table 933: Cumulative percent revision and number at risk for Evolution MP/Evolution MP combination in primary TKA cases.

Year	Number at risk	CPR
0	4692	0.00 (0.00,0.00)
1	3893	1.28 (0.98,1.67)
2	3178	2.43 (1.99,2.96)
3	2539	3.50 (2.95,4.16)
4	1725	4.09 (3.46,4.83)
5	997	4.56 (3.86,5.39)
6	549	4.87 (4.10,5.78)
7	343	5.42 (4.47,6.56)
8*	251	5.72 (4.64,7.04)
9*	187	5.72 (4.64,7.04)
10*	43	5.72 (4.64,7.04)

* No revision occurred after the termination of the red curve in Figure 229; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.052 (0.867,1.278). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 934: Reasons for revision following primary TKA for Evolution MP/Evolution MP combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	73	47.4
2	Aseptic Loosening	25	16.2
3	Joint Infection	25	16.2
4	Malalignment	7	4.5
5	Arthrofibrosis	6	3.9
6	Implant Failure	4	2.6
7	Peri-prosthetic fracture - Femur	4	2.6
8	Pain	3	1.9
9	Patellofemoral Joint	3	1.9
10	Extensor mechanism failure	2	1.3
11	Metal Reaction/Metallosis	1	0.6
12	Osteolysis	1	0.6

Table 935: Reasons for revision in first 90 days following primary TKA for Evolution MP/Evolution MP combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	42.9
2	Dislocation/Instability	1	14.3
3	Implant Failure	1	14.3
4	Peri-prosthetic fracture - Femur	1	14.3
5	Malalignment	1	14.3

Table 936: Reasons for revision between 91 and 365 days following primary TKA for Evolution MP/Evolution MP combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	23	50.0
2	Joint Infection	9	19.6
3	Aseptic Loosening	4	8.7
4	Implant Failure	2	4.3
5	Pain	2	4.3
6	Malalignment	2	4.3
7	Arthrofibrosis	2	4.3
8	Extensor mechanism failure	2	4.3

Table 937: Distribution of approach used for Evolution MP/Evolution MP combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	4631	98.5
Mid-vastus	59	1.3
Sub-vastus	2	0.0
Lateral parapatellar	5	0.1
Missing/unknown/other	5	0.1

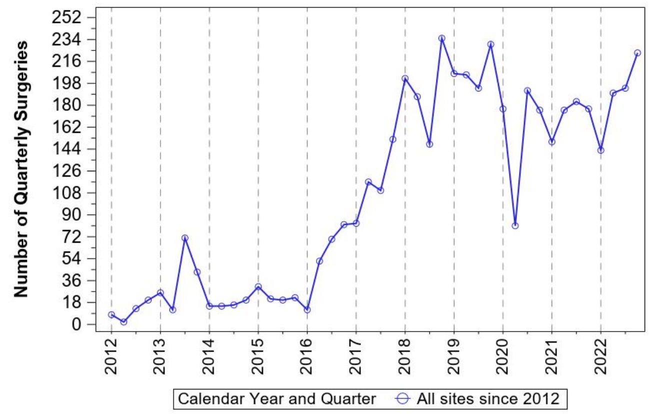

Figure 230: Utilization of the Evolution MP/Evolution MP combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

EFSRN5PR	EFSRP4PL	EFPSN4PR
EFSRN5PL	EFSRP4PR	EFPSN7PL
EFSRN4PR	EFSRP7PR	EFSRP2PL
EFSRN4PL	EFSRP7PL	EFPSN6PL
EFSRN6PR	EFSRP3PR	EFPSN6PR
EFSRN6PL	EFSRN8PL	EFPSN5PR
EFSRN7PR	EFSRP3PL	EFPSN7PR
EFSRP5PL	EFSRN8PR	EFPSN3PR
EFSRN3PL	EFSRP8PL	EFPSN8PR
EFSRN7PL	EFSRP8PR	EFPSN2PR
EFSRP5PR	EFSRN2PL	EFPSN8PL
EFSRN3PR	EFPSN5PL	EFSRP2PR
EFSRP6PR	EFPSN4PL	
EFSRP6PL	EFSRN2PR	

Catalog numbers of tibial components used in the analysis.

ETPKN4SR	ETPKN3SL	ETPLB6SL
ETPKN5SR	ETPK1534	ETPLB4SL
ETPKN4SL	ETPKN6PR	ETPLB4SR
ETPKN5SL	ETPKN7SL	ETPKN8SR
ETPKN6SR	ETPKN6PL	ETPKN8SL
ETPKN6SL	ETPKN3SR	ETPLB6PL
ETPK1556	ETPLB5SL	ETPLB6PR
ETPK1578	ETPLB5SR	ETPLB7SR
ETPKN7SR	ETPLB6SR	ETPLB8SL

ETPLB7SL
ETPLB8SR
ETPKN2PL
ETPLB3SR
ETPKN8PR
ETPKN2PR
ETPKN2SL
ETPKN8PL
ETPLB3SL
ETPKN2SR
ETRKN5SR
ETRKN4SR
ETRKN5SL
ETPLB2PL
ETRKN6SL
ETRKN7SL
ETPSB5SL
ETRKN3SL
ETRKN3SR
ETRKN4SL
ETRKN6PL
ETRKN6PR
ETRKN6SR
ETRKN7SR

Genesis II/Genesis II
N=1429

Distribution of utilization: 24 surgeons across 13 sites used this implant combination in primary TKA.

Table 938: Volume of cases by surgeon and site for the Genesis II/Genesis II combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	59 (95)	4 (133)
Cases per site	109 (153)	12 (145)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 939: Descriptive statistics of cases receiving the Genesis II/Genesis II combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	872	61	
Age (years)	1429	67(9.8)	67(14)
Height (cm)	1429	168.3(10.6)	167.6(16.5)
Weight (kg)	1429	94.7(21.2)	92.5(27.2)
BMI(kg/m^2)	1429	33.4(6.8)	32.6(8.8)
Smoking - never (%)	770	53.9	
Smoking - previous (%)	533	37.3	
Smoking - current (%)	118	8.3	
Smoking - unknown (%)	8	0.6	

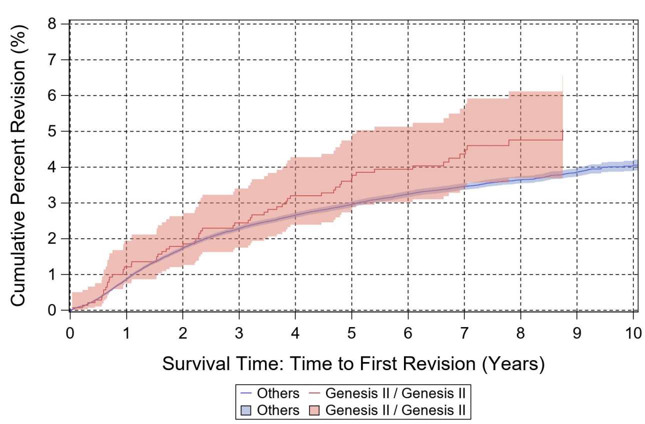

Figure 231: Cumulative percent revision curve for the Genesis II/Genesis II combination compared to all other implant combinations in primary TKA.

Table 940: Cumulative percent revision and number at risk for Genesis II/Genesis II combination in primary TKA cases.

Year	Number at risk	CPR
0	1401	0.00 (0.00,0.00)
1	1384	1.21 (0.76,1.94)
2	1358	1.79 (1.21,2.63)
3	1309	2.44 (1.75,3.40)
4	1249	3.20 (2.39,4.28)
5	1162	3.69 (2.81,4.84)
6	1034	3.94 (3.02,5.13)
7	814	4.37 (3.38,5.64)
8	551	4.76 (3.70,6.12)
9*	252	5.05 (3.88,6.56)
10*	61	5.05 (3.88,6.56)

* No revision occurred after the termination of the red curve in Figure 231; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.094 (0.743,1.612). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 941: Reasons for revision following primary TKA for Genesis II/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	16	28.6
2	Dislocation/Instability	9	16.1
3	Arthrofibrosis	8	14.3
4	Joint Infection	8	14.3
5	Pain	7	12.5
6	Implant Failure	2	3.6
7	Osteolysis	2	3.6
8	Poly liner wear	2	3.6
9	Malalignment	1	1.8
10	Patellofemoral Joint	1	1.8

Table 942: Reasons for revision in first 90 days following primary TKA for Genesis II/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 943: Reasons for revision between 91 and 365 days following primary TKA for Genesis II/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	3	25.0
2	Joint Infection	3	25.0
3	Aseptic Loosening	2	16.7
4	Pain	2	16.7
5	Arthrofibrosis	2	16.7

Table 944: Distribution of approach used for Genesis II/Genesis II combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	1228	85.9
Mid-vastus	194	13.6
Sub-vastus	0	0.0
Lateral parapatellar	3	0.2
Missing/unknown/other	4	0.3

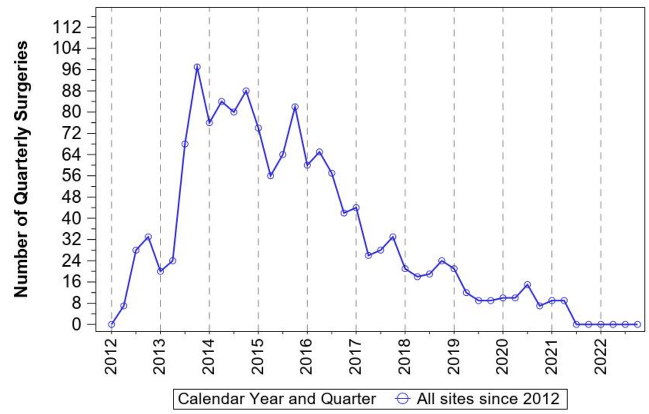

Figure 232: Utilization of the Genesis II/Genesis II combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

71420136	71420020	71420118
71420152	71420090	71420094
71420154	71420122	71420108
71420138	71420124	71420014
71420140	71421115	71420132
71420022	71420074	71421014
71420026	71420076	71421113
71420008	71420086	71421118
71420010	71420158	71420030
71420024	71421016	71420100
71420006	71421015	71420110
71420156	71421117	71420116
71420134	71420070	71420084
71420150	71421116	71421018
71420012	71420092	71930008
71420088	71420120	71420126
71420028	71420102	71421013
71420072	71420106	71930007
71420142	71420148	71930009
71420104	71421017	71930010
71420004	71421114	

Catalog numbers of tibial components used in the analysis.

71420184	71420182	71420180
71420168	71420188	71420162
71420166	71420190	71420176
71420186	71420172	71423116
71420170	71420174	
71420164	71420191	

Genesis II (CoCr)/Genesis II
N=733

Distribution of utilization: 14 surgeons used this implant combination at fewer than 10 sites in primary TKA.

Table 945: Volume of cases by surgeon and site for the Genesis II (CoCr)/Genesis II combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	52 (84)	13 (73)
Cases per site	81 (100)	65 (91)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 946: Descriptive statistics of cases receiving the Genesis II (CoCr)/Genesis II combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	448	61.1	
Age (years)	733	72.1(8.3)	73(11)
Height (cm)	733	167.2(10.1)	167.6(15.3)
Weight (kg)	733	89.9(19.2)	88.6(26.2)
BMI(kg/m^2)	733	32.1(6.2)	31.6(8.3)
Smoking - never (%)	381	52	
Smoking - previous (%)	298	40.7	
Smoking - current (%)	49	6.7	
Smoking - unknown (%)	5	0.7	

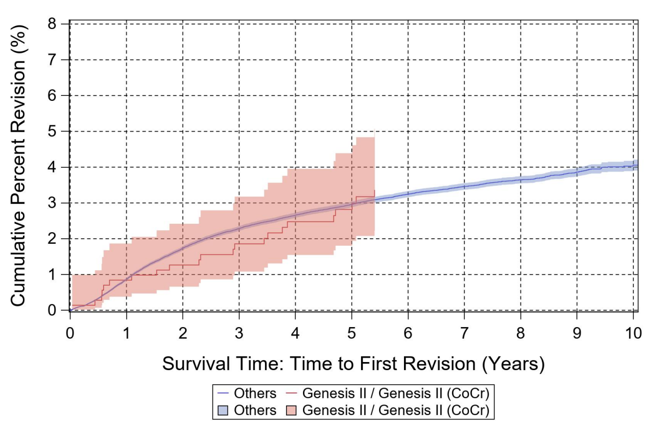

Figure 233: Cumulative percent revision curve for the Genesis II (CoCr)/Genesis II combination compared to all other implant combinations in primary TKA.

Table 947: Cumulative percent revision and number at risk for Genesis II (CoCr)/Genesis II combination in primary TKA cases.

Year	Number at risk	CPR
0	712	0.00 (0.00,0.00)
1	706	0.84 (0.38,1.87)
2	690	1.27 (0.66,2.42)
3	653	1.86 (1.08,3.18)
4	611	2.48 (1.55,3.95)
5	547	2.82 (1.81,4.39)
6*	470	3.36 (2.22,5.08)
7*	384	3.36 (2.22,5.08)
8*	286	3.36 (2.22,5.08)
9*	131	3.36 (2.22,5.08)
10*	49	3.36 (2.22,5.08)

* No revision occurred after the termination of the red curve in Figure 233; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.975 (0.547,1.739). It was 0.843 (0.801,0.888) and 0.961 (0.959,0.964) for sex (female) and age, respectively.

Table 948: Reasons for revision following primary TKA for Genesis II (CoCr)/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	5	25.0
2	Joint Infection	5	25.0
3	Aseptic Loosening	4	20.0
4	Pain	4	20.0
5	Malalignment	1	5.0
6	Poly liner wear	1	5.0

Table 949: Reasons for revision in first 90 days following primary TKA for Genesis II (CoCr)/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 950: Reasons for revision between 91 and 365 days following primary TKA for Genesis II (CoCr)/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	33.3
2	Joint Infection	1	33.3
3	Pain	1	33.3

Table 951: Distribution of approach used for Genesis II (CoCr)/Genesis II combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	687	93.7
Mid-vastus	44	6.0
Sub-vastus	0	0.0
Lateral parapatellar	2	0.3
Missing/unknown/other	0	0.0

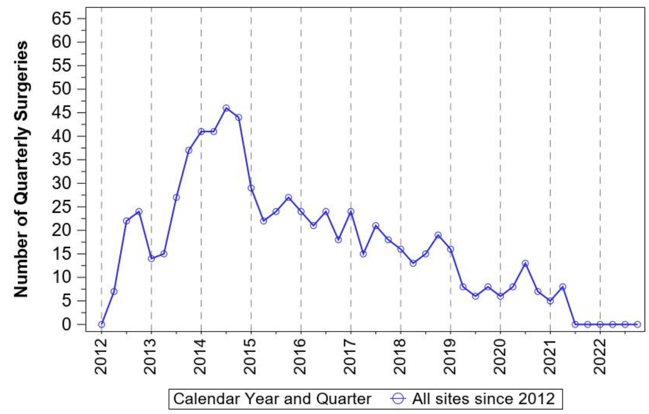

Figure 234: Utilization of the Genesis II (CoCr)/Genesis II combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

71420022	71420020	71420118
71420026	71420090	71420094
71420008	71420122	71420108
71420010	71420124	71420014
71420024	71420074	71420030
71420006	71420076	71420100
71420012	71420086	71420110
71420088	71420070	71420116
71420028	71420092	71420084
71420072	71420120	71420126
71420104	71420102	
71420004	71420106	

Catalog numbers of tibial components used in the analysis.

71420184	71420182	71420180
71420166	71420188	71420162
71420186	71420190	71423116
71420170	71420172	
71420164	71420174	
71420168	71420191	

Genesis II (Oxinium)/Genesis II
N=696

Distribution of utilization: 23 surgeons across 13 sites used this implant combination in primary TKA.

Table 952: Volume of cases by surgeon and site for the Genesis II (Oxinium)/Genesis II combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	30 (51)	3 (56)
Cases per site	53 (97)	7 (59)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 953: Descriptive statistics of cases receiving the Genesis II (Oxinium)/Genesis II combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	424	60.9	
Age (years)	696	61.6(8.3)	62(10)
Height (cm)	696	169.4(11.1)	168(17.8)
Weight (kg)	696	99.7(22.1)	97.5(29)
BMI(kg/m^2)	696	34.8(7.1)	33.8(9.2)
Smoking - never (%)	389	55.9	
Smoking - previous (%)	235	33.8	
Smoking - current (%)	69	9.9	
Smoking - unknown (%)	3	0.4	

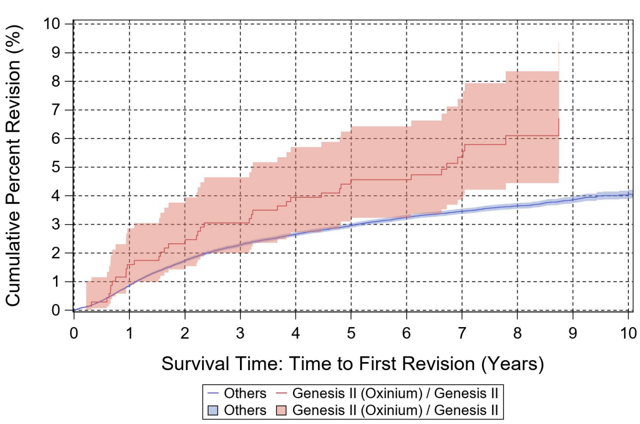

Figure 235: Cumulative percent revision curve for the Genesis II (Oxinium)/Genesis II combination compared to all other implant combinations in primary TKA.

Table 954: Cumulative percent revision and number at risk for Genesis II (Oxinium)/Genesis II combination in primary TKA cases.

Year	Number at risk	CPR
0	689	0.00 (0.00,0.00)
1	678	1.60 (0.89,2.86)
2	668	2.32 (1.43,3.76)
3	656	3.05 (2.00,4.65)
4	638	3.95 (2.72,5.70)
5	615	4.56 (3.23,6.43)
6	564	4.56 (3.23,6.43)
7	430	5.35 (3.86,7.39)
8	265	6.10 (4.44,8.35)
9*	121	6.71 (4.79,9.36)
10*	12	6.71 (4.79,9.36)

* No revision occurred after the termination of the red curve in Figure 235; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.137 (0.728,1.777). It was 0.841 (0.799,0.886) and 0.961 (0.959,0.964) for sex (female) and age, respectively.

Table 955: Reasons for revision following primary TKA for Genesis II (Oxinium)/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	12	33.3
2	Arthrofibrosis	8	22.2
3	Dislocation/Instability	4	11.1
4	Joint Infection	3	8.3
5	Pain	3	8.3
6	Implant Failure	2	5.6
7	Osteolysis	2	5.6
8	Patellofemoral Joint	1	2.8
9	Poly liner wear	1	2.8

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 956: Reasons for revision between 91 and 365 days following primary TKA for Genesis II (Oxinium)/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	22.2
2	Dislocation/Instability	2	22.2
3	Joint Infection	2	22.2
4	Arthrofibrosis	2	22.2
5	Pain	1	11.1

Table 957: Distribution of approach used for Genesis II (Oxinium)/Genesis II combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	541	77.7
Mid-vastus	150	21.6
Sub-vastus	0	0.0
Lateral parapatellar	1	0.1
Missing/unknown/other	4	0.6

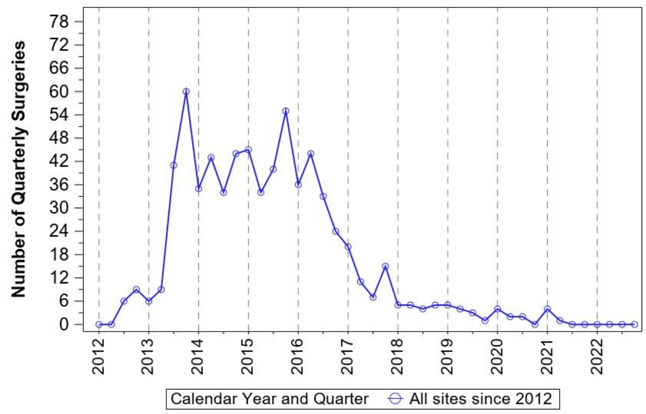

Figure 236: Utilization of the Genesis II (Oxinium)/Genesis II combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

71420136	71420158	71421113
71420152	71421016	71421118
71420154	71421015	71421018
71420138	71421117	71930008
71420140	71421116	71421013
71420156	71420148	71930007
71420134	71421017	71930009
71420150	71421114	71930010
71420142	71420132	
71421115	71421014	

Catalog numbers of tibial components used in the analysis.

71420184	71420182	71420180
71420168	71420188	71420162
71420166	71420190	71420176
71420186	71420172	71423116
71420170	71420174	
71420164	71420191	

iBalance/iBalance
N=628

Fewer than ten surgeons used this implant combination at fewer than ten sites in primary TKA.

Table 958: Volume of cases by surgeon and site for the iBalance/iBalance combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	89 (215)	2 (43)
Cases per site	78 (160)	2 (76)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 959: Descriptive statistics of cases receiving the iBalance/iBalance combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	325	51.8	
Age (years)	628	63.6(9.4)	63(14)
Height (cm)	628	170.3(10.9)	170.2(15.2)
Weight (kg)	628	93(20.7)	92.3(28.3)
BMI(kg/m^2)	628	31.9(6)	31.2(7.6)
Smoking - never (%)	362	57.6	
Smoking - previous (%)	182	29	
Smoking - current (%)	78	12.4	
Smoking - unknown (%)	6	1	

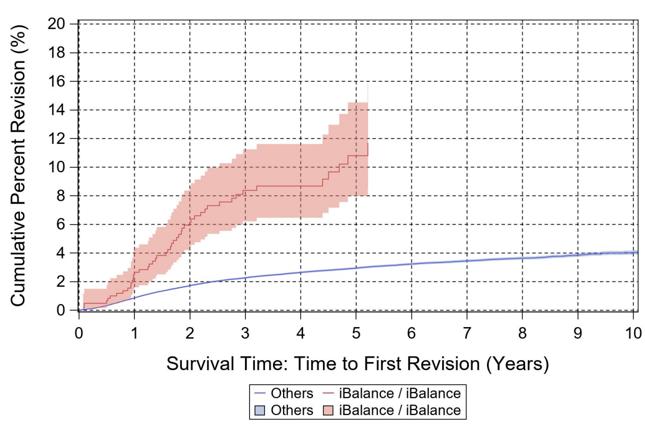

Figure 237: Cumulative percent revision curve for the iBalance/iBalance combination compared to all other implant combinations in primary TKA.

Table 960: Cumulative percent revision and number at risk for iBalance/iBalance combination in primary TKA cases.

Year	Number at risk	CPR
0	626	0.00 (0.00,0.00)
1	524	2.66 (1.61,4.37)
2	431	6.17 (4.39,8.62)
3	321	8.38 (6.21,11.25)
4	222	8.68 (6.46,11.62)
5	129	10.80 (7.99,14.52)
6*	36	11.70 (8.54,15.92)
7*	36	11.70 (8.54,15.92)
8*	23	11.70 (8.54,15.92)
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 237; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 2.031 (1.332,3.098). It was 0.841 (0.799,0.886) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 961: Reasons for revision following primary TKA for iBalance/iBalance combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	16	34.0
2	Aseptic Loosening	14	29.8
3	Joint Infection	9	19.1
4	Arthrofibrosis	2	4.3
5	Pain	2	4.3
6	Implant Failure	1	2.1
7	Malalignment	1	2.1
8	Peri-prosthetic fracture - Femur	1	2.1
9	Peri-prosthetic fracture - Tibia	1	2.1

Table 962: Reasons for revision in first 90 days following primary TKA for iBalance/iBalance combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	33.3
2	Dislocation/Instability	1	33.3
3	Joint Infection	1	33.3

Table 963: Reasons for revision between 91 and 365 days following primary TKA for iBalance/iBalance combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	5	41.7
2	Joint Infection	2	16.7
3	Arthrofibrosis	2	16.7
4	Aseptic Loosening	1	8.3
5	Implant Failure	1	8.3
6	Malalignment	1	8.3

Table 964: Distribution of approach used for iBalance/iBalance combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	625	99.5
Mid-vastus	0	0.0
Sub-vastus	0	0.0
Lateral parapatellar	1	0.2
Missing/unknown/other	2	0.3

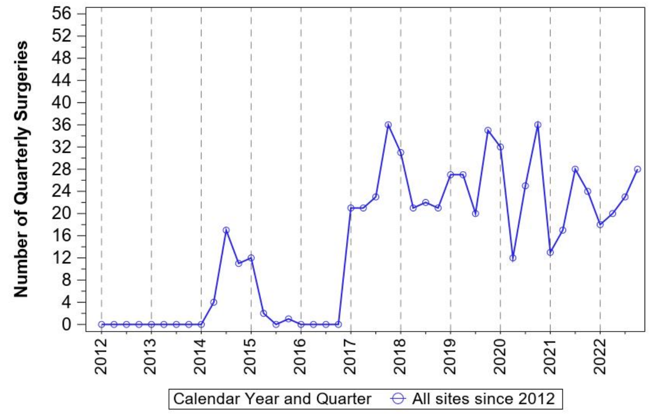

Figure 238: Utilization of the iBalance/iBalance combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

AR5174R	AR5172R	AR5168L
AR5175R	AR5166R	AR5179R
AR5177L	AR5165L	AR5162R
AR5174L	AR5164R	AR5163R
AR5176L	AR5172L	AR5166L
AR5175L	AR5179L	AR51710R
AR5176R	AR5165R	AR5171R
AR5178R	AR5167L	AR51610L
AR5173R	AR5163L	AR5162L
AR5178L	AR5164L	AR5169L
AR5173L	AR5168R	AR51710L
AR5177R	AR5167R	

Catalog numbers of tibial components used in the analysis.

AR513T4	AR513T2	AR503TTTH
AR513T6	AR513T9	AR503TTTJ
AR513T5	AR503TTTF	AR513T1
AR513T8	AR513T10	AR503TTTC
AR513T7	AR503TTTE	AR503TTTD
AR513T3	AR503TTTG	

iTotal
N=751

Distribution of utilization: 15 surgeons across 12 sites used this implant combination in primary TKA.

Table 965: Volume of cases by surgeon and site for the iTotal combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	50 (81)	7 (70)
Cases per site	62 (90)	18 (78)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 966: Descriptive statistics of cases receiving the iTotal combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	498	66.3	
Age (years)	751	64.4(9)	65(11)
Height (cm)	751	168.2(10.1)	167.6(15.3)
Weight (kg)	751	93.1(22.4)	90.7(27.4)
BMI(kg/m^2)	751	32.9(7)	32(8.7)
Smoking - never (%)	410	54.6	
Smoking - previous (%)	281	37.4	
Smoking - current (%)	59	7.9	
Smoking - unknown (%)	1	0.1	

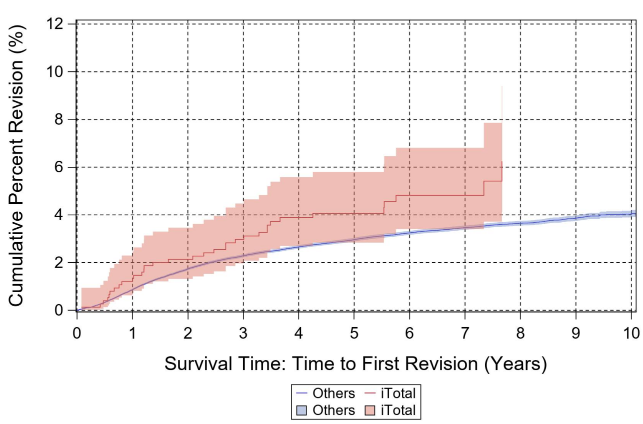

Figure 239: Cumulative percent revision curve for the iTotal combination compared to all implants other than iTotal or iTotal G2+ in primary TKA.

Table 967: Cumulative percent revision and number at risk for iTotal combination in primary TKA cases.

Year	Number at risk	CPR
0	749	0.00 (0.00,0.00)
1	740	1.20 (0.63,2.30)
2	726	2.14 (1.31,3.46)
3	674	2.97 (1.97,4.48)
4	567	3.88 (2.70,5.58)
5	443	4.06 (2.84,5.80)
6	341	4.82 (3.40,6.81)
7	189	4.82 (3.40,6.81)
8*	84	6.25 (4.12,9.41)
9*	28	6.25 (4.12,9.41)
10*	7	6.25 (4.12,9.41)

* No revision occurred after the termination of the red curve in Figure 239; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.032 (0.697,1.53). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 968: Reasons for revision following primary TKA for iTotal combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	13	39.4
2	Aseptic Loosening	11	33.3
3	Implant Failure	2	6.1
4	Metal Reaction/Metallosis	2	6.1
5	Pain	2	6.1
6	Arthrofibrosis	1	3.0
7	Malalignment	1	3.0
8	Patellofemoral Joint	1	3.0

Table 969: Reasons for revision in first 90 days following primary TKA for iTotal combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 970: Reasons for revision between 91 and 365 days following primary TKA for iTotal combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	25.0
2	Dislocation/Instability	2	25.0
3	Metal Reaction/Metallosis	1	12.5
4	Pain	1	12.5
5	Malalignment	1	12.5
6	Arthrofibrosis	1	12.5

Table 971: Distribution of approach used for iTotal combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	527	70.2
Mid-vastus	211	28.1
Sub-vastus	0	0.0
Lateral parapatellar	0	0.0
Missing/unknown/other	13	1.7

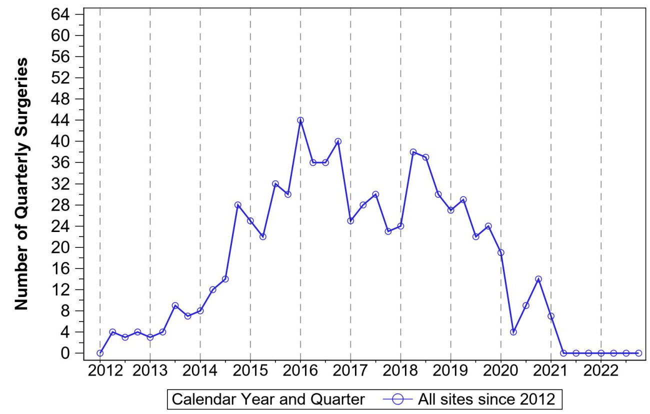

Figure 240: Utilization of the iTotal combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

TCR1111111FI	M57250600020FI
TPS1111111FI	M57250600010FI

Catalog numbers of tibial components used in the analysis.

TCR1111111TT	M57250600020TT
TPS1111111TT	M57250600010TT

iTotal G2+
N=728

Distribution of utilization: 13 surgeons across 12 sites used this implant combination in primary TKA.

Table 972: Volume of cases by surgeon and site for the iTotal G2+ combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	56 (85)	7 (69)
Cases per site	60 (90)	14 (76)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 973: Descriptive statistics of cases receiving the iTotal G2+ combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	486	66.8	
Age (years)	728	64.5(9)	65(11)
Height (cm)	728	168.1(10.1)	167.6(15.3)
Weight (kg)	728	93(22.6)	90.6(27.8)
BMI(kg/m^2)	728	32.8(7)	31.9(8.6)
Smoking - never (%)	396	54.4	
Smoking - previous (%)	274	37.6	
Smoking - current (%)	57	7.8	
Smoking - unknown (%)	1	0.1	

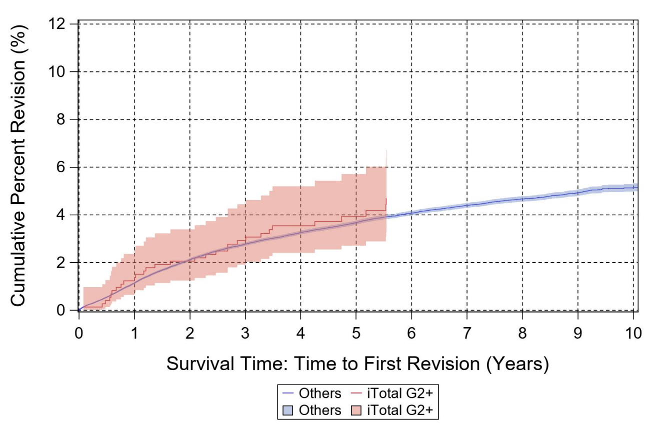

Figure 241: Cumulative percent revision curve for the iTotal G2+ combination compared to all implants other than iTotal or iTotal G2+ in primary TKA.

Table 974: Cumulative percent revision and number at risk for iTotal G2+ combination in primary TKA cases.

Year	Number at risk	CPR
0	728	0.00 (0.00,0.00)
1	719	1.24 (0.65,2.36)
2	706	2.06 (1.25,3.39)
3	654	2.92 (1.91,4.44)
4	549	3.54 (2.41,5.20)
5	424	3.94 (2.71,5.71)
6*	322	4.70 (3.27,6.72)
7*	170	4.70 (3.27,6.72)
8*	67	4.70 (3.27,6.72)
9*	11	4.70 (3.27,6.72)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 241; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.875 (0.581,1.318). It was 0.791 (0.756,0.828) and 0.982 (0.98,0.985) for sex (female) and age, respectively.

Table 975: Reasons for revision following primary TKA for iTotal G2+ combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	12	42.9
2	Aseptic Loosening	10	35.7
3	Metal Reaction/Metallosis	2	7.1
4	Arthrofibrosis	1	3.6
5	Implant Failure	1	3.6
6	Malalignment	1	3.6
7	Pain	1	3.6

Table 976: Reasons for revision in first 90 days following primary TKA for iTotal G2+ combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 977: Reasons for revision between 91 and 365 days following primary TKA for iTotal G2+ combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	25.0
2	Dislocation/Instability	2	25.0
3	Metal Reaction/Metallosis	1	12.5
4	Pain	1	12.5
5	Malalignment	1	12.5
6	Arthrofibrosis	1	12.5

Table 978: Distribution of approach used for iTotal G2+ combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	511	70.2
Mid-vastus	206	28.3
Sub-vastus	0	0.0
Lateral parapatellar	0	0.0
Missing/unknown/other	11	1.5

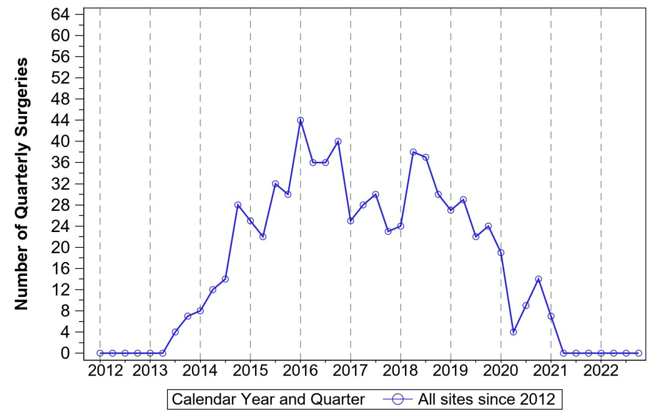

Figure 242: Utilization of the iTotal G2+ combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

TCR1111111FI	M57250600020FI
TPS1111111FI	M57250600010FI

Catalog numbers of tibial components used in the analysis.

TCR1111111TT	M57250600020TT
TPS1111111TT	M57250600010TT

Journey II/Journey
N=1390

Distribution of utilization: 66 surgeons across 41 sites used this implant combination in primary TKA.

Table 979: Volume of cases by surgeon and site for the Journey II/Journey combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	21 (46)	5 (18)
Cases per site	33 (63)	14 (36)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 980: Descriptive statistics of cases receiving the Journey II/Journey combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	934	67.2	
Age (years)	1390	64.7(9.2)	65(12)
Height (cm)	1389	167.9(10.5)	167(15.2)
Weight (kg)	1389	96.1(21.8)	94.4(27.9)
BMI(kg/m^2)	1389	34(6.9)	33.4(9.4)
Smoking - never (%)	641	46.1	
Smoking - previous (%)	542	39	
Smoking - current (%)	188	13.5	
Smoking - unknown (%)	19	1.4	

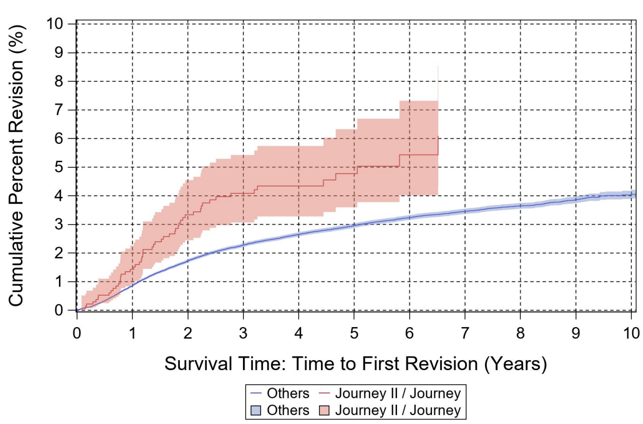

Figure 243: Cumulative percent revision curve for the Journey II/Journey combination compared to all other implant combinations in primary TKA.

Table 981: Cumulative percent revision and number at risk for Journey II/Journey combination in primary TKA cases.

Year	Number at risk	CPR
0	1384	0.00 (0.00,0.00)
1	1165	1.43 (0.90,2.26)
2	982	3.34 (2.45,4.55)
3	789	4.08 (3.07,5.43)
4	543	4.34 (3.28,5.74)
5	372	4.77 (3.60,6.33)
6	216	5.43 (4.02,7.32)
7*	93	6.09 (4.33,8.54)
8*	19	6.09 (4.33,8.54)
9*	1	6.09 (4.33,8.54)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 243; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.556 (1.161,2.087). It was 0.84 (0.798,0.885) and 0.961 (0.958,0.964) for sex (female) and age, respectively.

Table 982: Reasons for revision following primary TKA for Journey II/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	25	47.2
2	Aseptic Loosening	7	13.2
3	Arthrofibrosis	6	11.3
4	Joint Infection	6	11.3
5	Pain	6	11.3
6	Implant Failure	1	1.9
7	Malalignment	1	1.9
8	Metal Reaction/Metallosis	1	1.9

Table 983: Reasons for revision in first 90 days following primary TKA for Journey II/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	33.3
2	Dislocation/Instability	1	33.3
3	Joint Infection	1	33.3

Table 984: Reasons for revision between 91 and 365 days following primary TKA for Journey II/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	6	40.0
2	Joint Infection	4	26.7
3	Aseptic Loosening	2	13.3
4	Arthrofibrosis	2	13.3
5	Pain	1	6.7

Table 985: Distribution of approach used for Journey II/Journey combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	1334	96.0
Mid-vastus	45	3.2
Sub-vastus	4	0.3
Lateral parapatellar	3	0.2
Missing/unknown/other	4	0.3

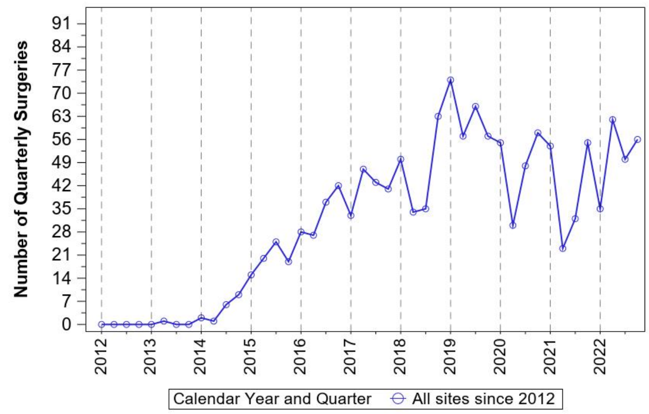

Figure 244: Utilization of the Journey II/Journey combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

74021155	74021163	74021255
74021165	74021153	74021254
74021154	74021158	74021257
74021164	74021168	74021265
74021156	74021159	74021266
74021166	74021169	74021267
74021167	74021160	74021268
74021157	74021162	

Catalog numbers of tibial components used in the analysis.

74022214	74022216	74022218
74022224	74022226	74022228
74022223	74022227	74022221
74022213	74022217	74022211
74022215	74022222	
74022225	74022212	

Journey II (Oxinium)/Journey
N=1382

Distribution of utilization: 66 surgeons across 41 sites used this implant combination in primary TKA.

Table 986: Volume of cases by surgeon and site for the Journey II (Oxinium)/Journey combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	20 (46)	5 (16)
Cases per site	33 (63)	11 (36)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 987: Descriptive statistics of cases receiving the Journey II (Oxinium)/Journey combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	929	67.2	
Age (years)	1382	64.7(9.2)	65(12)
Height (cm)	1381	167.9(10.5)	167(15.2)
Weight (kg)	1381	96(21.8)	94.4(27.9)
BMI(kg/m^2)	1381	34(6.9)	33.4(9.5)
Smoking - never (%)	639	46.2	
Smoking - previous (%)	536	38.8	
Smoking - current (%)	188	13.6	
Smoking - unknown (%)	19	1.4	

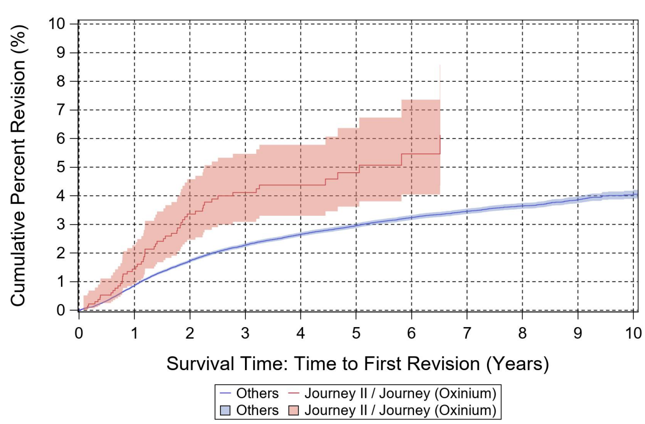

Figure 245: Cumulative percent revision curve for the Journey II (Oxinium)/Journey combination compared to all other implant combinations in primary TKA.

Table 988: Cumulative percent revision and number at risk for Journey II (Oxinium)/Journey combination in primary TKA cases.

Year	Number at risk	CPR
0	1376	0.00 (0.00,0.00)
1	1157	1.44 (0.91,2.28)
2	974	3.36 (2.46,4.58)
3	781	4.11 (3.09,5.47)
4	540	4.37 (3.30,5.78)
5	372	4.81 (3.62,6.37)
6	216	5.46 (4.04,7.36)
7*	93	6.12 (4.36,8.57)
8*	19	6.12 (4.36,8.57)
9*	1	6.12 (4.36,8.57)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 245; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.57 (1.171,2.105). It was 0.84 (0.798,0.885) and 0.961 (0.958,0.964) for sex (female) and age, respectively.

Table 989: Reasons for revision following primary TKA for Journey II (Oxinium)/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	25	47.2
2	Aseptic Loosening	7	13.2
3	Arthrofibrosis	6	11.3
4	Joint Infection	6	11.3
5	Pain	6	11.3
6	Implant Failure	1	1.9
7	Malalignment	1	1.9
8	Metal Reaction/Metallosis	1	1.9

Table 990: Reasons for revision in first 90 days following primary TKA for Journey II (Oxinium)/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	33.3
2	Dislocation/Instability	1	33.3
3	Joint Infection	1	33.3

Table 991: Reasons for revision between 91 and 365 days following primary TKA for Journey II (Oxinium)/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	23	31.9
2	Joint Infection	18	25.0
3	Arthrofibrosis	15	20.8
4	Aseptic Loosening	4	5.6
5	Pain	4	5.6
6	Malalignment	3	4.2
7	Poly liner wear	2	2.8
8	Implant Failure	2	2.8
9	Patellofemoral Joint	1	1.4

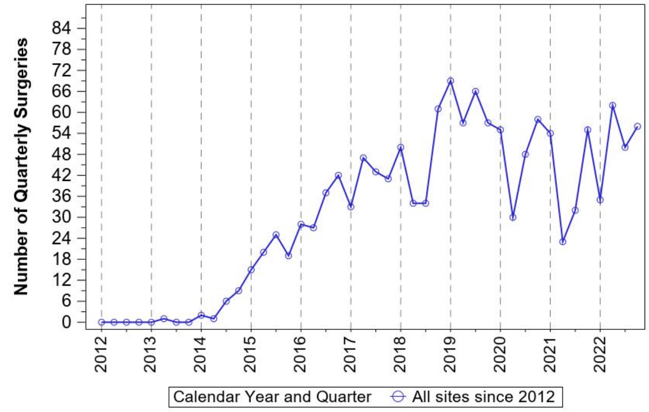

Figure 246: Utilization of the Journey II (Oxinium)/Journey combination in primary TKA cases.

Table 992: Distribution of approach used for Journey II (Oxinium)/Journey combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	1326	95.9
Mid-vastus	45	3.3
Sub-vastus	4	0.3
Lateral parapatellar	3	0.2
Missing/unknown/other	4	0.3

Catalog numbers of femoral components used in the analysis.

74021155	74021167	74021159
74021165	74021157	74021169
74021154	74021163	74021160
74021164	74021153	74021162
74021156	74021158	
74021166	74021168	

Catalog numbers of tibial components used in the analysis.

74022214	74022216	74022218
74022224	74022226	74022228
74022223	74022227	74022221
74022213	74022217	74022211
74022215	74022222	
74022225	74022212	

Journey II BCS/Journey
N=6438

Distribution of utilization: 94 surgeons across 51 sites used this implant combination in primary TKA.

Table 993: Volume of cases by surgeon and site for the Journey II BCS/Journey combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	68 (138)	7 (73)
Cases per site	126 (205)	67 (169)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 994: Descriptive statistics of cases receiving the Journey II BCS/Journey combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	4002	62.2	
Age (years)	6438	65.4(9.4)	66(13)
Height (cm)	6438	168.5(10.5)	167.6(16)
Weight (kg)	6438	97(22.2)	95.4(29.6)
BMI(kg/m^2)	6438	34.1(7.2)	33.3(9.6)
Smoking - never (%)	3286	51	
Smoking - previous (%)	2407	37.4	
Smoking - current (%)	711	11	
Smoking - unknown (%)	34	0.5	

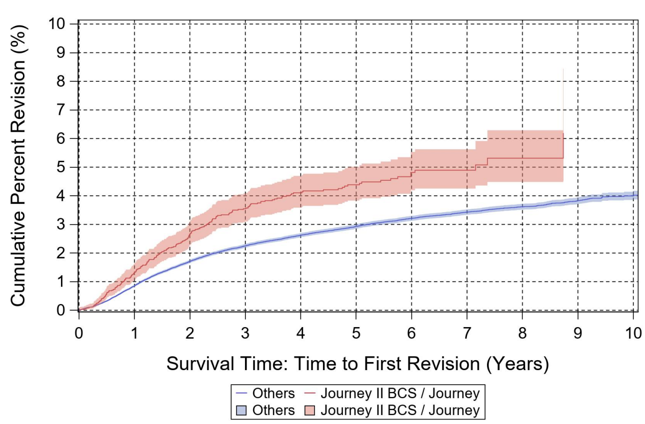

Figure 247: Cumulative percent revision curve for the Journey II BCS/Journey combination compared to all other implant combinations in primary TKA.

Table 995: Cumulative percent revision and number at risk for Journey II BCS/Journey combination in primary TKA cases.

Year	Number at risk	CPR
0	6413	0.00 (0.00,0.00)
1	5680	1.33 (1.07,1.65)
2	4785	2.66 (2.27,3.12)
3	3915	3.55 (3.08,4.08)
4	2867	4.10 (3.59,4.69)
5	2005	4.39 (3.83,5.01)
6	1268	4.82 (4.19,5.53)
7	573	4.89 (4.25,5.63)
8	225	5.31 (4.48,6.29)
9*	62	6.19 (4.53,8.44)
10*	4	6.19 (4.53,8.44)

* No revision occurred after the termination of the red curve in Figure 247; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.263 (1.063,1.503). It was 0.84 (0.798,0.885) and 0.961 (0.958,0.964) for sex (female) and age, respectively.

Table 996: Reasons for revision following primary TKA for Journey II BCS/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	74	32.5
2	Joint Infection	39	17.1
3	Aseptic Loosening	35	15.4
4	Arthrofibrosis	30	13.2
5	Pain	17	7.5
6	Implant Failure	11	4.8
7	Poly liner wear	10	4.4
8	Malalignment	5	2.2
9	Peri-prosthetic fracture - Femur	4	1.8
10	Patellofemoral Joint	2	0.9
11	Extensor mechanism failure	1	0.4

Table 997: Reasons for revision in first 90 days following primary TKA for Journey II BCS/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	3	37.5
2	Joint Infection	2	25.0
3	Arthrofibrosis	2	25.0
4	Extensor mechanism failure	1	12.5

Table 998: Reasons for revision between 91 and 365 days following primary TKA for Journey II BCS/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	19	26.8
2	Joint Infection	17	23.9
3	Arthrofibrosis	17	23.9
4	Poly liner wear	4	5.6
5	Pain	4	5.6
6	Malalignment	4	5.6
7	Aseptic Loosening	3	4.2
8	Implant Failure	2	2.8
9	Patellofemoral Joint	1	1.4

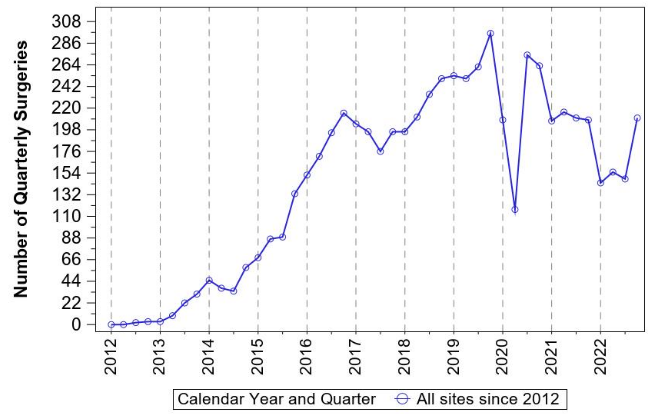

Figure 248: Utilization of the Journey II BCS/Journey combination in primary TKA cases.

Table 999: Distribution of approach used for Journey II BCS/Journey combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	5906	91.7
Mid-vastus	501	7.8
Sub-vastus	5	0.1
Lateral parapatellar	12	0.2
Missing/unknown/other	14	0.2

Catalog numbers of femoral components used in the analysis.

74022125	74022123	74024928
74022115	74024215	74024218
74022116	74024925	74024213
74022126	74024216	74024923
74022114	74024926	74022112
74022124	74024214	74022122
74022117	74024924	74022110
74022127	74022129	74022120
74022118	74022119	
74022128	74024217	
74022113	74024927	

Catalog numbers of tibial components used in the analysis.

74022224	74022216	74022218
74022214	74022226	74022228
74022213	74022227	74022211
74022223	74022217	74022221
74022215	74022222	
74022225	74022212	

Journey II BCS (CoCr)/Journey
N=871

Distribution of utilization: 11 surgeons across 10 sites used this implant combination in primary TKA.

Table 1000: Volume of cases by surgeon and site for the Journey II BCS (CoCr)/Journey combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	79 (133)	12 (142)
Cases per site	87 (166)	10 (134)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1001: Descriptive statistics of cases receiving the Journey II BCS (CoCr)/Journey combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	565	64.9	
Age (years)	871	71.3(6.9)	72(9)
Height (cm)	871	166.8(10.4)	165.1(16.3)
Weight (kg)	871	95.3(21.5)	93.4(31.2)
BMI(kg/m^2)	871	34.2(7.3)	33.4(10.2)
Smoking - never (%)	471	54.1	
Smoking - previous (%)	351	40.3	
Smoking - current (%)	48	5.5	
Smoking - unknown (%)	1	0.1	

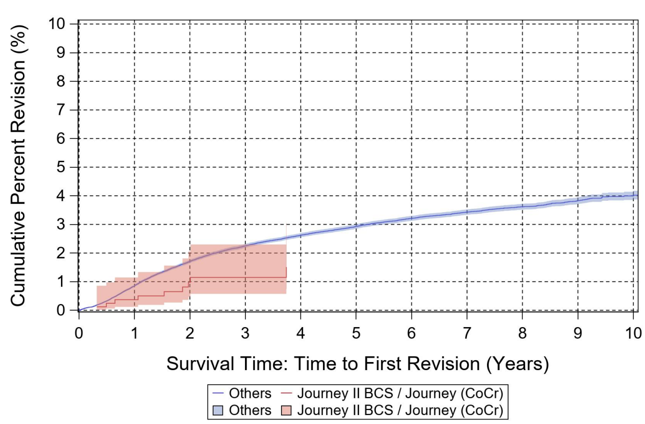

Figure 249: Cumulative percent revision curve for the Journey II BCS (CoCr)/Journey combination compared to all other implant combinations in primary TKA.

Table 1002: Cumulative percent revision and number at risk for Journey II BCS (CoCr)/Journey combination in primary TKA cases.

Year	Number at risk	CPR
0	866	0.00 (0.00,0.00)
1	754	0.37 (0.12,1.15)
2	589	0.98 (0.47,2.06)
3	436	1.15 (0.57,2.30)
4*	225	1.51 (0.75,3.05)
5*	95	1.51 (0.75,3.05)
6*	36	1.51 (0.75,3.05)
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 249; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 1003: Reasons for revision following primary TKA for Journey II BCS (CoCr)/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Arthrofibrosis	3	30.0
2	Aseptic Loosening	2	20.0
3	Dislocation/Instability	2	20.0
4	Joint Infection	2	20.0
5	Implant Failure	1	10.0

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

There were no reasons for revision recorded between day 91 and day 365 so no table of reasons for revisions during this time period is included.

Table 1004: Distribution of approach used for Journey II BCS (CoCr)/Journey combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	863	99.1
Mid-vastus	5	0.6
Sub-vastus	0	0.0
Lateral parapatellar	1	0.1
Missing/unknown/other	2	0.2

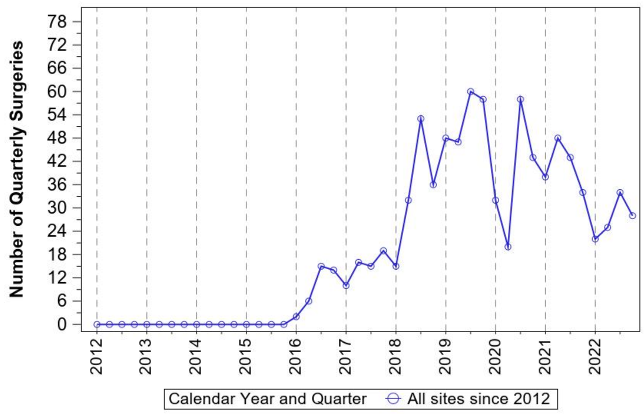

Figure 250: Utilization of the Journey II BCS (CoCr)/Journey combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

74024215	74024924	74024213
74024925	74024217	74024923
74024216	74024927	
74024926	74024928	
74024214	74024218	

Catalog numbers of tibial components used in the analysis.

74022214	74022216	74022228
74022224	74022217	74022218
74022213	74022226	74022221
74022223	74022227	74022211
74022215	74022212	
74022225	74022222	

Journey II BCS (Oxinium)/Journey
N=5567

Distribution of utilization: 94 surgeons across 51 sites used this implant combination in primary TKA.

Table 1005: Volume of cases by surgeon and site for the Journey II BCS (Oxinium)/Journey combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	59 (104)	7 (73)
Cases per site	109 (146)	67 (164)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1006: Descriptive statistics of cases receiving the Journey II BCS (Oxinium)/Journey combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	3437	61.7	
Age (years)	5567	64.5(9.4)	64(13)
Height (cm)	5567	168.8(10.5)	167.6(17.8)
Weight (kg)	5567	97.3(22.3)	95.7(29.6)
BMI(kg/m^2)	5567	34.1(7.2)	33.3(9.5)
Smoking - never (%)	2815	50.6	
Smoking - previous (%)	2056	36.9	
Smoking - current (%)	663	11.9	
Smoking - unknown (%)	33	0.6	

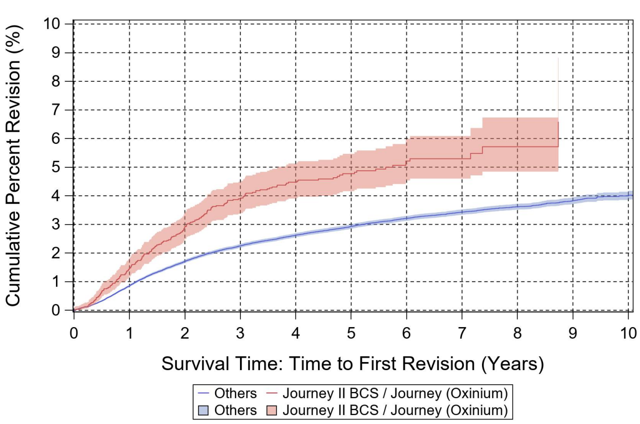

Figure 251: Cumulative percent revision curve for the Journey II BCS (Oxinium)/Journey combination compared to all other implant combinations in primary TKA.

Table 1007: Cumulative percent revision and number at risk for Journey II BCS (Oxinium)/Journey combination in primary TKA cases.

Year	Number at risk	CPR
0	5547	0.00 (0.00,0.00)
1	4926	1.48 (1.18,1.84)
2	4196	2.92 (2.48,3.43)
3	3479	3.89 (3.37,4.49)
4	2642	4.47 (3.90,5.13)
5	1910	4.77 (4.16,5.47)
6	1232	5.22 (4.54,5.99)
7	573	5.29 (4.60,6.09)
8	225	5.71 (4.84,6.73)
9*	62	6.59 (4.90,8.83)
10*	4	6.59 (4.90,8.83)

* No revision occurred after the termination of the red curve in Figure 251; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.293 (1.087,1.539). It was 0.84 (0.798,0.885) and 0.961 (0.959,0.964) for sex (female) and age, respectively.

Table 1008: Reasons for revision following primary TKA for Journey II BCS (Oxinium)/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	72	33.0
2	Joint Infection	37	17.0
3	Aseptic Loosening	33	15.1
4	Arthrofibrosis	27	12.4
5	Pain	17	7.8
6	Implant Failure	10	4.6
7	Poly liner wear	10	4.6
8	Malalignment	5	2.3
9	Peri-prosthetic fracture - Femur	4	1.8
10	Patellofemoral Joint	2	0.9
11	Extensor mechanism failure	1	0.5

Table 1009: Reasons for revision in first 90 days following primary TKA for Journey II BCS (Oxinium)/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	100.0

Table 1010: Reasons for revision between 91 and 365 days following primary TKA for Journey II BCS (Oxinium)/Journey combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	27.3
2	Dislocation/Instability	2	18.2
3	Poly liner wear	2	18.2
4	Arthrofibrosis	2	18.2
5	Pain	1	9.1
6	Malalignment	1	9.1

Table 1011: Distribution of approach used for Journey II BCS (Oxinium)/Journey combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	5043	90.6
Mid-vastus	496	8.9
Sub-vastus	5	0.1
Lateral parapatellar	11	0.2
Missing/unknown/other	12	0.2

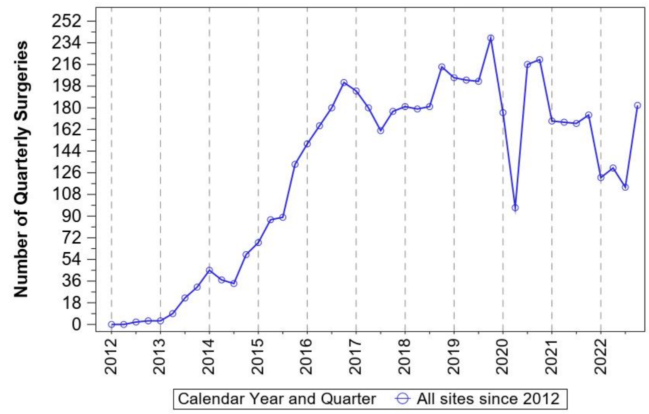

Figure 252: Utilization of the Journey II BCS (Oxinium)/Journey combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

74022125	74022127	74022112
74022115	74022118	74022122
74022116	74022128	74022110
74022126	74022113	74022120
74022114	74022123	
74022124	74022129	
74022117	74022119	

Catalog numbers of tibial components used in the analysis.

74022224	74022216	74022218
74022214	74022226	74022228
74022213	74022227	74022211
74022223	74022217	74022221
74022215	74022222	
74022225	74022212	

LCS Complete/M.B.T.

N=1814

Fewer than ten surgeons across 12 sites used this implant combination in primary TKA.

Table 1012: Volume of cases by surgeon and site for the LCS Complete/M.B.T. combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	226 (465)	35 (179)
Cases per site	151 (387)	10 (54)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1013: Descriptive statistics of cases receiving the LCS Complete/M.B.T. combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1098	60.5	
Age (years)	1814	67.7(9.5)	68(14)
Height (cm)	1814	168.2(10.2)	167.6(15.2)
Weight (kg)	1814	96.1(21.5)	94(28.1)
BMI(kg/m^2)	1814	33.9(6.9)	33.2(9.2)
Smoking - never (%)	992	54.7	
Smoking - previous (%)	615	33.9	
Smoking - current (%)	150	8.3	
Smoking - unknown (%)	57	3.1	

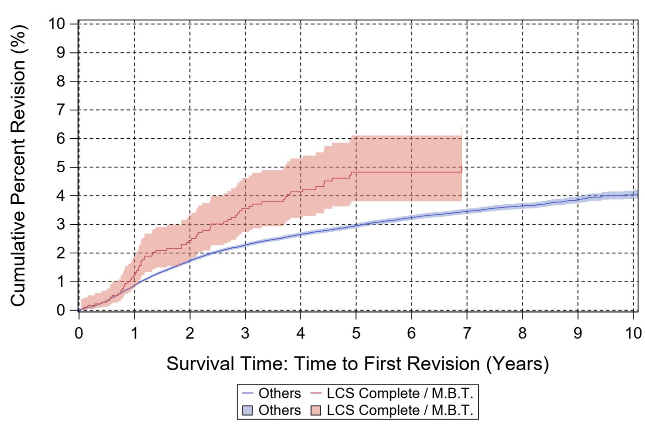

Figure 253: Cumulative percent revision curve for the LCS Complete/M.B.T. combination compared to all other implant combinations in primary TKA.

Table 1014: Cumulative percent revision and number at risk for LCS Complete/M.B.T. combination in primary TKA cases.

Year	Number at risk	CPR
0	1806	0.00 (0.00,0.00)
1	1581	1.20 (0.77,1.85)
2	1370	2.44 (1.79,3.32)
3	1230	3.55 (2.73,4.62)
4	1073	4.14 (3.23,5.30)
5	879	4.83 (3.81,6.11)
6	623	4.83 (3.81,6.11)
7*	386	5.06 (3.97,6.44)
8*	227	5.06 (3.97,6.44)
9*	59	5.06 (3.97,6.44)
10*	5	5.06 (3.97,6.44)

* No revision occurred after the termination of the red curve in Figure 253; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.421 (0.892,2.265). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1015: Reasons for revision following primary TKA for LCS Complete/M.B.T. combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	24	37.5
2	Aseptic Loosening	20	31.2
3	Pain	8	12.5
4	Joint Infection	6	9.4
5	Implant Failure	4	6.2
6	Peri-prosthetic fracture - Femur	2	3.1

Table 1016: Reasons for revision in first 90 days following primary TKA for LCS Complete/M.B.T. combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	33.3
2	Joint Infection	1	33.3
3	Peri-prosthetic fracture - Femur	1	33.3

Table 1017: Reasons for revision between 91 and 365 days following primary TKA for LCS Complete/M.B.T. combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	9	56.2
2	Aseptic Loosening	2	12.5
3	Joint Infection	2	12.5
4	Pain	2	12.5
5	Implant Failure	1	6.2

Table 1018: Distribution of approach used for LCS Complete/M.B.T. combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	1807	99.6
Mid-vastus	1	0.1
Sub-vastus	0	0.0
Lateral parapatellar	1	0.1
Missing/unknown/other	5	0.3

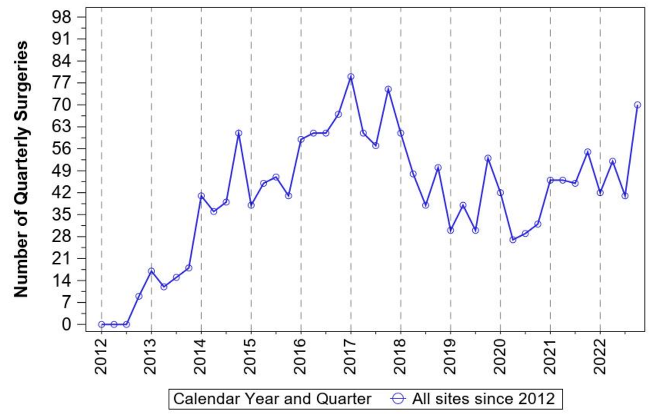

Figure 254: Utilization of the LCS Complete/M.B.T. combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

129401040	129404060	129404030
129402040	129401030	129428040
129401060	129402030	129428050
129402060	129402070	129411050
129402050	129401070	129411060
129401050	129404070	129411070
129403040	129403070	129412060
129404040	129411040	129429040
129404050	129412050	129429050
129403050	129403030	
129403060	129412040	

Catalog numbers of tibial components used in the analysis.

129431130	129431160	129435125
129431140	129431120	129435130
129431150	129433160	129433170
129433140	129432140	129434130
129433130	129432150	129435120
129431125	129432125	129435150
129433150	129433120	
129433125	129435140	

Legion/Genesis II
N=12828

Distribution of utilization: 199 surgeons across 67 sites used this implant combination in primary TKA.

Table 1019: Volume of cases by surgeon and site for the Legion/Genesis II combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	64 (142)	8 (54)
Cases per site	191 (369)	45 (188)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1020: Descriptive statistics of cases receiving the Legion/Genesis II combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	8476	66.1	
Age (years)	12828	66.4(9.2)	67(13)
Height (cm)	12828	167.9(10.3)	167.6(15.2)
Weight (kg)	12828	94.7(21.4)	93(28.3)
BMI(kg/m^2)	12828	33.6(6.9)	32.8(9.3)
Smoking - never (%)	6594	51.4	
Smoking - previous (%)	5033	39.2	
Smoking - current (%)	1165	9.1	
Smoking - unknown (%)	36	0.3	

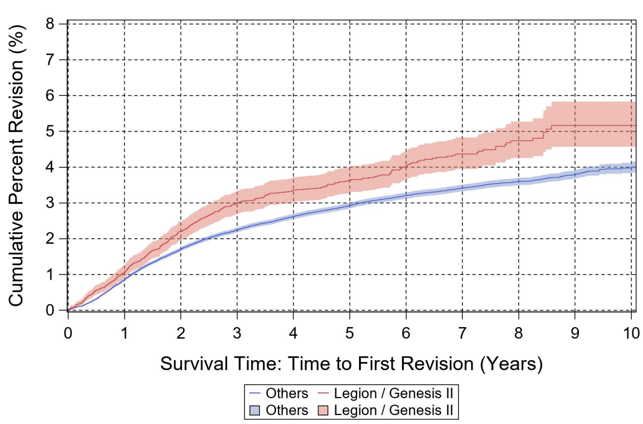

Figure 255: Cumulative percent revision curve for the Legion/Genesis II combination compared to all other implant combinations in primary TKA.

Table 1021: Cumulative percent revision and number at risk for Legion/Genesis II combination in primary TKA cases.

Year	Number at risk	CPR
0	12735	0.00 (0.00,0.00)
1	11367	1.06 (0.89,1.26)
2	10237	2.19 (1.94,2.48)
3	9090	3.00 (2.70,3.33)
4	7550	3.36 (3.03,3.72)
5	5971	3.64 (3.29,4.02)
6	4331	4.01 (3.63,4.43)
7	2789	4.37 (3.95,4.83)
8	1645	4.74 (4.26,5.27)
9	597	5.16 (4.57,5.83)
10	167	5.16 (4.57,5.83)

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.041 (0.912,1.189). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1022: Reasons for revision following primary TKA for Legion/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	141	34.3
2	Aseptic Loosening	83	20.2
3	Joint Infection	75	18.2
4	Arthrofibrosis	30	7.3
5	Pain	29	7.1
6	Implant Failure	20	4.9
7	Malalignment	9	2.2
8	Peri-prosthetic fracture - Femur	8	1.9
9	Patellofemoral Joint	5	1.2
10	Osteolysis	4	1.0
11	Extensor mechanism failure	3	0.7
12	Metal Reaction/Metallosis	2	0.5
13	Poly liner wear	2	0.5

Table 1023: Reasons for revision in first 90 days following primary TKA for Legion/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	11	44.0
2	Dislocation/Instability	5	20.0
3	Peri-prosthetic fracture - Femur	5	20.0
4	Pain	2	8.0
5	Aseptic Loosening	1	4.0
6	Extensor mechanism failure	1	4.0

Table 1024: Reasons for revision between 91 and 365 days following primary TKA for Legion/Genesis II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	24	27.0
2	Joint Infection	21	23.6
3	Arthrofibrosis	12	13.5
4	Implant Failure	9	10.1
5	Aseptic Loosening	8	9.0
6	Pain	7	7.9
7	Malalignment	3	3.4
8	Peri-prosthetic fracture - Femur	2	2.2
9	Extensor mechanism failure	2	2.2
10	Patellofemoral Joint	1	1.1

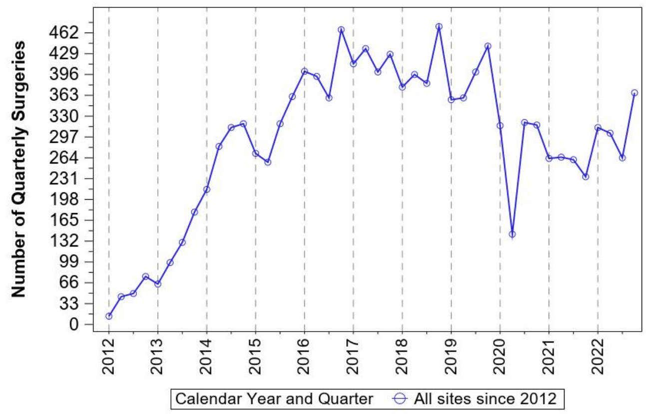

Figure 256: Utilization of the Legion/Genesis II combination in primary TKA cases.

Table 1025: Distribution of approach used for Legion/Genesis II combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	11745	91.6
Mid-vastus	1022	8.0
Sub-vastus	21	0.2
Lateral parapatellar	13	0.1
Missing/unknown/other	27	0.2

Catalog numbers of femoral components used in the analysis.

71421225	71423234	71933646
71421224	71423224	71421203
71421235	71423237	71423223
71421236	71421223	71421238
71421226	71423216	71421228
71421234	71421256	71933649
71421255	71421233	71423238
71421245	71423206	71423228
71421227	71423227	71423233
71421237	71421246	71933653
71421205	71423215	71933655
71421215	71421274	71933647
71421214	71421276	71933651
71421216	71421264	71423213
71421204	71423214	71933641
71421206	71423205	71421253
71423235	71421266	71423203
71423225	71423217	71933645
71421275	71423204	71421243
71421207	71423207	71421263
71421244	71421208	71423218
71421254	71933654	71421273
71423236	71421218	71933643
71421265	71933642	71933652
71423226	71421213	71423208
71421217	71933650	71421212

71421175	71421232	71423212
71933640	71421163	71423222
71933644	71421177	71423232
71421202	71426003	71425003
71933648	71421164	71426007
71421165	71421167	71426008
71421174	71421173	
71421176	71421222	

Catalog numbers of tibial components used in the analysis.

71420184	71420296	71420268
71420182	71420298	71420270
71420166	71420306	71420272
71420164	71420314	71420274
71420186	71420234	71420308
71420168	71420386	71420316
71420170	71420328	71420344
71420188	71420368	71420350
71420190	71420384	71420388
71420172	71420264	71420392
71420180	71420378	71420394
71420162	71420446	71420396
71420191	71420242	71420432
71420174	71420322	71420434
71420312	71420336	71420440
71420240	71420338	71420444
71420304	71420376	71420452
71420248	71420380	71420456
71420160	71926221	71420458
71420176	71420244	71420460
71420320	71420252	71420464
71420232	71420258	
71420256	71420262	
71420250	71420266	

NexGen GS/NexGen Pegged
N=682

Distribution of utilization: 17 surgeons across 11 sites used this implant combination in primary TKA.

Table 1026: Volume of cases by surgeon and site for the NexGen GS/NexGen Pegged combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	40 (110)	6 (8)
Cases per site	62 (134)	11 (40)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1027: Descriptive statistics of cases receiving the NexGen GS/NexGen Pegged combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	567	83.1	
Age (years)	682	68.2(9.2)	68(13)
Height (cm)	682	165.3(8.8)	165(10)
Weight (kg)	682	85.3(18.3)	83.8(25.7)
BMI(kg/m^2)	682	31.2(6.3)	30.7(8.8)
Smoking - never (%)	398	58.4	
Smoking - previous (%)	252	37	
Smoking - current (%)	31	4.6	
Smoking - unknown (%)	0	0.0	

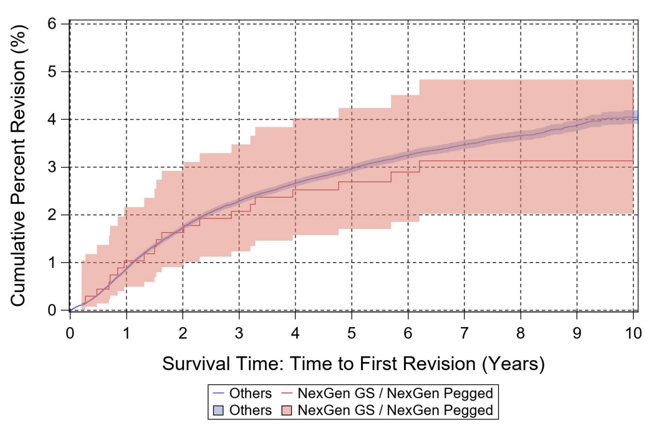

Figure 257: Cumulative percent revision curve for the NexGen GS/NexGen Pegged combination compared to all other implant combinations in primary TKA.

Table 1028: Cumulative percent revision and number at risk for NexGen GS/NexGen Pegged combination in primary TKA cases.

Year	Number at risk	CPR
0	675	0.00 (0.00,0.00)
1	668	1.04 (0.50,2.16)
2	664	1.63 (0.91,2.92)
3	661	2.07 (1.23,3.48)
4	628	2.52 (1.58,4.03)
5	551	2.69 (1.70,4.24)
6	430	2.90 (1.85,4.51)
7	325	3.13 (2.02,4.84)
8	244	3.13 (2.02,4.84)
9	166	3.13 (2.02,4.84)
10*	62	4.67 (2.30,9.35)

* No revision occurred after the termination of the red curve in Figure 257; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.307 (0.762,2.241). It was 0.839 (0.797,0.884) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1029: Reasons for revision following primary TKA for NexGen GS/NexGen Pegged combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	5	33.3
2	Dislocation/Instability	4	26.7
3	Poly liner wear	2	13.3
4	Arthrofibrosis	1	6.7
5	Joint Infection	1	6.7
6	Malalignment	1	6.7
7	Pain	1	6.7

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1030: Reasons for revision between 91 and 365 days following primary TKA for NexGen GS/NexGen Pegged combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	50.0
2	Dislocation/Instability	1	50.0

Table 1031: Distribution of approach used for NexGen GS/NexGen Pegged combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	659	96.6
Mid-vastus	16	2.3
Sub-vastus	2	0.3
Lateral parapatellar	2	0.3
Missing/unknown/other	3	0.4

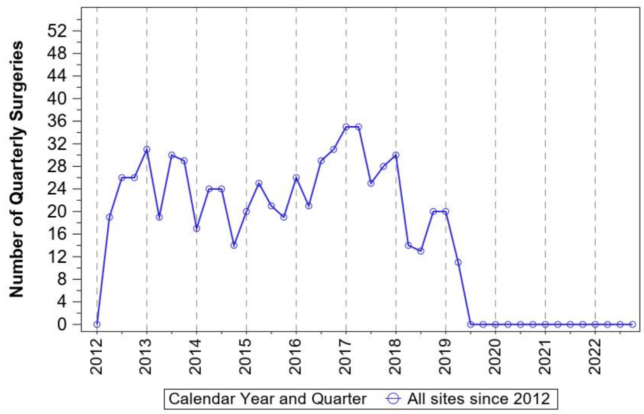

Figure 258: Utilization of the NexGen GS/NexGen Pegged combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

575001501	575001706	575201502
575001505	575001701	575201601
575001502	575001702	575001305
575001506	575001406	575201505
575001602	575001401	575201605
575001606	575001405	575201606
575001601	575001402	575001301
575001605	575201602	
575001705	575001306	

Catalog numbers of tibial components used in the analysis.

597003502	597004502
597004501	597002502
597003501	597005501

NexGen GS/NexGen Precoat
N=649

Distribution of utilization: 21 surgeons across 17 sites used this implant combination in primary TKA.

Table 1032: Volume of cases by surgeon and site for the NexGen GS/NexGen Precoat combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	30 (52)	8 (44)
Cases per site	38 (70)	12 (45)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1033: Descriptive statistics of cases receiving the NexGen GS/NexGen Precoat combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	637	98.2	
Age (years)	649	66.4(9.5)	66(12)
Height (cm)	648	162.1(7.4)	162.6(10.1)
Weight (kg)	649	86.9(18.6)	85.6(25)
BMI(kg/m^2)	648	33(6.5)	32.7(9.3)
Smoking - never (%)	369	56.9	
Smoking - previous (%)	199	30.7	
Smoking - current (%)	79	12.2	
Smoking - unknown (%)	2	0.3	

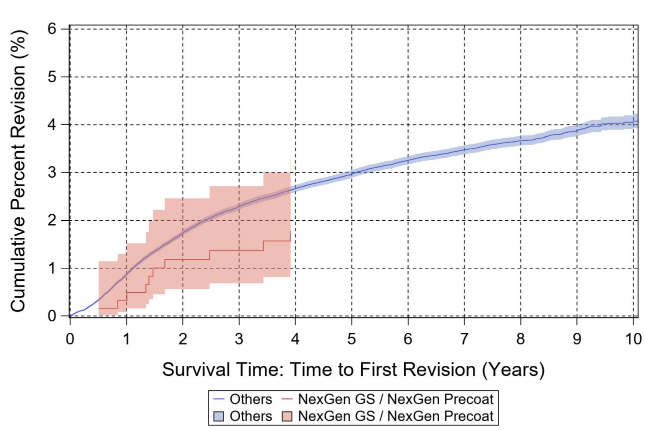

Figure 259: Cumulative percent revision curve for the NexGen GS/NexGen Precoat combination compared to all other implant combinations in primary TKA.

Table 1034: Cumulative percent revision and number at risk for NexGen GS/NexGen Precoat combination in primary TKA cases.

Year	Number at risk	CPR
0	641	0.00 (0.00,0.00)
1	600	0.33 (0.08,1.30)
2	555	1.18 (0.56,2.46)
3	512	1.37 (0.68,2.71)
4*	456	1.78 (0.96,3.30)
5*	399	1.78 (0.96,3.30)
6*	320	1.78 (0.96,3.30)
7*	236	1.78 (0.96,3.30)
8*	201	1.78 (0.96,3.30)
9*	163	1.78 (0.96,3.30)
10*	98	1.78 (0.96,3.30)

* No revision occurred after the termination of the red curve in Figure 259; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.635 (0.327,1.234). It was 0.842 (0.8,0.887) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1035: Reasons for revision following primary TKA for NexGen GS/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Metal Reaction/Metallosis	3	30.0
2	Aseptic Loosening	2	20.0
3	Joint Infection	2	20.0
4	Arthrofibrosis	1	10.0
5	Pain	1	10.0
6	Peri-prosthetic fracture - Femur	1	10.0

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1036: Reasons for revision between 91 and 365 days following primary TKA for NexGen GS/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	50.0
2	Pain	1	50.0

Table 1037: Distribution of approach used for NexGen GS/NexGen Precoat combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	625	96.3
Mid-vastus	11	1.7
Sub-vastus	3	0.5
Lateral parapatellar	1	0.2
Missing/unknown/other	9	1.4

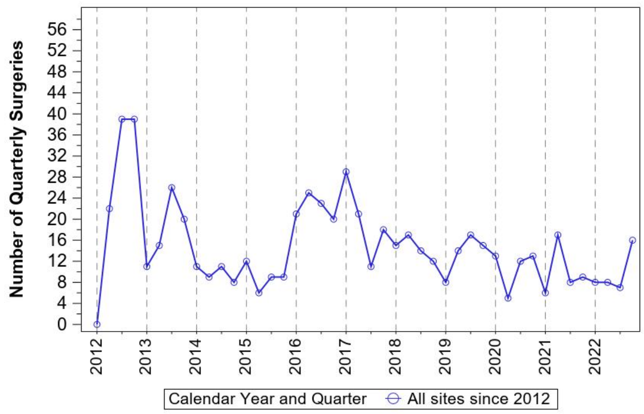

Figure 260: Utilization of the NexGen GS/NexGen Precoat combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

575001502	575001402	575001406
575001501	575001506	575001605
575001602	575001702	575001705
575001601	575001606	575001706
575001401	575001701	575001301
575001505	575001405	

Catalog numbers of tibial components used in the analysis.

598003701	598002702
598003702	598004702
598004701	598005701

NexGen LPS GS/NexGen Precoat

N=535

Distribution of utilization: 38 surgeons across 18 sites used this implant combination in primary TKA.

Table 1038: Volume of cases by surgeon and site for the NexGen LPS GS/NexGen Precoat combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	14 (18)	6 (19)
Cases per site	29 (76)	6 (15)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1039: Descriptive statistics of cases receiving the NexGen LPS GS/NexGen Precoat combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	524	97.9	
Age (years)	535	65.5(9.7)	65(14)
Height (cm)	534	162.4(7.6)	162.6(10.2)
Weight (kg)	535	90.6(21.2)	88.9(29.8)
BMI(kg/m^2)	534	34.3(7.4)	33.8(11)
Smoking - never (%)	318	59.4	
Smoking - previous (%)	180	33.6	
Smoking - current (%)	36	6.7	
Smoking - unknown (%)	1	0.2	

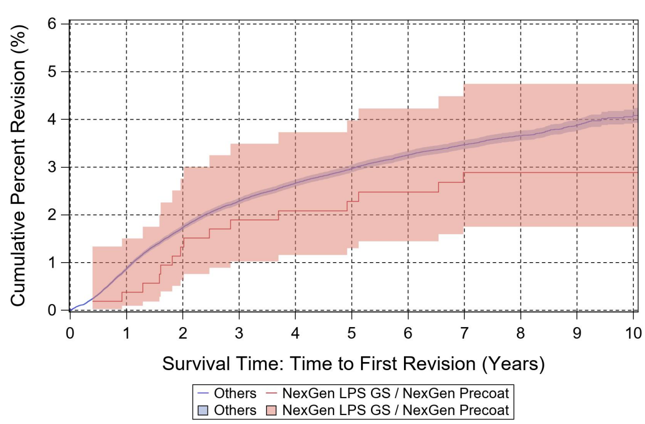

Figure 261: Cumulative percent revision curve for the NexGen LPS GS/NexGen Precoat combination compared to all other implant combinations in primary TKA.

Table 1040: Cumulative percent revision and number at risk for NexGen LPS GS/NexGen Precoat combination in primary TKA cases.

Year	Number at risk	CPR
0	528	0.00 (0.00,0.00)
1	526	0.38 (0.09,1.51)
2	521	1.33 (0.63,2.76)
3	517	1.89 (1.02,3.49)
4	510	2.08 (1.16,3.73)
5	496	2.28 (1.30,3.98)
6	486	2.48 (1.45,4.23)
7	470	2.89 (1.75,4.75)
8	462	2.89 (1.75,4.75)
9	428	2.89 (1.75,4.75)
10	326	2.89 (1.75,4.75)

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.686 (0.415,1.137). It was 0.842 (0.8,0.887) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1041: Reasons for revision following primary TKA for NexGen LPS GS/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	44.4
2	Aseptic Loosening	2	22.2
3	Arthrofibrosis	1	11.1
4	Implant Failure	1	11.1
5	Pain	1	11.1

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

There were no reasons for revision recorded between day 91 and day 365 so no table of reasons for revisions during this time period is included.

Table 1042: Distribution of approach used for NexGen LPS GS/NexGen Precoat combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	519	97.0
Mid-vastus	5	0.9
Sub-vastus	0	0.0
Lateral parapatellar	4	0.7
Missing/unknown/other	7	1.3

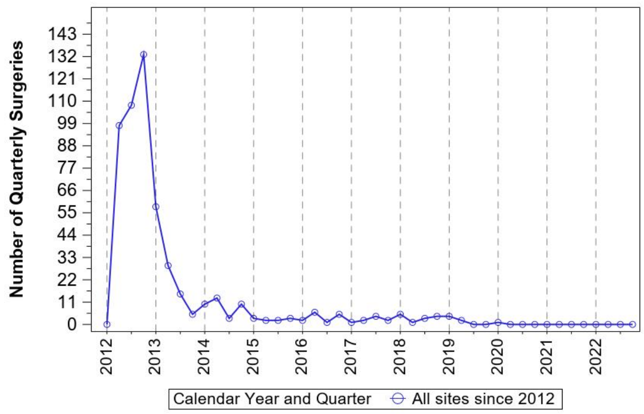

Figure 262: Utilization of the NexGen LPS GS/NexGen Precoat combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

576401552	576401452	576401351
576401652	576401451	
576401551	576401752	
576401651	576401751	

Catalog numbers of tibial components used in the analysis.

598003702	598004702	598002701
598004701	598002702	598005702
598003701	598005701	

NexGen LPS Option/NexGen Precoat
N=745

Distribution of utilization: 58 surgeons across 29 sites used this implant combination in primary TKA.

Table 1043: Volume of cases by surgeon and site for the NexGen LPS Option/NexGen Precoat combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	12 (19)	6 (12)
Cases per site	25 (38)	17 (32)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1044: Descriptive statistics of cases receiving the NexGen LPS Option/NexGen Precoat combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	340	45.6	
Age (years)	745	66.8(10.5)	67(14)
Height (cm)	745	170.2(10.7)	170.2(16)
Weight (kg)	745	95.4(20.3)	93.7(28.5)
BMI(kg/m^2)	745	33(6.7)	32.3(8.9)
Smoking - never (%)	336	45.1	
Smoking - previous (%)	318	42.7	
Smoking - current (%)	88	11.8	
Smoking - unknown (%)	3	0.4	

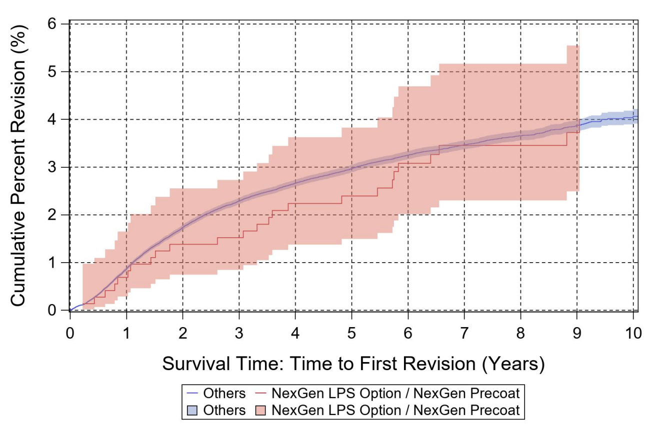

Figure 263: Cumulative percent revision curve for the NexGen LPS Option/NexGen Precoat combination compared to all other implant combinations in primary TKA.

Table 1045: Cumulative percent revision and number at risk for NexGen LPS Option/NexGen Precoat combination in primary TKA cases.

Year	Number at risk	CPR
0	726	0.00 (0.00,0.00)
1	718	0.69 (0.29,1.65)
2	710	1.38 (0.75,2.56)
3	705	1.52 (0.85,2.73)
4	660	2.24 (1.38,3.63)
5	612	2.40 (1.50,3.83)
6	551	3.08 (2.02,4.69)
7	466	3.46 (2.30,5.17)
8	419	3.46 (2.30,5.17)
9	339	3.73 (2.49,5.55)
10*	212	4.01 (2.70,5.95)

* No revision occurred after the termination of the red curve in Figure 263; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.856 (0.562,1.304). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1046: Reasons for revision following primary TKA for NexGen LPS Option/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	6	31.6
2	Aseptic Loosening	4	21.1
3	Dislocation/Instability	2	10.5
4	Implant Failure	2	10.5
5	Arthrofibrosis	1	5.3
6	Malalignment	1	5.3
7	Metal Reaction/Metallosis	1	5.3
8	Pain	1	5.3
9	Patellofemoral Joint	1	5.3

Table 1047: Reasons for revision in first 90 days following primary TKA for NexGen LPS Option/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Arthrofibrosis	1	100.0

Table 1048: Reasons for revision between 91 and 365 days following primary TKA for NexGen LPS Option/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	100.0

Table 1049: Distribution of approach used for NexGen LPS Option/NexGen Precoat combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	719	96.5
Mid-vastus	18	2.4
Sub-vastus	2	0.3
Lateral parapatellar	2	0.3
Missing/unknown/other	4	0.5

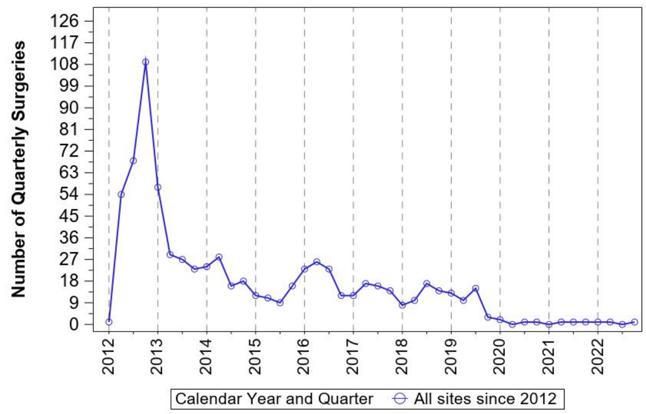

Figure 264: Utilization of the NexGen LPS Option/NexGen Precoat combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

596401751	599601751	596401352
596401752	599601752	599601352
599601552	596401551	599601851
599601551	599601452	599601852
596401651	596401652	596401351
599601651	599601451	599601351
596401552	596401451	
599601652	596401452	

Catalog numbers of tibial components used in the analysis.

598004702	598005702	598800300
598003702	598002702	598800700
598005701	598005703	
598004701	598002701	
598003701	598005704	

NexGen LPS Option/NexGen TM
N=1346

Fewer than ten surgeons used this implant combination at fewer than ten sites in primary TKA.

Table 1050: Volume of cases by surgeon and site for the NexGen LPS Option/NexGen TM combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	168 (282)	24 (326)
Cases per site	192 (299)	13 (550)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1051: Descriptive statistics of cases receiving the NexGen LPS Option/NexGen TM combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	690	51.3	
Age (years)	1346	66.1(8.2)	66(11)
Height (cm)	1346	170.4(10.4)	170.2(15.2)
Weight (kg)	1346	93.2(19.8)	92.1(25.2)
BMI(kg/m^2)	1346	32(6)	31.4(7.4)
Smoking - never (%)	744	55.3	
Smoking - previous (%)	547	40.6	
Smoking - current (%)	53	3.9	
Smoking - unknown (%)	2	0.2	

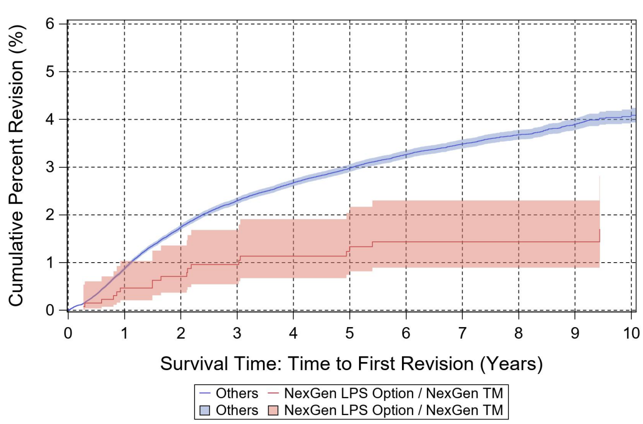

Figure 265: Cumulative percent revision curve for the NexGen LPS Option/NexGen TM combination compared to all other implant combinations in primary TKA.

Table 1052: Cumulative percent revision and number at risk for NexGen LPS Option/NexGen TM combination in primary TKA cases.

Year	Number at risk	CPR
0	1332	0.00 (0.00,0.00)
1	1254	0.47 (0.21,1.04)
2	1200	0.71 (0.37,1.36)
3	1129	0.96 (0.55,1.68)
4	1061	1.14 (0.67,1.91)
5	998	1.33 (0.82,2.17)
6	935	1.43 (0.89,2.30)
7	863	1.43 (0.89,2.30)
8	705	1.43 (0.89,2.30)
9	470	1.43 (0.89,2.30)
10*	238	1.70 (1.03,2.82)

* No revision occurred after the termination of the red curve in Figure 265; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.588 (0.323,1.073). It was 0.84 (0.798,0.884) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1053: Reasons for revision following primary TKA for NexGen LPS Option/NexGen TM combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	4	30.8
2	Joint Infection	4	30.8
3	Aseptic Loosening	3	23.1
4	Arthrofibrosis	2	15.4

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1054: Reasons for revision between 91 and 365 days following primary TKA for NexGen LPS Option/NexGen TM combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	2	66.7
2	Aseptic Loosening	1	33.3

Table 1055: Distribution of approach used for NexGen LPS Option/NexGen TM combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	719	53.4
Mid-vastus	616	45.8
Sub-vastus	4	0.3
Lateral parapatellar	2	0.1
Missing/unknown/other	5	0.4

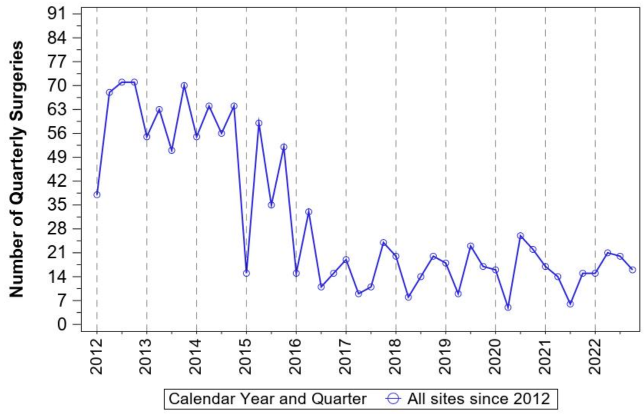

Figure 266: Utilization of the NexGen LPS Option/NexGen TM combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

599601651	599601751	599601452
596401551	599601551	599601451
596401552	596401451	596401352
599601652	599601552	596401351
596401651	596401752	599601352
596401652	596401751	
599601752	599601851	
596401452	599601852	

Catalog numbers of tibial components used in the analysis.

588606410	588605314	588605617
588606610	588605410	588606417
588606310	588605614	588606617
588605510	588605712	595403702
588606412	588606314	595404702
588605512	588606512	588605417
588605310	588606614	588606514
588605312	588605810	588606710
588606510	588605412	595403701
588605610	588605317	595405701
588605710	588605812	588605717
588606612	595402702	588606712
588606312	588605714	588607512
588605514	588605414	588605814
588606414	588605517	
588605612	595404701	

NexGen Option/NexGen Option
N=1324

Distribution of utilization: 11 surgeons used this implant combination at fewer than 10 sites in primary TKA.

Table 1056: Volume of cases by surgeon and site for the NexGen Option/NexGen Option combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	120 (167)	49 (141)
Cases per site	220 (410)	54 (141)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1057: Descriptive statistics of cases receiving the NexGen Option/NexGen Option combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	654	49.4	
Age (years)	1324	69.6(8.3)	70(11)
Height (cm)	1324	170.1(10.3)	170.2(15.2)
Weight (kg)	1324	92.9(19)	91.8(24.5)
BMI(kg/m^2)	1324	32.1(5.8)	31.4(7.8)
Smoking - never (%)	621	46.9	
Smoking - previous (%)	612	46.2	
Smoking - current (%)	90	6.8	
Smoking - unknown (%)	1	0.1	

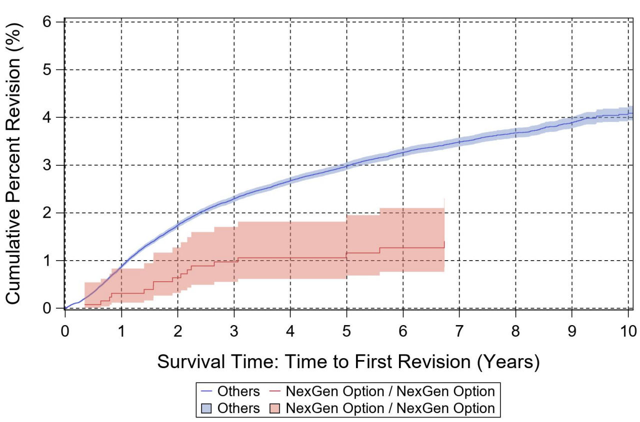

Figure 267: Cumulative percent revision curve for the NexGen Option/NexGen Option combination compared to all other implant combinations in primary TKA.

Table 1058: Cumulative percent revision and number at risk for NexGen Option/NexGen Option combination in primary TKA cases.

Year	Number at risk	CPR
0	1313	0.00 (0.00,0.00)
1	1241	0.31 (0.12,0.83)
2	1207	0.64 (0.32,1.28)
3	1161	0.97 (0.55,1.71)
4	1077	1.06 (0.62,1.82)
5	974	1.16 (0.69,1.95)
6	841	1.27 (0.76,2.10)
7*	641	1.41 (0.86,2.31)
8*	410	1.41 (0.86,2.31)
9*	208	1.41 (0.86,2.31)
10*	41	1.41 (0.86,2.31)

* No revision occurred after the termination of the red curve in Figure 267; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.591 (0.348,1.005). It was 0.84 (0.798,0.885) and 0.961 (0.958,0.964) for sex (female) and age, respectively.

Table 1059: Reasons for revision following primary TKA for NexGen Option/NexGen Option combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	4	26.7
2	Dislocation/Instability	4	26.7
3	Joint Infection	2	13.3
4	Pain	2	13.3
5	Arthrofibrosis	1	6.7
6	Implant Failure	1	6.7
7	Osteolysis	1	6.7

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1060: Reasons for revision between 91 and 365 days following primary TKA for NexGen Option/NexGen Option combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	1	33.3
2	Dislocation/Instability	1	33.3
3	Joint Infection	1	33.3

Table 1061: Distribution of approach used for NexGen Option/NexGen Option combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	1308	98.8
Mid-vastus	12	0.9
Sub-vastus	0	0.0
Lateral parapatellar	4	0.3
Missing/unknown/other	0	0.0

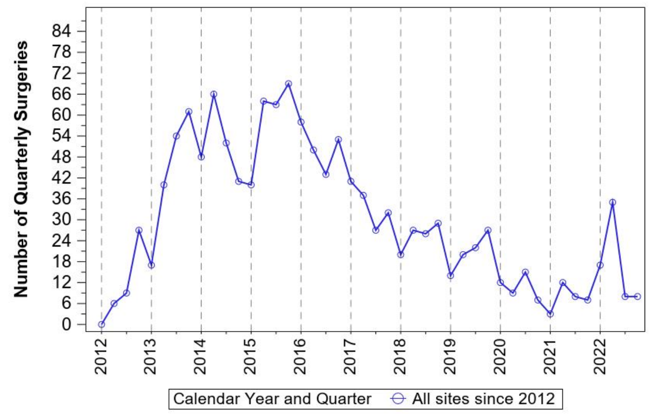

Figure 268: Utilization of the NexGen Option/NexGen Option combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

595601502	595601506	595601401
595601501	595601505	595601705
595601701	595601605	595601405
595601601	595601706	595601406
595601702	595601402	595601302
595601602	595601606	

Catalog numbers of tibial components used in the analysis.

598604702	598605701
598603702	598603701
598604701	598605702

NexGen Option/NexGen Pegged
N=623

Fewer than ten surgeons used this implant combination at fewer than ten sites in primary TKA.

Table 1062: Volume of cases by surgeon and site for the NexGen Option/NexGen Pegged combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	77 (130)	42 (33)
Cases per site	124 (191)	25 (109)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1063: Descriptive statistics of cases receiving the NexGen Option/NexGen Pegged combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	315	50.6	
Age (years)	623	67.1(8.9)	67(12)
Height (cm)	623	169.9(10.5)	169(16)
Weight (kg)	623	95.7(19.7)	94.7(28.4)
BMI(kg/m^2)	623	33.1(5.8)	32.4(8.8)
Smoking - never (%)	279	44.8	
Smoking - previous (%)	274	44	
Smoking - current (%)	68	10.9	
Smoking - unknown (%)	2	0.3	

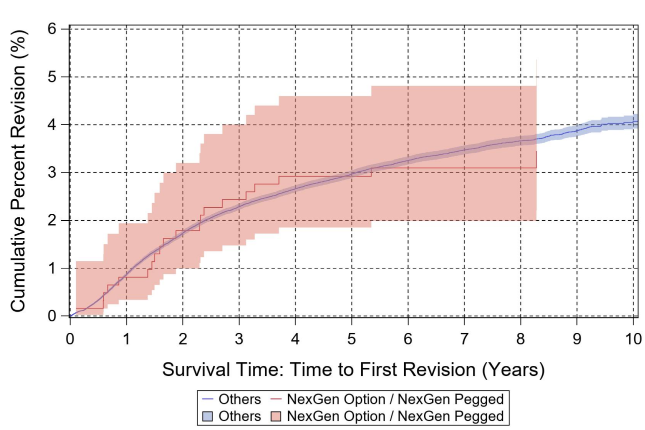

Figure 269: Cumulative percent revision curve for the NexGen Option/NexGen Pegged combination compared to all other implant combinations in primary TKA.

Table 1064: Cumulative percent revision and number at risk for NexGen Option/NexGen Pegged combination in primary TKA cases.

Year	Number at risk	CPR
0	616	0.00 (0.00,0.00)
1	611	0.81 (0.34,1.94)
2	605	1.79 (0.99,3.20)
3	601	2.44 (1.48,4.01)
4	598	2.92 (1.85,4.60)
5	579	2.92 (1.85,4.60)
6	505	3.10 (1.99,4.81)
7	442	3.10 (1.99,4.81)
8	317	3.10 (1.99,4.81)
9*	174	3.45 (2.21,5.36)
10*	44	3.45 (2.21,5.36)

* No revision occurred after the termination of the red curve in Figure 269; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.508 (0.895,2.541). It was 0.841 (0.799,0.886) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1065: Reasons for revision following primary TKA for NexGen Option/NexGen Pegged combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	6	37.5
2	Pain	3	18.8
3	Dislocation/Instability	2	12.5
4	Joint Infection	2	12.5
5	Arthrofibrosis	1	6.2
6	Implant Failure	1	6.2
7	Peri-prosthetic fracture - Tibia	1	6.2

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1066: Reasons for revision between 91 and 365 days following primary TKA for NexGen Option/NexGen Pegged combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Tibia	1	100.0

Table 1067: Distribution of approach used for NexGen Option/NexGen Pegged combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	611	98.1
Mid-vastus	2	0.3
Sub-vastus	0	0.0
Lateral parapatellar	10	1.6
Missing/unknown/other	0	0.0

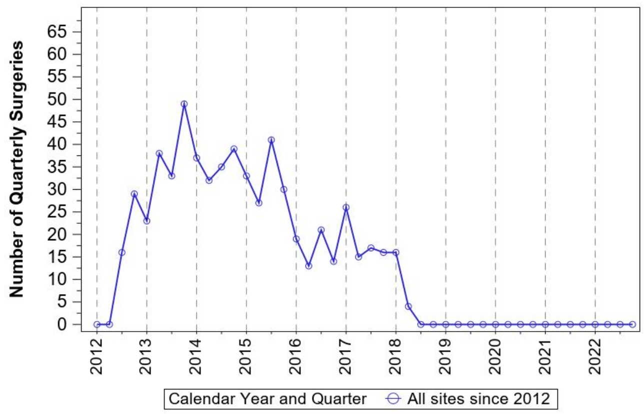

Figure 270: Utilization of the NexGen Option/NexGen Pegged combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

595601501	595601605	595601302
595601502	595601606	595601305
595601506	595601401	596601701
595601702	595601705	596601401
595601602	595601405	596601402
595601505	595601406	595601301
595601701	596601602	595601306
595601706	596601501	
595601402	596601601	
595601601	596601502	

Catalog numbers of tibial components used in the analysis.

597003502	597005501	597002502
597004501	597003501	597005503
597004502	597005502	

NexGen Precoat/NexGen Precoat
N=565

Distribution of utilization: 16 surgeons across 19 sites used this implant combination in primary TKA.

Table 1068: Volume of cases by surgeon and site for the NexGen Precoat/NexGen Precoat combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	35 (54)	12 (34)
Cases per site	29 (53)	9 (24)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1069: Descriptive statistics of cases receiving the NexGen Precoat/NexGen Precoat combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	139	24.6	
Age (years)	565	66.9(8.8)	67(12)
Height (cm)	565	175.6(10.7)	177.8(15.2)
Weight (kg)	565	102.5(21.6)	100.2(29)
BMI(kg/m^2)	565	33.2(6.2)	32.5(8.2)
Smoking - never (%)	219	38.8	
Smoking - previous (%)	269	47.6	
Smoking - current (%)	69	12.2	
Smoking - unknown (%)	8	1.4	

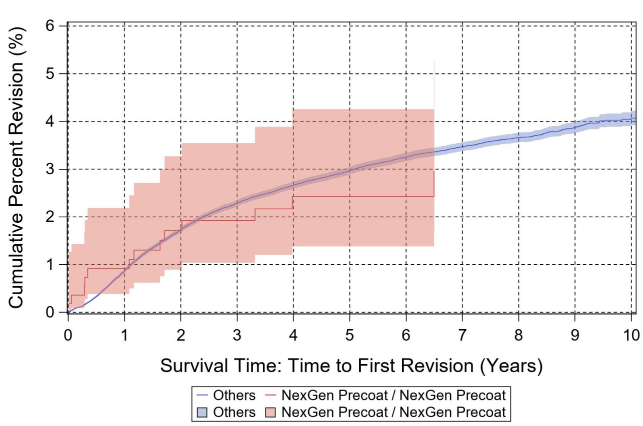

Figure 271: Cumulative percent revision curve for the NexGen Precoat/NexGen Precoat combination compared to all other implant combinations in primary TKA.

Table 1070: Cumulative percent revision and number at risk for NexGen Precoat/NexGen Precoat combination in primary TKA cases.

Year	Number at risk	CPR
0	557	0.00 (0.00,0.00)
1	522	0.92 (0.38,2.19)
2	467	1.71 (0.89,3.27)
3	429	1.92 (1.04,3.55)
4	371	2.43 (1.38,4.26)
5	309	2.43 (1.38,4.26)
6	234	2.43 (1.38,4.26)
7*	143	2.97 (1.66,5.29)
8*	117	2.97 (1.66,5.29)
9*	72	2.97 (1.66,5.29)
10*	23	2.97 (1.66,5.29)

* No revision occurred after the termination of the red curve in Figure 271; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.906 (0.498,1.649). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1071: Reasons for revision following primary TKA for NexGen Precoat/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	4	36.4
2	Aseptic Loosening	2	18.2
3	Dislocation/Instability	2	18.2
4	Arthrofibrosis	1	9.1
5	Pain	1	9.1
6	Patellofemoral Joint	1	9.1

Table 1072: Reasons for revision in first 90 days following primary TKA for NexGen Precoat/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 1073: Reasons for revision between 91 and 365 days following primary TKA for NexGen Precoat/NexGen Precoat combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	2	100.0

Table 1074: Distribution of approach used for NexGen Precoat/NexGen Precoat combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	545	96.5
Mid-vastus	4	0.7
Sub-vastus	11	1.9
Lateral parapatellar	2	0.4
Missing/unknown/other	3	0.5

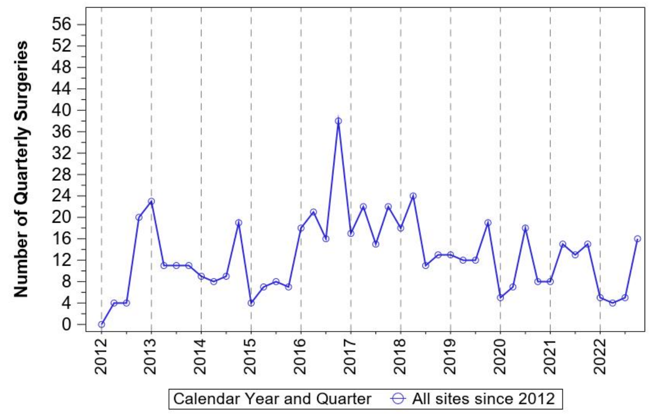

Figure 272: Utilization of the NexGen Precoat/NexGen Precoat combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

595001701	597001801	595001501
595001702	597001701	595001605
597001502	597001802	595001402
595001601	597001401	595001705
595001602	597001402	595001302
597001602	595001502	595001401
597001501	595001606	
597001601	595001505	
597001702	595001706	

Catalog numbers of tibial components used in the analysis.

598004702	598003701	598005703
598004701	598005702	598002701
598005701	598003702	

NK II/NK II
N=994

Fewer than ten surgeons used this implant combination at fewer than ten sites in primary TKA.

Table 1075: Volume of cases by surgeon and site for the NK II/NK II combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	110 (181)	11 (104)
Cases per site	198 (166)	129 (247)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1076: Descriptive statistics of cases receiving the NK II/NK II combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	642	64.6	
Age (years)	994	66.9(9.2)	67(14)
Height (cm)	991	168.3(10.1)	167.6(15.2)
Weight (kg)	991	93.7(21.4)	90.7(28.6)
BMI(kg/m^2)	991	33(6.8)	32.1(8.9)
Smoking - never (%)	538	54.1	
Smoking - previous (%)	376	37.8	
Smoking - current (%)	76	7.7	
Smoking - unknown (%)	4	0.4	

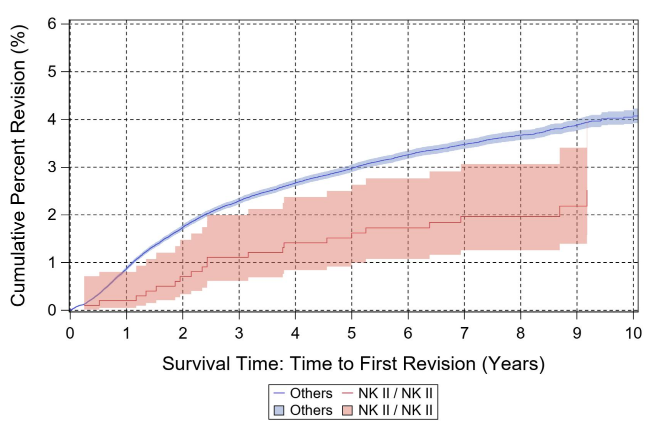

Figure 273: Cumulative percent revision curve for the NK II/NK II combination compared to all other implant combinations in primary TKA.

Table 1077: Cumulative percent revision and number at risk for NK II/NK II combination in primary TKA cases.

Year	Number at risk	CPR
0	990	0.00 (0.00,0.00)
1	988	0.20 (0.05,0.81)
2	983	0.71 (0.34,1.48)
3	979	1.11 (0.62,2.00)
4	973	1.41 (0.84,2.38)
5	938	1.62 (1.00,2.63)
6	881	1.73 (1.08,2.76)
7	789	1.97 (1.26,3.07)
8	549	1.97 (1.26,3.07)
9	360	2.18 (1.40,3.41)
10*	107	2.52 (1.58,4.00)

* No revision occurred after the termination of the red curve in Figure 273; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.655 (0.379,1.134). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1078: Reasons for revision following primary TKA for NK II/NK II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	7	36.8
2	Joint Infection	4	21.1
3	Implant Failure	3	15.8
4	Pain	2	10.5
5	Poly liner wear	2	10.5
6	Aseptic Loosening	1	5.3

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1079: Reasons for revision between 91 and 365 days following primary TKA for NK II/NK II combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 1080: Distribution of approach used for NK II/NK II combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	925	93.1
Mid-vastus	38	3.8
Sub-vastus	12	1.2
Lateral parapatellar	5	0.5
Missing/unknown/other	14	1.4

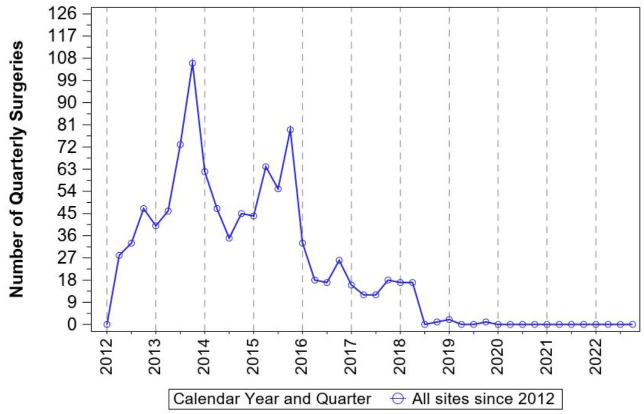

Figure 274: Utilization of the NK II/NK II combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

630700021	621200021	630700008
630700020	621200041	632000103
630700030	621200040	632000203
630700031	630700040	630700009
621200031	621200010	632000102
621200030	621200050	632000202
621200020	621200011	621200008
630700041	621200051	632000101
630700011	630700051	
630700010	630700050	

Catalog numbers of tibial components used in the analysis.

630701210	630700240	642001240
630700210	630701240	642000100
630700220	642000210	630700002
630701220	642001210	642000240
630701230	642001220	630700250
630700230	642001230	630701002
630700200	642000230	
630701200	642000220	

NK II GS/NK II
N=3939

Distribution of utilization: 12 surgeons across 11 sites used this implant combination in primary TKA.

Table 1081: Volume of cases by surgeon and site for the NK II GS/NK II combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	328 (489)	59 (626)
Cases per site	358 (457)	119 (862)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1082: Descriptive statistics of cases receiving the NK II GS/NK II combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2299	58.4	
Age (years)	3939	67.9(9)	68(12)
Height (cm)	3938	169.5(10.6)	167.6(15.2)
Weight (kg)	3937	93.7(21.1)	92(28.1)
BMI(kg/m^2)	3937	32.5(6.2)	31.9(8.8)
Smoking - never (%)	2060	52.3	
Smoking - previous (%)	1607	40.8	
Smoking - current (%)	270	6.9	
Smoking - unknown (%)	0	0.0	

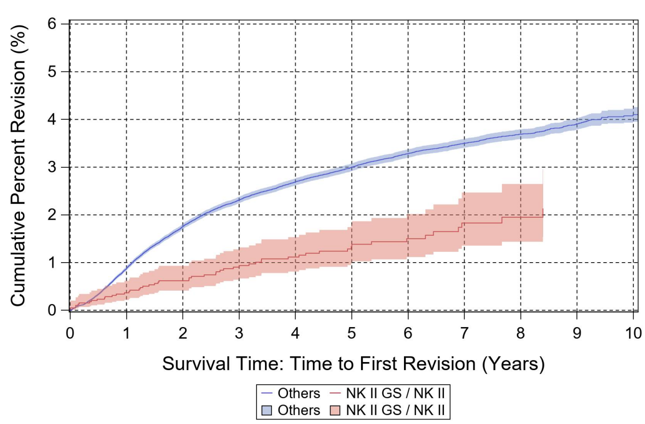

Figure 275: Cumulative percent revision curve for the NK II GS/NK II combination compared to all other implant combinations in primary TKA.

Table 1083: Cumulative percent revision and number at risk for NK II GS/NK II combination in primary TKA cases.

Year	Number at risk	CPR
0	3924	0.00 (0.00,0.00)
1	3664	0.37 (0.22,0.62)
2	3300	0.62 (0.41,0.93)
3	2989	0.91 (0.64,1.28)
4	2520	1.12 (0.81,1.53)
5	2025	1.34 (0.99,1.81)
6	1534	1.50 (1.12,2.02)
7	1064	1.83 (1.36,2.47)
8	683	1.95 (1.44,2.65)
9*	341	2.13 (1.54,2.96)
10*	71	2.13 (1.54,2.96)

* No revision occurred after the termination of the red curve in Figure 275; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.674 (0.44,1.035). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1084: Reasons for revision following primary TKA for NK II GS/NK II combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	13	23.6
2	Aseptic Loosening	9	16.4
3	Dislocation/Instability	8	14.5
4	Pain	8	14.5
5	Implant Failure	7	12.7
6	Malalignment	3	5.5
7	Poly liner wear	2	3.6
8	Arthrofibrosis	1	1.8
9	Metal Reaction/Metallosis	1	1.8
10	Osteolysis	1	1.8
11	Peri-prosthetic fracture - Femur	1	1.8
12	Peri-prosthetic fracture - Tibia	1	1.8

Table 1085: Reasons for revision in first 90 days following primary TKA for NK II GS/NK II combination cases.

Rank	Reason for Revision	N	Percent
1	Implant Failure	3	50.0
2	Joint Infection	1	16.7
3	Malalignment	1	16.7
4	Peri-prosthetic fracture - Tibia	1	16.7

Table 1086: Reasons for revision between 91 and 365 days following primary TKA for NK II GS/NK II combination cases.

Rank	Reason for Revision	N	Percent
1	Pain	4	40.0
2	Dislocation/Instability	2	20.0
3	Joint Infection	1	10.0
4	Peri-prosthetic fracture - Femur	1	10.0
5	Malalignment	1	10.0
6	Arthrofibrosis	1	10.0

Table 1087: Distribution of approach used for NK II GS/NK II combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	3750	95.2
Mid-vastus	65	1.7
Sub-vastus	108	2.7
Lateral parapatellar	5	0.1
Missing/unknown/other	11	0.3

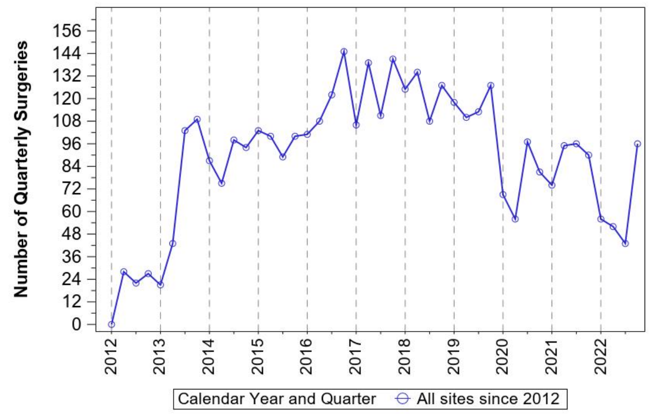

Figure 276: Utilization of the NK II GS/NK II combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

541401501	541001502	541001801
541401502	541401401	541001802
541001602	541401601	541601601
541001601	541001501	541201402
541001702	541601502	541201801
541001701	541601501	541201401
541201602	541001402	541401302
541201701	541001401	541601701
541201601	541201802	541401301
541201501	541401701	541601302
541201702	541601401	541601702
541201502	541601402	541601301
541401602	541601602	
541401402	541401702	

Catalog numbers of tibial components used in the analysis.

630701210	630700200	621200240
630700210	621201210	621201240
630701220	621200220	630701250
630701230	621200210	621201002
630700230	621201220	630700250
630700220	621201230	621200250
630701240	621200230	621201250
630700240	621201200	642001220
630701200	621200200	

Persona/Persona
N=65352

Distribution of utilization: 261 surgeons across 79 sites used this implant combination in primary TKA.

Table 1088: Volume of cases by surgeon and site for the Persona/Persona combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	250 (453)	66 (290)
Cases per site	827 (1222)	341 (869)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1089: Descriptive statistics of cases receiving the Persona/Persona combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	40607	62.1	
Age (years)	65352	66.8(9.2)	67(12)
Height (cm)	64824	168.5(10.5)	167.6(16.5)
Weight (kg)	64824	94(21)	92.3(27.8)
BMI(kg/m^2)	64824	33(6.6)	32.3(8.8)
Smoking - never (%)	34565	52.9	
Smoking - previous (%)	25054	38.3	
Smoking - current (%)	5498	8.4	
Smoking - unknown (%)	235	0.4	

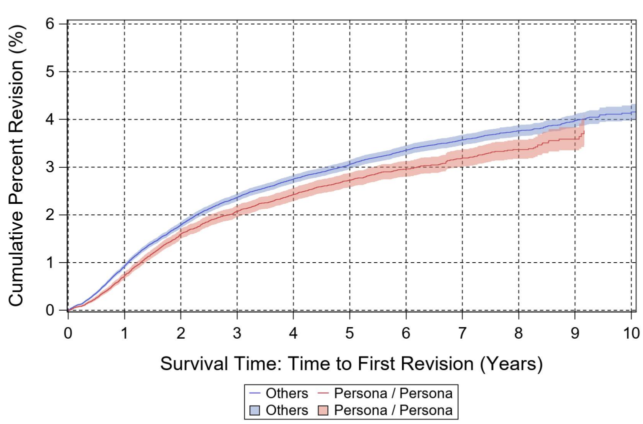

Figure 277: Cumulative percent revision curve for the Persona/Persona combination compared to all other implant combinations in primary TKA.

Table 1090: Cumulative percent revision and number at risk for Persona/Persona combination in primary TKA cases.

Year	Number at risk	CPR
0	64991	0.00 (0.00,0.00)
1	54673	0.72 (0.65,0.79)
2	45994	1.59 (1.49,1.70)
3	39373	2.07 (1.95,2.20)
4	31561	2.42 (2.29,2.57)
5	24401	2.73 (2.58,2.88)
6	17876	2.96 (2.80,3.12)
7	11728	3.19 (3.02,3.38)
8	6414	3.37 (3.18,3.57)
9	2026	3.59 (3.35,3.84)
10*	18	3.77 (3.46,4.10)

* No revision occurred after the termination of the red curve in Figure 312; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 1091: Reasons for revision following primary TKA for Persona/Persona combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	416	29.9
2	Joint Infection	335	24.0
3	Aseptic Loosening	301	21.6
4	Pain	98	7.0
5	Arthrofibrosis	96	6.9
6	Implant Failure	40	2.9
7	Malalignment	29	2.1
8	Poly liner wear	26	1.9
9	Peri-prosthetic fracture - Femur	21	1.5
10	Metal Reaction/Metallosis	10	0.7
11	Extensor mechanism failure	8	0.6
12	Patellofemoral Joint	6	0.4
13	Peri-prosthetic fracture - Tibia	4	0.3
14	Osteolysis	3	0.2

Table 1092: Reasons for revision in first 90 days following primary TKA for Persona/Persona combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	25	42.4
2	Peri-prosthetic fracture - Femur	10	16.9
3	Dislocation/Instability	7	11.9
4	Aseptic Loosening	5	8.5
5	Pain	4	6.8
6	Implant Failure	3	5.1
7	Malalignment	1	1.7
8	Peri-prosthetic fracture - Tibia	1	1.7
9	Arthrofibrosis	1	1.7
10	Extensor mechanism failure	1	1.7
11	Patellofemoral Joint	1	1.7

Table 1093: Reasons for revision between 91 and 365 days following primary TKA for Persona/Persona combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	122	35.2
2	Dislocation/Instability	89	25.6
3	Aseptic Loosening	41	11.8
4	Arthrofibrosis	37	10.7
5	Pain	27	7.8
6	Implant Failure	8	2.3
7	Malalignment	8	2.3
8	Extensor mechanism failure	5	1.4
9	Peri-prosthetic fracture - Femur	4	1.1
10	Poly liner wear	3	0.9
11	Metal Reaction/Metallosis	2	0.6
12	Osteolysis	1	0.3

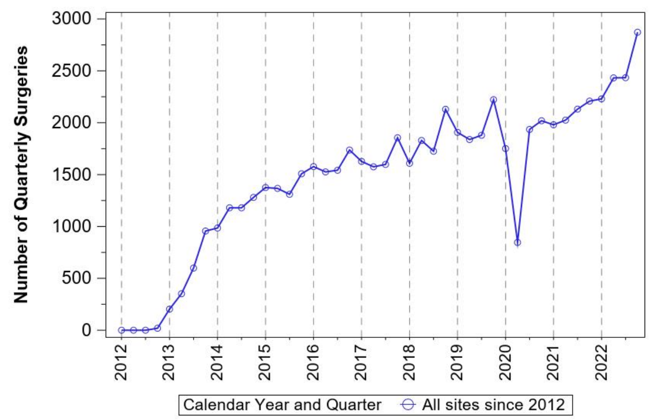

Figure 278: Utilization of the Persona/Persona combination in primary TKA cases.

Table 1094: Distribution of approach used for Persona/Persona combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	57982	88.7
Mid-vastus	5804	8.9
Sub-vastus	887	1.4
Lateral parapatellar	64	0.1
Missing/unknown/other	615	0.9

Catalog numbers of femoral components used in the analysis.

42502606202	42500607002	42502005802
42502607002	42502006601	42502007002
42502607001	42500606601	42502005801
42502006202	42500606401	42502007001
42502606402	42500006402	42500006801
42502606201	42500006401	42500006802
42502606802	42500607001	42500005802
42502006402	42500006201	42500005801
42502606602	42500006202	42502605601
42502606801	42500606002	42502605602
42502606601	42500606001	42500605602
42502006201	42502607401	42500605601
42502606401	42502607402	42500007001
42502006401	42502605802	42500007002
42502606002	42500006002	42502005601
42502606001	42502605801	42502005602
42500606202	42500006001	42502806602
42502006602	42502006802	42502806601
42500606402	42500006602	42502806802
42500606802	42500006601	42502807002
42500606602	42500605802	42502806401
42502006002	42502006801	42502807001
42500606801	42500605801	42502806801
42500606201	42500607401	42502806201
42502006001	42500607402	42502806402

42500005601	42504606602	42570606002
42502806202	42572606001	42504605811
42500005602	42504606201	42504606212
42502807401	42572606002	42570606601
42502206402	42570006001	42572607001
42502806001	42570606201	42572607002
42502206401	42570606202	42500806601
42572606201	42572606602	42572005802
42502206201	42502205801	42500806001
42502806002	42570606402	42502005002
42572606202	42572006001	42572005801
42502807402	42572606802	42500206201
42502206602	42572006002	42500206401
42500605402	42572606601	42500805802
42502206202	42502205802	42500806402
42502206601	42502207002	42502005001
42502206002	42502805602	42504605812
42504606202	42570006002	42504606211
42572606401	42570606401	42504606611
42502206001	42502005401	42504606612
42572606402	42502005402	42504607012
42500605401	42504607001	42570606001
42502605401	42572605802	42500206002
42502605402	42500005401	42500805601
42502805802	42500005402	42500806202
42504606601	42502805601	42500806801
42502206801	42504605801	42502005202
42502805801	42504605802	42504607011
42502206802	42504607002	

Catalog numbers of tibial components used in the analysis.

42532007102	42530007502	42542006701
42532007101	42530006702	42542006702
42532006702	42530007901	42542007102
42532006701	42530007501	42542006401
42532007502	42530007902	42542006402
42532007501	42532008802	42542007501
42532007902	42532008801	42532005802
42532007901	42530008302	42542007902
42532006402	42530008301	42542008302
42532006401	42530006401	42542008301
42532008302	42530006402	42532005801
42532008301	42532006101	42542007901
42530007101	42532006102	
42530007102	42542007101	
42530006701	42542007502	

Scorpio/Series 7000
N=656

Fewer than ten surgeons used this implant combination at fewer than ten sites in primary TKA.

Table 1095: Volume of cases by surgeon and site for the Scorpio/Series 7000 combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	93 (190)	13 (80)
Cases per site	164 (195)	75 (215)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1096: Descriptive statistics of cases receiving the Scorpio/Series 7000 combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	340	51.8	
Age (years)	656	66(9.5)	65(14)
Height (cm)	656	169.8(10.5)	170(15.4)
Weight (kg)	656	97.4(21.3)	96(28)
BMI(kg/m^2)	656	33.8(7)	32.7(9.5)
Smoking - never (%)	350	53.4	
Smoking - previous (%)	251	38.3	
Smoking - current (%)	53	8.1	
Smoking - unknown (%)	2	0.3	

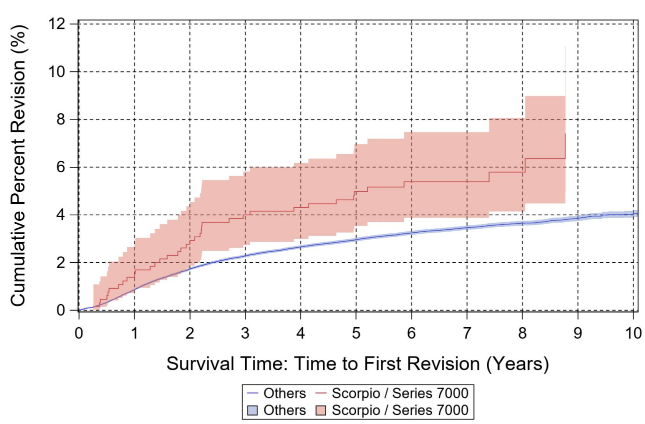

Figure 279: Cumulative percent revision curve for the Scorpio/Series 7000 combination compared to all other implant combinations in primary TKA.

Table 1097: Cumulative percent revision and number at risk for Scorpio/Series 7000 combination in primary TKA cases.

Year	Number at risk	CPR
0	650	0.00 (0.00,0.00)
1	641	1.38 (0.72,2.64)
2	631	2.92 (1.87,4.54)
3	624	4.00 (2.74,5.82)
4	622	4.31 (2.99,6.18)
5	540	4.98 (3.55,6.97)
6	413	5.39 (3.87,7.47)
7	281	5.39 (3.87,7.47)
8	170	5.79 (4.14,8.06)
9*	66	7.41 (4.93,11.07)
10*	26	7.41 (4.93,11.07)

* No revision occurred after the termination of the red curve in Figure 279; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 2.43 (1.458,4.051). It was 0.842 (0.8,0.888) and 0.961 (0.958,0.964) for sex (female) and age, respectively.

Table 1098: Reasons for revision following primary TKA for Scorpio/Series 7000 combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	12	32.4
2	Aseptic Loosening	7	18.9
3	Dislocation/Instability	5	13.5
4	Pain	5	13.5
5	Arthrofibrosis	3	8.1
6	Poly liner wear	2	5.4
7	Implant Failure	1	2.7
8	Malalignment	1	2.7
9	Peri-prosthetic fracture - Tibia	1	2.7

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1099: Reasons for revision between 91 and 365 days following primary TKA for Scorpio/Series 7000 combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	3	37.5
2	Pain	2	25.0
3	Arthrofibrosis	2	25.0
4	Dislocation/Instability	1	12.5

Table 1100: Distribution of approach used for Scorpio/Series 7000 combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	13	2.0
Mid-vastus	643	98.0
Sub-vastus	0	0.0
Lateral parapatellar	0	0.0
Missing/unknown/other	0	0.0

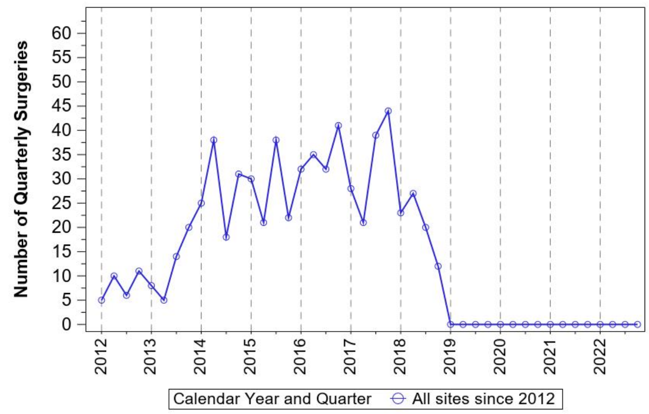

Figure 280: Utilization of the Scorpio/Series 7000 combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

704107R	713009L	704113L
704107L	713009R	713007L
704109L	714509L	713007R
704109R	704105L	714511L
704111R	714509R	714505L
704111L	704113R	714511R
713011L	714507R	714507L
713011R	704105R	

Catalog numbers of tibial components used in the analysis.

71150007	71150005	71150003
71150009	71150013	71150004
71150011	71150006	

Sigma/M.B.T.

N=977

Distribution of utilization: 43 surgeons across 30 sites used this implant combination in primary TKA.

Table 1101: Volume of cases by surgeon and site for the Sigma/M.B.T. combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	22 (46)	4 (20)
Cases per site	32 (47)	11 (36)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1102: Descriptive statistics of cases receiving the Sigma/M.B.T. combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	619	63.4	
Age (years)	977	64.3(10.2)	64(13)
Height (cm)	977	168.5(10.8)	167.6(17.8)
Weight (kg)	977	98.7(22.7)	97.5(31.8)
BMI(kg/m^2)	977	34.8(7.3)	34.4(9.8)
Smoking - never (%)	482	49.3	
Smoking - previous (%)	346	35.4	
Smoking - current (%)	113	11.6	
Smoking - unknown (%)	36	3.7	

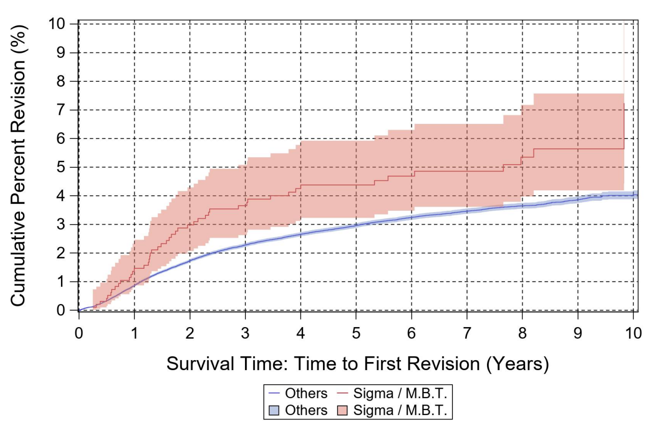

Figure 281: Cumulative percent revision curve for the Sigma/M.B.T. combination compared to all other implant combinations in primary TKA.

Table 1103: Cumulative percent revision and number at risk for Sigma/M.B.T. combination in primary TKA cases.

Year	Number at risk	CPR
0	973	0.00 (0.00,0.00)
1	927	1.47 (0.87,2.46)
2	879	2.98 (2.07,4.29)
3	843	3.65 (2.62,5.08)
4	758	4.38 (3.23,5.92)
5	661	4.38 (3.23,5.92)
6	568	4.69 (3.48,6.30)
7	453	4.86 (3.62,6.51)
8	362	5.35 (3.98,7.17)
9	193	5.64 (4.19,7.57)
10*	44	7.24 (4.44,11.70)

* No revision occurred after the termination of the red curve in Figure 281; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.109 (0.782,1.575). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1104: Reasons for revision following primary TKA for Sigma/M.B.T. combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	13	31.0
2	Dislocation/Instability	7	16.7
3	Joint Infection	7	16.7
4	Pain	5	11.9
5	Malalignment	3	7.1
6	Implant Failure	2	4.8
7	Metal Reaction/Metallosis	2	4.8
8	Arthrofibrosis	1	2.4
9	Extensor mechanism failure	1	2.4
10	Poly liner wear	1	2.4

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1105: Reasons for revision between 91 and 365 days following primary TKA for Sigma/M.B.T. combination cases.

Rank	Reason for Revision	N	Percent
1	Pain	3	42.9
2	Aseptic Loosening	1	14.3
3	Joint Infection	1	14.3
4	Arthrofibrosis	1	14.3
5	Extensor mechanism failure	1	14.3

Table 1106: Distribution of approach used for Sigma/M.B.T. combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	710	72.7
Mid-vastus	254	26.0
Sub-vastus	1	0.1
Lateral parapatellar	1	0.1
Missing/unknown/other	11	1.1

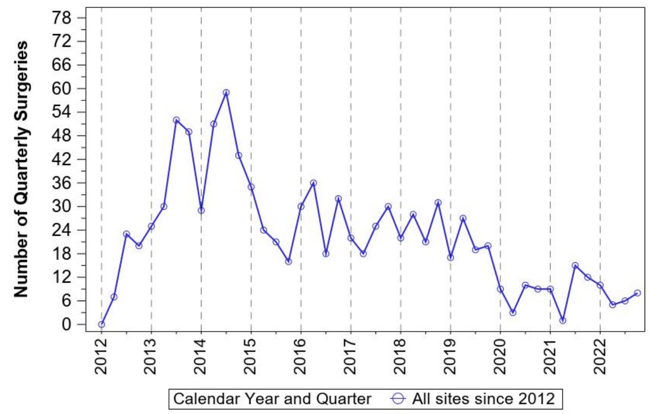

Figure 282: Utilization of the Sigma/M.B.T. combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

196050300	196040600	196030450
196040300	196050600	196040150
196050400	940023	196020400
196050500	940015	196020450
196040400	940013	196030400
196050250	940029	196064500
196040500	940019	196074500
196050450	940018	940012
196040250	940025	940016
196040450	940014	940022
196050200	196050150	940024
196040200	940028	

Catalog numbers of tibial components used in the analysis.

129433130	129435125	129434120
129433140	129434125	129431130
129433125	129435130	129433110
129433150	129434150	129433170
129433120	129435140	129435115
129434130	129435150	
129433160	129435120	
129434140	129433115	

Sigma/Sigma
N=1686

Distribution of utilization: 39 surgeons across 28 sites used this implant combination in primary TKA.

Table 1107: Volume of cases by surgeon and site for the Sigma/Sigma combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	43 (75)	4 (37)
Cases per site	60 (131)	17 (39)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1108: Descriptive statistics of cases receiving the Sigma/Sigma combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1053	62.5	
Age (years)	1686	67.7(10)	68(14)
Height (cm)	1649	167.8(10.4)	167.6(15.3)
Weight (kg)	1649	90.1(20.3)	88(26.1)
BMI(kg/m^2)	1649	31.9(6.2)	31.2(8.6)
Smoking - never (%)	892	52.9	
Smoking - previous (%)	652	38.7	
Smoking - current (%)	133	7.9	
Smoking - unknown (%)	9	0.5	

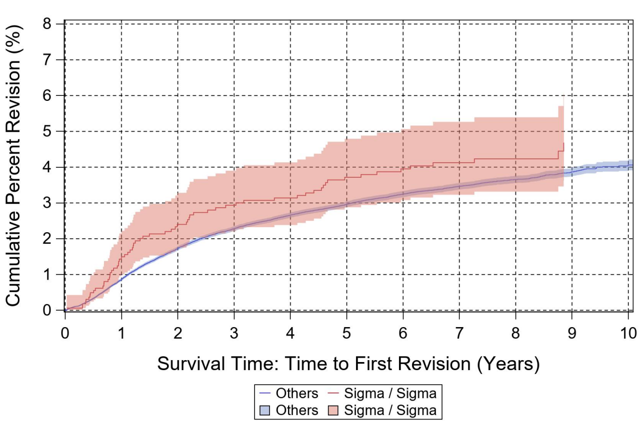

Figure 283: Cumulative percent revision curve for the Sigma/Sigma combination compared to all other implant combinations in primary TKA.

Table 1109: Cumulative percent revision and number at risk for Sigma/Sigma combination in primary TKA cases.

Year	Number at risk	CPR
0	1663	0.00 (0.00,0.00)
1	1561	1.49 (1.00,2.22)
2	1468	2.40 (1.75,3.28)
3	1436	2.94 (2.21,3.90)
4	1394	3.14 (2.38,4.13)
5	1291	3.72 (2.88,4.79)
6	1178	3.95 (3.08,5.06)
7	959	4.13 (3.23,5.27)
8	778	4.23 (3.32,5.39)
9*	340	4.69 (3.62,6.05)
10*	42	4.69 (3.62,6.05)

* No revision occurred after the termination of the red curve in Figure 283; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.888 (0.665,1.187). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1110: Reasons for revision following primary TKA for Sigma/Sigma combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	21	34.4
2	Aseptic Loosening	13	21.3
3	Dislocation/Instability	12	19.7
4	Pain	5	8.2
5	Arthrofibrosis	4	6.6
6	Implant Failure	3	4.9
7	Extensor mechanism failure	1	1.6
8	Malalignment	1	1.6
9	Peri-prosthetic fracture - Femur	1	1.6

Table 1111: Reasons for revision in first 90 days following primary TKA for Sigma/Sigma combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 1112: Reasons for revision between 91 and 365 days following primary TKA for Sigma/Sigma combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	8	40.0
2	Pain	3	15.0
3	Arthrofibrosis	3	15.0
4	Dislocation/Instability	2	10.0
5	Aseptic Loosening	1	5.0
6	Peri-prosthetic fracture - Femur	1	5.0
7	Malalignment	1	5.0
8	Extensor mechanism failure	1	5.0

Table 1113: Distribution of approach used for Sigma/Sigma combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	1602	95.0
Mid-vastus	32	1.9
Sub-vastus	0	0.0
Lateral parapatellar	1	0.1
Missing/unknown/other	51	3.0

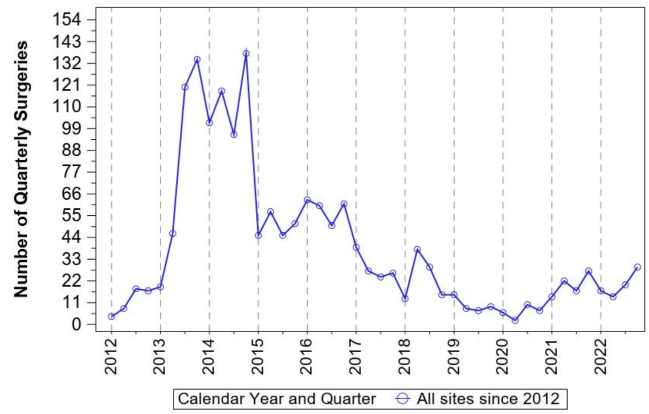

Figure 284: Utilization of the Sigma/Sigma combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

196050300	196050600	940014
196040300	196073500	940025
196050500	196030400	196062500
196050450	196040600	940013
196040450	196074500	940015
196040500	196020400	196020600
196040400	196063500	196066500
196050400	196064500	196072500
196020500	196065500	940024
196030500	196075500	196020200
196050250	196079500	196030600
196040250	196040200	196076500
196020300	196078500	940019
196030300	196068500	940029
196020450	196069500	940028
196030250	196030200	
196030450	196050200	
196020250	940023	

Catalog numbers of tibial components used in the analysis.

158130000	158150000	158115000
158140000	158120000	
158125000	158160000	

Sigma PFC/Sigma

N=3787

Distribution of utilization: 49 surgeons across 27 sites used this implant combination in primary TKA.

Table 1114: Volume of cases by surgeon and site for the Sigma PFC/Sigma combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	77 (165)	17 (60)
Cases per site	140 (265)	29 (68)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1115: Descriptive statistics of cases receiving the Sigma PFC/Sigma combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	2299	60.7	
Age (years)	3787	66.8(9.1)	67(12)
Height (cm)	3649	168.4(10.6)	167.6(17)
Weight (kg)	3648	94(21.1)	92.5(28)
BMI(kg/m^2)	3648	33.1(6.5)	32.3(8.7)
Smoking - never (%)	1916	50.6	
Smoking - previous (%)	1505	39.7	
Smoking - current (%)	353	9.3	
Smoking - unknown (%)	13	0.3	

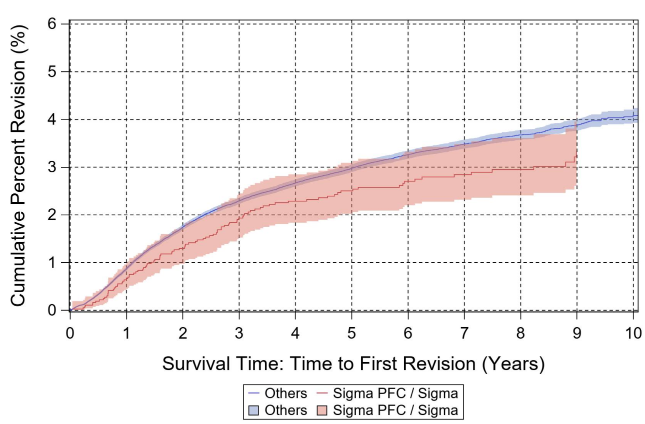

Figure 285: Cumulative percent revision curve for the Sigma PFC/Sigma combination compared to all other implant combinations in primary TKA.

Table 1116: Cumulative percent revision and number at risk for Sigma PFC/Sigma combination in primary TKA cases.

Year	Number at risk	CPR
0	3702	0.00 (0.00,0.00)
1	3519	0.67 (0.45,0.99)
2	3363	1.30 (0.97,1.73)
3	3142	1.93 (1.52,2.45)
4	2887	2.29 (1.84,2.85)
5	2605	2.50 (2.02,3.09)
6	2260	2.71 (2.20,3.32)
7	1939	2.84 (2.32,3.48)
8	1570	2.95 (2.41,3.61)
9*	848	3.33 (2.69,4.11)
10*	181	3.33 (2.69,4.11)

* No revision occurred after the termination of the red curve in Figure 285; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.704 (0.537,0.922). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1117: Reasons for revision following primary TKA for Sigma PFC/Sigma combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	27	28.1
2	Aseptic Loosening	24	25.0
3	Dislocation/Instability	18	18.8
4	Arthrofibrosis	10	10.4
5	Pain	8	8.3
6	Implant Failure	2	2.1
7	Malalignment	2	2.1
8	Peri-prosthetic fracture - Femur	2	2.1
9	Extensor mechanism failure	1	1.0
10	Metal Reaction/Metallosis	1	1.0
11	Poly liner wear	1	1.0

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1118: Reasons for revision between 91 and 365 days following primary TKA for Sigma PFC/Sigma combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	10	47.6
2	Arthrofibrosis	5	23.8
3	Aseptic Loosening	2	9.5
4	Dislocation/Instability	1	4.8
5	Implant Failure	1	4.8
6	Pain	1	4.8
7	Extensor mechanism failure	1	4.8

Table 1119: Distribution of approach used for Sigma PFC/Sigma combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	3501	92.4
Mid-vastus	137	3.6
Sub-vastus	1	0.0
Lateral parapatellar	5	0.1
Missing/unknown/other	143	3.8

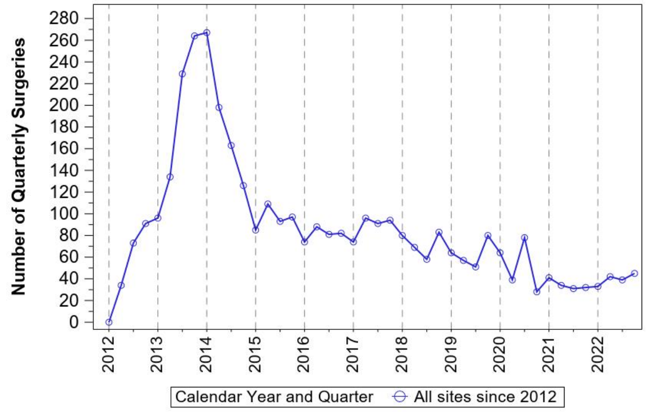

Figure 286: Utilization of the Sigma PFC/Sigma combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

960013	196001400	960012
960003	960008	960002
960005	196000400	960007
960015	960018	960017
960004	960016	
960014	960006	

Catalog numbers of tibial components used in the analysis.

158130000	158150000	158115000
158140000	158120000	
158125000	158160000	

Sigma PFC/Sigma PFC All-Poly
N=554

Fewer than ten surgeons used this implant combination at fewer than ten sites in primary TKA.

Table 1120: Volume of cases by surgeon and site for the Sigma PFC/Sigma PFC All-Poly combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	61 (165)	1 (1)
Cases per site	69 (167)	1 (32)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1121: Descriptive statistics of cases receiving the Sigma PFC/Sigma PFC All-Poly combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	511	92.2	
Age (years)	554	78.5(5.4)	78(7)
Height (cm)	554	161.3(7.4)	160(8.1)
Weight (kg)	554	78.4(15.9)	77.3(21.4)
BMI(kg/m^2)	554	30.2(5.9)	29.6(8.3)
Smoking - never (%)	330	59.6	
Smoking - previous (%)	191	34.5	
Smoking - current (%)	11	2	
Smoking - unknown (%)	22	4	

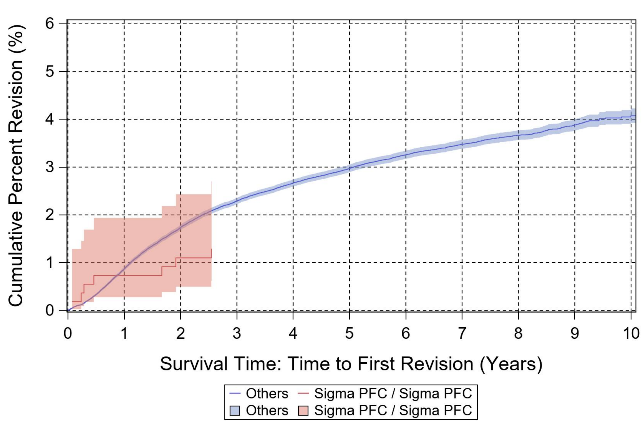

Figure 287: Cumulative percent revision curve for the Sigma PFC/Sigma PFC All-Poly combination compared to all other implant combinations in primary TKA.

Table 1122: Cumulative percent revision and number at risk for Sigma PFC/Sigma PFC All-Poly combination in primary TKA cases.

Year	Number at risk	CPR
0	547	0.00 (0.00,0.00)
1	541	0.73 (0.28,1.94)
2	532	1.10 (0.50,2.43)
3*	497	1.29 (0.62,2.70)
4*	456	1.29 (0.62,2.70)
5*	376	1.29 (0.62,2.70)
6*	276	1.29 (0.62,2.70)
7*	191	1.29 (0.62,2.70)
8*	114	1.29 (0.62,2.70)
9*	50	1.29 (0.62,2.70)
10*	7	1.29 (0.62,2.70)

* No revision occurred after the termination of the red curve in Figure 287; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.284 (0.588,2.805). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1123: Reasons for revision following primary TKA for Sigma PFC/Sigma PFC All-Poly combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	3	42.9
2	Joint Infection	3	42.9
3	Peri-prosthetic fracture - Tibia	1	14.3

Table 1124: Reasons for revision in first 90 days following primary TKA for Sigma PFC/Sigma PFC All-Poly combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	1	50.0
2	Peri-prosthetic fracture - Tibia	1	50.0

Table 1125: Reasons for revision between 91 and 365 days following primary TKA for Sigma PFC/Sigma PFC All-Poly combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	100.0

Table 1126: Distribution of approach used for Sigma PFC/Sigma PFC All-Poly combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	60	10.8
Mid-vastus	492	88.8
Sub-vastus	1	0.2
Lateral parapatellar	0	0.0
Missing/unknown/other	1	0.2

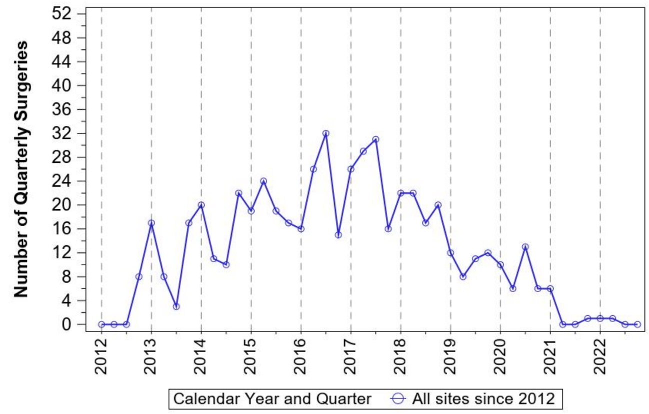

Figure 288: Utilization of the Sigma PFC/Sigma PFC All-Poly combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

960013	960004	960002
960003	960008	960006
196001400	960018	960012
196000400	960015	960016
960014	960005	

Catalog numbers of tibial components used in the analysis.

960640	960660	960621
960630	960632	960622
960650	960652	960661
960641	960642	962630
960620	860123	
960631	860124	
960651	860127	

Triathlon/Triathlon
N=39939

Distribution of utilization: 186 surgeons across 62 sites used this implant combination in primary TKA.

Table 1127: Volume of cases by surgeon and site for the Triathlon/Triathlon combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	214 (400)	50 (212)
Cases per site	644 (972)	217 (853)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1128: Descriptive statistics of cases receiving the Triathlon/Triathlon combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	23226	58.2	
Age (years)	39938	65.7(9.4)	66(13)
Height (cm)	39939	169.3(10.6)	168(16.5)
Weight (kg)	39939	95.9(21.3)	94(28)
BMI(kg/m^2)	39939	33.4(6.6)	32.7(9)
Smoking - never (%)	21075	52.8	
Smoking - previous (%)	14561	36.5	
Smoking - current (%)	4173	10.5	
Smoking - unknown (%)	130	0.3	

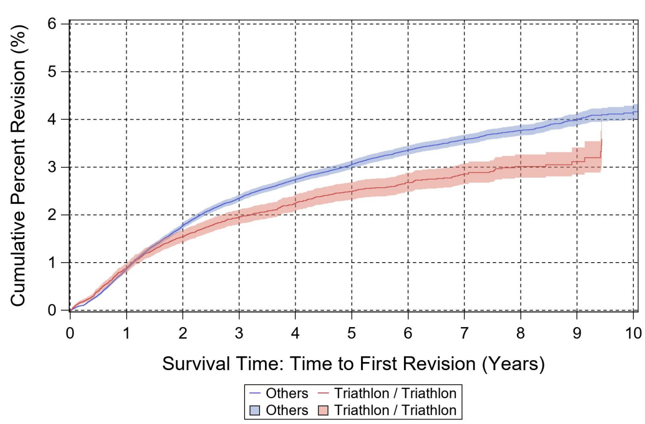

Figure 289: Cumulative percent revision curve for the Triathlon/Triathlon combination compared to all other implant combinations in primary TKA.

Table 1129: Cumulative percent revision and number at risk for Triathlon/Triathlon combination in primary TKA cases.

Year	Number at risk	CPR
0	39654	0.00 (0.00,0.00)
1	33826	0.88 (0.79,0.98)
2	28688	1.54 (1.41,1.67)
3	24089	1.95 (1.81,2.11)
4	18432	2.24 (2.08,2.42)
5	14314	2.49 (2.32,2.68)
6	10153	2.68 (2.49,2.88)
7	6514	2.86 (2.65,3.08)
8	3673	3.01 (2.78,3.27)
9	1337	3.12 (2.84,3.41)
10*	224	3.59 (3.08,4.18)

* No revision occurred after the termination of the red curve in Figure 289; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 1130: Reasons for revision following primary TKA for Triathlon/Triathlon combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	253	31.9
2	Dislocation/Instability	169	21.3
3	Aseptic Loosening	131	16.5
4	Arthrofibrosis	76	9.6
5	Pain	38	4.8
6	Implant Failure	37	4.7
7	Peri-prosthetic fracture - Tibia	25	3.2
8	Malalignment	19	2.4
9	Peri-prosthetic fracture - Femur	17	2.1
10	Poly liner wear	8	1.0
11	Metal Reaction/Metallosis	7	0.9
12	Extensor mechanism failure	6	0.8
13	Osteolysis	4	0.5
14	Patellofemoral Joint	2	0.3

Table 1131: Reasons for revision in first 90 days following primary TKA for Triathlon/Triathlon combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	20	26.3
2	Peri-prosthetic fracture - Tibia	19	25.0
3	Aseptic Loosening	11	14.5
4	Peri-prosthetic fracture - Femur	9	11.8
5	Dislocation/Instability	7	9.2
6	Implant Failure	3	4.0
7	Malalignment	3	4.0
8	Pain	2	2.6
9	Osteolysis	1	1.3
10	Extensor mechanism failure	1	1.3

Table 1132: Reasons for revision between 91 and 365 days following primary TKA for Triathlon/Triathlon combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	87	37.7
2	Dislocation/Instability	46	19.9
3	Arthrofibrosis	31	13.4
4	Aseptic Loosening	27	11.7
5	Pain	13	5.6
6	Implant Failure	7	3.0
7	Malalignment	7	3.0
8	Peri-prosthetic fracture - Tibia	4	1.7
9	Metal Reaction/Metallosis	3	1.3
10	Peri-prosthetic fracture - Femur	2	0.9
11	Extensor mechanism failure	2	0.9
12	Poly liner wear	1	0.4
13	Patellofemoral Joint	1	0.4

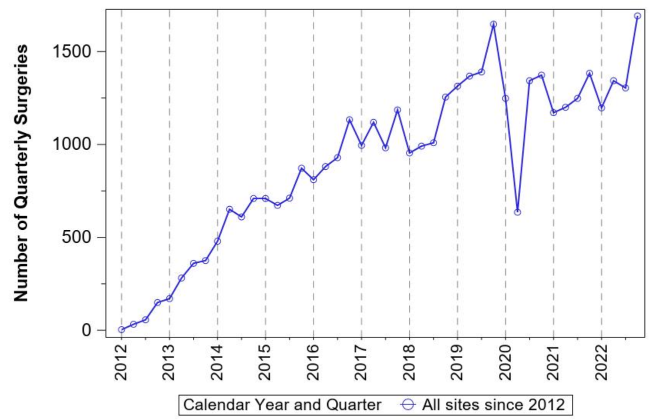

Figure 290: Utilization of the Triathlon/Triathlon combination in primary TKA cases.

Table 1133: Distribution of approach used for Triathlon/Triathlon combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	33485	83.8
Mid-vastus	4954	12.4
Sub-vastus	1197	3.0
Lateral parapatellar	43	0.1
Missing/unknown/other	260	0.7

Catalog numbers of femoral components used in the analysis.

5510F402	5515F502	5516F701
5510F401	5516F401	5517F801
5510F502	5516F502	5516F202
5510F501	5517F201	5516F201
5517F402	5510F201	5517F101
5517F401	5510F202	5515F802
5510F302	5517F202	5515F201
5517F502	5516F501	5515F202
5517F501	5515F501	5510F102
5510F601	5516F301	5515F801
5510F602	5516F302	5517F102
5510F301	5515F602	5516F801
5517F302	5510F801	5516F802
5517F301	5516F602	5510F101
5517F602	5510F802	5516F102
5517F601	5515F301	5516F101
5510F702	5515F601	5515F101
5510F701	5516F601	5515F102
5517F702	5515F302	5514F302
5517F701	5515F702	5514F501
5515F402	5515F701	5514F502
5515F401	5517F802	5514F602
5516F402	5516F702	

Catalog numbers of tibial components used in the analysis.

5520B400	5534A509	5520M400
5520B500	5534A409	5534A209
5536B400	5527B400	5534A711
5520B300	5527B500	5526B200
5520B600	5534A309	5527B200
5536B500	5526B600	5535A509
5536B600	5526B500	5535A809
5536B300	5527B700	5534A511
5520B700	5527B600	5523B500
5536B700	5526B400	5534A413
5536B200	5526B700	5534A416
5520B200	5527B800	5534A716
5520B800	5527B300	5534A811
5536B800	5534A809	5535A409
5536B100	5526B300	5535A611
5520B100	5535A709	5535A711
5534A609	5535A609	
5534A709	5534A611	

Triathlon/Triathlon TS
N=29527

Distribution of utilization: 206 surgeons across 58 sites used this implant combination in primary TKA.

Table 1134: Volume of cases by surgeon and site for the Triathlon/Triathlon TS combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	143 (345)	19 (105)
Cases per site	509 (1182)	108 (514)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1135: Descriptive statistics of cases receiving the Triathlon/Triathlon TS combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	19511	66.1	
Age (years)	29527	67.2(9.6)	67(13)
Height (cm)	29526	167.7(10.5)	167(15.3)
Weight (kg)	29526	93.4(22.1)	91(29.6)
BMI(kg/m^2)	29526	33.2(7.1)	32.3(9.5)
Smoking - never (%)	16317	55.3	
Smoking - previous (%)	10761	36.4	
Smoking - current (%)	2366	8	
Smoking - unknown (%)	83	0.3	

Figure 291: Cumulative percent revision curve for the Triathlon/Triathlon TS combination compared to all other implant combinations in primary TKA.

Table 1136: Cumulative percent revision and number at risk for Triathlon/Triathlon TS combination in primary TKA cases.

Year	Number at risk	CPR
0	29312	0.00 (0.00,0.00)
1	25887	0.91 (0.81,1.03)
2	22794	1.74 (1.59,1.91)
3	20065	2.22 (2.05,2.41)
4	16764	2.52 (2.33,2.72)
5	13175	2.84 (2.64,3.07)
6	9805	3.17 (2.94,3.41)
7	6615	3.38 (3.13,3.65)
8	4065	3.60 (3.33,3.90)
9	1789	3.95 (3.60,4.32)
10*	525	4.08 (3.70,4.51)

* No revision occurred after the termination of the red curve in Figure 291; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.013 (0.904,1.135). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1137: Reasons for revision following primary TKA for Triathlon/Triathlon TS combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	233	31.5
2	Joint Infection	214	29.0
3	Aseptic Loosening	92	12.4
4	Arthrofibrosis	73	9.9
5	Pain	38	5.1
6	Peri-prosthetic fracture - Femur	25	3.4
7	Implant Failure	22	3.0
8	Malalignment	13	1.8
9	Extensor mechanism failure	6	0.8
10	Patellofemoral Joint	6	0.8
11	Poly liner wear	6	0.8
12	Metal Reaction/Metallosis	5	0.7
13	Peri-prosthetic fracture - Tibia	4	0.5
14	Osteolysis	2	0.3

Table 1138: Reasons for revision in first 90 days following primary TKA for Triathlon/Triathlon TS combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	8	36.4
2	Joint Infection	7	31.8
3	Dislocation/Instability	3	13.6
4	Extensor mechanism failure	2	9.1
5	Aseptic Loosening	1	4.5
6	Arthrofibrosis	1	4.5

Table 1139: Reasons for revision between 91 and 365 days following primary TKA for Triathlon/Triathlon TS combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	82	37.3
2	Dislocation/Instability	62	28.2
3	Arthrofibrosis	32	14.6
4	Aseptic Loosening	14	6.4
5	Pain	14	6.4
6	Peri-prosthetic fracture - Femur	5	2.3
7	Implant Failure	4	1.8
8	Poly liner wear	2	0.9
9	Malalignment	2	0.9
10	Metal Reaction/Metallosis	1	0.5
11	Extensor mechanism failure	1	0.5
12	Patellofemoral Joint	1	0.5

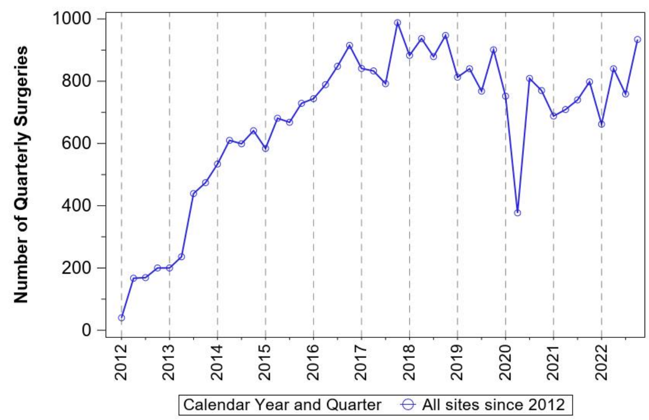

Figure 292: Utilization of the Triathlon/Triathlon TS combination in primary TKA cases.

Table 1140: Distribution of approach used for Triathlon/Triathlon TS combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	23398	79.2
Mid-vastus	5916	20.0
Sub-vastus	88	0.3
Lateral parapatellar	34	0.1
Missing/unknown/other	91	0.3

Catalog numbers of femoral components used in the analysis.

5515F402	5510F201	5517F701
5515F401	5515F202	5517F102
5510F402	5515F201	5517F601
5510F401	5515F801	5516F302
5515F502	5515F802	5516F502
5515F501	5510F801	5516F401
5515F302	5510F802	5516F501
5510F302	5510F101	5516F301
5510F301	5510F102	5516F402
5510F502	5517F401	5517F702
5515F301	5515F102	5516F202
5510F501	5517F402	5516F602
5515F602	5517F302	5516F702
5515F601	5515F101	5517F802
5510F601	5517F301	5514F401
5510F602	5517F201	5516F101
5515F702	5517F202	5516F701
5515F701	5517F502	5516F801
5510F702	5517F602	5517F801
5510F202	5517F501	
5510F701	5517F101	

Catalog numbers of tibial components used in the analysis.

5521B400	5521B600	5521B800
5521B300	5521B200	5521B100
5521B500	5521B700	

Vanguard/Maxim
N=22808

Distribution of utilization: 108 surgeons across 54 sites used this implant combination in primary TKA.

Table 1141: Volume of cases by surgeon and site for the Vanguard/Maxim combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	211 (369)	59 (256)
Cases per site	422 (669)	110 (463)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1142: Descriptive statistics of cases receiving the Vanguard/Maxim combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	14090	61.8	
Age (years)	22808	66.7(9.5)	67(13)
Height (cm)	22808	168.5(10.5)	167.6(16.5)
Weight (kg)	22808	95.4(21.9)	93.2(29.3)
BMI(kg/m^2)	22808	33.5(7)	32.7(9.4)
Smoking - never (%)	11764	51.6	
Smoking - previous (%)	8719	38.2	
Smoking - current (%)	2110	9.3	
Smoking - unknown (%)	215	0.9	

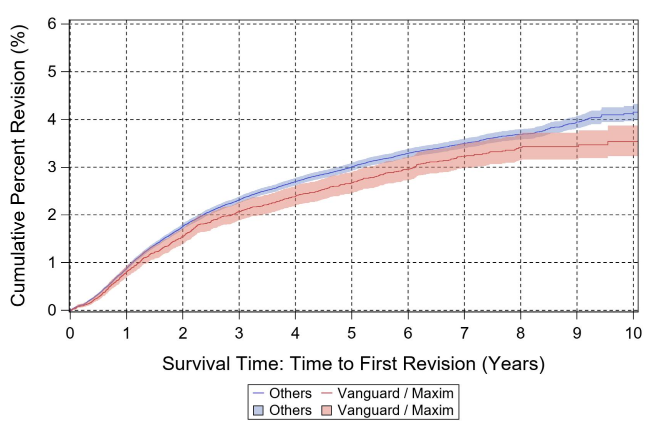

Figure 293: Cumulative percent revision curve for the Vanguard/Maxim combination compared to all other implant combinations in primary TKA.

Table 1143: Cumulative percent revision and number at risk for Vanguard/Maxim combination in primary TKA cases.

Year	Number at risk	CPR
0	22671	0.00 (0.00,0.00)
1	21644	0.81 (0.70,0.93)
2	20319	1.55 (1.39,1.72)
3	19014	2.07 (1.88,2.27)
4	17177	2.39 (2.19,2.61)
5	14629	2.67 (2.46,2.90)
6	11578	2.96 (2.73,3.21)
7	8131	3.23 (2.98,3.50)
8	5032	3.41 (3.14,3.70)
9	2550	3.43 (3.16,3.72)
10	716	3.54 (3.23,3.87)

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.73 (0.645,0.827). It was 0.838 (0.797,0.883) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1144: Reasons for revision following primary TKA for Vanguard/Maxim combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	163	28.2
2	Joint Infection	126	21.8
3	Aseptic Loosening	108	18.7
4	Implant Failure	42	7.3
5	Pain	42	7.3
6	Arthrofibrosis	36	6.2
7	Peri-prosthetic fracture - Femur	17	2.9
8	Metal Reaction/Metallosis	12	2.1
9	Poly liner wear	12	2.1
10	Malalignment	11	1.9
11	Patellofemoral Joint	4	0.7
12	Extensor mechanism failure	3	0.5
13	Peri-prosthetic fracture - Tibia	3	0.5

Table 1145: Reasons for revision in first 90 days following primary TKA for Vanguard/Maxim combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	6	27.3
2	Peri-prosthetic fracture - Femur	5	22.7
3	Dislocation/Instability	3	13.6
4	Implant Failure	2	9.1
5	Pain	2	9.1
6	Aseptic Loosening	1	4.5
7	Malalignment	1	4.5
8	Peri-prosthetic fracture - Tibia	1	4.5
9	Arthrofibrosis	1	4.5

Table 1146: Reasons for revision between 91 and 365 days following primary TKA for Vanguard/Maxim combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	40	31.8
2	Dislocation/Instability	38	30.2
3	Pain	14	11.1
4	Arthrofibrosis	10	7.9
5	Aseptic Loosening	6	4.8
6	Implant Failure	5	4.0
7	Peri-prosthetic fracture - Femur	3	2.4
8	Metal Reaction/Metallosis	3	2.4
9	Extensor mechanism failure	3	2.4
10	Malalignment	2	1.6
11	Patellofemoral Joint	2	1.6

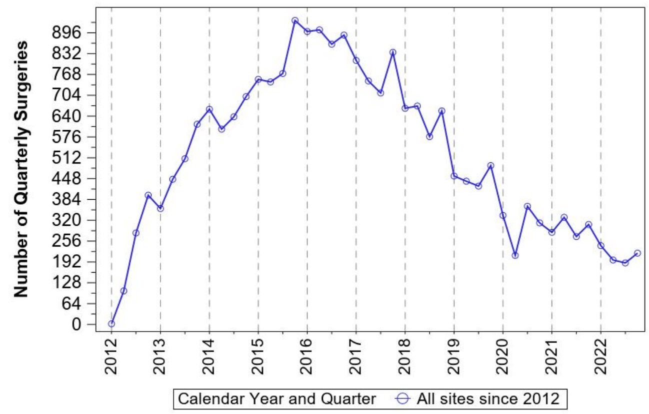

Figure 294: Utilization of the Vanguard/Maxim combination in primary TKA cases.

Table 1147: Distribution of approach used for Vanguard/Maxim combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	20447	89.6
Mid-vastus	2045	9.0
Sub-vastus	205	0.9
Lateral parapatellar	52	0.2
Missing/unknown/other	59	0.3

Catalog numbers of femoral components used in the analysis.

183008	183113	183116
183028	183114	183210
183006	183022	183230
183026	183002	183208
183010	183048	183228
183030	183050	183136
183032	183068	183206
183012	183070	183212
183004	183052	183233
183024	183134	183062
183013	183102	183042
183108	183122	183213
183128	183072	183232
183033	183066	183226
183106	183046	183214
183110	183073	183224
183130	183053	183234
183126	183044	183056
183014	183016	183076
183112	183036	183204
183132	183064	183216
183034	183020	183060
183104	183054	183236
183124	183074	CP113614
183133	183120	CP113620

CP113638	CP113617	CP113637
183202	CP113619	CP113640
184508	CP113626	
184526	CP113631	
184534	CP113633	

Catalog numbers of tibial components used in the analysis.

141233	141237	141220
141232	141221	141263
141234	141273	141265
141235	141227	141271
141236	141274	141262
141223	141275	141266
141231	141272	141264
141224	141230	141270
141222	141276	
141225	141238	
141226	141228	

Vanguard/Maxim Mono-Lock
N=1273

Distribution of utilization: 68 surgeons across 36 sites used this implant combination in primary TKA.

Table 1148: Volume of cases by surgeon and site for the Vanguard/Maxim Mono-Lock combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	18 (38)	4 (13)
Cases per site	35 (72)	7 (17)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1149: Descriptive statistics of cases receiving the Vanguard/Maxim Mono-Lock combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1117	87.8	
Age (years)	1273	64.9(9.2)	65(11)
Height (cm)	1273	164.7(8.6)	163(10.2)
Weight (kg)	1273	93.3(22.5)	90.7(30.2)
BMI(kg/m^2)	1273	34.3(7.5)	33.5(10.1)
Smoking - never (%)	630	49.5	
Smoking - previous (%)	481	37.8	
Smoking - current (%)	159	12.5	
Smoking - unknown (%)	3	0.2	

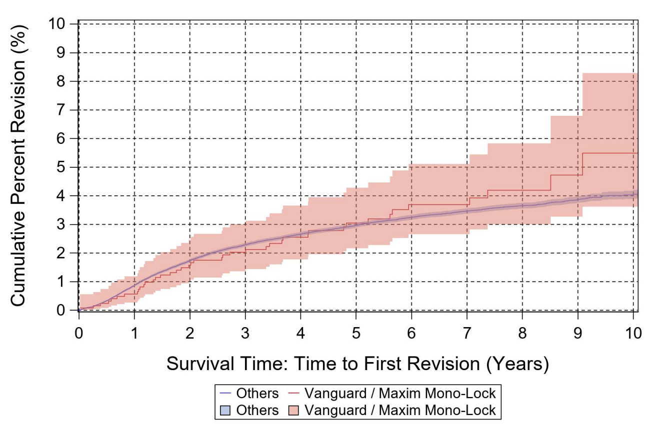

Figure 295: Cumulative percent revision curve for the Vanguard/Maxim Mono-Lock combination compared to all other implant combinations in primary TKA.

Table 1150: Cumulative percent revision and number at risk for Vanguard/Maxim Mono-Lock combination in primary TKA cases.

Year	Number at risk	CPR
0	1260	0.00 (0.00,0.00)
1	1207	0.57 (0.27,1.19)
2	1131	1.57 (1.01,2.46)
3	1020	2.03 (1.36,3.01)
4	855	2.55 (1.78,3.66)
5	711	3.05 (2.17,4.28)
6	543	3.69 (2.66,5.11)
7	412	3.69 (2.66,5.11)
8	269	4.19 (3.01,5.83)
9	132	4.72 (3.27,6.79)
10	60	5.49 (3.62,8.29)

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.959 (0.691,1.331). It was 0.841 (0.799,0.886) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1151: Reasons for revision following primary TKA for Vanguard/Maxim Mono-Lock combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	10	26.3
2	Dislocation/Instability	5	13.2
3	Pain	5	13.2
4	Implant Failure	4	10.5
5	Metal Reaction/Metallosis	4	10.5
6	Joint Infection	3	7.9
7	Peri-prosthetic fracture - Femur	3	7.9
8	Arthrofibrosis	2	5.3
9	Malalignment	1	2.6
10	Poly liner wear	1	2.6

Table 1152: Reasons for revision in first 90 days following primary TKA for Vanguard/Maxim Mono-Lock combination cases.

Rank	Reason for Revision	N	Percent
1	Dislocation/Instability	1	100.0

Table 1153: Reasons for revision between 91 and 365 days following primary TKA for Vanguard/Maxim Mono-Lock combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	2	50.0
2	Dislocation/Instability	1	25.0
3	Implant Failure	1	25.0

Table 1154: Distribution of approach used for Vanguard/Maxim Mono-Lock combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	1145	89.9
Mid-vastus	125	9.8
Sub-vastus	1	0.1
Lateral parapatellar	2	0.2
Missing/unknown/other	0	0.0

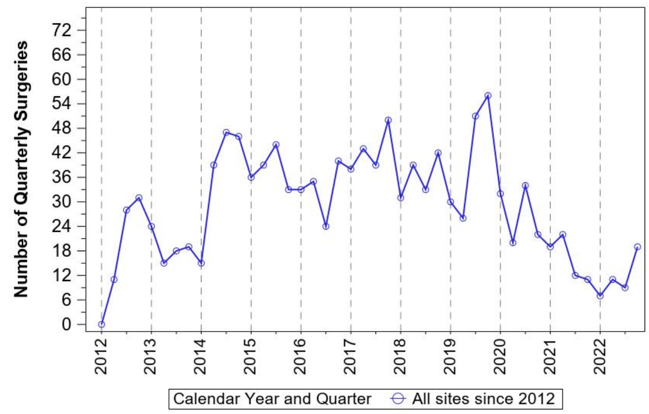

Figure 296: Utilization of the Vanguard/Maxim Mono-Lock combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

CP113617	183050	183014
CP113616	183130	183122
CP113618	183064	183133
CP113619	183124	CP113624
CP113614	183128	183034
CP113615	183006	183053
CP113621	183026	CP113630
CP113620	CP113640	183013
CP113634	CP113632	183054
CP113635	183010	183056
CP113639	183028	183062
CP113636	183032	183102
183048	CP113633	183114
CP113638	183012	CP113625
183068	183073	CP113627
183126	183104	183022
CP113622	183110	183033
183052	CP113643	183042
CP113612	183004	183112
183106	183024	183113
CP113613	183108	183120
CP113623	CP113631	183132
183066	183008	183134
183070	183030	CP113611
183072	183044	CP113626
CP113637	183074	
CP113641	CP113610	
183046	CP113642	

Catalog numbers of tibial components used in the analysis.

141213	141211	141217
141212	141215	141210
141214	141216	

Vanguard XP/Vanguard XP
N=547

Distribution of utilization: 13 surgeons across 13 sites used this implant combination in primary TKA.

Table 1155: Volume of cases by surgeon and site for the Vanguard XP/Vanguard XP combination in primary TKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	42 (123)	4 (12)
Cases per site	42 (121)	5 (9)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1156: Descriptive statistics of cases receiving the Vanguard XP/Vanguard XP combination in primary TKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	324	59.2	
Age (years)	547	66.3(9.1)	67(12)
Height (cm)	547	169.2(9.8)	168(12.7)
Weight (kg)	547	88.5(18.9)	86.4(24.3)
BMI(kg/m^2)	547	30.8(5.7)	29.8(7.9)
Smoking - never (%)	273	49.9	
Smoking - previous (%)	220	40.2	
Smoking - current (%)	52	9.5	
Smoking - unknown (%)	2	0.4	

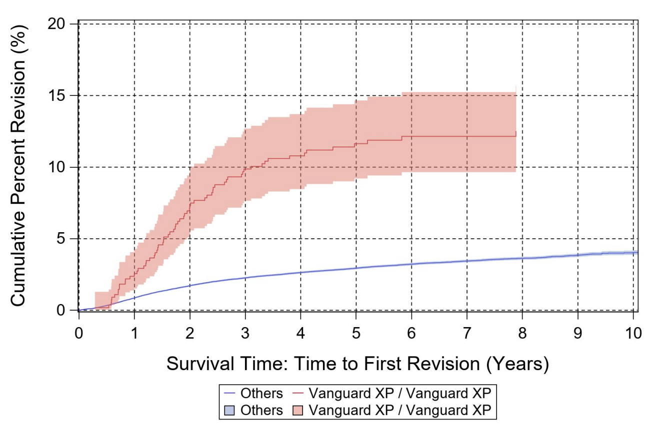

Figure 297: Cumulative percent revision curve for the Vanguard XP/Vanguard XP combination compared to all other implant combinations in primary TKA.

Table 1157: Cumulative percent revision and number at risk for Vanguard XP/Vanguard XP combination in primary TKA cases.

Year	Number at risk	CPR
0	547	0.00 (0.00,0.00)
1	533	2.56 (1.52,4.28)
2	507	7.31 (5.42,9.84)
3	493	9.87 (7.65,12.69)
4	450	10.79 (8.47,13.71)
5	382	11.64 (9.21,14.66)
6	314	12.15 (9.65,15.25)
7	291	12.15 (9.65,15.25)
8*	220	12.52 (9.94,15.70)
9*	78	12.52 (9.94,15.70)
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 297; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 2.24 (1.689,2.972). It was 0.84 (0.798,0.885) and 0.96 (0.958,0.964) for sex (female) and age, respectively.

Table 1158: Reasons for revision following primary TKA for Vanguard XP/Vanguard XP combination cases.

Rank	Reason for Revision	N	Percent
1	Arthrofibrosis	16	26.7
2	Pain	16	26.7
3	Dislocation/Instability	10	16.7
4	Aseptic Loosening	9	15.0
5	Joint Infection	6	10.0
6	Implant Failure	2	3.3
7	Extensor mechanism failure	1	1.7

There were no revisions within 90 days so no table of reasons for revisions during this time period is included.

Table 1159: Reasons for revision between 91 and 365 days following primary TKA for Vanguard XP/Vanguard XP combination cases.

Rank	Reason for Revision	N	Percent
1	Pain	3	37.5
2	Joint Infection	2	25.0
3	Aseptic Loosening	1	12.5
4	Dislocation/Instability	1	12.5
5	Arthrofibrosis	1	12.5

Table 1160: Distribution of approach used for Vanguard XP/Vanguard XP combination in primary TKA cases.

Approach	N	Percent
Medial parapatellar	345	63.1
Mid-vastus	1	0.2
Sub-vastus	201	36.7
Lateral parapatellar	0	0.0
Missing/unknown/other	0	0.0

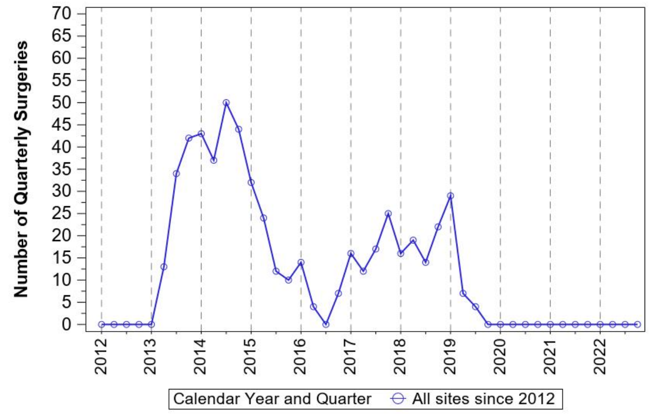

Figure 298: Utilization of the Vanguard XP/Vanguard XP combination in primary TKA cases.

Catalog numbers of femoral components used in the analysis.

195203	195206	195207
195214	195910	195924
195204	195205	195202
195908	195912	195208
195215	195923	195219
195909	195922	195913
195920	195907	195925
195911	195216	195213
195919	195217	195914
195921	195218	

Catalog numbers of tibial components used in the analysis.

195755	195253	195270
195250	195252	195753
195758	195248	195247
195272	195251	195752
195757	195756	195246
195271	195759	195751
195273	195754	195245
195276	195269	
195249	195274	
195275	195277	

3.3 UKA cases

3.3.1 UKA descriptive statistics

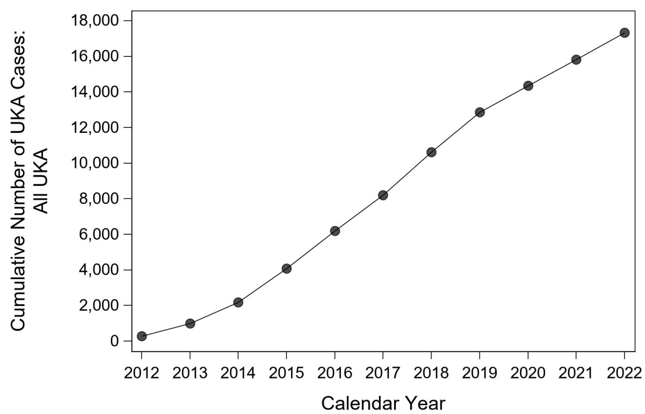

Figure 299: UKA cases over time. These cases were performed in a total of 15,079 patients.

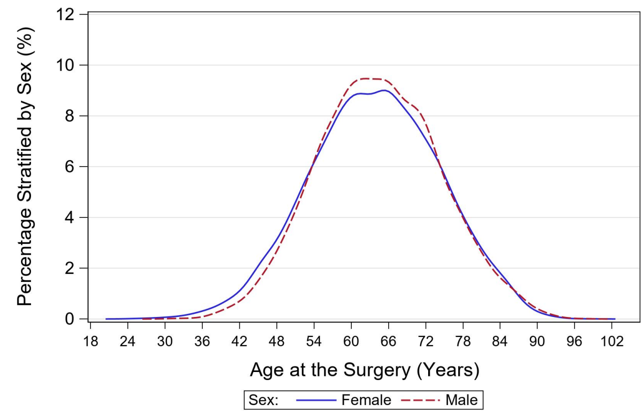

Figure 301: Age distribution of primary UKA cases by sex.

Table 1161: UKA cases over time (numerical values)

Year	Annual cases	Cumulative cases
2012	275	275
2013	717	992
2014	1193	2185
2015	1886	4071
2016	2111	6182
2017	1995	8177
2018	2406	10583
2019	2246	12829
2020	1491	14320
2021	1461	15781
2022	1511	17292

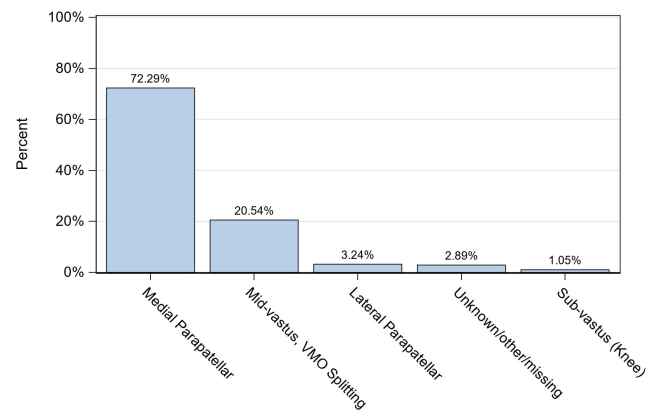

Figure 302: Percent of primary UKA cases by approach.

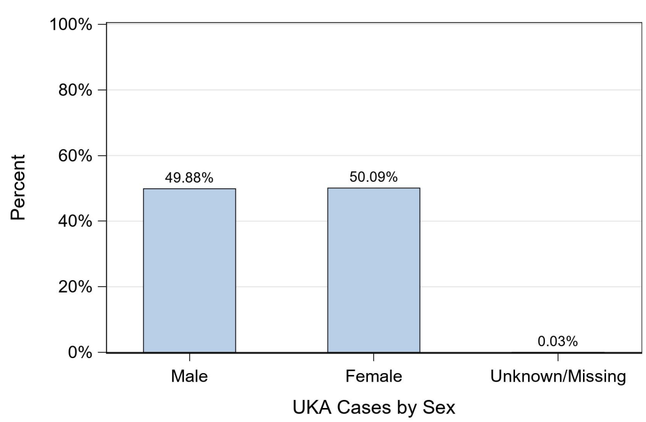

Figure 300: Percent of primary UKA cases by sex.

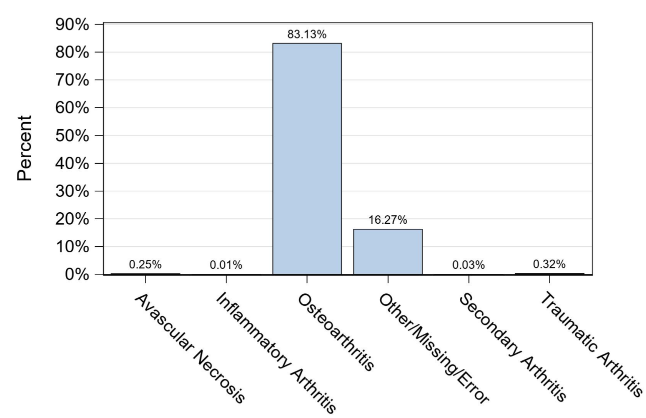

Figure 303: Percent of primary UKA cases by diagnosis.

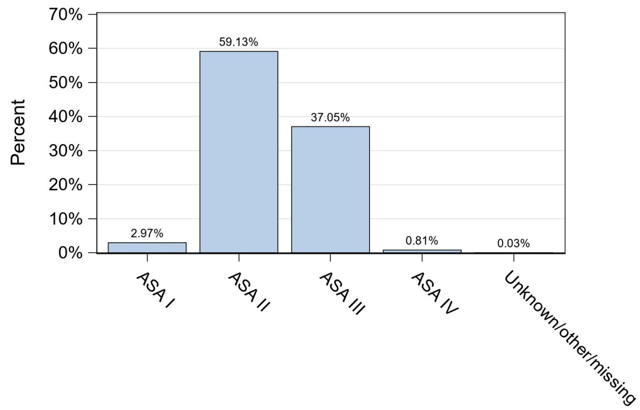

Figure 304: Percent of primary UKA cases by ASA class.

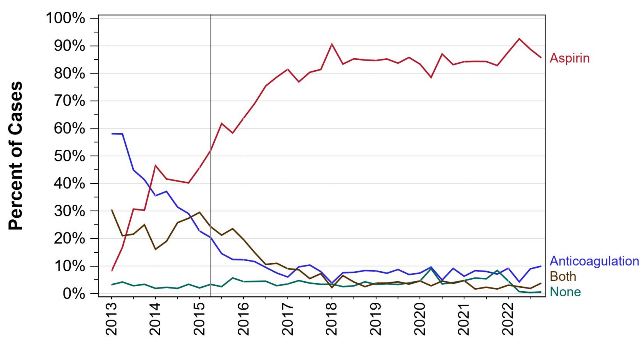

Figure 305: Percent of primary UKA patients (first case) by thrombosis prophylaxis.

3.3.2 Most commonly used UKA implants

The following three tables provide utilization data of implants used in primary UKA.

Table 1162: Ten most commonly used femoral components in primary UKA.

Rank	Stem	N	Percent
1	Restoris MCK	6512	37.7
2	Oxford	3233	18.7
3	ZUK*	3114	18.0
4	Persona	2760	16.0
5	Journey	490	2.8
6	Triathlon PKR	421	2.4
7	iBalance	237	1.4
8	Sigma HP	213	1.2
9	Stride	111	0.6
10	Journey II	99	0.6
11	Others	102	0.6

Table 1163: Ten most commonly used tibial components in primary UKA

Rank	Cup	N	Percent
1	Restoris MCK	6490	37.5
2	ZUK*	3448	19.9
3	Oxford	3136	18.1
4	Persona	2749	15.9
5	Triathlon PKR	416	2.4
6	iBalance	231	1.3
7	Sigma HP	210	1.2
8	Journey	113	0.7
9	Stride	111	0.6
10	Vanguard M	66	0.4
11	Others	322	1.9

Table 1164: Ten most commonly used femoral/tibial component combinations in primary UKA.

Rank	Stem/cup combination	N	Percent
1	Restoris MCK / Restoris MCK	6489	37.5
2	Oxford / Oxford	3136	18.1
3	ZUK* / ZUK*	3080	17.8
4	Persona / Persona	2748	15.9
5	Triathlon PKR / Triathlon PKR	416	2.4
6	Journey / ZUK*	367	2.1
7	iBalance / iBalance	231	1.3
8	Sigma HP / Sigma HP	210	1.2
9	Journey / Journey	113	0.7
10	Stride / Stride	111	0.6
11	Others	391	2.3

* ZUK (Zimmer Unicondylar Knee) was formerly known as the Zimmer High Flex Knee.

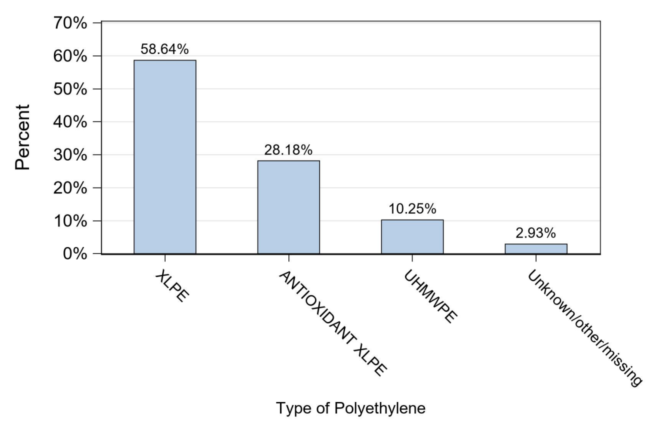

Figure 306: Percentage of polyethylene inserts by type of polyethylene in primary UKA.

3.3.3 UKA revision risk summary

Reason for revision is of central importance to quality improvement because it helps focus attention on specific causes that may be addressed. Therefore, the data are presented in two formats below: tabular and Pareto chart. The tabular format is consistent with how other arthroplasty registries report cause of revision. The Pareto chart figure presents the same data in a format commonly used in quality improvement. The Pareto chart sorts the reasons for revision by frequency (bar chart on bottom, from left to right) and presents a cumulative percent using a line graph above. The causes corresponding to each bar are numbered and a key at the bottom links the numbers to text descriptions.

In addition to an overall summary of reason for revision, tables showing reason for revision for the first, second, and third year post-operatively are provided because the reasons change over this time horizon. It is important to note that the time window for the cases reported in reasons for revision tables and figures differ from the time window used for other figures because reason for revision was added to the database on 1/1/2015. While these data capture revisions for primaries performed back to 2/15/2012, only revisions occurring on or after 1/1/2015 are included in the reasons for revision figure and tables. Also note that for knees instability/dislocation should be interpreted as instability.

Table 1165: Reasons for first revision following primary UKA.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	339	40.5
2	Aseptic Loosening	184	22.0
3	Dislocation/Instability	64	7.6
4	Pain	61	7.3
5	Joint Infection	52	6.2
6	Implant Failure	52	6.2
7	Peri-prosthetic fracture - Tibia	20	2.4
8	Patellofemoral Joint	13	1.6
9	Malalignment	12	1.4
10	Poly liner wear	11	1.3
11	Arthrofibrosis	10	1.2
12	Osteolysis	7	0.8
13	Metal Reaction/Metallosis	6	0.7
14	Extensor mechanism failure	5	0.6
15	Peri-prosthetic fracture - Femur	2	0.2

Table 1166: Reasons for first revision following primary UKA in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	55	26.8
2	Aseptic Loosening	33	16.1
3	Joint Infection	32	15.6
4	Dislocation/Instability	17	8.3
5	Implant Failure	17	8.3
6	Peri-prosthetic fracture - Tibia	17	8.3
7	Pain	16	7.8
8	Metal Reaction/Metallosis	4	2.0
9	Arthrofibrosis	4	2.0
10	Extensor mechanism failure	4	2.0
11	Osteolysis	2	1.0
12	Patellofemoral Joint	2	1.0
13	Peri-prosthetic fracture - Femur	1	0.5
14	Malalignment	1	0.5

Table 1167: Reasons for first revision following primary UKA in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	89	40.6
2	Aseptic Loosening	58	26.5
3	Pain	22	10.0
4	Dislocation/Instability	18	8.2
5	Implant Failure	12	5.5
6	Joint Infection	9	4.1
7	Malalignment	4	1.8
8	Osteolysis	2	0.9
9	Arthrofibrosis	2	0.9
10	Poly liner wear	1	0.5
11	Metal Reaction/Metallosis	1	0.5
12	Patellofemoral Joint	1	0.5

Table 1168: Reasons for first revision following primary UKA in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	53	43.8
2	Aseptic Loosening	28	23.1
3	Pain	13	10.7
4	Dislocation/Instability	8	6.6
5	Implant Failure	6	5.0
6	Malalignment	5	4.1
7	Joint Infection	4	3.3
8	Patellofemoral Joint	2	1.7
9	Poly liner wear	1	0.8
10	Arthrofibrosis	1	0.8

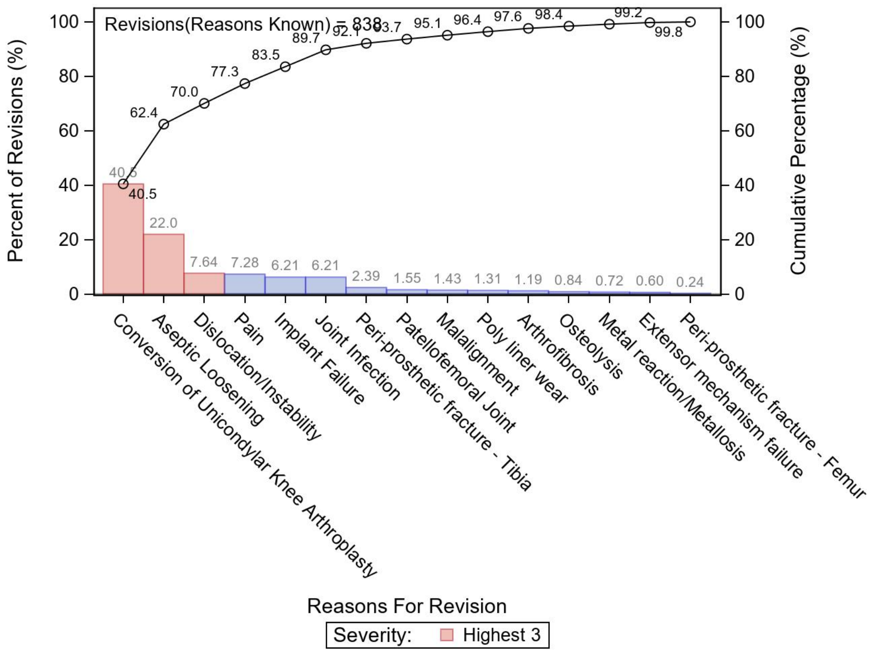

Figure 307: Most common reasons for first revision following primary UKA (Pareto chart). Solid line is cumulative percent.

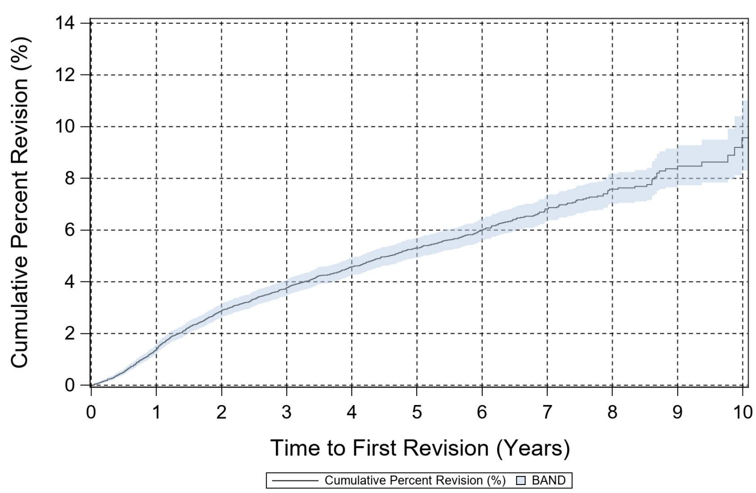

Figure 308: Cumulative percent revision for primary UKA.

Table 1169: Cumulative percent revision for primary UKA (numerical values).

	1 year	3 years	5 years	7 years	10 years
CPR	1.38 (1.21,1.57)	3.77 (3.48,4.09)	5.31 (4.94,5.71)	6.82 (6.34,7.33)	9.57 (8.31,11.01)
Number at risk	15508	12277	7650	3736	241

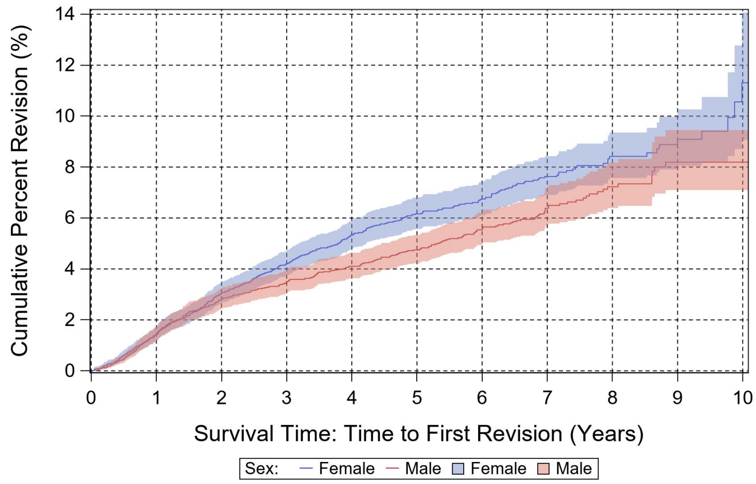

Figure 309: Cumulative percent revision for primary UKA by sex for osteoarthritis diagnosis.

Table 1170: Cumulative percent revision for primary UKA by sex for osteoarthritis diagnosis (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Female	7301	1.42 (1.17,1.72)	4.20 (3.74,4.72)	6.16 (5.57,6.82)	7.63 (6.90,8.43)	11.31 (9.07,14.07)
Male	7015	1.43 (1.18,1.75)	3.50 (3.07,3.98)	4.75 (4.22,5.33)	6.38 (5.68,7.16)	8.19 (7.10,9.45)
Unknown/Missing	4	nan	nan	nan	nan	nan

3.3.4 Revision risk for UKA implant combinations

While the reader is encouraged to read the details of each femur/tibia implant combination, the following table summarizes the ten-year CPR values.

We remind readers to be cautious in interpreting CPR values when the number at risk is low.

Table 1171: Cumulative percent revision following primary UKA for femoral/tibial combinations having at least 500 primary cases, sorted alphabetically.

Femoral/tibial combination	N*	1 year	3 years	5 years	7 years	10 years
Oxford / Oxford	3116	1.79 (1.38,2.33)	4.85 (4.14,5.69)	6.96 (6.07,7.98)	9.19 (8.08,10.45)	13.10 (10.71,15.97)
Persona / Persona	2745	1.27 (0.89,1.80)	2.83 (2.19,3.66)	3.22 (2.49,4.15)	N/A	N/A
Restoris MCK / Restoris MCK	6474	1.12 (0.89,1.42)	3.16 (2.73,3.66)	4.68 (4.11,5.33)	5.87 (5.10,6.76)	12.59 (7.53,20.65)
ZUK / ZUK**	3061	1.08 (0.77,1.51)	3.04 (2.49,3.72)	4.00 (3.35,4.78)	4.69 (3.95,5.56)	5.93 (4.82,7.29)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.

** This implant (Zimmer Unicondylar Knee) was formerly known as the Zimmer High Flex Knee.

Table 1172: Cumulative percent revision following primary UKA for femoral/tibial combinations having at least 500 primary cases, sorted by 10-year CPR

Femoral/tibial combination	N*	1 year	3 years	5 years	7 years	10 years
ZUK/ZUK**	3061	1.08 (0.77,1.51)	3.04 (2.49,3.72)	4.00 (3.35,4.78)	4.69 (3.95,5.56)	5.93 (4.82,7.29)
Restoris MCK / Restoris MCK	6474	1.12 (0.89,1.42)	3.16 (2.73,3.66)	4.68 (4.11,5.33)	5.87 (5.10,6.76)	12.59 (7.53,20.65)
Oxford / Oxford	3116	1.79 (1.38,2.33)	4.85 (4.14,5.69)	6.96 (6.07,7.98)	9.19 (8.08,10.45)	13.10 (10.71,15.97)

Notes:

* Number of patients that contribute to survival analysis used to compute cumulative percent revision.

** This implant (Zimmer Unicondylar Knee) was formerly known as the Zimmer High Flex Knee.

Oxford/Oxford
N=3136

Distribution of utilization: 79 surgeons across 47 sites used this implant combination in primary UKA.

Table 1173: Volume of cases by surgeon and site for the Oxford/Oxford combination in primary UKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	39 (104)	14 (33)
Cases per site	66 (127)	18 (70)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1174: Descriptive statistics of cases receiving the Oxford/Oxford combination in primary UKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1531	48.8	
Age (years)	3136	64.2(10.3)	64(14)
Height (cm)	3136	170.4(10.4)	170.2(15.4)
Weight (kg)	3136	91.9(19.7)	90.7(26)
BMI(kg/m^2)	3136	31.6(5.9)	30.8(7.4)
Smoking - never (%)	1539	49.1	
Smoking - previous (%)	1245	39.7	
Smoking - current (%)	327	10.4	
Smoking - unknown (%)	25	0.8	

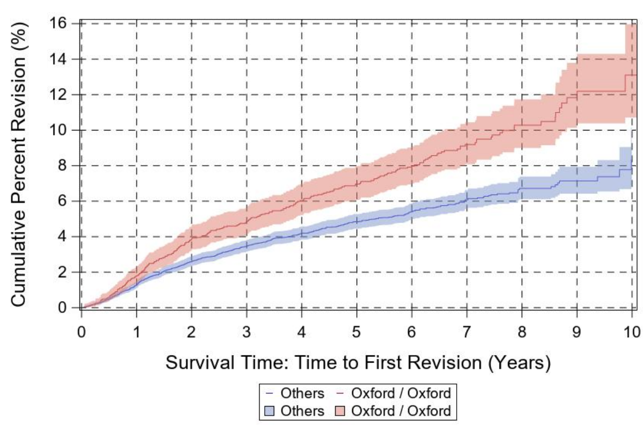

Figure 310: Cumulative percent revision curve for the Oxford/Oxford combination compared to all other implant combinations in primary UKA.

Table 1175: Cumulative percent revision and number at risk for Oxford/Oxford combination in primary UKA cases.

Year	Number at risk	CPR
0	3116	0.00 (0.00,0.00)
1	2970	1.79 (1.38,2.33)
2	2771	3.86 (3.22,4.61)
3	2580	4.85 (4.14,5.69)
4	2265	6.03 (5.22,6.97)
5	1920	6.96 (6.07,7.98)
6	1526	7.98 (7.00,9.09)
7	1019	9.19 (8.08,10.45)
8	540	10.28 (8.99,11.74)
9	243	12.19 (10.38,14.30)
10	78	13.10 (10.71,15.97)

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 1.448 (1.177,1.783). It was 1.142 (0.997,1.31) and 0.967 (0.961,0.974) for sex (female) and age, respectively.

Table 1176: Reasons for revision following primary UKA for Oxford/Oxford combination cases.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	92	37.4
2	Aseptic Loosening	61	24.8
3	Dislocation/Instability	25	10.2
4	Pain	15	6.1
5	Implant Failure	14	5.7
6	Joint Infection	14	5.7
7	Arthrofibrosis	4	1.6
8	Osteolysis	4	1.6
9	Patellofemoral Joint	4	1.6
10	Poly liner wear	4	1.6
11	Extensor mechanism failure	3	1.2
12	Peri-prosthetic fracture - Tibia	3	1.2
13	Malalignment	2	0.8
14	Peri-prosthetic fracture - Femur	1	0.4

Table 1177: Reasons for revision in first 90 days following primary UKA for Oxford/Oxford combination cases.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	2	40.0
2	Dislocation/Instability	1	20.0
3	Implant Failure	1	20.0
4	Extensor mechanism failure	1	20.0

Table 1178: Reasons for revision between 91 and 365 days following primary UKA for Oxford/Oxford combination cases.

Rank	Reason for Revision	N	Percent
1	Aseptic Loosening	12	25.5
2	Joint Infection	7	14.9
3	Dislocation/Instability	6	12.8
4	Conversion of Unicondylar Knee Arthro.	6	12.8
5	Implant Failure	4	8.5
6	Pain	3	6.4
7	Peri-prosthetic fracture - Tibia	2	4.3
8	Arthrofibrosis	2	4.3
9	Extensor mechanism failure	2	4.3
10	Patellofemoral Joint	2	4.3
11	Osteolysis	1	2.1

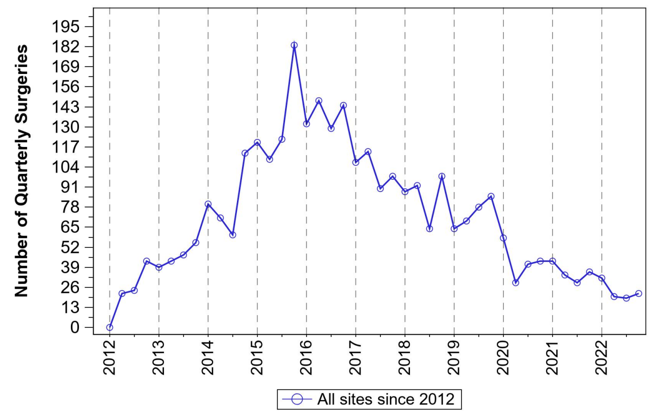

Figure 311: Utilization of the Oxford/Oxford combination in primary UKA cases.

Table 1179: Distribution of approach used for Oxford/Oxford combination in primary UKA cases.

Approach	N	Percent
Medial parapatellar	2857	91.1
Mid-vastus	175	5.6
Sub-vastus	27	0.9
Lateral parapatellar	8	0.3
Missing/unknown/other	69	2.2

Catalog numbers of femoral components used in the analysis.

161469	161471	166942
161468	166943	166944
161470	166940	
161467	166941	

Catalog numbers of tibial components used in the analysis.

154722	154718	154776
154723	154719	154775
154721	154726	154355
154720	154727	154331
154724	159531	154370
154725	159532	

Persona/Persona
N=2748

Distribution of utilization: 81 surgeons across 47 sites used this implant combination in primary UKA.

Table 1180: Volume of cases by surgeon and site for the Persona/Persona combination in primary UKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	33 (89)	10 (19)
Cases per site	58 (108)	18 (57)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1181: Descriptive statistics of cases receiving the Persona/Persona combination in primary UKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1305	47.5	
Age (years)	2748	64.8(10)	65(13)
Height (cm)	2741	170.2(10.6)	170.2(15.2)
Weight (kg)	2741	91.3(19.7)	90.1(25)
BMI(kg/m^2)	2741	31.4(5.8)	30.9(7.4)
Smoking - never (%)	1442	52.5	
Smoking - previous (%)	1039	37.8	
Smoking - current (%)	258	9.4	
Smoking - unknown (%)	9	0.3	

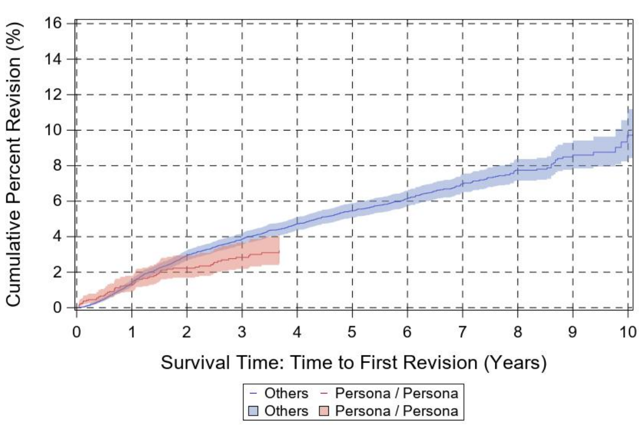

Figure 312: Cumulative percent revision curve for the Persona/Persona combination compared to all other implant combinations in primary UKA.

Table 1182: Cumulative percent revision and number at risk for Persona/Persona combination in primary UKA cases.

Year	Number at risk	CPR
0	2745	0.00 (0.00,0.00)
1	2087	1.27 (0.89,1.80)
2	1674	2.23 (1.69,2.94)
3	1255	2.83 (2.19,3.66)
4*	595	3.22 (2.49,4.15)
5*	111	3.22 (2.49,4.15)
6	0	N/A
7	0	N/A
8	0	N/A
9	0	N/A
10	0	N/A

* No revision occurred after the termination of the red curve in Figure 312; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 1183: Reasons for revision following primary UKA for Persona/Persona combination cases.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	27	42.9
2	Aseptic Loosening	11	17.5
3	Joint Infection	8	12.7
4	Peri-prosthetic fracture - Tibia	7	11.1
5	Implant Failure	4	6.3
6	Dislocation/Instability	3	4.8
7	Malalignment	1	1.6
8	Pain	1	1.6
9	Patellofemoral Joint	1	1.6

Table 1184: Reasons for revision in first 90 days following primary UKA for Persona/Persona combination cases.

Rank	Reason for Revision	N	Percent
1	Joint Infection	5	41.7
2	Peri-prosthetic fracture - Tibia	5	41.7
3	Aseptic Loosening	1	8.3
4	Conversion of Unicondylar Knee Arthro.	1	8.3

Table 1185: Reasons for revision between 91 and 365 days following primary UKA for Persona/Persona combination cases.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	9	47.4
2	Aseptic Loosening	3	15.8
3	Implant Failure	3	15.8
4	Peri-prosthetic fracture - Tibia	2	10.5
5	Dislocation/Instability	1	5.3
6	Joint Infection	1	5.3

Table 1186: Distribution of approach used for Persona/Persona combination in primary UKA cases.

Approach	N	Percent
Medial parapatellar	1717	62.5
Mid-vastus	973	35.4
Sub-vastus	37	1.3
Lateral parapatellar	8	0.3
Missing/unknown/other	13	0.5

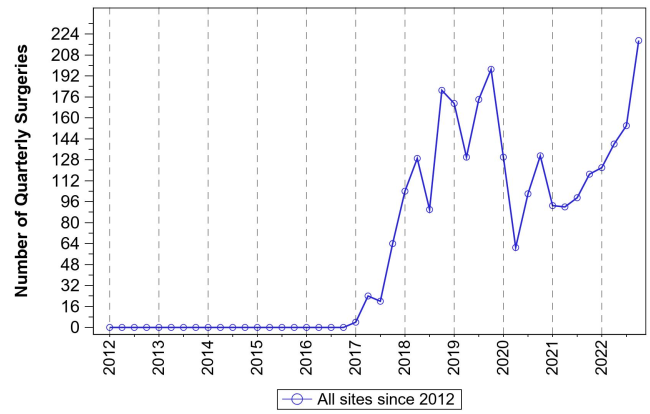

Figure 313: Utilization of the Persona/Persona combination in primary UKA cases.

Catalog numbers of femoral components used in the analysis.

42558000401	42558000502	42558000102
42558000301	42558000601	42558000701
42558000402	42558000201	42558000702
42558000302	42558000202	42558000101
42558000501	42558000602	

Catalog numbers of tibial components used in the analysis.

42538000501	42538000702	42538000902
42538000601	42538000801	42538000901
42538000602	42538000802	42538000302
42538000502	42538000401	42538000301
42538000701	42538000402	

Restoris MCK/Restoris MCK
N=6489

Distribution of utilization: 106 surgeons across 26 sites used this implant combination in primary UKA.

Table 1187: Volume of cases by surgeon and site for the Restoris MCK/Restoris MCK combination in primary UKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	61 (109)	20 (50)
Cases per site	249 (367)	79 (248)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1188: Descriptive statistics of cases receiving the Restoris MCK/Restoris MCK combination in primary UKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	3292	50.7	
Age (years)	6489	64.2(9.7)	64(13)
Height (cm)	6489	170.1(10.6)	170(15.2)
Weight (kg)	6489	90.8(19.3)	89.4(25.8)
BMI(kg/m^2)	6489	31.3(5.7)	30.6(7.4)
Smoking - never (%)	3492	53.8	
Smoking - previous (%)	2419	37.3	
Smoking - current (%)	566	8.7	
Smoking - unknown (%)	12	0.2	

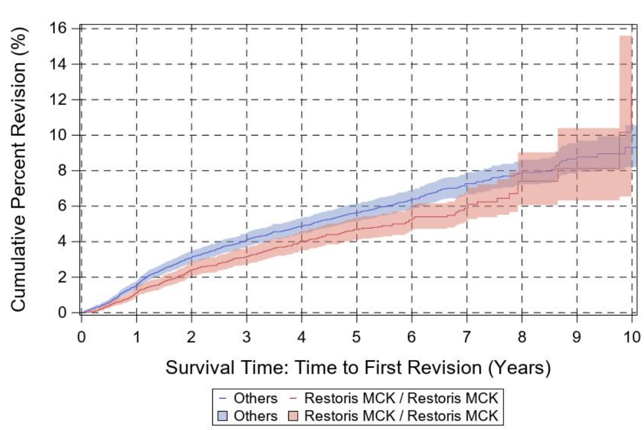

Figure 314: Cumulative percent revision curve for the Restoris MCK/Restoris MCK combination compared to all other implant combinations in primary UKA.

Table 1189: Cumulative percent revision and number at risk for Restoris MCK/Restoris MCK combination in primary UKA cases.

Year	Number at risk	CPR
0	6474	0.00 (0.00,0.00)
1	5727	1.12 (0.89,1.42)
2	4935	2.42 (2.05,2.85)
3	4311	3.16 (2.73,3.66)
4	3453	4.03 (3.52,4.62)
5	2449	4.68 (4.11,5.33)
6	1620	5.22 (4.58,5.96)
7	830	5.87 (5.10,6.76)
8	255	7.41 (6.07,9.03)
9	99	8.12 (6.32,10.40)
10	36	12.59 (7.53,20.65)

Adjusting for sex and age, the hazard ratio for the implant compared to all other conventional implants was 0.74 (0.594,0.924). It was 1.143 (0.997,1.31) and 0.967 (0.961,0.974) for sex (female) and age, respectively.

Table 1190: Reasons for revision following primary UKA for Restoris MCK/Restoris MCK combination cases.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	103	39.9
2	Aseptic Loosening	61	23.6
3	Dislocation/Instability	24	9.3
4	Pain	20	7.8
5	Implant Failure	15	5.8
6	Joint Infection	14	5.4
7	Peri-prosthetic fracture - Tibia	6	2.3
8	Arthrofibrosis	5	1.9
9	Patellofemoral Joint	4	1.6
10	Osteolysis	2	0.8
11	Poly liner wear	2	0.8
12	Malalignment	1	0.4
13	Metal Reaction/Metallosis	1	0.4

Table 1191: Reasons for revision in first 90 days following primary UKA for Restoris MCK/Restoris MCK combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Tibia	2	40.0
2	Joint Infection	1	20.0
3	Implant Failure	1	20.0
4	Arthrofibrosis	1	20.0

Table 1192: Reasons for revision between 91 and 365 days following primary UKA for Restoris MCK/Restoris MCK combination cases.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	20	31.8
2	Aseptic Loosening	12	19.1
3	Joint Infection	9	14.3
4	Dislocation/Instability	8	12.7
5	Pain	5	7.9
6	Peri-prosthetic fracture - Tibia	4	6.3
7	Implant Failure	3	4.8
8	Metal Reaction/Metallosis	1	1.6
9	Arthrofibrosis	1	1.6

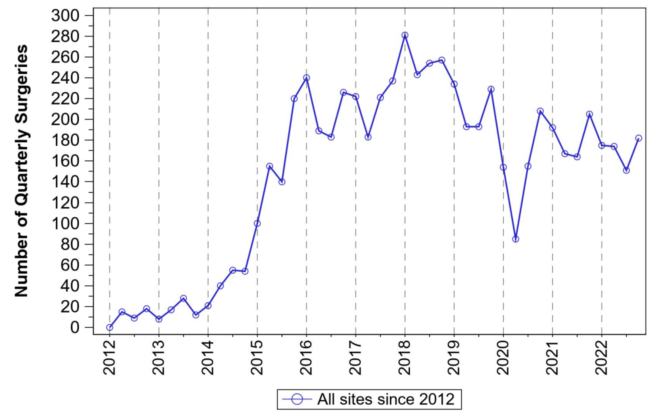

Figure 315: Utilization of the Restoris MCK/Restoris MCK combination in primary UKA cases.

Table 1193: Distribution of approach used for Restoris MCK/Restoris MCK combination in primary UKA cases.

Approach	N	Percent
Medial parapatellar	4713	72.6
Mid-vastus	1225	18.9
Sub-vastus	16	0.2
Lateral parapatellar	287	4.4
Missing/unknown/other	248	3.8

Catalog numbers of femoral components used in the analysis.

180503	180506	180501
180504	180516	180511
180513	180502	180518
180514	180512	
180515	180507	
180505	180517	

Catalog numbers of tibial components used in the analysis.

180604	180606	180608
180614	180616	180618
180605	180602	180611
180613	180607	180601
180603	180612	1807272
180615	180617	

ZUK/ZUK
N=3080

This implant (Zimmer Unicondylar Knee) was formerly known as the Zimmer High Flex Knee. Distribution of utilization: 117 surgeons across 47 sites used this implant combination in primary UKA.

Table 1194: Volume of cases by surgeon and site for the ZUK/ZUK combination in primary UKA.

Quantity	Mean (SD)	Median (IQR)
Cases per surgeon	26 (54)	7 (19)
Cases per site	65 (90)	31 (91)

Note: The mean is substantially greater than median, which suggests there are some high-volume surgeons who skew this distribution.

Table 1195: Descriptive statistics of cases receiving the ZUK/ZUK combination in primary UKA.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1522	49.4	
Age (years)	3080	64.8(10.6)	65(15)
Height (cm)	3063	170(10.5)	170(15.2)
Weight (kg)	3064	89.2(19.3)	88(26.6)
BMI(kg/m^2)	3063	30.8(5.8)	30(7.6)
Smoking - never (%)	1506	48.9	
Smoking - previous (%)	1234	40.1	
Smoking - current (%)	312	10.1	
Smoking - unknown (%)	28	0.9	

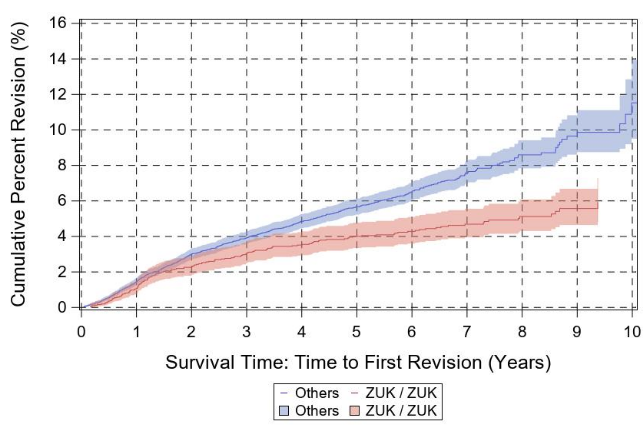

Figure 316: Cumulative percent revision curve for the ZUK/ZUK combination compared to all other implant combinations in primary UKA.

Table 1196: Cumulative percent revision and number at risk for ZUK/ZUK combination in primary UKA cases.

Year	Number at risk	CPR
0	3061	0.00 (0.00,0.00)
1	3024	1.08 (0.77,1.51)
2	2927	2.26 (1.79,2.85)
3	2761	3.04 (2.49,3.72)
4	2505	3.52 (2.91,4.24)
5	2225	4.00 (3.35,4.78)
6	1882	4.29 (3.60,5.10)
7	1412	4.69 (3.95,5.56)
8	933	5.12 (4.31,6.08)
9	449	5.57 (4.64,6.69)
10*	99	5.93 (4.82,7.29)

* No revision occurred after the termination of the red curve in Figure 316; therefore, numerical revision risk at this time point is the same as it was at the time of the last revision.

The proportional-hazards assumption of the Cox model is not satisfied, so hazard ratios are not reported.

Table 1197: Reasons for revision following primary UKA for ZUK/ZUK combination cases.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	68	53.1
2	Aseptic Loosening	18	14.1
3	Implant Failure	11	8.6
4	Pain	9	7.0
5	Joint Infection	7	5.5
6	Dislocation/Instability	3	2.3
7	Extensor mechanism failure	2	1.6
8	Malalignment	2	1.6
9	Patellofemoral Joint	2	1.6
10	Peri-prosthetic fracture - Tibia	2	1.6
11	Metal Reaction/Metallosis	1	0.8
12	Osteolysis	1	0.8
13	Peri-prosthetic fracture - Femur	1	0.8
14	Poly liner wear	1	0.8

Table 1198: Reasons for revision in first 90 days following primary UKA for ZUK/ZUK combination cases.

Rank	Reason for Revision	N	Percent
1	Peri-prosthetic fracture - Femur	1	33.3
2	Peri-prosthetic fracture - Tibia	1	33.3
3	Conversion of Unicondylar Knee Arthro.	1	33.3

Table 1199: Reasons for revision between 91 and 365 days following primary UKA for ZUK/ZUK combination cases.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	7	35.0
2	Joint Infection	5	25.0
3	Aseptic Loosening	2	10.0
4	Implant Failure	2	10.0
5	Pain	2	10.0
6	Osteolysis	1	5.0
7	Extensor mechanism failure	1	5.0

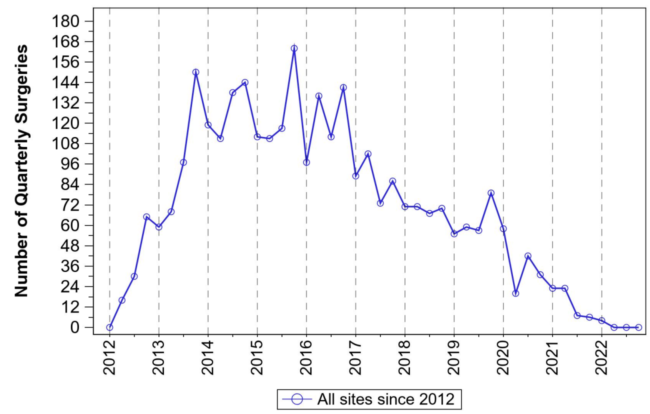

Figure 317: Utilization of the ZUK/ZUK combination in primary UKA cases.

Table 1200: Distribution of approach used for ZUK/ZUK combination in primary UKA cases.

Approach	N	Percent
Medial parapatellar	1916	62.2
Mid-vastus	906	29.4
Sub-vastus	52	1.7
Lateral parapatellar	158	5.1
Missing/unknown/other	48	1.6

Catalog numbers of femoral components used in the analysis.

584201402	584201301	584201701
584201401	584201602	584201702
584201501	584201601	584201102
584201502	584201201	584201101
584201302	584201202	

Catalog numbers of tibial components used in the analysis.

584200301	584206108	584206210
584200402	584205108	584205110
584200302	584207108	584205210
584200401	584200102	584206110
584200502	584206208	584206112
584200501	584207208	584207212
584200202	584200101	584205210
584200201	584204208	584206210
584200601	584208108	
584200602	584204108	
584205208	584208208	

3.4 PFJ cases

3.4.1 PFJ descriptive statistics

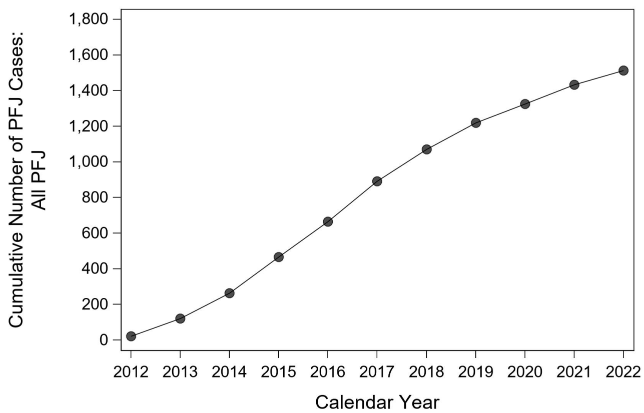

Figure 318: PFJ cases over time. These cases were performed in a total of 1,281 patients.

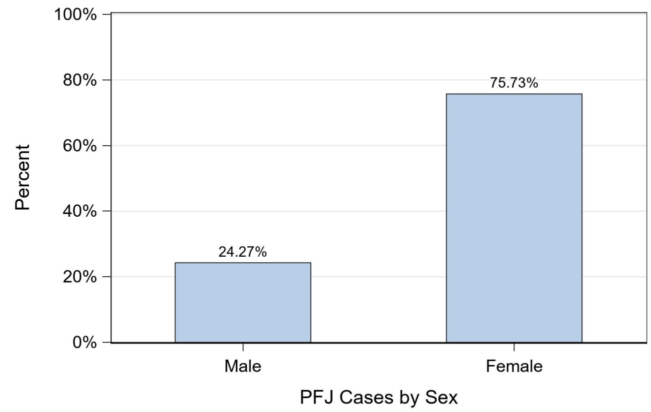

Figure 319: Percent of primary PFJ cases by sex.

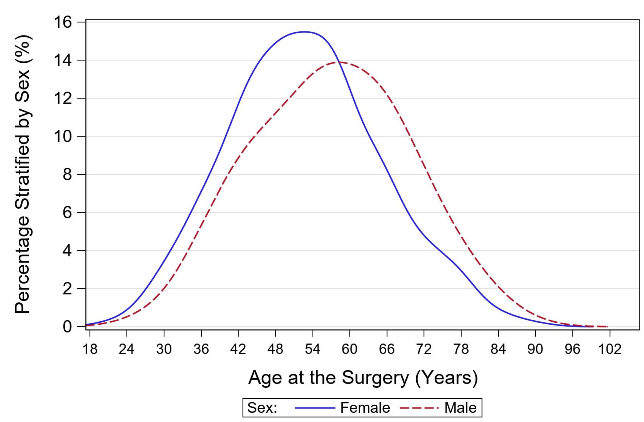

Figure 320: Age distribution of primary PFJ cases by sex.

Table 1201: PFJ cases over time (numerical values)

Year	Annual cases	Cumulative cases
2012	23	23
2013	98	121
2014	142	263
2015	204	467
2016	198	665
2017	226	891
2018	180	1071
2019	149	1220
2020	105	1325
2021	109	1434
2022	80	1514

Table 1202: Descriptive statistics of primary PFJ cases.

Quantity	N	Mean (SD)	Median (IQR)
Female (%)	1067	75.7	
Age (years)	1409	53.8(12.5)	54(18)
Height (cm)	1407	168.4(10)	167.6(13.3)
Weight (kg)	1407	87.1(19.9)	85.3(28.2)
BMI(kg/m^2)	1407	30.6(6.1)	30.1(8.2)
Smoking - never (%)	724	51.4	
Smoking - previous (%)	411	29.2	
Smoking - current (%)	216	15.3	
Smoking - unknown (%)	58	4.1	

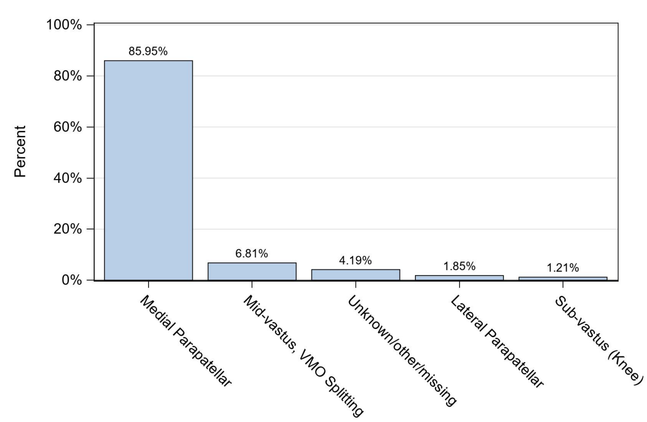

Figure 321: Percent of primary PFJ cases by approach.

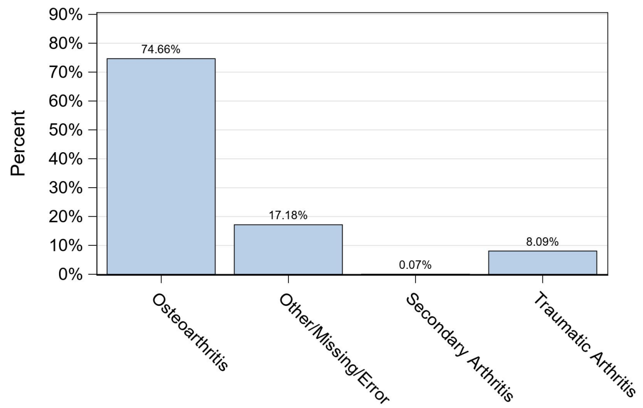

Figure 322: Percent of primary PFJ cases by diagnosis.

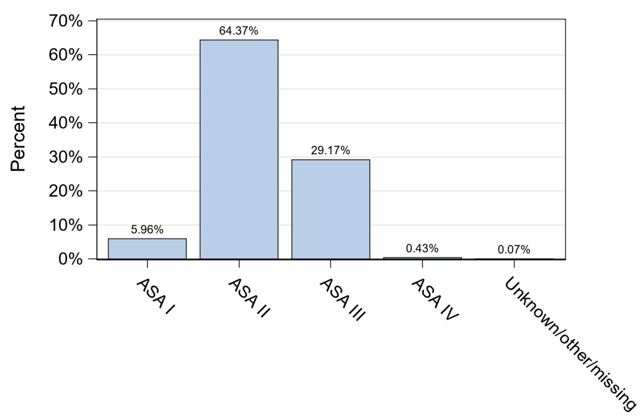

Figure 323: Percent of primary PFJ cases by ASA class.

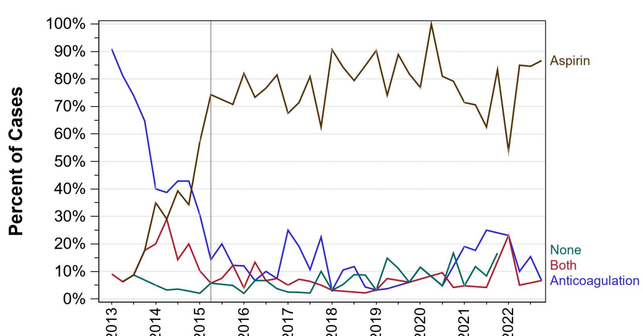

Figure 324: Percent of primary PFJ patients (first case) by thrombosis prophylaxis.

3.4.2 Most commonly used PFJ implants

Table 1203: Ten most commonly used trochlear components in primary PFJ.

Rank	Stem	N	Percent
1	Gender Solutions PFJ	462	32.8
2	Restoris MCK	364	25.8
3	iBalance	283	20.1
4	HemiCAP	117	8.3
5	Competitor PFJ	84	6.0
6	Avon	45	3.2
7	Sigma HP	38	2.7
8	Vanguard PFR	16	1.1

3.4.3 PFJ revision risk summary

Since no implant combination exceeds 500 cases, no implant-specific CPR data are presented.

Table 1204: Reasons for first revision following primary PFJ.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	38	25.0
2	Patellofemoral Joint	30	19.7
3	Dislocation/Instability	21	13.8
4	Pain	15	9.9
5	Implant Failure	12	7.9
6	Aseptic Loosening	9	5.9
7	Joint Infection	9	5.9
8	Metal Reaction/Metallosis	8	5.3
9	Malalignment	7	4.6
10	Arthrofibrosis	2	1.3
11	Poly liner wear	1	0.7

Table 1205: Reasons for first revision following primary PFJ in first year post-operatively.

Rank	Reason for Revision	N	Percent
1	Patellofemoral Joint	6	19.4
2	Malalignment	4	12.9
3	Conversion of Unicondylar Knee Arthro.	4	12.9
4	Aseptic Loosening	3	9.7
5	Dislocation/Instability	3	9.7
6	Implant Failure	3	9.7
7	Pain	3	9.7
8	Joint Infection	2	6.5
9	Metal Reaction/Metallosis	2	6.5
10	Arthrofibrosis	1	3.2

Table 1206: Reasons for first revision following primary PFJ in second year post-operatively.

Rank	Reason for Revision	N	Percent
1	Pain	7	20.6
2	Conversion of Unicondylar Knee Arthro.	7	20.6
3	Patellofemoral Joint	7	20.6
4	Dislocation/Instability	4	11.8
5	Joint Infection	3	8.8
6	Implant Failure	3	8.8
7	Metal Reaction/Metallosis	2	5.9
8	Malalignment	1	2.9

Table 1207: Reasons for first revision following primary PFJ in third year post-operatively.

Rank	Reason for Revision	N	Percent
1	Conversion of Unicondylar Knee Arthro.	6	24.0
2	Dislocation/Instability	4	16.0
3	Implant Failure	3	12.0
4	Metal Reaction/Metallosis	3	12.0
5	Patellofemoral Joint	3	12.0
6	Joint Infection	2	8.0
7	Pain	2	8.0
8	Aseptic Loosening	1	4.0
9	Malalignment	1	4.0

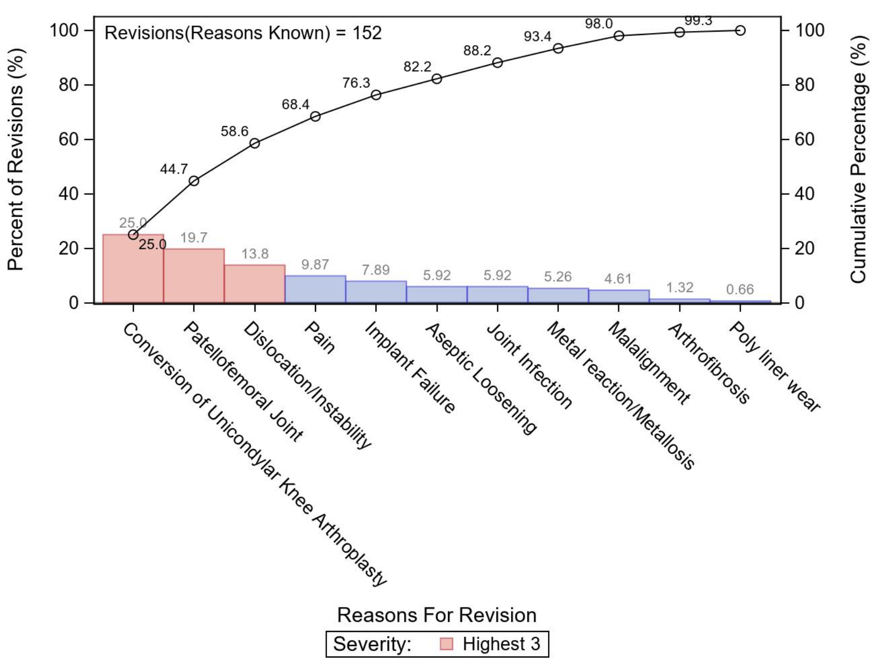

Figure 325: Most common reasons for first revision following primary PFJ (Pareto chart). Solid line is cumulative percent.

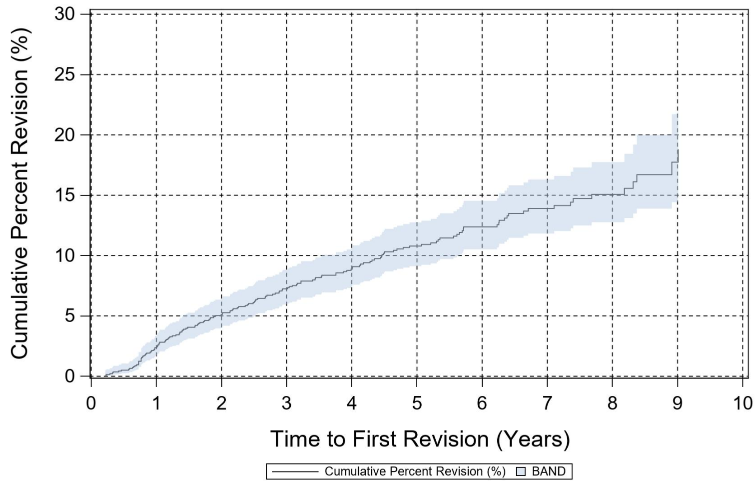

Figure 326: Cumulative percent revision for primary PFJ.

We remind readers to be cautious in interpreting CPR values when the number at risk is low.

Table 1208: Cumulative percent revision for primary PFJ (numerical values).

	1 year	3 years	5 years	7 years	10 years
CPR	2.37 (1.68,3.33)	7.25 (5.94,8.82)	10.79 (9.12,12.75)	13.90 (11.82,16.30)	18.81 (15.05,23.37)
Number at risk	1294	1033	712	359	14

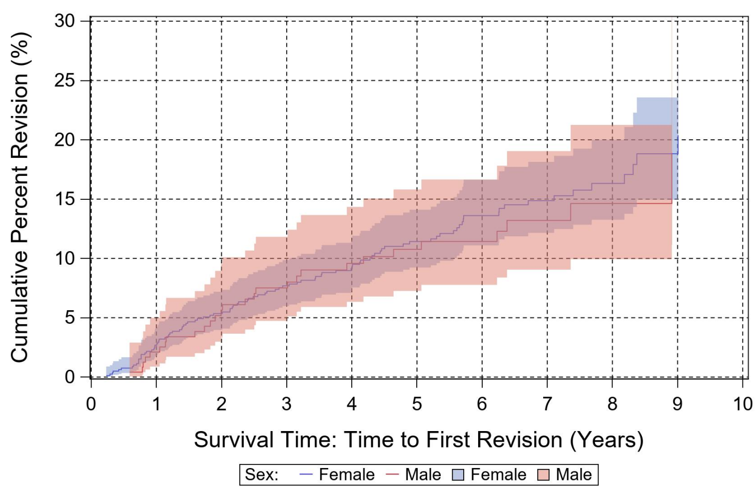

Figure 327: Cumulative percent revision for primary PFJ by sex for osteoarthritis diagnosis.

Table 1209: Cumulative percent revision for primary PFJ by sex for osteoarthritis diagnosis (numerical values).

	N	1 year	3 years	5 years	7 years	10 years
Female	803	2.68 (1.76,4.08)	7.69 (5.98,9.86)	11.43 (9.23,14.11)	14.87 (12.15,18.14)	20.39 (15.74,26.17)
Male	245	2.11 (0.88,4.99)	7.52 (4.74,11.82)	10.76 (7.26,15.81)	13.20 (9.05,19.05)	18.90 (11.14,31.01)
Unknown/Missing	0					

Appendices

Appendix A

Statistical methods

This appendix is intended to provide a clear and precise description of the analytical methods used to generate figures, tables, and text in this report. It is written primarily for registry methodologists. It can be used as a reference for readers most interested in clinical aspects of arthroplasty.

A.1 MARCQI cohort: Qualifying patients

MARCQI was designed to improve quality of care for elective primary total hip and knee arthroplasty and associated revisions, excluding treatment for trauma cases. Therefore, MARCQI includes:

1. *Elective primary*. All primary hip and knee joint replacements for which the procedure has been planned and the patient undergoes the surgery for a non-emergent condition.
2. *Urgent/emergent*. Rare situations may occur when the patient has a scheduled elective primary procedure but enters the hospital through the emergency room or clinic. These cases are occasionally classified or scheduled by the hospital as urgent or emergent. If the case proceeds under this designation and the original diagnosis and plan are otherwise unchanged then they may be included. This situation is very uncommon.
3. *Revision*. All revision hip and knee replacements regardless of diagnosis are included.
4. *Trauma*. Primary trauma cases do not qualify. The CDA reviews the case to determine if an urgent/emergent qualifying revision of a knee or hip was performed.

A.2 Time window, inclusion and exclusion criteria for the hip and knee chapters

This report covers MARCQI activities from 02/15/2012 to 12/31/2022, and includes both primary and revision(s) cases.

A.3 Events for descriptive statistics and implant survival analysis

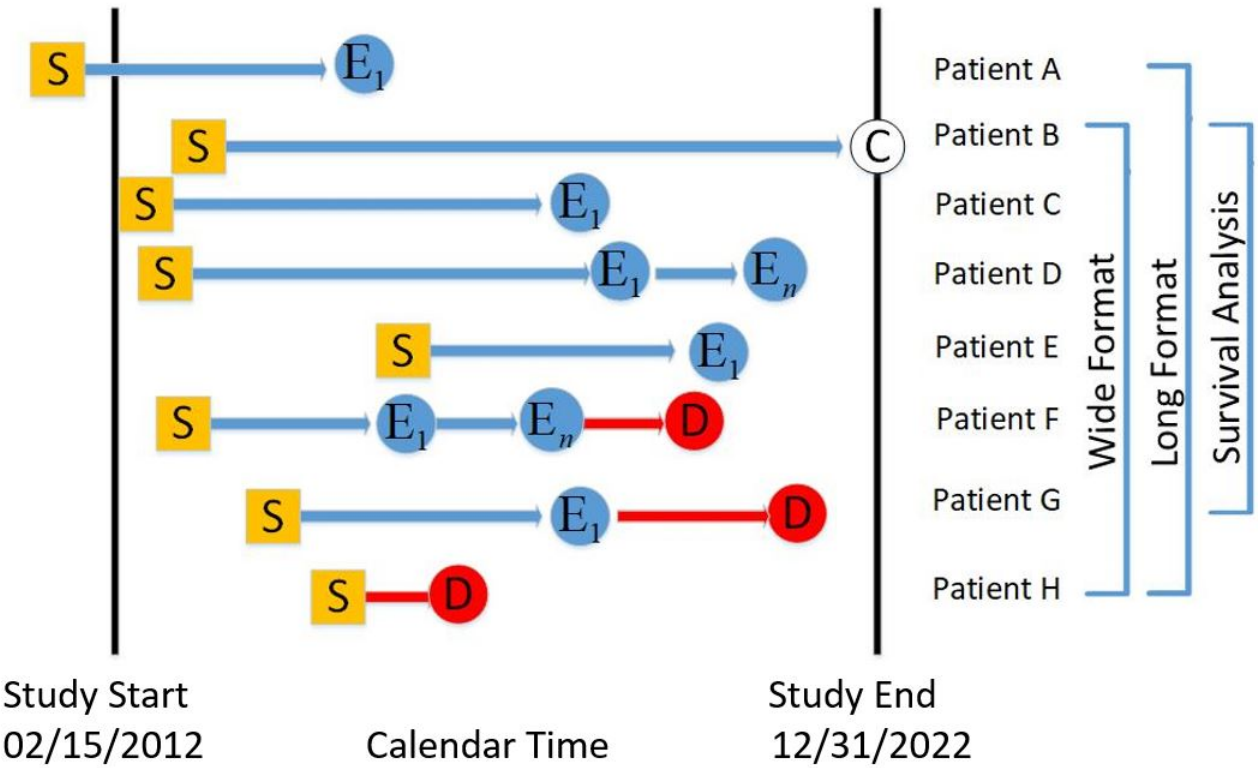

Figure 328: Illustration of event flow and eight types of patients in MARCQI database.

There are many different combinations of events that can occur for each patient within and outside the 2/15/2012 - 12/31/2022 time window. For example, a patient could have a primary and revision, have a primary and then die, or have a primary and have no revision before 12/31/2022 but remain alive. It is important to understand each when interpreting data in this report, especially time-to-revision and the resulting cumulative percent revision curves and numbers. Figure 328 illustrates the possible events (*e.g.*, revision) for the report window using eight types of patients. Symbols in the figure represent start of a primary surgery (S), single event (E_1) and/or multiple events (E_n), death (D), and censoring (C). The figure helps define important concepts used in MARCQI analyses:

1. *Study time window*. All primary and revision surgeries performed between 02/15/2012 to 12/31/2022 are included. The revision event might be registered after 12/31/2022 in the database, but those post-study end event(s) do NOT qualify for implant survival analysis and were censored at the end of the study. In addition, primary surgeries performed prior to 02/15/2012 are not included in the revision analysis.

2. *Qualified patients*. All eight types of patients qualify for volume reporting, including patient A and patient H. Patient B through patient G qualified for implant survival analysis (thus patients A and H are disqualified). Patient C and patient E are of the same type, even though starting time varies. Deaths are addressed in (7) below. Patient type A, included in long format dataset, is only qualified to calculate total volumes over time. Patient types B through H are included in the wide format dataset as primary surgery cases.

3. *Censoring*. The patients who did not have the event as of the study-end are considered right-censored. These patients provide some information, but not complete information, *e.g.*, Patient B. Patient A is excluded in implant survival analysis because the surgery occurred prior to the onset of the MARCQI registry; thus, no left-censoring is considered in this report.

4. *Time-to-event*. Number of days elapsed from primary surgery to the event of interest (*e.g.*, first revision following surgery).

5. *Qualified revision events for implant survival analysis*. First event E_1 after primary surgery (thus events $E_2, E_3, \ldots, E_n$ disqualified). However, $E_2, E_3, \ldots, E_n$ are counted in the total volume calculations.

6. *Lost-to-follow-up (LTFU)*. This report does not consider LTFU (*e.g.*, due to geographical relocation of patient) as an event of interest. Instead, if MARCQI has no follow-up or death information until study-end, that patient is treated as a right-censoring at the study-end.

7. *Handling of deaths*. The MARCQI data abstractor records deaths within 90 days of surgery. A national death index is used to identify deaths after 90 days (note: this is new because we did not use such an index for previous annual reports). In the time window used for this report, the 90-day death rate after primary THA surgeries is about 0.23%, including patient types F, G, and H. The death rate without any event(s) after primary surgery is approximately 0.18%, like patient type H. Following primary TKA cases, the death rate is 0.15% and 0.12% with and without any revision event(s), respectively. Patients A and H are treated as qualified patients (in the denominator) in calculating descriptive statistics, implant combinations, surgeon volumes, and site volumes. However, they are excluded in implant survival analysis. Patients that die after a revision event (like patient F and G) are included in the implant survival analysis since those patients contributed information of time-to-first revision. This strategy ensures minimal information loss. Kandala *et al.* (2015) showed that low death rate does not substantially affect the implant survival analysis. Thus, in the report, the patient type A and H are excluded in the implant survival analysis without conducting competing risk analysis and left censoring.

Finally, for purposes of this report, "unit" is a general term and context specific and may refer to the surgeon, hospital, or implant that a patient is embedded.

A.4 MARCQI definition of revision

For the purposes of MARCQI revision analyses, a revision is defined to be a procedure that involves either (a) removing and replacing some, or all, of the joint replacement components or (b) adding a component. This applies to all MARCQI qualifying cases. There are two situations likely to cause confusion that need to be clarified: (1) adding a cup after a hemi-arthroplasty is a conversion, which is a primary case according to MARCQI criteria; and (2) adding a unicompartmental knee to another compartment of a knee having pre-existing unicompartmental components is considered another primary case rather than a revision.

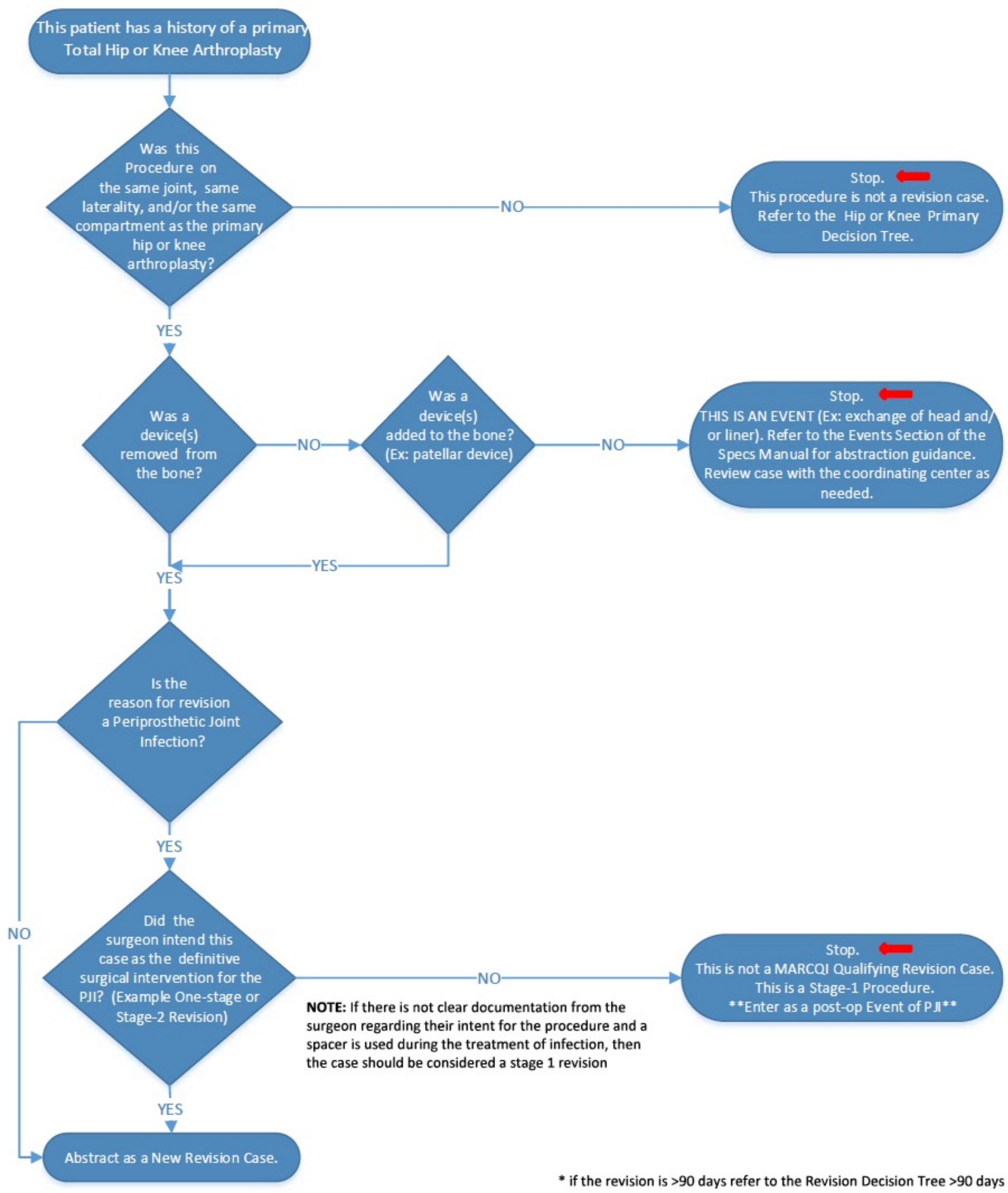

Figure 329: Flowchart of method used to identify revisions within 90 days of surgery.

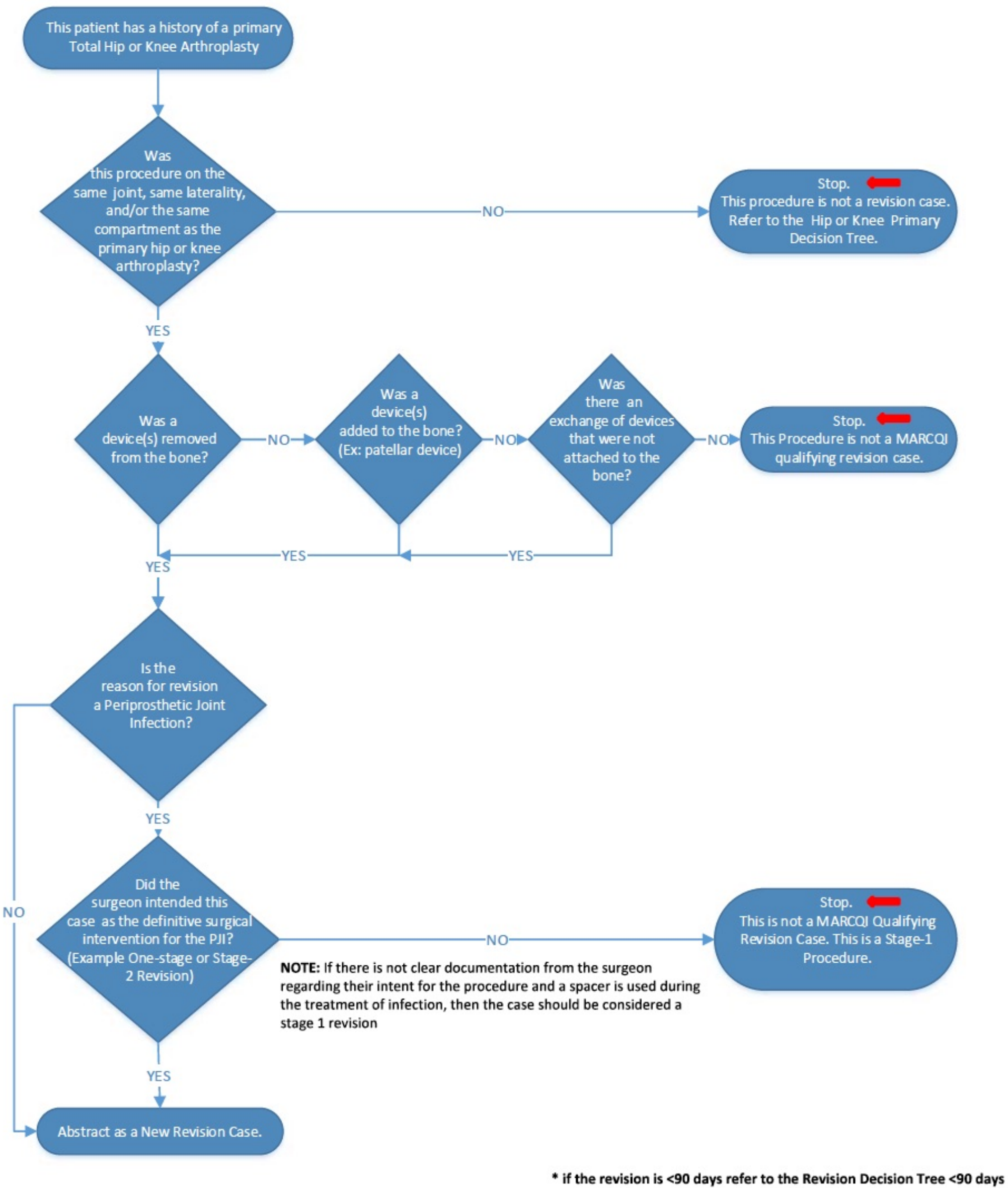

Figure 330: Flowchart of method used to identify revisions more than 90 days of surgery.

MARCQI uses a multi-faceted methodology for identifying revisions for two reasons: (1) revision data comes from both abstracted and administrative data sources, and (2) hospitals switched from ICD-9 to ICD-10 coding in 2015. Figures 329 and 330 illustrates the process used to identify revisions for this report. The process is different within 90 days and beyond 90 days because MARCQI was designed to focus primarily on reduction in 90-day events. For surgeries occurring on or after October 1, 2015, a registry-based MARCQI revision is a case identified by ICD-10 code and confirmed by a CDA. For surgeries occurring prior to October 1, 2015, a revision surgery was identified by the ICD-9 procedure recorded for the case and confirmed by a CDA. MARCQI qualifying revisions are identified by the following criteria:

1. Did the patient have a primary procedure?

2. Determine, if possible, if the revision was performed less than or greater than 90 days from the primary.

3. Determine what devices were removed or implanted by using the surgeon's narrative (operative note) and the device record.

4. IDC 10 codes may be used as validation.

A common question is how MARCQI handles staged revisions for the treatment of infection. MARCQI data abstractors are taught the following logic, which is included in the MARCQI data manual:

1. A *stage-one revision* is performed to treat the infection and may involve removal of all or some devices. It often involves debridement of tissues (I&D) and treatment with antibiotics via a functional spacer (static or articulating), cement antibiotic beads, IVs, or an intra-articular catheter. The intent is to perform a second procedure to replace the devices. If performed $\leq$ 90 days of the associated case, the stage one would be an event of prosthetic joint infection. If performed $>$ 90 days, it is not a qualifying case. Note: if the case is within 90 days of surgery performed at another site, this is a new revision case.

2. A *stage-two revision* is performed to insert new devices after an infection is treated. Typically, this includes removal of the spacer, beads, or intra-articular catheter and insertion of the new permanent devices. This procedure is intended as the final stage in treating the infection or the definitive surgical intervention. This qualifies as a new revision case (new devices were implanted into bone).

3. A *one-stage revision* treats infection and replaces the devices during the same operative encounter. There is no intent for another procedure; therefore, these are considered a definitive surgical intervention and a new revision case (new devices were implanted into bone).

Procedures performed within 90 days of surgery that involve an exchange of a device(s) not attached to bone, are events. These procedures may also be called an incision and drainage (I&D) or washout. For a hip case, it may involve the femoral head and acetabular liner. For a knee case, it may involve the tibial insert. Note: If the case is within 90 days of a surgery performed at another site, this is a new revision case.

A.5 Data structure for analytics

Two formats of data sets are used for this report, called “long” format and “wide” format.

1. The “long” format has a record (or row) for each case, *i.e.*, an individual record for each primary and revision case. Some patients may have multiple records indicating they have had multiple hip or knee replacement procedures over time. There may be a few patients with primary cases before 02/15/2012, and revision after 02/15/2012 (but before the end of the study 12/31/2022). This dataset is used to calculate statistics for total number of performed cases, overall and per calendar year.

2. In contrast, the “wide” format has one record (or row) for each primary case because a patient can only have one primary surgery per joint; subsequent procedures on the same joint would indicate revisions. There are no stand-alone records dedicated to revision(s). Rather, in the wide format the existence of a first revision is indicated as a dummy variable (1 means having a revision, 0 means not having a revision). Time to first revision in days was calculated for implant survival analysis. No revisions beyond first revision are coded in the wide data format. Some patients may have multiple records (or rows) if this patient had more than one primary surgery on different joints and/or lateralities. In this report, each primary surgery was treated as a new case. The date of primary cases must fall within the study window. This dataset is used to calculate descriptive statistics for primary cases, overall and breakdown by sex, diagnosis, and type of implant. It is also used for implant survival analysis.

A.6 Multi-level closed-loop data quality QC/QA

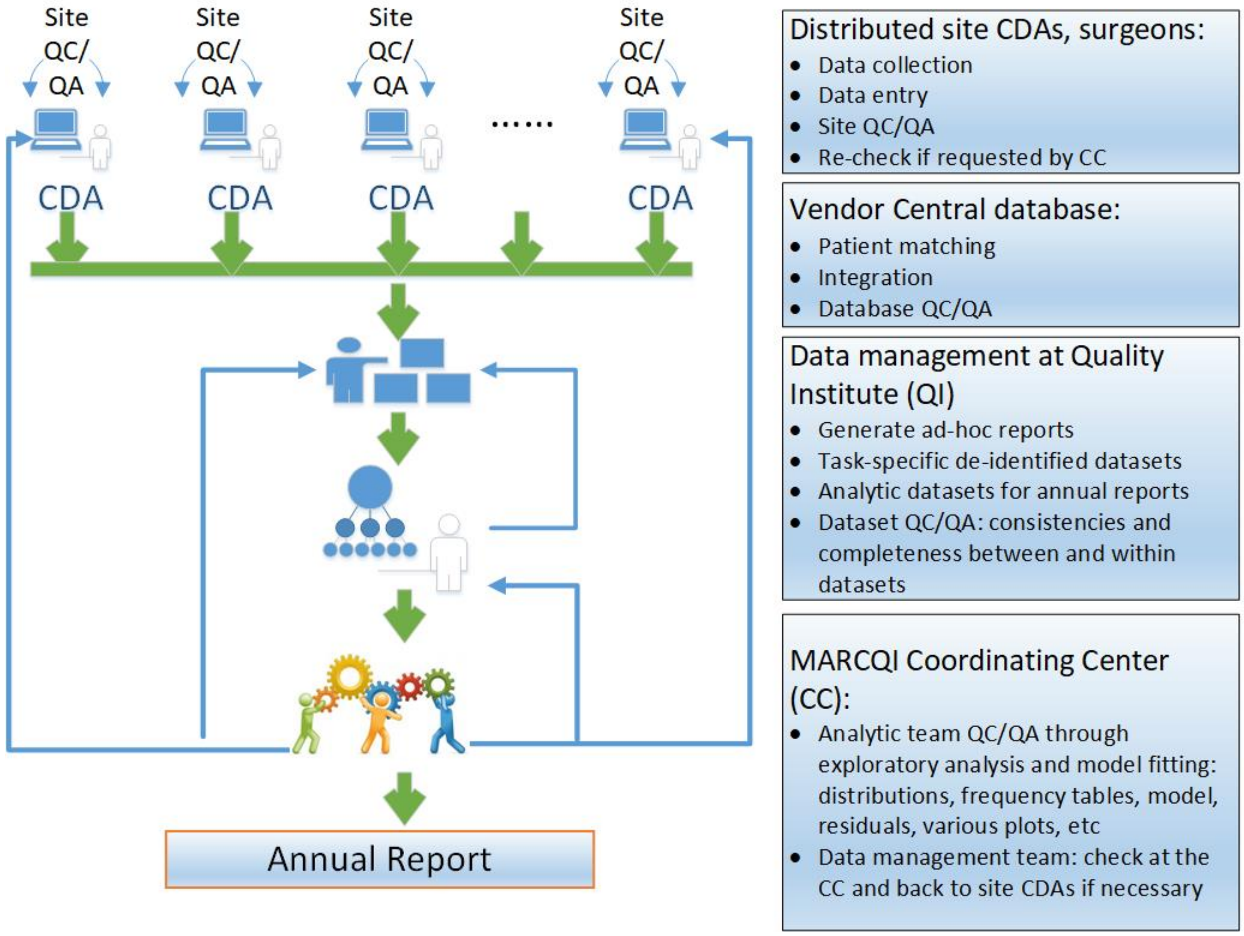

Figure 331: Flowchart of MARCQI four-level QC/QA process.

Data quality is critical in MARCQI. In order to meet quality dimensions, including accuracy/validity, reliability/consistency, completeness, precision, timeliness, confidentiality, and integrity (Sheppard and Terveen, 2011), MARCQI data has been checked and validated on four levels: (1) hospital, (2) vendor database, (3) data management, and (4) analytical. At the analytical level, the measures were further checked through distributions, frequency tables, model fittings, residuals, and other visualization tools. The questionable measures were directed to the coordinating center data management team and then returned to site clinical data abstractors (CDAs) if necessary. The CDAs validated data and made necessary corrections in the database if a measure was found to be in error. Figure 331 is the flowchart of MARCQI's four-level quality control/quality assurance (QC/QA) process.

The following goals are the focus of data quality in MARCQI:

1. *Accuracy/validity*. MARCQI data accuracy is validated based on the definitions and medical domain knowledge to ensure that data is entered correctly and appropriately into the domain. At the data entry stage, validation messages are created and a warning message window will pop-up if a value is out of normal range as pre-defined by the domain experts. This helps filter out potential data collection errors and allows confirmation of out-of-range but accurate values.

2. *Reliability/consistency*. The coordinating center staff ensures that the definition of measures is consistent over time and across sites.

3. *Completeness*. Data are fully inclusive, *e.g.*, a complete list of eligible implant names, device materials, patient demographics, etc. Missing data, invalid data, and/or incomplete data are checked.

4. *Precision*. MARCQI data are detailed and include demographics, lab, OR log, implant, etc.

5. *Timeliness*. MARCQI data are up-to-date and available quickly and frequently. Data reports are updated monthly, and the analytical datasets are updated quarterly.

6. *Integrity*. MARCQI maintains the accuracy, validity, and consistency of data over the whole data lifecycle, within and between data tables so that data is recoverable, searchable, traceable, and stable.

7. *Confidentiality*. MARCQI data are maintained according to national/international standards for data. All MARCQI data are protected and used appropriately.

This entire process guarantees the quality of MARCQI data.

A.7 Descriptive statistics and visualization

For this report continuous measures were checked for normality and skewness. Categorical variables were checked for cell sizes and questionable category values. If any potential issues were found and confirmed by the MARCQI data management team, then the data quality checking/correction was directed to a different level accordingly.

Univariate analyses are performed to compute descriptive statistics for this report, including frequency tables for smoking, both mean and standard deviation (SD), median and interquartile range (IQR) for age, weight, height, body mass index (BMI), and surgeon volumes (overall and device-specific). Frequency tables and various visualization tools, including pie charts, bar charts, Pareto charts (Montgomery, 2009; Tague, 2004), and line plots are employed to present data for sex, approach, diagnosis, distribution of primary vs. revision cases, venous thrombosis prophylaxis, polyethylene type, procedure type, bearing surface couple, head size, reason for revision, and American Society of Anesthesiologists (ASA) class.

A.8 Kaplan-Meier: Unadjusted survival probabilities and cumulative percent revision (CPR)

MARCQI presents revision risk for implants using a curve called the “cumulative percent revision,” which is abbreviated CPR and inspired by the Australian Orthopaedic Association National Joint Replacement Registry. Obviously, lower revision risk is preferred to higher risk.

The CPR is constructed starting with the time a primary joint replacement is performed, with the endpoint of interest being revision surgery on that joint. MARCQI computes the time to first revision since the primary procedure for those patients having revision surgery, which is the X-axis in the CPR curve. The Y-axis is the percent of patients who have had a revision among patients with the joint replacement by the corresponding X-axis, time.

Computationally, the CPR curve is derived from unadjusted survival probabilities, $\hat{S}(t)$, which is calculated using the Kaplan-Meier product-limit estimator (Kaplan and Meier, 1958; Rich *et al.*, 2010), and corresponding standard errors are calculated with Greenwood's formula (Kalbfleisch and Prentice, 2002). Then the overall, stratified, and implant-specific CPRs are expressed as percentages and calculated by $C\hat{P}R = (1 - \hat{S}(t)) \times 100$. The log-rank test is used to compare survival curves between groups at the $\alpha = 0.05$. There is a significant difference in the survival time between groups if the *p*-value is less than 0.05.

A.9 Cox proportional-hazards model

The Cox proportional-hazards model (Cox, 1972) is commonly used for investigating the association between the survival time of patients and one or more predictor variables. Specifically, the Cox proportional-hazard model formulates the hazard function for individual as $h_i(t, \mathbf{x}_i) = h_0(t, 0)e^{\mathbf{x}_i^T \boldsymbol{\beta}}$, where $h_i(t, \mathbf{x}_i)$ is the hazard at time t for the ith case, $h_i(t, 0)$ is the baseline hazard function with all covariates being 0, $\boldsymbol{\beta}$ is a column vector of regression coefficients, and $\mathbf{x}_i$ is a column vector of covariates for the ith case. The measures of association given by the Cox model as *hazard ratio (HR)* is used to explain the risk of event for certain categories of covariates or exposure of interest. The hazard ratio is obtained by taking the ratio of the hazards of two cases who have different values of the covariates, $\mathbf{x}$:

$$HR = \frac{h_i(t,\mathbf{x}_i)}{h_j(t,\mathbf{x}_j)} = \frac{h_0(t,0)e^{\mathbf{x}_i^T \boldsymbol{\beta}}}{h_0(t,0)e^{\mathbf{x}_j^T \boldsymbol{\beta}}} = e^{(\mathbf{x}_i - \mathbf{x}_j)^T \boldsymbol{\beta}}$$

The model includes surgeon as a random effect to account for within-subject correlation of the observed outcomes (Zhao *et al.*, 2005).

Parameters in a Cox model and HR are estimated using partial likelihood (Cox, 1975; Verweij and van Houwelingen, 1994). The proportional hazards assumption is assessed following Lin *et al.* (1993), *i.e.*, graphical and numerical methods for model assessment based on the cumulative sums of martingale residuals. Basically, the distributions of the stochastic processes under the assumed model are approximated by the distributions of zero-mean Gaussian processes. The 1000 realizations are generated by simulation. Each observed residual pattern was compared, both graphically and numerically, with simulated realizations from the null distribution. In this report, the risk-adjusted (age and sex) hazard ratio and 95% confidence interval are reported for each specific implant if the proportional-hazards assumption is met according to the supremum test.

A.10 Database and software platform

The raw data sources are securely transported to MARCQI by the data vendor (Ortech) in MS SQL format. All the data management, exploratory data analysis, descriptive statistics, graphs, and statistical modeling are performed using SAS 9.4 (SAS® Institute Inc., Cary, North Carolina)[1], SAS / Interactive Matrix Language (IML)[2], and SAS Macro Language [3].

[1] SAS® 9.4 Product Documentation.
[2] SAS/IML® 14.2: User's Guide, Copyright © 2016, SAS Institute Inc., Cary, NC, USA.
[3] SAS® 9.4 Macro Language: Reference, Fifth Edition.

Appendix B

Awards and publications

B.1 Awards

2016 Current Concepts in Joint Replacement/Orthopaedic Research and Education Foundation - Clinical Practice Award Paper, *No difference in dislocation seen in anterior vs posterior approach total hip arthroplasty* by J.D. Maratt, J.J. Gagnier, P.D. Butler, B.R. Hallstrom, A.G. Urquhart, and K.C. Roberts.

2022 John N. Insall Knee Society Award, *MARCQI's pain-control optimization pathway (POP): Impact of registry data and education on opioid utilization* by J.T. Layson, D.C. Markel, R.E. Hughes, J. Chubb, and N.B. Frisch.

B.2 Journal publications

2014

Franklin, P.D., Lewallen, D., Bozic, K., Hallstrom, B., Jiranek, W., and Ayers, D.C. (2014) Implementation of patient-reported outcome measures in U.S. total joint replacement registries: rationale, status, and plans. *Journal of Bone and Joint Surgery - American Volume*, 96 Suppl 1:104-109.

2015

Hughes, R.E., Hallstrom, B.R., Cowen, M.E., Igrisan, R.M., Singal, B.M., and Share, D.A. (2015) Michigan Arthroplasty Collaborative Quality Initiative (MARCQI) as a model for regional registries in the United States. *Orthopaedic Research and Reviews*, 7:47-56.

2016

Ellimoottil, C., Ryan, A.M., Hou, H., Dupree, J., Hallstrom, B., and Miller, D.C. (2016) Medicare's new bundled payment for joint replacement may penalize hospitals that treat medically complex patients. *Health Affairs*, 35(9):1651-1657.

Hallstrom, B.R., Singal, B., Cowen, M.E., Roberts, K.C., and Hughes, R.E. (2016) The Michigan experience with safety and effectiveness of tranexamic acid use in hip and knee arthroplasty. *Journal of Bone and Joint Surgery - American Volume*, 98:1646-1655.

Maratt, J.D., Gagnier, J.J., Butler, P.D., Hallstrom, B.R., Urquhart, A.G., and Roberts, K.C. (2016) No difference in dislocation seen in anterior vs posterior approach total hip arthroplasty. *Journal of Arthroplasty*, 31(9 Suppl):S127-S130.

Markel, D.C., Allen, M.W., and Zappa, N.M. (2016) Can an arthroplasty registry help decrease transfusions in primary total joint replacement? A quality initiative. *Clinical Orthopaedics and Related Research*, 474:126-131.

2017

Charles, R.J., Singal, B.M., Urquhart, A.G., Masini, M.A., and Hallstrom, B.R. (2017) Data sharing between providers and quality initiatives eliminate unnecessary nursing home admissions. *Journal of Arthroplasty*, 32(5):1418-1425.

Courtney, P.M., Huddleston, J.I., Iorio, R., and Markel, D.C. (2017) Socioeconomic risk adjustment models for reimbursement are necessary in primary total joint arthroplasty. *Journal of Arthroplasty*, 32:1-5.

Courtney, P.M. and Markel, D.C. (2017) Arthroplasty registries: Improving clinical and economic outcomes. *Journal of Knee Surgery*, 30(1):7-11.

Hughes, R.E., Batra, A., and Hallstrom, B.R. (2017) Arthroplasty registries around the world: valuable sources of hip implant revision risk data. *Current Reviews in Musculoskeletal Medicine*, 10:240-252.

Markel, D.C., Allen, M., Hughes, R., Singal, B., and Hallstrom, B. (2017) Quality initiative programs can decrease total joint arthroplasty transfusion rates - A multicenter study

utilizing the MARCQI total joint registry database. *Journal of Arthroplasty*, 32(11):3292-3297.

Omari, A., Hughes, R.E., Hallstrom, B.R., Singal, B.M., Igrisan, R.M., and McCardel, B.R. (2017) Using device data to improve identification of intraoperative femur fractures in total hip arthroplasty. *Michigan Journal of Medicine*, 2(1).

2018

Charpentier, P.M., Srivastava, A.K., Zheng, H., Ostrander, J.D., and Hughes, R.E. (2018) Readmission rates for single midnight versus two midnight length of stay in primary total knee arthroplasty: Analysis of the MARCQI Database. *Journal of Bone and Joint Surgery – American*, 100:1757-64.

Cheek, C., Zheng, H., Hallstrom, B.R., and Hughes, R.E. (2018) Application of a causal discovery algorithm to the analysis of arthroplasty registry data. *Biomedical Engineering and Computational Biology*, 9:1-9.

Hughes, R.E., Zheng, H., Igrisan, R.M., Cowen, M.E., Markel, D.C., and Hallstrom, B.R. (2018) The Michigan Arthroplasty Registry Collaborative Quality Initiative Experience: Improving the quality of care in Michigan. *Journal of Bone and Joint Surgery – American*, 100(22):e143.

2019

Hood, B.R., Cowen, M.E., Zheng, H., Hughes, R.E., Singal, B., and Hallstrom, B.R. (2019) Aspirin compared with other anticoagulants for prevention of venous thromboembolism in patients after total knee arthroplasty: A non-inferiority analysis. *Journal of the American Medical Association – Surgery*, 154(1):65-72.

2020

Foster, C., Posada, C., Pack, B., Hallstrom, B.R., and Hughes, R.E. (2020) Summary of knee implant one, three, five and 10-year revision risk reported by national and regional arthroplasty registries: A valuable source of evidence for clinical decision-making. *EFORT Open Reviews*, 5:268-272.

Hallstrom, B.R. and Hughes, R.E. (2020) Controversies in hip arthroplasty: Using registries to answer difficult questions (Editorial). *Journal of the American Medical Association*, 323:1046-1048.

Hughes, R.E, Zheng, H., and Hallstrom, B.R. (2020) Why registries are important: The example of the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) (Viewpoint). *Arthroplasty Today*, 6:747-748.

Hughes, R., Hallstrom, B., Schemanske, C., Howard, P.W., Wilton, T. (2020) Returning to operating following COVID-19 shutdown: what can human factors tell us? (Editorial) *Bone & Joint Journal*, 102-B(10):1277-1278.

Knapp, P., Weishuhn, L., Pizzimenti, N., and Markel, D.C. (2020) Risk factors for manipulation under anaesthesia after total knee arthroplasty. *Bone & Joint Journal*, 102-B(6 Supple A):66-72.

2021

Chubb, H.A., Cornish, E.R., Hallstrom, B.R., and Hughes, R.E. (2021) Early benchmarking total hip arthroplasty implants using data from the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI). *Orthopaedic Research and Reviews*, 13:215-228.

Muscatelli, S., Zheng, H., Hughes, R.E., Cowen, M.E., and Hallstrom, B.R. (2021) Non-inferiority of aspirin for venous thromboembolism prophylaxis after hip arthroplasty in a statewide registry. *Journal of Arthroplasty*, 36(6):2068-2075.

Schuman, A.D., Syrjamaki, J.D., Norton, E.C., Hallstrom, B.R., Regenbogen, S.E. (2021) Effect of statewide reduction in extended care facility use after joint replacement on hospital readmissions. *Surgery* 169(2):341-346.

2022

Hallstrom, B., Hughes, R.E., and Huddleston, J.I. 3rd (2022) State-based and national U.S. registries: The Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI), California Joint Replacement Registry (CJRR), and American Joint Replacement Registry (AJRR). *Journal of Bone and Joint Surgery – American*, 104 (Suppl 3):18-22.

Han, P., Fu, S., Kolis, J., Hughes, R., Hallstrom, B.R., Carvour, M., Maradit-Kremers, H., Sohn, S., and Vydiswaran, V. (2022) Multicenter validation of natural language processing algorithms for the detection of common data elements in operative notes for total hip arthroplasty: Algorithm development and validation. *JMIR Medical Informatics*, 10(8):e38155.

Layson, J.T., Markel, D.C., Hughes, R.E., Chubb H., and Frisch, N.B. (2022) MARCQI's pain-control optimization pathway (POP): Impact of registry data and education on opioid utilization. *Journal of Arthroplasty*, 37(6):S19-S26.

Markel, J.F., Driscoll, J.A., Zheng, T.H., Hughes, R.E., Moore, D.D., Hallstrom, B.R., Markel, D.C. (2022) Causes of early hip revision vary by age and sex: Analysis of data from a statewide quality registry. *Journal of Arthroplasty*, 37:S616-S621.

Muscatelli, S., Zheng, H., Muralidharan, A., Tollemar, V., and Hallstrom, B.R. (2022) Limiting the surveillance period to 90 days misses a large portion of infections in the first year after total hip and knee arthroplasty. *Arthroplasty Today*, 16:90-95.

2023

Cowen, M.E., Zheng, H., Hughes, R.E., Franklin, P.D., Masini, M.A., and Hallstrom, B.R. (2023) How much perioperative pain and dysfunction underlie the HOOS JR and KOOS JR? *Clinical Orthopaedics and Related Research* 481:1800-1810.

Hughes, R.E., Zheng, H., Kim, T., and Hallstrom, B.R. (2023) Total hip and knee arthroplasty implant revision risk to 5 years from a state-wide arthroplasty registry in Michigan. *Arthroplasty Today*, 21:101146.

Markel, J.F., Adams, N.A., Srivastava, A.K., Zheng, T.H., Hallstrom, B.R., Markel, D.C. (2023) Do ′Surgeon Champions′ and High-Volume Surgeons Have Lower Rates of Periprosthetic Femur Fracture? Perspective From a State-Wide Quality Improvement Registry. *Journal of Arthroplasty*, 38(7S):S247-S251.

Nelson, J., Zheng, H., Hallstrom, B., Hughes, R., Mont, M.A., and Masini, M. (2023) Are short stems associated with higher fracture rates and early revision rates in primary total hip arthroplasty? - A non-inferiority analysis. *Journal of Arthroplasty*, 38:1287-1294.

Powell, D., Comer, B., Hallstrom, B., Zheng. H., Hughes, R., Markel, D. (2023) Early survivorship of uncemented total knee arthroplasty varies by age and sex based on data from the Michigan Arthroplasty Registry Collaborative Quality Initiative. *Journal of Arthroplasty*, 38:S221-S226.

Powell, D., Markel, D., Chubb, H., Muscatelli, S., Hughes, R., Hallstrom, B., and Frisch, N. (2023) The differential effect of COVID on total joint arthroplasty between hospital and ambulatory surgery centers/hospital outpatient departments: A Michigan Arthroplasty Registry Collaborative Quality Initiative Analysis. *Arthroplasty Today*, 23:101189.

Wenzlick, T.S., Kutzner, A.R., Markel, D.C., Hughes, R.E., Chubb, H.D., Roberts, K.C. (2023) A reduction in opioid prescription size after total joint arthroplasty can be safely performed without an increase in complications. *Journal of Arthroplasty*, 38:1245-1250.

B.3 Conference abstracts

2014

Hughes, R.E., Igrisan, R., and Hallstrom, B. (2014) Designing pay-for-performance incentives for an arthroplasty quality improvement collaborative. *3^{rd} International Congress of Arthroplasty Registries*, May 31-June 2, Cambridge, MA, 2014.

2015

Hallstrom, B.R., Hughes, R., Igrisan, R., Cowen, M., and Singal, B. (2015) Dramatic reduction in blood transfusion through a quality improvement project in the Michigan arthroplasty registry. *4^{th} International Congress of Arthroplasty Registries*, Gothenburg, Sweden, May 23-25, 2015.

Hughes, R.E., Singal, B., Hallstrom, B., Cowen, M., and McCardel, B. (2015) Using device data to improve detection of intra-operative femur fractures in total hip arthroplasty. *4^{th} International Congress of Arthroplasty Registries*, Gothenburg, Sweden, May 23-25, 2015.

Hughes, R. (2015) Development and operation of a regional arthroplasty quality improvement collaborative. *Healthcare Systems Process Improvement Conference 2015*, February 18-20, Orlando, FL, 2015.

Maratt, J.D., Gagnier, J., Butler, P., Hallstrom, B.R., Urquhart, A.G., and Roberts, K. (2015) Direct anterior approach does not reduce dislocation risk. *American Association of Hip and Knee Surgeons*, November 5-8, Dallas, TX, USA, 2015.

2016

Hallstrom, B., Hughes, R., Singal, B., and Cowen, M. (2016) Primary and revision case capture in the Michigan arthroplasty registry. *5^{th} International Congress of Arthroplasty Registries*, Manchester, England, May 28-30, 2016.

Hughes, R.E., Chan, M.Y.H., and Hallstrom, B.R. (2016) A Bayesian network model for hip implant outlier detection in post-market surveillance. *2016 BMES/FDA Frontiers in Medical Devices Conference*, College Park, MD, USA, May 23-25, 2016.

Maratt, J.D., Gagnier, J.J., Butler, P.D., Hallstrom, B.R., Urquhart, A.G., and Roberts, K.C. (2016) No difference in dislocation in anterior versus posterior approach total hip arthroplasty. *American Orthopaedic Association*, June 24-27, Seattle, WA, USA, 2016.

Zarling, B.J., Sikora-Klak, J., Bergum, C., and Markel, D.C. (2016) How do pre-operative medications influence outcomes in total joint arthroplasty? *34^{th} Annual Meeting of the Mid-America Orthopaedic Association*, Bonita Springs, FL, USA, April 13-17, 2016.

2017

Hood, B., Singal, B., Zheng, H., Hughes, R., Cowen, M., and Hallstrom, B. (2017) Aspirin for venous thromboembolism prophylaxis after primary total knee arthroplasty: An analysis of 41,537 cases in the Michigan arthroplasty registry. *6th International Congress of Arthroplasty Registries*, San Francisco, CA, USA, May 20-22, 2017.

Hood, B.R., Hallstrom, B.R., Cowen, M., Hughes, R., Zheng, T., and Singal, B. (2017) Equivalence of aspirin for prophylaxis of venous thromboembolism after knee replacement in a state-wide registry. *American Association of Hip and Knee Surgeons 2017 Annual Meeting*, November 2-5, Dallas, TX, 2017.

Hughes, R.E., Batra, A., Pack, B.J., and Hallstrom, B.R. (2017) Translating registry data into clinical practice: Summary of arthroplasty registry reports of revision risk for hips. *6th International Congress of Arthroplasty Registries*, San Francisco, CA, USA, May 20-22, 2017.

Hughes, R.E., Zheng, H., Kabara, J., Mendenhall, S., Pack, B.J., and Hallstrom, B.R. (2017) Variation in bearing surface couples in conventional total hip arthroplasty within Michigan. *6th International Congress of Arthroplasty Registries*, San Francisco, CA, USA, May 20-22, 2017.

Hughes, R.E., Batra, A., Pack, B.J., and Hallstrom, B.R. (2017) Translating registry data into clinical practice: Summary of arthroplasty registry reports of revision risk for hips. *2017 Michigan Orthopaedic Society Annual Scientific Meeting*, Mackinac Island, MI, USA, June 16-18, 2017.

Zheng, H., Hughes, R.E., Kabara, J., Cowen, M.E., and Hallstrom, B.R. (2017) A multi-stage modeling framework to analyze discrete events with applications to venous thromboembolism (VTE) prophylaxis following total knee arthroplasty (TKA) within MARCQI. *6th International Congress of Arthroplasty Registries*, San Francisco, CA, USA, May 20-22, 2017.

2018

Cheek, C., Zheng, H., Hallstrom, B.R., and Hughes, R.E. (2018) Application of a causal discovery algorithm to the analysis of arthroplasty registry data. *7th Congress of Arthroplasty Registries*, Reykjavik, Iceland, June 9-11, 2018.

Hallstrom, B., Hughes, R., Cowen, M., and Zheng, H. (2018) Differences in reason for early revision between THA and TKA in Michigan. *7th Congress of Arthroplasty Registries*, Reykjavik, Iceland, June 9-11, 2018.

Hallstrom, B., Hughes, R., Cowen, M., and Zheng, H. (2018) Males are more likely to be revised than females in the first year after primary TKA in Michigan. *7th Congress of Arthroplasty Registries*, Reykjavik, Iceland, June 9-11, 2018.

Hughes, R.E., Zheng, H., and Hallstrom, B. (2018) Implant-specific revision risks to three years in Michigan. *7th Congress of Arthroplasty Registries*, Reykjavik, Iceland, June 9-11, 2018.

Zheng, H., Hughes, R.E., Hallstrom, B.R., Charpentier, P.M., Srivastava, A.K., Igrisan, R. (2018) A comparative study on propensity score approaches: Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI). *Joint Statistical Meetings (JSM)*, Vancouver, British Columbia, Canada, July 28 – August 2, 2018.

2019

Hallstrom, B.R., Hughes, R.E., Zheng, H., and Igrisan, R. (2019) Signal detection for implants in the Michigan Arthroplasty Registry Collaborative Quality Initiative. *8th Congress of Arthroplasty Registries*, Leiden, Netherlands, June 1-3, 2019.

Hallstrom, B.R., Zheng, H., Igrisan, R., Cowen, M., and Hughes, R.E. (2019) Combining funnel plots and risk adjusted cumulative sum charts in surgeon reporting and decision making. *8th Congress of Arthroplasty Registries*, Leiden, Netherlands, June 1-3, 2019.

Hallstrom, B.R., Zheng, H., Coon, S., and Hughes, R.E. (2019) First report of an increased 5 year revision risk for a novel knee design in statewide registry data. *American Association of Hip and Knee Surgeons Annual Meeting*, Dallas, November 7-10, 2019.

Hughes, R.E, Zheng, H., and Hallstrom, B.R. (2019) Reducing discharge to extended care facility does not increase readmission in knee and hip arthroplasty patients. *2019 Annual Meeting of the American Academy of Orthopaedic Surgeons*, Las Vegas, NV, March 13-19, 2019.

Knapp, P., Weishuhn, L., Pizzimenti, N., and Markel, D.C. (2019) Assessment of numerous risk factors for manipulation under anesthesia after total knee arthroplasty. *33rd Annual Congress of the International Society for Technology in Arthroplasty*, Toronto, October 2-5, 2019.

Zheng, H., Hughes, R.E., Hallstrom, B.R., and Igrisan, R. (2019) Effects of hospital scale and infection control program on infection reduction following TKA and THA: A simulation study. *8th Congress of Arthroplasty Registries*, Leiden, Netherlands, June 1-3, 2019.

Zheng, H., Hughes, R.E., Hallstrom, B.R., and Igrisan, R. (2019) Risk-adjusted cumulative sum charts (CUSUM) as a quality improvement toolkit to monitor early revisions with

Monte-Carlo simulation and application to Michigan arthroplasty registry data. *8th Congress of Arthroplasty Registries*, Leiden, Netherlands, June 1-3, 2019.

2020

Bolz, N.J., Zarling, B.J., and Markel, D.C. (2020) Long-term sustainability of a quality initiative program on transfusion rates in total joint arthroplasty: A follow-up study. *Journal of Arthroplasty*, 35:340-346.

Chubb, H.A., Kim, T., Hallstrom, B.R., and Hughes, R.E. (2020) Applying International Prosthesis Working Group benchmarking guidelines for Hip Prostheses in the State of Michigan. *Virtual 9th International Congress of Arthroplasty Registries*, November 13-16, 2020.

Hallstrom, B., Roberts, K., and Hughes, R. (2020) Reducing Opioid Prescribing with a Registry Quality Improvement Project in the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI). *Virtual 9th International Congress of Arthroplasty Registries*, November 13-16, 2020.

Hallstrom, B.R., Zheng, H., and Hughes, R.E. (2020) The Importance of Early Implant Registry Surveillance: An example with the iTotal knee in the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI). *Virtual 9th International Congress of Arthroplasty Registries*, November 13-16, 2020.

Hughes, R.E., Zheng, H., Coon, S., and Hallstrom, B.R. (2020) The 7-year annual report (2019) of the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI): Enhancements and Highlights. *Virtual 9th International Congress of Arthroplasty Registries*, November 13-16, 2020.

Nelson, J., Zheng, T., Hallstrom, B., Hughes, R., Mont, M., and Masini, M. (2020) Do Short Stems Lead to Higher Fracture Rates and Early Revision Rates in Primary Total Hip Arthroplasty? - A Non-Inferiority Analysis. *Virtual 9th International Congress of Arthroplasty Registries*, November 13-16, 2020.

Zheng, H., Hallstrom, B.R., Hughes, R.E., and Kim, T. (2020) Integrated Quantitative Methodology to Characterize the Improvement of Patient-report Outcome Measures (PROMs): Michigan Arthroplasty Registry. *Virtual 9th International Congress of Arthroplasty Registries*, November 13-16, 2020.

Zheng, H., Hughes, R., Cowen, M., Gumtow, M., Kim, T., Zhu, Q., and Hallstrom, B. (2020) Development of Infection Risk Calculator for Clinical Decision Making Using Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) Database. *Virtual 9th International Congress of Arthroplasty Registries*, November 13-16, 2020.

Zheng, H. Hallstrom, B.R., Hughes, R.E., Kim, T., and Cowen, M. (2020) Anchor-based improvement of patient-report outcome measures (PROMs) from Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI). *Virtual 9th International Congress of Arthroplasty Registries*, November 13-16, 2020.

2021

Hallstrom, B.R., Zheng, T., Hughes, R.E., and Kim, T. (2021) A method to track improvement in pain and function after hip and knee replacement using Markov transition modeling: Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI). *10th International Congress of Arthroplasty Registries. 2nd Virtual Congress*, Copenhagen, Denmark, November 11-13(14), 2021.

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Support for MARCQI is provided by Blue Cross and Blue Shield of Michigan and Blue Care Network as part of the BCBSM Value Partnerships program.