Online LROI annual report 2023

Joint arthroplasty data to 31 December 2022

Introduction

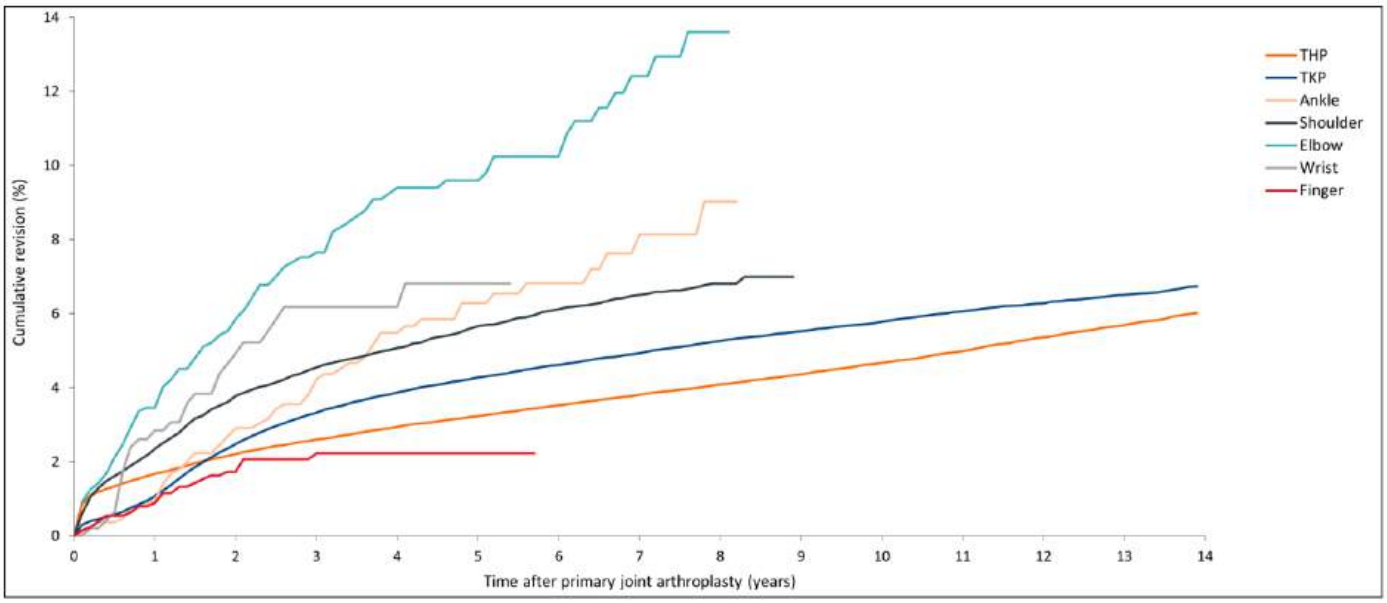
Welcome to LROI Report 2023

This online annual report 2023 of the Dutch Arthroplasty Register (LROI) contains trends and outcome information on primary and revision hip, knee, ankle, shoulder, elbow, wrist and finger arthroplasties in the Netherlands between 2007 and 2022. Since 2007, the LROI has been collecting data on hip and knee procedures, on ankle, shoulder, and elbow procedures since 2014, and on wrist and finger procedures since 2016.

What's new

Survival outcomes are available for all joints

FIGURE First revision outcomes of primary THA, TKA, ankle, shoulder, elbow, wrist and finger arthroplasties in the Netherlands in 2007-2022



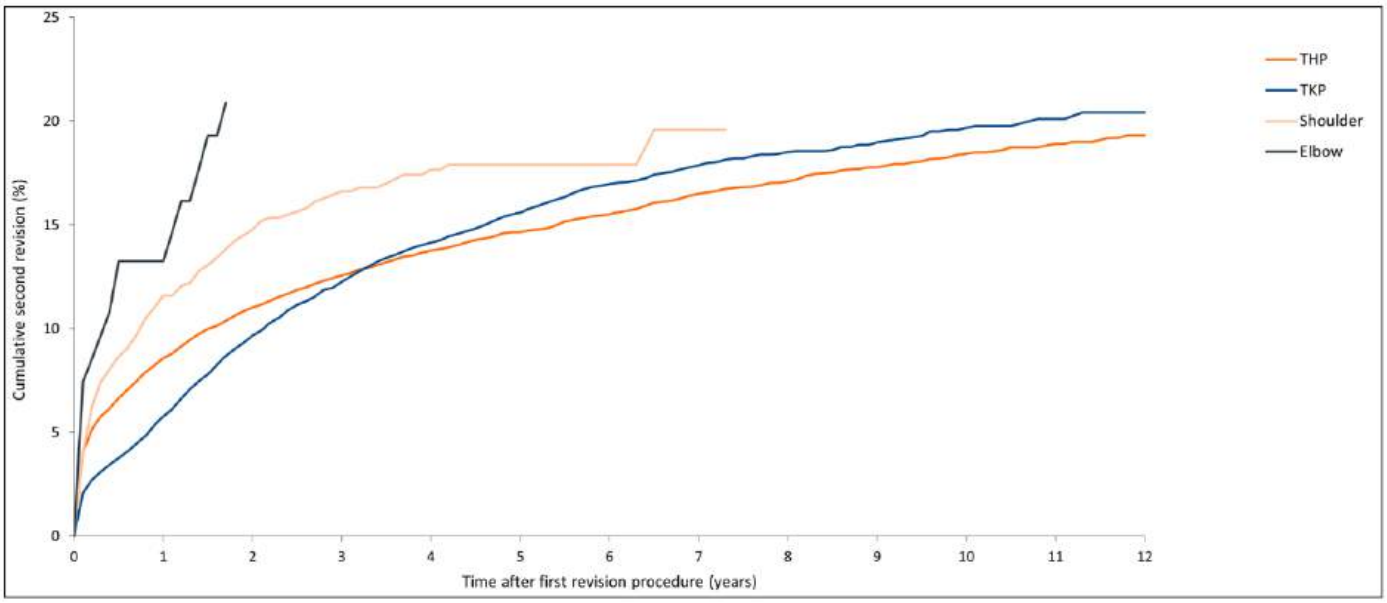
TABLE

Cumulative revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
THP	422,181	1.61 (1.57-1.65)	2.56 (2.51-2.61)	3.21 (3.15-3.27)	3.77 (3.70-3.84)	4.64 (4.56-4.72)	6.02 (5.88-6.16)
TKP	335,039	0.95 (0.91-0.98)	3.26 (3.20-3.32)	4.23 (4.16-4.30)	4.90 (4.82-4.98)	5.74 (5.64-5.84)	6.74 (6.60-6.88)
Ankle	1,100	0.86 (0.30-1.43)	3.82 (2.57-5.07)	6.29 (4.54-8.04)	7.62 (5.44-9.80)	n.a.	n.a.
Shoulder	26,112	2.17 (1.99-2.35)	4.47 (4.19-4.75)	5.59 (5.26-5.92)	6.47 (6.07-6.87)	n.a.	n.a.
Elbow	1,211	3.46 (2.41-4.51)	7.52 (5.90-9.14)	9.59 (7.67-11.51)	12.42 (9.77-15.07)	n.a.	n.a.
Wrist	501	2.61 (1.15-4.07)	6.18 (3.81-8.55)	6.81 (4.14-9.48)	n.a.	n.a.	n.a.
Finger	1,331	0.80 (0.30-1.29)	2.07 (1.22-2.92)	2.23 (1.33-3.13)	n.a.	n.a.	n.a.

Please note: THA: total hip arthroplasty; TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

FIGURE Second revision outcomes of primary THA, TKA, shoulder and elbow arthroplasties after first revision procedure in the Netherlands in 2007-2022



TABLE

Cumulative second revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr
THP	13,847	8.22 (7.75-8.69)	12.44 (11.86-13.02)	14.65 (14.00-15.30)	16.42 (15.69-17.15)	18.37 (17.50-19.24)
TKP	10,751	5.33 (4.90-5.76)	11.97 (11.31-12.63)	15.60 (14.82-16.38)	17.76 (16.88-18.64)	19.58 (18.54-20.62)
Shoulder	1,060	11.02 (9.08-12.96)	16.45 (14.02-18.88)	17.90 (15.27-20.53)	19.57 (16.12-23.02)	n.a.
Elbow	96	13.25 (6.25-20.25)	29.92 (18.96-40.88)	n.a.	n.a.	n.a.

THA: total hip arthroplasty; TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

Survival outcomes of hip, knee, ankle, shoulder and elbow arthroplasties are expanded. Examples are:

- survival by year of surgery by fixation of primary THA and TKA;
- survival by year of surgery by approach of primary THA;
- survival according to province of residence of the patient of THA and TKA;
- survival according to articulation and PE type of THA and TKA;
- survival by year of reverse TSA, anatomical TSA and hemi;
- survival according to patient characteristics of ankle and total elbow arthroplasties;
- survival by year of revision THA and TKA.

This year PROMs response rate are shown by hospital volume:

- of patients who underwent a primary total hip arthroplasty for osteoarthritis;
- of patients who underwent a primary total knee arthroplasty for osteoarthritis;
- of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis.

Contact

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Colophon

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Contents

Hip arthroplasty

Numbers

Registered procedures

TABLE Number of registered hip arthroplasties per year of surgery (2007-2022) in the LROI in April 2023

Year of surgery	Type of hip arthroplasty: Total arthroplasty (n)	Hemi-arthroplasty (n)	Resurfacing arthroplasty (n)	Unknown/ missing (n)	Revision arthroplasty (n)	Total (n)
2007	8,901	1,056	452	933	1,268	12,610
2008	15,452	1,524	731	395	1,858	19,960
2009	22,106	2,145	864	298	2,679	28,092
2010	23,913	2,423	610	296	2,951	30,193
2011	24,357	2,519	229	349	3,197	30,651
2012	25,730	2,897	10	420	3,766	32,823
2013	26,236	3,069	2	286	3,517	33,110
2014	28,191	3,766	0	152	3,583	35,692
2015	28,870	4,967	15	69	3,834	37,755
2016	29,571	5,450	16	103	3,883	39,023
2017	30,264	5,946	5	52	3,871	40,138
2018	31,635	6,384	2	26	3,843	41,890
2019	33,080	6,314	1	37	3,835	43,267
2020	27,193	6,597	0	18	3,466	37,274
2021	31,567	6,193	0	18	3,563	41,341
2022	36,707	6,077	0	32	3,592	46,408
Total	423,773	67,327	2,937	3,484	52,706	550,227

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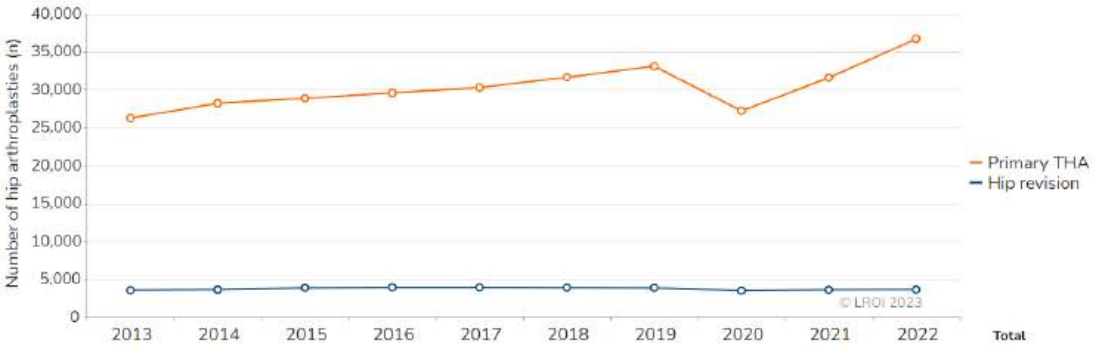
The LROI is nearly complete as of 2010. Therefore, a dotted line was inserted between 2009 and 2010.

Type of procedures

FIGURE Number of primary total hip arthroplasties and hip revision arthroplasties registered in the LROI in the Netherlands in 2013-2022



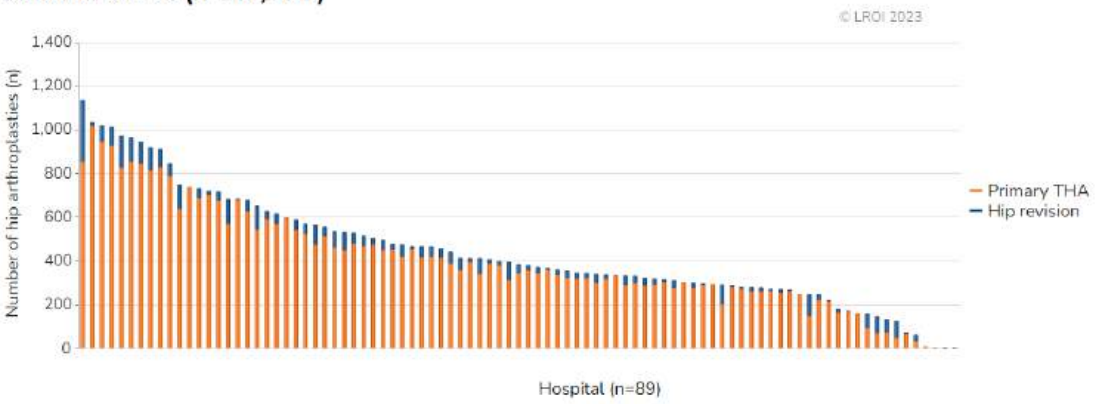
Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Type of procedure (n)											
Primary THA	26,236	28,191	28,870	29,571	30,264	31,635	33,080	27,193	31,567	36,707	**303,314**
Hip revision	3,517	3,583	3,834	3,883	3,871	3,843	3,835	3,466	3,563	3,592	**36,987**
Total:	**29,753**	**31,774**	**32,704**	**33,454**	**34,135**	**35,478**	**36,915**	**30,659**	**35,130**	**40,299**	**340,301**

THA: total hip arthroplasty.

Out of 36,707 primary total hip arthroplasties that were performed in 2022, 2.8% (n=1,018) was performed bilaterally.

Type of procedure per hospital

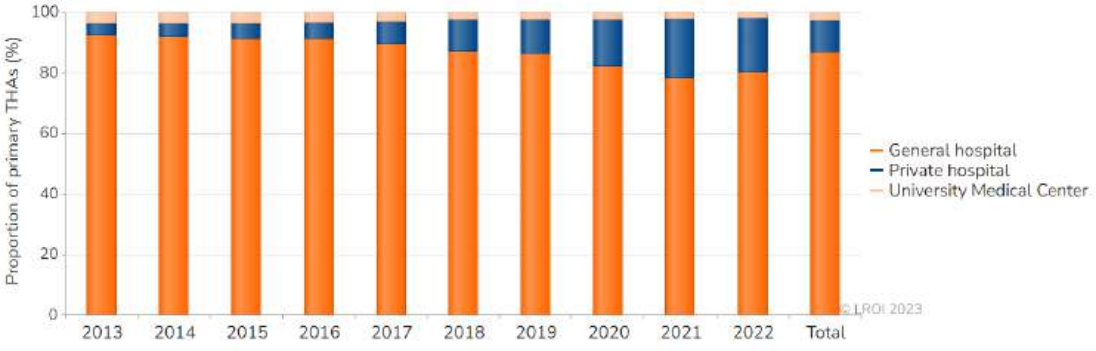
FIGURE Number of primary total hip arthroplasties and hip revision arthroplasties per hospital in the Netherlands in 2022 (n=40,299)



THA: total hip arthroplasty.

Type of hospital – primary

FIGURE Trend (proportion [%] per year) in type of hospital performing primary total hip arthroplasties in the Netherlands in 2013-2022

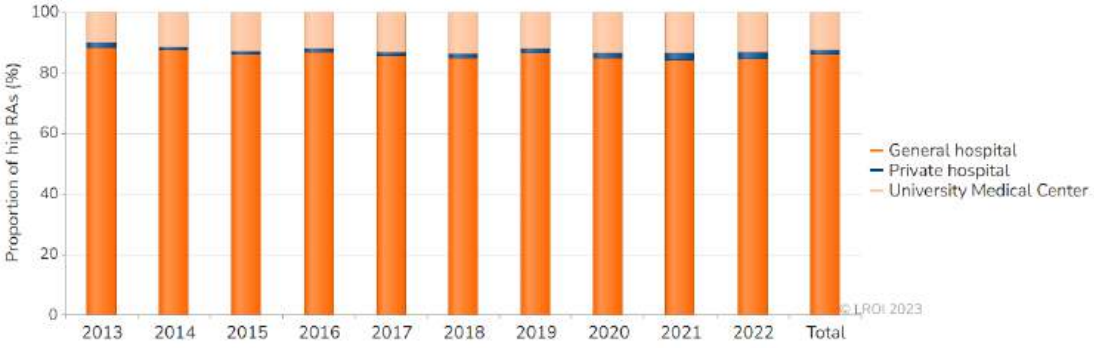


Type of hospital (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
General hospital	92.43	92.07	91.32	91.21	89.58	87.26	86.38	82.38	78.19	80.32	**86.84**
Private hospital	3.87	4.26	4.95	5.48	7.52	10.17	11.08	15.22	19.78	17.83	**10.34**
University Medical Center	3.70	3.66	3.72	3.30	2.90	2.57	2.55	2.39	2.04	1.84	**2.82**
Total (n):	**26,236**	**28,191**	**28,870**	**29,571**	**30,264**	**31,635**	**33,080**	**27,193**	**31,567**	**36,707**	**303,314**

Please note: The number of general hospitals that performed primary total hip arthroplasties increased from 72 to 73 between 2013-2022; the number of private hospitals increased from 6 to 16 and the number of University Medical Centers remained 7 between 2013-2022.
THA: total hip arthroplasty.

Type of hospital – revision

FIGURE Trend (proportion [%] per year) in type of hospital performing hip revision arthroplasties in the Netherlands in 2013-2022



Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Type of hospital (%)											
General hospital	88.48	87.50	86.05	86.97	85.71	84.99	86.62	84.91	84.34	84.55	**86.01**
Private hospital	1.54	1.20	1.17	1.11	1.11	1.48	1.49	1.59	2.33	2.34	**1.52**
University Medical Center	9.98	11.30	12.78	11.92	13.17	13.53	11.89	13.50	13.33	13.11	**12.46**
Total (n):	**3,517**	**3,583**	**3,834**	**3,883**	**3,871**	**3,843**	**3,835**	**3,466**	**3,563**	**3,592**	**36,987**

Please note: The number of general hospitals that performed hip revision arthroplasties decreased from 72 to 65 between 2013-2022; the number of private hospitals increased from 5 to 9 and the number of University Medical Centers remained 7 between 2013-2022.
RA: revision arthroplasty.

Total hip arthroplasty

Demographics

Patient characteristics by diagnosis

TABLE Patient characteristics of all patients with a registered primary total hip arthroplasty by diagnosis in the Netherlands in 2022

	Osteoarthritis	Fracture	Osteonecrosis	Late post-traumatic	Dysplasia	Rheumatoid arthritis	Post-Perthes disease	Tumour	Total
N (%)	**31,602 (86.1)**	**2,115 (5.8)**	**902 (2.5)**	**845 (2.3)**	**533 (1.5)**	**140 (0.4)**	**82 (0.2)**	**78 (0.2)**	**36,707**
Mean age (years) (SD)	70.0 (9.8)	70.3 (8.7)	62.5 (16.0)	67.4 (12.3)	51.6 (14.7)	62.8 (14.7)	50.0 (17.1)	63.3 (12.8)	69.4 (10.5)
Age (years) (%)									
<50	2	1	19	8	45	17	44	14	4
50-59	13	8	19	16	27	21	22	16	13
60-69	29	34	23	29	14	29	21	41	29
70-79	40	45	25	32	11	21	13	23	39
≥80	16	12	14	15	2	12	0	6	15
Gender (%)									
Men	36	36	47	46	28	25	66	44	36
Women	64	64	53	54	72	75	34	56	64
ASA score (%)									
I	14	12	9	13	30	1	28	3	14
II	62	54	52	50	59	71	66	27	60
III-IV	24	34	39	37	11	28	6	70	26
Type of hospital (%)									
General	79	96	82	88	73	86	73	67	80
UMC	1	4	9	6	10	7	6	32	2
Private	20	0	9	6	17	6	21	1	18
Charnley-score (%)									
A One hip joint affected	40	59	57	75	52	29	73	75	42
B1 Both hip joints affected	32	16	20	9	26	24	15	21	31
B2 Contralateral hip joint with a total hip prosthesis	25	18	18	10	19	20	12	0	24
C Multiple joints affected or chronic disease that affects quality of life	3	7	5	6	3	27	0	4	3
Mean Body Mass Index (kg/m²) (SD)	27.4 (4.5)	24.9 (4.1)	26.7 (5.2)	25.8 (4.5)	26.2 (4.9)	26.9 (4.5)	27.6 (4.4)	26.6 (4.5)	27.2 (4.6)
Body Mass Index (kg/m²) (%)									
Underweight (≤18.5)	1	4	4	4	2	3	0	1	1
Normal weight (>18.5-25)	33	54	38	43	45	31	34	40	35
Overweight (>25-30)	42	32	34	38	34	47	41	37	41
Obesity (>30-40)	23	10	23	14	18	18	25	21	22
Morbid obesity (>40)	1	0	1	1	1	1	0	1	1
Smoking (%)									
No	91	85	81	84	87	91	73	91	90
Yes	9	15	19	16	13	9	27	9	10

Please note: in 2022, 249 (0.7%) patients received a primary THA after a diagnosis that is not listed in the table. Of 143 (0.4%) primary THAs the diagnosis was not registered.
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation; THA: total hip arthroplasty.

Surgical techniques

Surgical approach

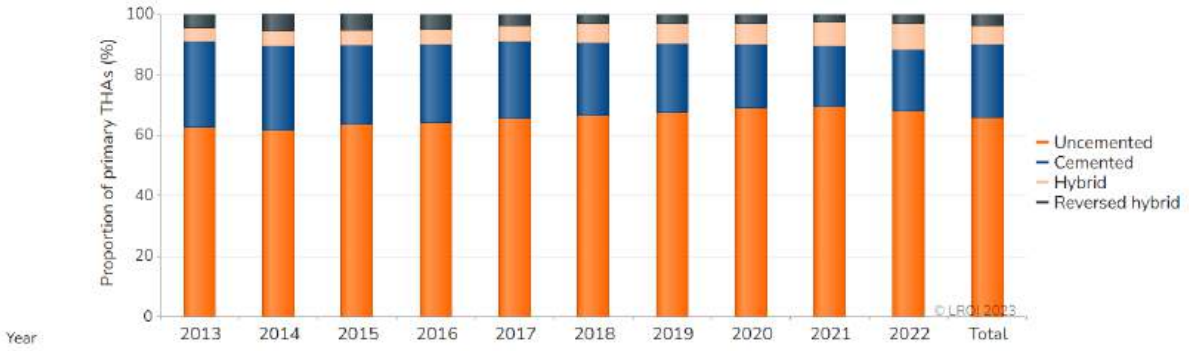
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary total hip arthroplasty in the Netherlands in 2013-2022

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Surgical approach (%)											
Posterolateral	61.81	62.00	60.64	59.30	55.63	55.18	52.42	49.92	47.34	45.92	**54.64**
Anterior	9.96	12.38	16.80	20.92	27.76	31.91	37.70	41.30	44.36	44.87	**29.62**
Straight lateral	21.53	20.17	17.02	13.49	10.62	7.38	5.19	4.08	3.52	3.50	**10.22**
Anterolateral	6.61	5.35	5.09	5.48	4.98	4.44	3.45	2.04	2.34	2.07	**4.10**
Direct superior	0.00	0.00	0.00	0.28	0.65	0.80	0.82	1.71	2.03	3.48	**1.05**
Other	0.09	0.11	0.44	0.54	0.36	0.28	0.42	0.94	0.42	0.16	**0.37**
Total (n):	**26,056**	**28,028**	**28,793**	**29,555**	**30,240**	**31,613**	**33,055**	**27,157**	**31,423**	**36,554**	**302,474**

THA: total hip arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary total hip arthroplasties in the Netherlands in 2013-2022



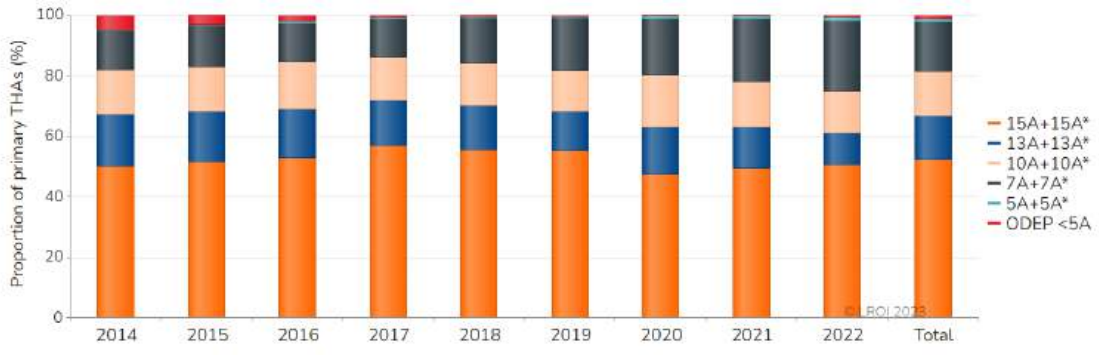
Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Fixation (%)											
Uncemented	62.76	61.62	63.64	64.05	65.60	66.53	67.73	69.00	69.33	68.05	**65.97**
Cemented	28.06	27.87	26.09	26.06	25.27	24.08	22.67	21.00	20.30	20.36	**24.00**
Hybrid	4.63	4.79	4.91	4.90	5.28	6.27	6.69	7.03	7.75	8.60	**6.18**
Reversed hybrid	4.55	5.72	5.37	4.99	3.85	3.12	2.91	2.97	2.62	2.99	**3.85**
Total (n):	**26,050**	**28,025**	**28,743**	**29,419**	**29,829**	**31,453**	**32,848**	**26,984**	**31,335**	**36,537**	**301,223**

THA: total hip arthroplasty.

Prosthesis characteristics and materials

ODEP acetabular component

FIGURE Trend (proportion [%] per year) in ODEP rating acetabulum component in primary total hip arthroplasties in the Netherlands in 2014-2022

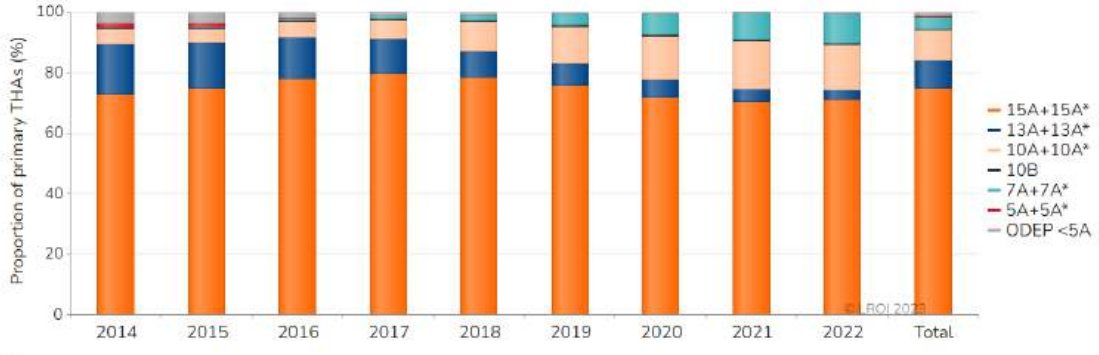


Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
ODEP rating (%)										
15A+15A*	50.12	51.41	52.90	57.08	55.62	55.16	47.57	49.44	50.76	**52.30**
13A+13A*	17.18	16.67	16.27	14.79	14.61	13.15	15.45	13.66	10.14	**14.49**
10A+10A*	14.71	14.80	15.47	14.29	13.92	13.39	17.20	14.79	13.82	**14.64**
7A+7A*	12.94	13.68	12.50	12.63	14.97	17.43	18.37	20.80	23.46	**16.52**
5A+5A*	0.40	0.53	0.86	0.59	0.50	0.53	1.18	1.05	1.15	**0.76**
ODEP <5A	4.65	2.92	2.00	0.62	0.39	0.34	0.23	0.27	0.67	**1.29**
Total (n):	**28,008**	**28,709**	**28,951**	**29,667**	**31,004**	**31,976**	**25,801**	**31,246**	**36,242**	271,604

Please note: More information on ODEP rating can be found on www.odep.org.uk.
THA: total hip arthroplasty.

ODEP femoral component

FIGURE Trend (proportion [%] per year) in ODEP rating femur component in primary total hip arthroplasties in the Netherlands in 2014-2022

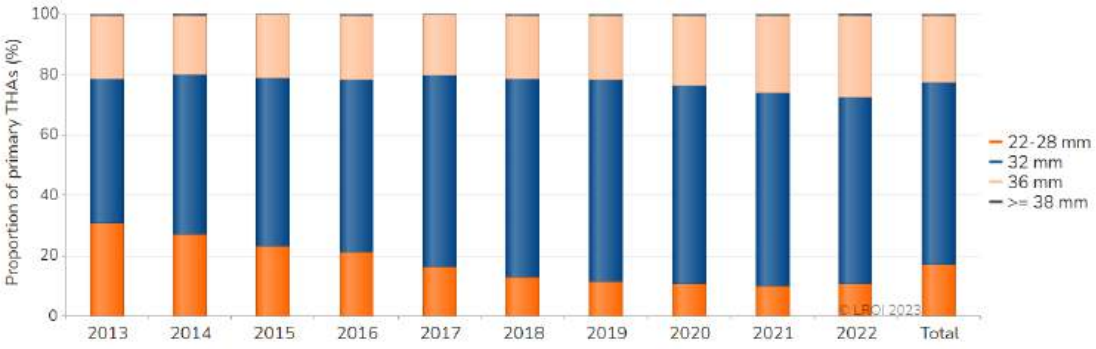


Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
ODEP rating (%)										
15A+15A*	72.93	74.93	77.85	79.70	78.54	75.82	71.91	70.53	71.18	**74.79**
13A+13A*	16.66	15.11	14.07	11.54	8.72	7.27	5.71	4.01	2.98	**9.34**
10A+10A*	4.69	4.36	5.03	6.15	9.71	12.22	14.46	16.09	15.15	**9.93**
10B	0.32	0.31	0.34	0.33	0.43	0.43	0.48	0.44	0.52	**0.40**
7A+7A*	0.48	0.64	0.55	0.88	1.53	3.82	7.06	8.65	9.67	**3.84**
5A+5A*	1.31	1.09	0.33	0.09	0.16	0.03	0.01	0.01	0.15	**0.34**
ODEP <5A	3.60	3.55	1.82	1.31	0.91	0.41	0.37	0.27	0.36	**1.35**
Total (n):	**27,929**	**28,588**	**28,715**	**29,531**	**30,911**	**31,760**	**25,133**	**31,017**	**36,062**	269,646

Please note: More information on ODEP rating can be found on www.odep.org.uk.
THA: total hip arthroplasty.

Femoral head diameter

FIGURE Trend (proportion [%] per year) in femoral head component diameter in primary total hip arthroplasties in the Netherlands in 2013-2022

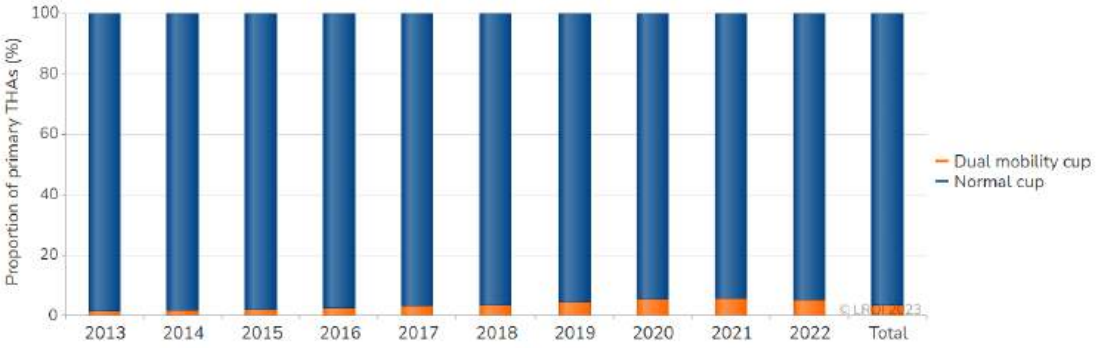


Femoral head size (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
22-28 mm	30.74	27.19	23.38	21.22	16.54	13.02	11.49	10.70	10.19	10.56	**17.11**
32 mm	47.81	52.86	55.57	57.00	63.03	65.53	66.65	65.48	63.76	61.98	**60.23**
36 mm	21.12	19.66	20.83	21.48	20.15	21.10	21.52	23.44	25.72	27.08	**22.34**
>= 38 mm	0.33	0.30	0.22	0.30	0.28	0.34	0.34	0.37	0.33	0.39	**0.32**
Total (n):	**25,914**	**27,882**	**28,618**	**28,780**	**29,492**	**30,810**	**31,555**	**25,206**	**31,016**	**36,073**	**295,346**

THA: total hip arthroplasty.

Dual mobility

FIGURE Trend (proportion [%] per year) in type of acetabulum component in primary total hip arthroplasties in the Netherlands in 2013-2022

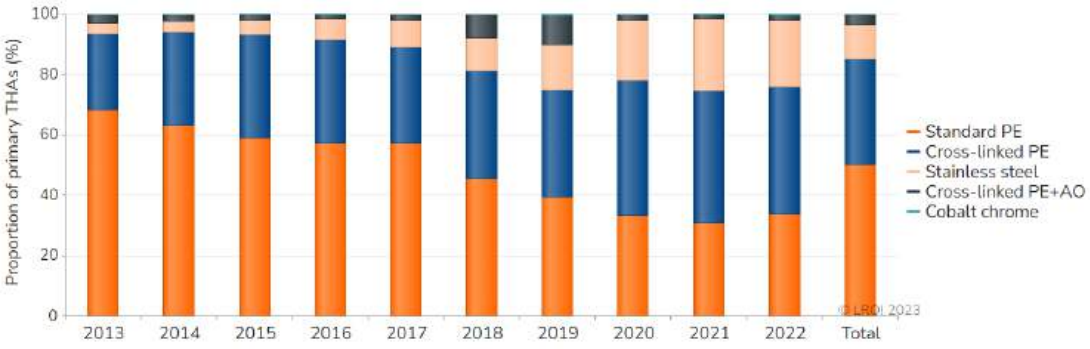


Type of acetabulum component (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Dual mobility cup	1.43	1.73	1.94	2.59	3.17	3.47	4.26	5.47	5.78	5.18	**3.57**
Normal cup	98.57	98.27	98.06	97.41	96.83	96.53	95.74	94.53	94.22	94.82	**96.43**
Total (n):	**26,042**	**28,008**	**28,709**	**28,951**	**29,668**	**31,004**	**31,977**	**25,803**	**31,249**	**36,255**	**297,666**

THA: total hip arthroplasty.

Cemented acetabular component

FIGURE Trend (proportion [%] per year) in cemented acetabulum material in primary total hip arthroplasties in the Netherlands in 2013-2022



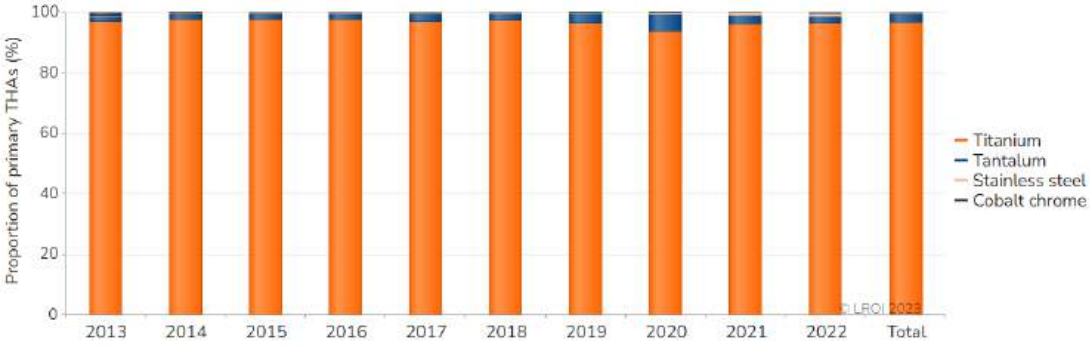
Cemented acetabulum material (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Standard PE	68.34	63.09	58.96	57.32	57.27	45.39	39.50	33.33	30.75	33.80	**49.93**
Cross-linked PE	25.31	30.89	34.29	34.19	31.54	35.71	35.28	44.63	43.80	42.17	**35.29**
Stainless steel	3.28	3.65	4.68	7.02	9.14	11.09	14.94	19.74	23.82	21.85	**11.26**
Cross-linked PE+AO	3.00	2.14	1.91	1.25	1.82	7.59	9.97	2.11	1.44	1.85	**3.30**
Cobalt chrome	0.07	0.22	0.17	0.23	0.22	0.22	0.32	0.19	0.20	0.34	**0.22**
Total (n):	**8,421**	**9,358**	**8,918**	**8,875**	**8,468**	**8,266**	**8,008**	**6,252**	**6,966**	**7,956**	**81,488**

Please note: Titanium was used in 10 (0.01%) primary THAs in 2013-2022.
Please note: Stainless steel was used in cemented dual mobility cups.
THA: total hip arthroplasty; PE: polyethylene; AO: antioxidant.

Uncemented acetabular component

FIGURE Trend (proportion [%] per year) in uncemented acetabulum material in primary total hip arthroplasties in the Netherlands in 2013-2022



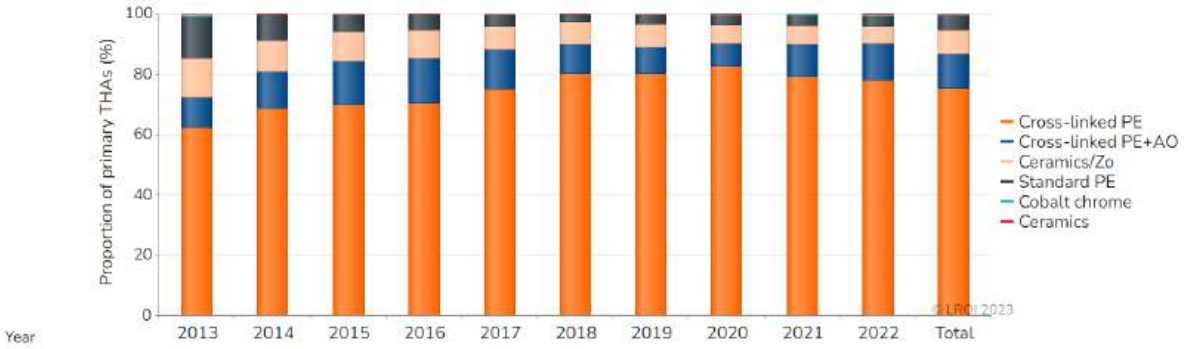
Uncemented acetabulum material (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Titanium	96.94	97.53	97.61	97.54	97.05	97.31	96.47	93.88	96.15	96.39	**96.67**
Tantalum	1.85	1.87	1.73	1.97	2.23	2.23	2.97	5.33	2.96	2.22	**2.54**
Stainless steel	0.26	0.26	0.29	0.27	0.38	0.26	0.40	0.70	0.78	0.83	**0.46**
Cobalt chrome	0.95	0.34	0.36	0.21	0.34	0.19	0.17	0.10	0.11	0.56	**0.33**
Total (n):	**17,620**	**18,649**	**19,790**	**20,076**	**21,200**	**22,738**	**23,963**	**19,547**	**24,276**	**28,283**	**216,142**

THA: total hip arthroplasty.

Inlay

FIGURE Trend (proportion [%] per year) in inlay material in primary total hip arthroplasties in the Netherlands in 2013-2022

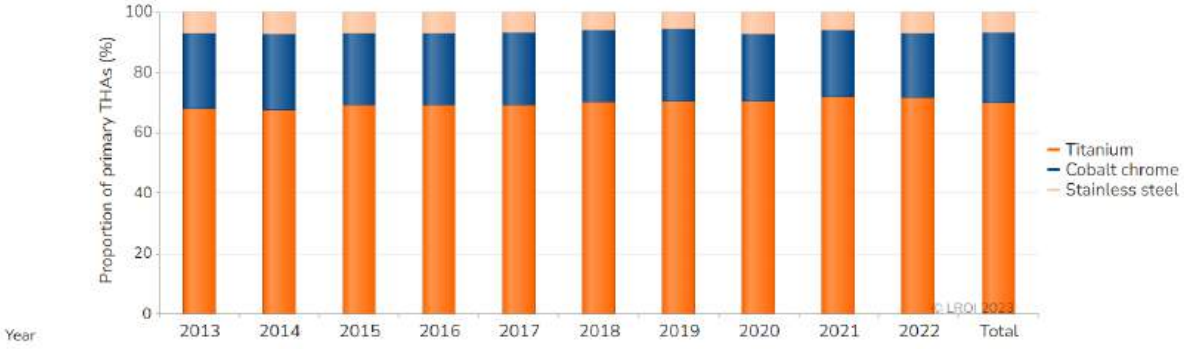


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Inlay material (%)											
Cross-linked PE	62.32	68.64	69.95	70.52	75.23	80.27	80.32	82.62	79.27	78.06	**75.39**
Cross-linked PE+AO	10.25	12.14	14.38	15.07	13.21	9.87	8.57	7.68	10.87	12.26	**11.38**
Ceramics/Zo	12.80	10.51	9.81	9.18	7.34	7.15	7.76	6.13	6.02	5.62	**7.96**
Standard PE	13.49	8.50	5.60	5.15	4.08	2.62	3.14	3.25	3.45	3.22	**4.89**
Cobalt chrome	0.94	0.15	0.14	0.05	0.11	0.08	0.19	0.31	0.40	0.56	**0.29**
Ceramics	0.20	0.06	0.12	0.03	0.02	0.01	0.02	0.02	0.00	0.29	**0.08**
Total (n):	**16,183**	**17,337**	**18,511**	**19,074**	**20,545**	**22,163**	**23,419**	**18,857**	**24,150**	**27,319**	**207,558**

THA: total hip arthroplasty; PE: polyethylene; AO: antioxidant; Zo: Oxidized Zirconium.

Femur component

FIGURE Trend (proportion [%] per year) in femur component material in primary total hip arthroplasties in the Netherlands in 2013-2022

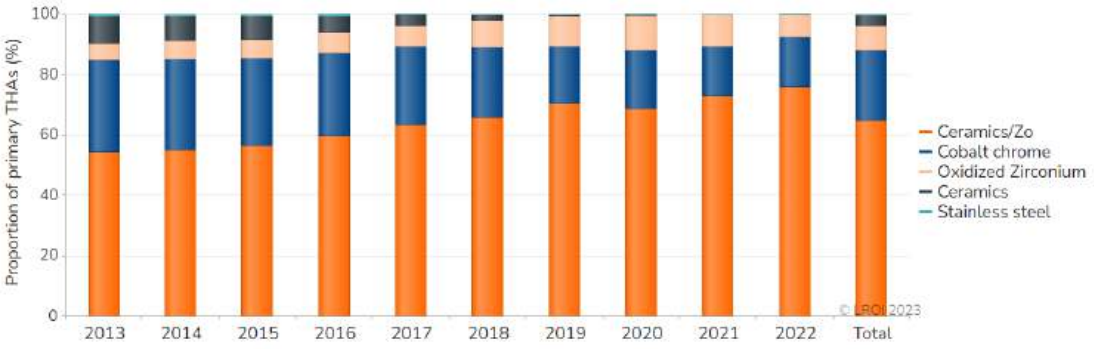


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Femur material (%)											
Titanium	67.80	67.65	69.46	69.27	69.34	70.19	70.54	70.53	71.93	71.67	**69.93**
Cobalt chrome	25.27	25.06	23.50	23.60	23.89	23.94	23.71	22.12	22.10	21.40	**23.40**
Stainless steel	6.94	7.29	7.04	7.12	6.77	5.87	5.75	7.35	5.96	6.93	**6.67**
Total (n):	**25,937**	**27,929**	**28,586**	**28,715**	**29,531**	**30,909**	**31,759**	**25,133**	**31,016**	**36,061**	**295,576**

THA: total hip arthroplasty.

Femoral head component

FIGURE Trend (proportion [%] per year) in femoral head material in primary total hip arthroplasties in the Netherlands in 2013-2022



Femoral head material (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Ceramics/Zo	54.30	54.91	56.47	59.65	63.21	65.99	70.61	68.66	72.82	75.85	**64.74**
Cobalt chrome	30.45	30.39	29.11	27.47	26.04	22.90	18.51	19.46	16.36	16.56	**23.41**
Oxidized Zirconium	5.74	6.03	6.03	6.79	6.80	8.95	10.06	11.57	10.67	7.57	**8.04**
Ceramics	8.82	8.01	7.69	5.39	3.69	2.07	0.72	0.23	0.09	0.01	**3.49**
Stainless steel	0.70	0.66	0.70	0.71	0.27	0.08	0.10	0.09	0.06	0.02	**0.32**
Total (n):	**25,915**	**27,875**	**28,618**	**28,780**	**29,489**	**30,812**	**31,557**	**25,205**	**31,010**	**36,073**	**295,334**

Please note: A titanium femoral head was used in 14 (<0.01%) primary THAs in 2013-2022. A standard PE femoral head was used in 7 (<0.01%) primary THAs in 2013-2022.
THA: total hip arthroplasty; PE: polyethylene; Zo: Oxidized Zirconium.

Articulation

FIGURE Trend (proportion [%] per year) in articulation in primary total hip arthroplasties in the Netherlands in 2013-2022

Articulation (%)

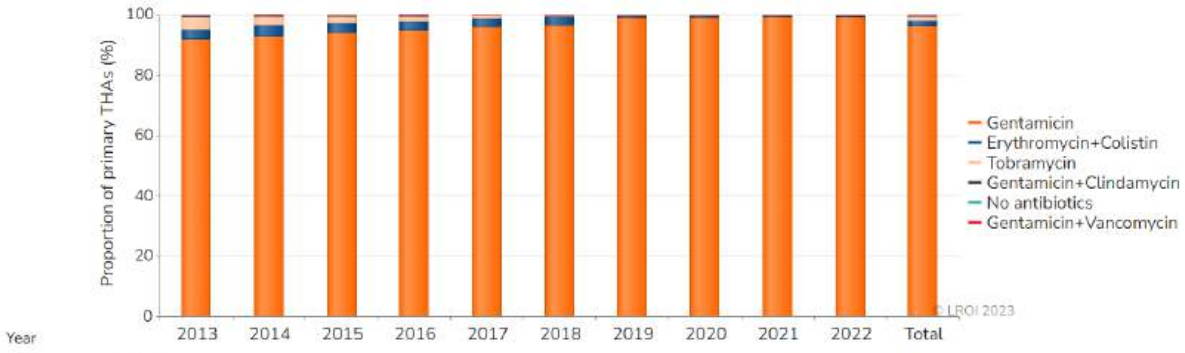
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
CoP	54.26	55.73	57.46	58.73	61.73	63.20	65.38	63.98	68.55	71.59	**62.44**
MoP	30.88	31.40	29.92	28.23	26.23	22.69	18.56	19.45	15.68	15.70	**23.54**
ZoP	5.79	6.10	6.07	6.84	6.81	8.83	10.09	11.72	10.74	7.67	**8.08**
CoC	8.46	6.73	6.50	6.18	5.16	5.22	5.82	4.62	4.72	4.62	**5.75**
MoM	0.59	0.03	0.04	0.02	0.05	0.04	0.12	0.17	0.11	0.13	**0.12**
CoM	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.06	0.20	0.30	**0.07**
Total (n):	**25,389**	**27,329**	**28,154**	**28,352**	**29,135**	**30,303**	**31,039**	**24,633**	**30,399**	**34,761**	**289,494**

THA: total hip arthroplasty; CoP: Ceramics-on-polyethylene; MoP: Metal-on-polyethylene; CoC: Ceramics-on-ceramics; ZoP: Oxidized Zirconium-on-polyethylene; MoM: Metal-on-Metal; CoM: Ceramics-on-Metal; MoC: Metal-on-ceramics.
Please note: MoC was used in 4 (<0.01%) primary THAs in 2013-2022.

Bone cement

Antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in primary total hip arthroplasties in the Netherlands in 2013-2022



Bone cement antibiotics (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gentamicin	92.20	93.00	94.03	94.94	96.13	96.61	99.00	98.69	99.20	99.37	**96.28**
Erythromycin+Colistin	3.05	3.65	3.21	2.87	2.63	2.76	0.47	0.41	0.14	0.07	**1.96**
Tobramycin	4.05	2.86	2.31	1.85	0.98	0.32	0.17	0.13	0.04	0.20	**1.31**
Gentamicin+Clindamycin	0.33	0.28	0.36	0.29	0.22	0.26	0.25	0.50	0.44	0.30	**0.32**
No antibiotics	0.33	0.20	0.07	0.01	0.02	0.00	0.01	0.01	0.05	0.01	**0.07**
Gentamicin+Vancomycin	0.03	0.01	0.01	0.04	0.02	0.05	0.10	0.26	0.12	0.04	**0.06**
Total (n):	**9,401**	**10,249**	**9,869**	**9,746**	**9,901**	**9,676**	**9,696**	**7,813**	**9,114**	**10,869**	**96,334**

THA: total hip arthroplasty.

Viscosity

FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary total hip arthroplasties in the Netherlands in 2013-2022

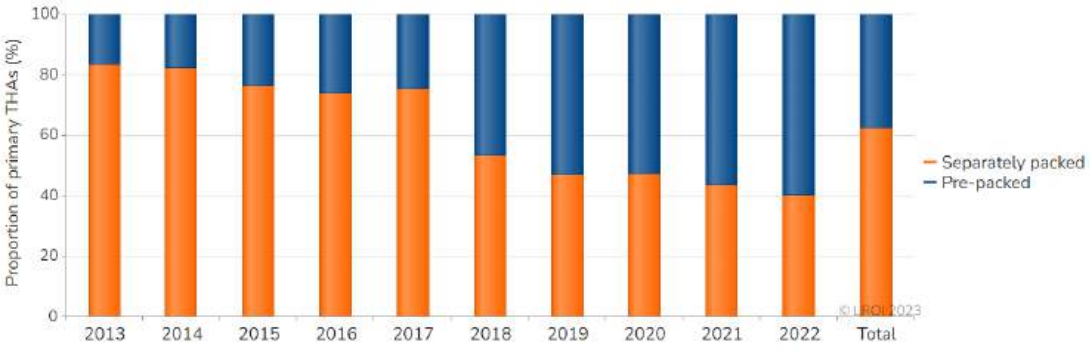
Bone cement viscosity (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
High	87.54	88.43	90.64	92.05	93.84	94.05	95.68	95.98	96.85	97.52	**93.22**
Medium	12.45	11.56	9.36	7.95	6.15	5.95	4.32	4.02	3.13	2.48	**6.78**
Low	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	**0.01**
Total (n):	**9,401**	**10,249**	**9,869**	**9,746**	**9,901**	**9,676**	**9,696**	**7,813**	**9,114**	**10,869**	**96,334**

THA: total hip arthroplasty.

Vacuum mixing system

FIGURE Trend (proportion [%] per year) in use of bone cement pre-packed in a vacuum mixing system in primary total hip arthroplasties in the Netherlands in 2013-2022



Vacuum mixing system (%)											
Separately packed	83.35	82.32	76.23	74.01	75.26	53.32	46.81	47.15	43.54	40.20	**62.47**
Pre-packed	16.65	17.68	23.77	25.99	24.74	46.68	53.19	52.85	56.46	59.80	**37.53**
Total (n):	**9,401**	**10,249**	**9,869**	**9,746**	**9,901**	**9,676**	**9,696**	**7,813**	**9,114**	**10,869**	**96,334**

THA: total hip arthroplasty; Separately packed: separately packed bone cement components; Pre-packed: bone cement pre-packed in a vacuum mixing system.

Most frequently registered

Components acetabulum

TABLE The most frequently registered acetabulum (both cemented and uncemented) components in primary total hip arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Acetabulum cemented (n)	**8,332**	**8,064**	**6,345**	**7,087**	**8,250**
Acetabulum name; Proportion (%)					
Avantage Cemented	9.6	12.9	16.4	19.5	17.4
Muller low profile Durasul	16.3	15.9	15.4	18.7	16.0
IP Cup	14.4	14.5	13.5	13.0	12.6
FAL Cup	10.1	11.1	7.1	6.7	11.7
Marathon	2.8	3.0	10.8	8.7	8.7
Exeter Rimfit X3	8.4	8.4	9.2	6.6	7.3
CCB cup Low Profile	3.1	1.8	5.0	4.7	4.5
IP Cup X-Linked	2.6	2.9	2.5	3.3	3.7
Reflection All Poly XLPE	4.2	3.8	3.3	3.2	2.3
Polarcup cemented	0.8	1.4	2.4	2.6	2.3

Year	2018	2019	2020	2021	2022
Acetabulum uncemented (n)	**22,457**	**23,621**	**19,206**	**23,860**	**27,736**
Acetabulum name; Proportion (%)					
Allofit	32.6	35.7	32.0	34.9	37.6
Pinnacle	21.6	19.8	19.5	20.5	19.4
G7 PPS	0.0	0.0	1.3	5.8	9.3
R3	11.3	13.0	14.4	13.3	8.9
Trident	6.6	6.9	7.7	8.9	7.3
RM Pressfit Vitamys cup	2.9	3.5	4.3	3.7	3.7
Trident Tritanium	3.0	3.5	3.5	0.6	2.5
Pinnacle Gription	0.8	0.9	2.4	2.2	2.4
Continuum	2.2	2.9	5.1	2.9	2.1
Delta-TT	1.6	1.8	1.6	1.5	1.7

Components femur

TABLE The most frequently registered femur (both cemented and uncemented) components in primary total hip arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Femur cemented (n)	**9,241**	**9,269**	**7,305**	**8,589**	**10,172**
Femur name; Proportion (%)					
Lubinus SPII	37.1	37.4	33.8	34.5	36.7
Original ME Muller	25.5	27.0	27.8	28.3	28.7
Exeter	12.5	11.7	12.5	9.5	9.0
Taperloc Hip Cemented CoCr	1.5	1.5	2.7	6.2	6.3
C-Stem AMT	2.7	2.4	6.7	5.8	5.6
Twinsys stem Cemented	1.5	1.9	1.9	1.3	3.5
CPT	0.1	1.3	1.6	3.7	3.2
Spectron EF	5.3	4.0	2.8	2.7	1.9
Stanmore	8.5	8.5	2.1	0.7	1.5
Corail Cemented	0.2	0.3	0.2	0.7	0.6

Year	2018	2019	2020	2021	2022
Femur uncemented (n)	**21,456**	**22,198**	**17,582**	**22,126**	**25,626**
Femur name; Proportion (%)					
Taperloc Complete	28.9	32.3	27.1	30.6	31.5
Corail	22.1	19.9	20.3	20.1	19.4
Accolade II	1.0	3.9	7.8	10.0	11.2
Polarstem	10.1	13.1	14.6	13.7	10.1
Avenir Muller	0.1	0.0	1.2	2.2	5.2
Fitmore	0.2	1.2	1.9	4.2	3.6
Corail AMT	1.2	1.7	2.4	3.3	3.6
Twinsys stem Cementless	4.4	4.7	4.2	3.5	3.4
M/L Taper	2.4	2.6	3.2	2.1	2.3
CLS Spotorno	4.1	3.3	3.2	2.2	2.2

Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during primary total hip arthroplasties in the Netherlands in 2018-2022

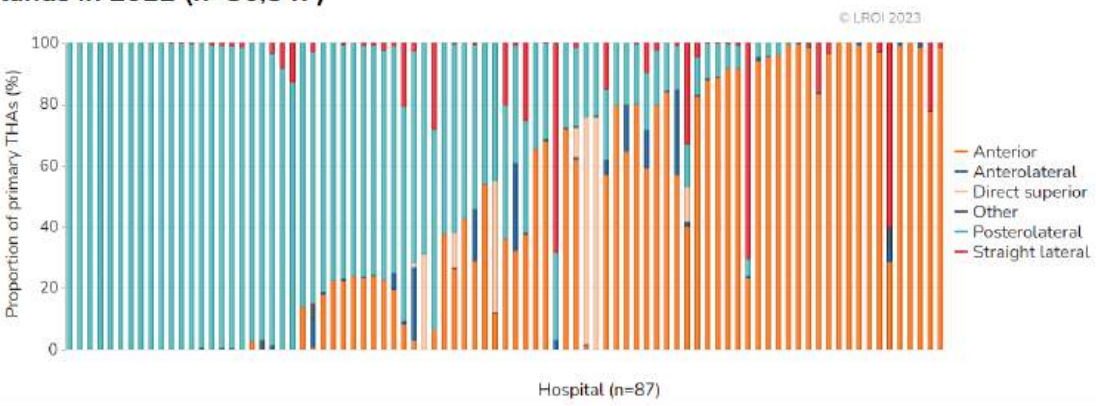
Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**4,504**	**5,120**	**4,100**	**5,097**	**6,434**
Cement name; Proportion (%)					
Palacos R+G	45.0	47.3	51.2	50.9	58.9
Refobacin Bone Cement R	50.2	46.9	41.3	43.5	34.9
Refobacin Plus Bone Cement	4.8	5.8	7.4	5.6	6.2

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**5,135**	**4,509**	**3,660**	**3,941**	**4,329**
Cement name; Proportion (%)					
Palacos R+G	83.6	86.5	82.6	87.5	88.8
Palacos MV+G	4.6	5.0	4.2	3.7	4.3
Refobacin Bone Cement R	2.3	3.2	7.2	3.8	4.2
Subiton G	0.7	2.9	3.2	2.5	1.2
Copal G+C	0.4	0.3	0.6	0.8	0.6

Practice variation

Surgical approach

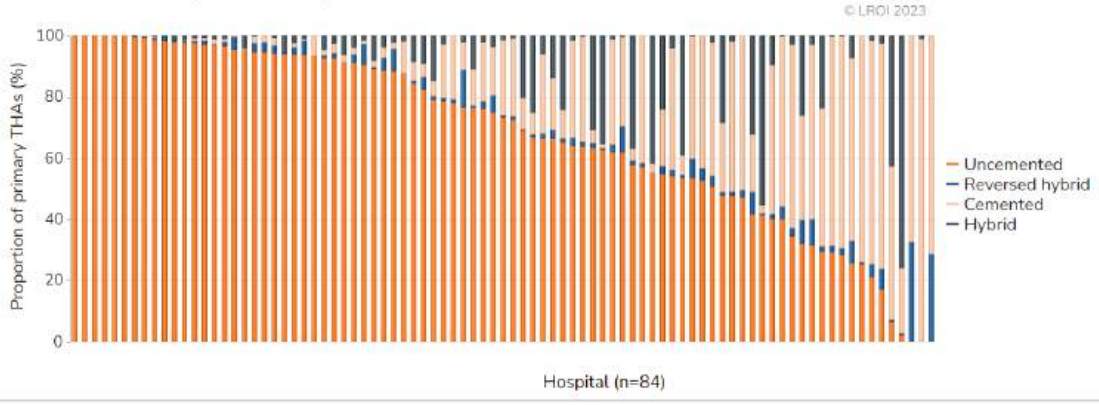
FIGURE Distribution of surgical approach used during primary total hip arthroplasties per hospital in the Netherlands in 2022 (n=36,547)



THA: total hip arthroplasty.

Fixation

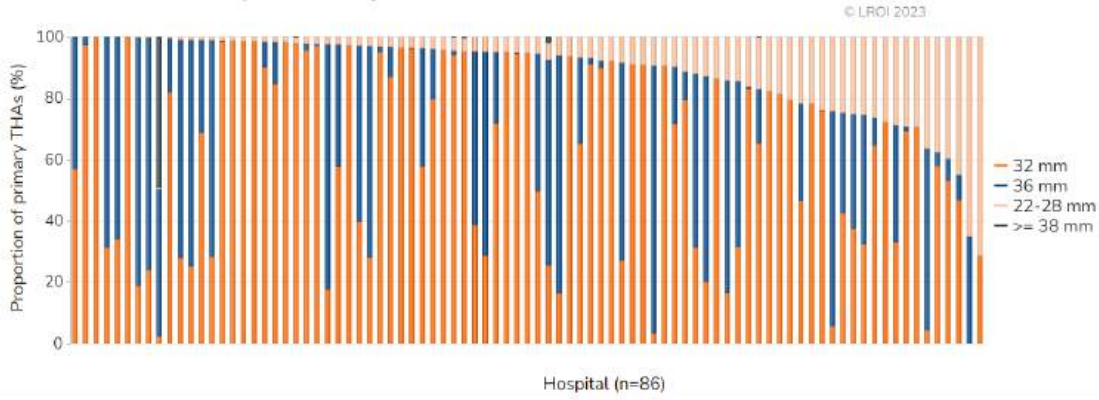
FIGURE Distribution of type of fixation used during primary total hip arthroplasties per hospital in the Netherlands in 2022 (n=36,530)



THA: total hip arthroplasty.

Femoral head diameter

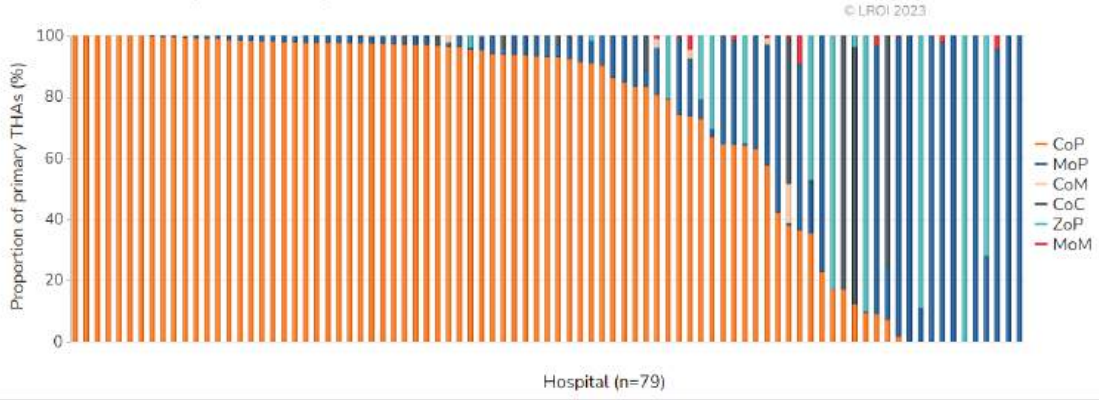
FIGURE Distribution of diameter femoral head used during primary total hip arthroplasties per hospital in the Netherlands in 2022 (n=36,067)



THA: total hip arthroplasty.

Articulation

FIGURE Distribution of articulation used during primary total hip arthroplasties per hospital in the Netherlands in 2022 (n=34,755)



THA: total hip arthroplasty; CoP: Ceramics-on-polyethylene; MoP: Metal-on-polyethylene; ZoP: Oxidized Zirconium-on-polyethylene; CoC: Ceramics-on-ceramics; MoM: Metal-on-Metal; CoM: Ceramics-on-Metal.

Hip hemiarthroplasty

Demographics

TABLE Patient characteristics of all patients with a primary hip hemiarthroplasty by specialism in the Netherlands in 2022

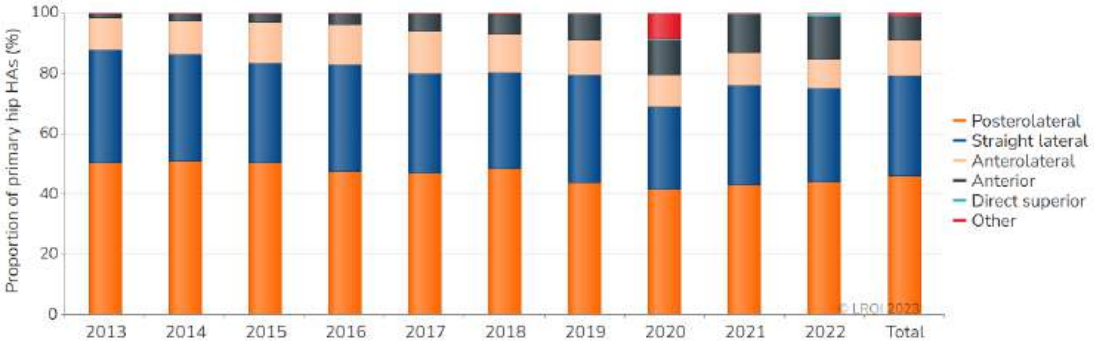
	Orthopaedic surgeon	Trauma surgeon	Total
N	4,317 (70.6%)	1,789 (29.4%)	6,077
Mean age (years) (SD)	81.1 (9.0)	82.0 (7.9)	81.3 (8.7)
Age (years) (%)			
<50	1	0	0
50-59	2	1	2
60-69	6	5	6
70-79	29	26	28
≥80	62	68	64
Gender (%)			
Men	36	38	37
Women	64	62	63
ASA score (%)			
I	1	1	1
II	28	24	27
III-IV	71	75	72
Type of hospital (%)			
General	97	96	97
Private	0	0	0
UMC	3	4	3
Diagnosis (%)			
Fracture (acute)	93	99	94
Osteoarthritis	4	0	3
Late post-traumatic	1	0	1
Tumour	1	1	1
Osteonecrosis	0	0	0
Dysplasia	0	0	0
Rheumatoid arthritis	0	0	0
Post-Perthes' disease	0	0	0
Inflammatory arthritis	0	0	0
Other	1	0	1
Charnley-score (%)			
A One hip joint affected	51	34	47
B1 Both hip joints affected	17	42	22
B2 Contralateral hip joint with a total hip prosthesis	24	16	23
C Multiple joints affected or chronic disease that affects quality of life	8	8	8
Mean Body Mass Index (kg/m²) (SD)	24.6 (4.4)	24.3 (3.7)	24.5 (4.2)
Body Mass Index (kg/m²) (%)			
Underweight (≤18.5)	5	5	5
Normal weight (>18.5-25)	55	57	55
Overweight (>25-30)	30	32	31
Obesity (>30-40)	9	6	8
Morbid obesity (>40)	1	0	1
Smoking (%)			
No	91	91	91
Yes	9	9	9

Please note: in 2022, 65 general hospitals, 7 UMCs and 7 private hospital performed primary hip hemiarthroplasties.
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

Surgical techniques

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary hip hemiarthroplasty in the Netherlands in 2013-2022

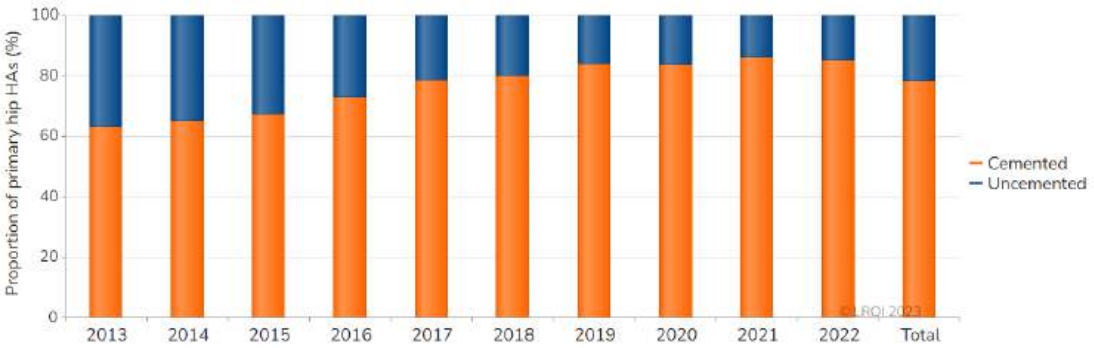


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Surgical approach (%)											
Posterolateral	50.48	50.99	50.27	47.37	46.88	48.27	43.76	41.45	42.76	44.00	**46.07**
Straight lateral	37.22	35.29	33.27	35.48	32.98	32.07	35.57	27.60	33.21	31.13	**33.02**
Anterolateral	10.81	11.08	13.58	13.40	13.83	12.64	11.67	10.40	10.85	9.53	**11.79**
Anterior	1.36	2.60	2.77	3.62	6.04	6.62	8.67	11.62	12.75	13.95	**7.69**
Direct superior	0.00	0.00	0.00	0.00	0.12	0.11	0.16	0.53	0.38	1.25	**0.29**
Other	0.13	0.03	0.11	0.13	0.15	0.29	0.17	8.39	0.05	0.13	**1.14**
Total (n):	**3,025**	**3,726**	**4,758**	**5,442**	**5,909**	**6,236**	**6,287**	**6,565**	**6,055**	**6,020**	**54,023**

HA: hemiarthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary hip hemiarthroplasties in the Netherlands in 2013-2022



Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Fixation (%)											
Cemented	62.94	64.98	67.38	72.69	78.57	80.04	83.92	83.73	86.13	85.30	**78.21**
Uncemented	37.06	35.02	32.62	27.31	21.43	19.96	16.08	16.27	13.87	14.70	**21.79**
Total (n):	**2,933**	**3,692**	**4,693**	**5,342**	**5,809**	**6,106**	**6,188**	**6,378**	**6,063**	**5,974**	**53,178**

HA: hemiarthroplasty.

Most frequently registered

Components

TABLE The most frequently registered femur and femoral head components in primary hip hemiarthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Femur component (n)	**5,997**	**5,913**	**6,079**	**5,894**	**5,700**
Name; Proportion (%)					
Original ME Muller	24.3	28.2	28.3	25.0	25.4
Lubinus SPII	18.8	20.8	18.6	19.7	24.5
C-Stem AMT	4.1	4.1	4.7	6.7	6.0
Spectron EF	7.8	7.4	7.6	9.4	5.8
CPT	0.0	0.1	0.1	4.5	5.2
Corail Cemented	2.0	2.2	1.7	3.0	4.6
CCA stem	8.6	6.5	10.0	8.5	3.5
EXETER	5.1	5.5	4.9	1.4	3.5
ACCOLADE II	0.0	0.9	2.5	2.8	3.0
Lubinus Classic Plus	0.0	1.7	2.7	3.1	3.0

Year	2018	2019	2020	2021	2022
Femoral head component (n)	**5,877**	**5,841**	**6,152**	**5,839**	**5,702**
Name; Proportion (%)					
Zimmerbiomet Unipolar Head	30.2	32.6	33.2	27.9	27.5
Link CoCr head	18.3	20.1	19.0	21.6	24.6
Modular Cathcard Unipolar head	10.0	9.6	9.9	13.4	13.6
Versys Endo	1.0	1.0	0.9	5.6	6.7
Stainless Steel head	9.5	7.9	10.9	9.3	5.8
UHR Unitrax	8.9	7.5	6.9	3.7	5.4
Smith & Nephew CoCr head	3.3	3.9	3.3	6.4	3.8
Smith & Nephew Uni-polar	7.1	6.0	5.9	4.1	2.4
ZimmerBiomet CoCr head	0.1	0.0	0.2	1.0	2.3
Link Modular trauma head	0.1	1.7	1.7	1.0	1.8

Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during primary hip hemiarthroplasties in the Netherlands in 2018-2022

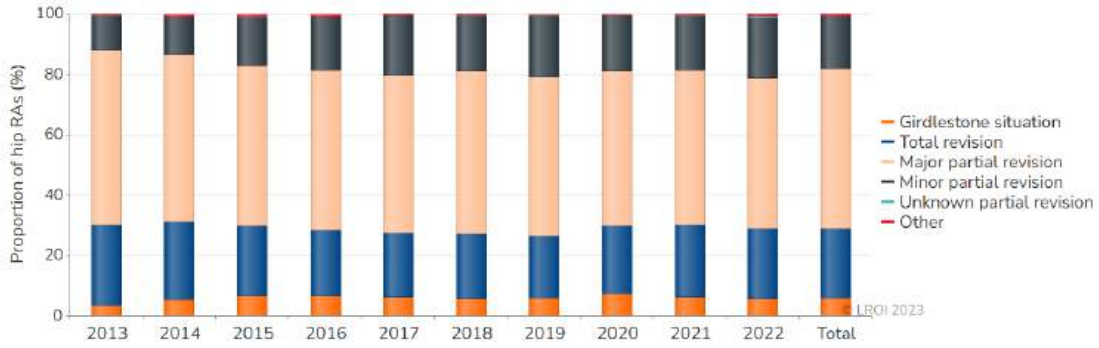
Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**2,189**	**2,541**	**2,569**	**2,892**	**2,937**
Cement name; Proportion (%)					
PALACOS R+G	49.7	42.8	48.3	48.9	49.3
Refobacin Bone Cement R	41.1	45.7	41.7	44.6	45.3
Refobacin Plus Bone Cement	9.2	11.5	10.0	6.4	5.5
Cemex Genta	0.0	0.0	0.0	0.1	0.0

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**1,901**	**1,667**	**1,710**	**1,585**	**1,475**
Cement name; Proportion (%)					
Palacos R+G	77.3	77.4	64.2	76.1	79.1
Copal G+C	0.9	5.9	7.2	10.9	11.5
Palacos MV+G	3.7	5.2	4.8	6.1	6.4
Refobacin Bone Cement R	3.6	3.4	16.4	1.1	1.2
Subiton G	1.6	3.7	4.7	4.5	0.9

Hip revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in hip revision arthroplasties in the Netherlands in 2013-2022



Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Type of revision (%)											
Girdlestone situation	3.46	5.47	6.74	6.53	6.32	5.87	5.92	7.51	6.32	5.67	**5.99**
Total revision	26.62	25.82	23.19	21.95	21.17	21.45	20.63	22.48	23.94	23.28	**22.99**
Major partial revision	58.01	55.30	53.07	52.85	52.18	53.96	52.55	51.07	51.25	49.90	**53.00**
Minor partial revision	11.33	12.34	15.77	17.55	19.87	18.07	20.16	18.42	17.87	19.82	**17.18**
Unknown partial revision	0.15	0.03	0.08	0.10	0.08	0.23	0.24	0.03	0.11	0.61	**0.17**
Other	0.44	1.04	1.15	1.01	0.39	0.42	0.50	0.49	0.51	0.73	**0.67**
Total (n):	**3,441**	**3,548**	**3,812**	**3,858**	**3,860**	**3,836**	**3,819**	**3,448**	**3,559**	**3,583**	**36,764**

RA: revision arthroplasty.
Major partial revision: revision of at least acetabulum or femur component.
Minor partial revision: only inlay and/or femoral head exchange (including DAIR procedures).
Unknown partial revision: partial revision of which the revised components were unknown.

In 1,120 (63%) major partial hip revision arthroplasties the acetabulum component was revised and in 668 (37%) major partial revision arthroplasties the femur component was revised in 2022.

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a hip revision arthroplasty in the Netherlands in 2014-2022

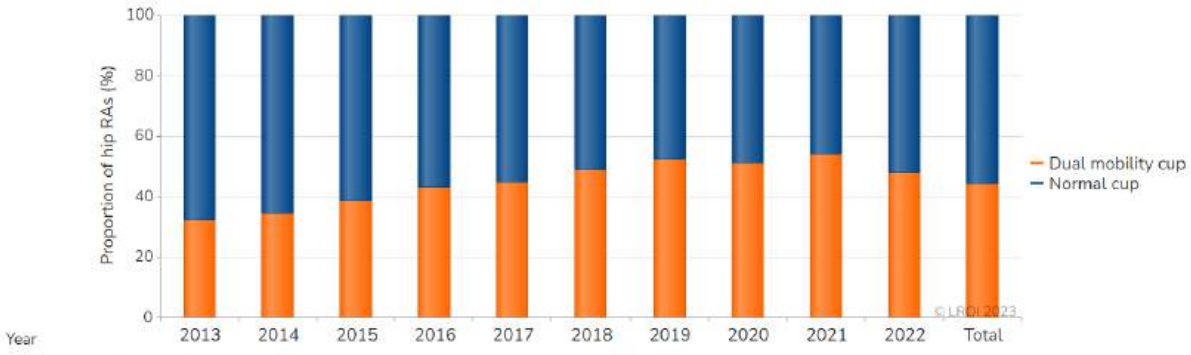
Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Hip revision arthroplasty (n)	3,583	3,834	3,883	3,871	3,843	3,835	3,466	3,563	3,592	33,470
Reasons for revision: Proportion[1] (%)										
Loosening of acetabulum component	26.4	24.8	22.3	21.8	21.1	20.6	18.5	16.8	18.3	21.2
Infection	12.3	17.9	19.4	21.2	20.7	22.7	25.0	25.3	23.9	20.9
Dislocation	19.1	19.9	19.4	17.8	18.9	18.5	17.6	18.9	17.4	18.6
Loosening of femur component	20.9	19.5	18.8	18.2	19.2	17.2	17.0	17.1	15.6	18.2
Inlay wear	20.1	19.6	18.3	18.2	16.0	15.8	13.4	13.1	13.1	16.5
Peri-prosthetic fracture	11.7	11.4	12.5	14.7	14.4	14.5	17.1	16.2	17.0	14.3
Girdlestone situation	6.4	5.7	6.1	5.2	4.8	4.5	4.3	4.9	4.2	5.1
Symptomatic MoM bearing	5.8	4.6	3.9	2.7	2.7	2.8	2.6	2.3	2.3	3.3
Peri-articular ossification	2.6	2.0	2.3	1.5	1.3	1.1	1.2	1.2	1.0	1.6
Other	11.6	11.3	10.6	10.1	11.3	12.8	10.8	11.8	10.4	11.2

[1] One patient may have more than one reason for revision. As such, the total proportion is over 100%.

Surgical techniques

Dual mobility

FIGURE Trend (proportion [%] per year) in type of acetabulum component in hip revision arthroplasties in the Netherlands in 2013-2022

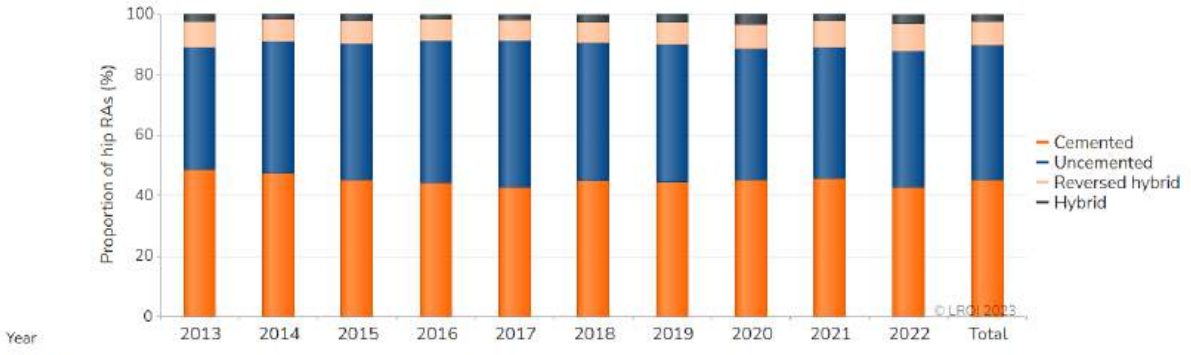


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Type of acetabulum component (%)											
Dual mobility cup	32.17	34.53	38.54	43.29	44.91	48.83	52.36	51.22	54.02	48.13	**44.46**
Normal cup	67.83	65.47	61.46	56.71	55.09	51.17	47.64	48.78	45.98	51.87	**55.54**
Total (n):	**2,288**	**2,346**	**2,418**	**2,347**	**2,182**	**2,222**	**2,162**	**1,931**	**2,112**	**2,005**	**22,013**

RA: revision arthroplasty

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in hip revision arthroplasties in the Netherlands in 2013-2022

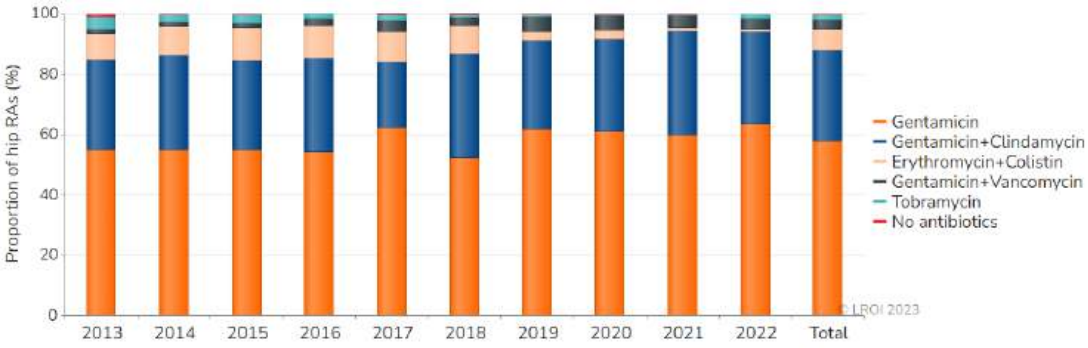


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Fixation (%)											
Cemented	48.53	47.59	45.28	44.24	42.82	44.90	44.55	45.08	45.76	43.01	**45.14**
Uncemented	40.30	43.29	45.02	46.87	48.47	45.83	45.55	43.69	43.24	44.64	**44.76**
Reversed hybrid	8.67	7.57	7.51	7.34	6.73	6.61	7.31	7.88	8.80	9.28	**7.74**
Hybrid	2.51	1.56	2.20	1.55	1.98	2.66	2.60	3.36	2.21	3.07	**2.36**
Total (n):	**3,231**	**3,278**	**3,461**	**3,542**	**3,536**	**3,572**	**3,502**	**3,097**	**3,263**	**3,318**	**33,800**

RA: revision arthroplasty

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in hip revision arthroplasties in the Netherlands in 2013-2022



Bone cement antibiotics (%)											
Gentamicin	54.91	54.97	55.09	54.35	62.35	52.47	61.79	61.13	59.82	63.69	**57.81**
Gentamicin+Clindamycin	29.97	31.37	29.54	31.12	21.78	34.53	29.43	30.71	34.58	30.34	**30.39**
Erythromycin+Colistin	8.77	9.37	10.98	10.51	10.03	9.00	2.99	2.98	1.16	1.07	**6.89**
Gentamicin+Vancomycin	1.43	1.60	1.37	2.34	3.72	2.71	4.81	4.61	4.06	3.29	**2.91**
Tobramycin	4.03	2.57	2.90	1.69	2.06	1.18	0.91	0.50	0.32	1.61	**1.84**
No antibiotics	0.88	0.11	0.11	0.00	0.07	0.12	0.06	0.07	0.06	0.00	**0.16**
Total (n):	**1,812**	**1,750**	**1,757**	**1,713**	**1,506**	**1,700**	**1,641**	**1,410**	**1,553**	**1,490**	**16,332**

RA: revision arthroplasty.

Most frequently registered

Most frequently registered acetabulum components

TABLE The most frequently registered acetabulum (both cemented and uncemented) components in hip revision arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Acetabulum cemented (n)	**1,421**	**1,396**	**1,208**	**1,411**	**1,335**
Acetabulum name; Proportion (%)					
Avantage Cemented	53.4	54.2	56.5	60.2	52.5
Polarcup cemented	12.0	14.4	14.7	11.3	12.5
Trabecular Metal	1.3	3.1	5.5	6.4	8.5
Bi-Mentum Cemented Cups	0.0	0.0	0.2	5.0	5.2
BiMobile DM	0.1	0.4	1.2	1.6	3.4
Exeter Rimfot X3	6.4	4.0	2.9	2.6	2.6
DS Evolution	2.9	1.9	2.2	2.8	2.3
FAL Cup	2.8	2.7	0.9	0.9	2.2
Muller low profile Durasul	3.0	1.6	2.1	1.1	1.4
Marathon	1.8	1.6	1.7	1.3	1.4

Year	2018	2019	2020	2021	2022
Acetabulum uncemented (n)	**546**	**508**	**428**	**447**	**440**
Acetabulum name; Proportion (%)					
Continuum	23.4	17.5	22.2	16.3	13.0
Allofit	8.4	8.9	6.5	11.0	9.5
G7 OsseoTi	0.0	0.0	0.2	3.4	9.1
Delta-One TT	11.2	11.0	11.7	10.5	8.6
Avantage Reload	5.5	4.9	10.0	7.6	7.0
G7 PPS	0.0	0.0	0.0	2.0	3.9
DS Evolution	1.5	1.6	1.2	2.7	3.6
Trident	10.8	10.0	7.7	6.9	3.6
Redapt	0.2	0.4	2.6	2.9	3.4
Avantage Cemented	1.6	3.3	2.8	4.3	3.0

Most frequently registered femur components

TABLE The most frequently registered femur (both cemented and uncemented) components in hip revision arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Femur cemented (n)	**663**	**635**	**602**	**616**	**585**
Femur name; Proportion (%)					
Lubinus SPII	25.9	26.8	21.4	22.7	27.0
Exeter	30.8	20.9	24.4	21.1	22.4
Original ME Muller	9.5	10.4	10.8	6.8	10.4
CPT	0.8	6.0	6.6	11.2	5.3
Spectron EF	9.5	7.6	7.3	4.9	4.8
C-Stem AMT	2.7	1.9	4.5	4.2	4.6
C-Stem AMT Long	1.2	2.0	2.8	6.2	4.1
TAPERLOC Hip Cemented CoCr	0.2	0.5	1.0	2.8	3.2
MP Reconstruction Prosthesis	2.6	2.8	3.0	4.7	3.1
Twinsys stem Cemented	2.7	3.5	2.3	1.9	2.6

Year	2018	2019	2020	2021	2022
Femur uncemented (n)	**764**	**730**	**706**	**781**	**784**
Femur name; Proportion (%)					
Arcos	9.4	9.9	12.3	22.7	21.8
MP Reconstruction Prosthesis	10.7	13.4	12.9	18.8	16.3
Restoration Modular	20.3	21.9	17.4	10.5	12.9
Redapt	3.3	7.7	10.5	8.2	9.9
Revitan	9.4	7.8	10.1	6.1	4.3
Corail Revision	4.6	3.3	1.8	3.1	3.8
Alloclassic SLL	6.2	4.5	3.1	3.2	3.4
Taperloc Complete	3.1	1.5	3.0	2.9	3.3
Wagner SL	2.1	4.1	3.4	3.8	2.8
MRP-Titan	0.4	1.5	1.3	0.6	2.4

Most frequently registered types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during hip revision arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**337**	**470**	**460**	**575**	**561**
Cement name; Proportion (%)					
Palacos R+G	30.9	35.7	52.0	56.7	58.3
Refobacin Bone Cement R	62.6	54.3	40.7	36.5	35.5
Refobacin Plus Bone Cement	5.9	8.9	5.9	2.8	3.9
Refobacin Revision	0.6	1.1	1.5	4.0	2.3

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**1,330**	**1,140**	**900**	**911**	**866**
Cement name; Proportion (%)					
Palacos R+G	34.4	38.5	31.8	32.1	35.9
Copal G+C	29.2	28.3	29.7	35.3	29.4
Refobacin Bone Cement R	13.5	12.6	14.7	15.3	16.7
Copal G+V	1.4	5.1	6.0	6.5	5.4
Palacos MV+G	4.1	3.6	4.0	3.1	4.7

Survival total hip arthroplasty

Revision within 1 and 3 years

By type of revision within 1 year

TABLE Cumulative 1-year revision percentage of primary total hip arthroplasties by type of revision in the Netherlands in 2017-2021 (n=153,183)

	Cumulative 1-year revision percentage Kaplan Meier (95% CI)
Any type of revision[1]	1.8 (1.8-1.9)
Major revision[2]	1.0 (1.0-1.1)
Only acetabulum	0.3 (0.3-0.3)
Only femur	0.5 (0.4-0.5)
Acetabulum and femur	0.2 (0.2-0.2)
Minor revision[3]	0.8 (0.8-0.8)
DAIR	0.6 (0.5-0.6)
No DAIR	0.2 (0.2-0.3)

[1] Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
[2] Revision of at least the acetabulum or femur component.
[3] Only inlay and/or femoral head exchange (including DAIR procedures).
THA: total hip arthroplasty; CI: confidence interval.

In 2017-2021, 1,860 (1.2%) primary THAs were implanted in patients who died within one year after the primary procedure.

By type of revision within 3 year

TABLE Cumulative 3-year revision percentage of primary total hip arthroplasties by type of revision in the Netherlands in 2015-2019 (n=152,915)

	Cumulative 3-year revision percentage Kaplan Meier (95% CI)
Any type of revision[1]	2.7 (2.6-2.8)
Major revision[2]	1.8 (1.7-1.8)
Only acetabulum	0.7 (0.6-0.7)
Only femur	0.8 (0.7-0.8)
Acetabulum and femur	0.4 (0.4-0.4)
Minor revision[3]	0.9 (0.8-0.9)
DAIR	0.6 (0.5-0.6)
No DAIR	0.3 (0.3-0.3)

[1] Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
[2] Revision of at least the acetabulum or femur component.
[3] Only inlay and/or femoral head exchange (including DAIR procedures).
THA: total hip arthroplasty; CI: confidence interval.

In 2015-2019, 6,782 (4.4%) primary THAs were implanted in patients who died within three years after the primary procedure.

First major or minor revision

TABLE Cumulative 1-year first revision percentage of primary total hip arthroplasties by type of first major or minor revision in the Netherlands in 2017-2021 (n=153,183)

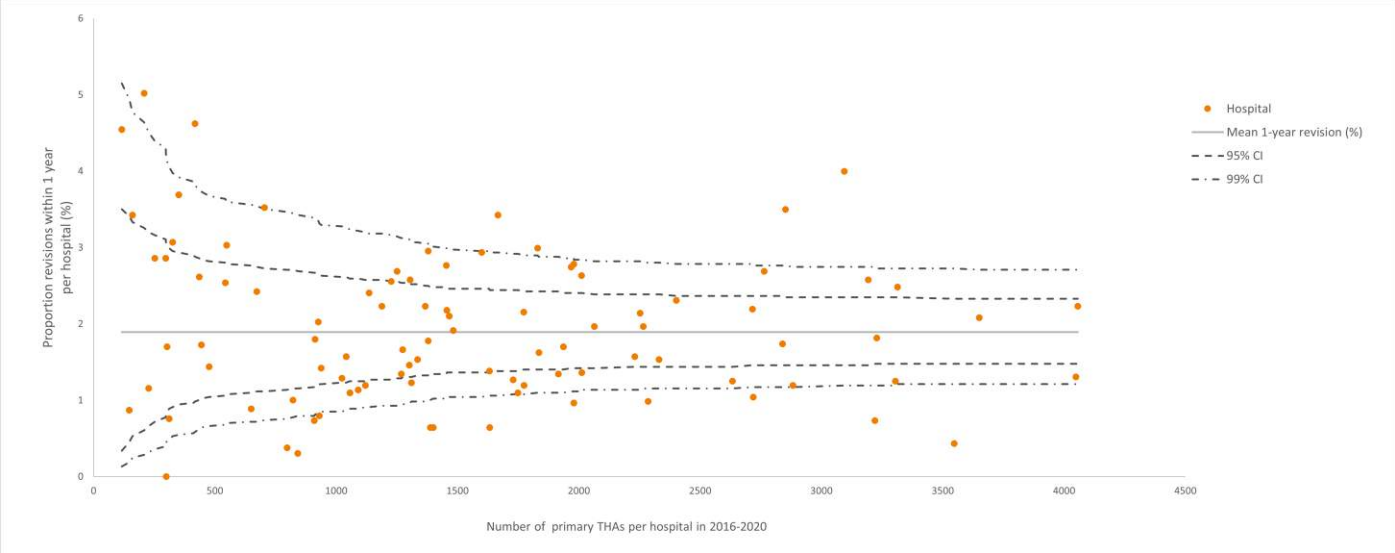
	Cumulative 1-year first revision percentage Kaplan Meier (95% CI)
First major revision[1]	1.1 (1-1.1)
Acetabulum	0.6 (0.6-0.7)
Femur	0.8 (0.7-0.8)
First minor revision[2]	0.8 (0.8-0.8)
Inlay	0.4 (0.3-0.4)
Femoral head	0.8 (0.7-0.8)

[1] First revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
[2] Only inlay and/or femoral head exchange (including DAIR procedures).
THA: total hip arthroplasty; CI: confidence interval.

In 2017-2021, 1,860 (1.2%) primary THAs were implanted in patients who died within one year after the primary procedure.

Overall revision per hospital

FIGURE Funnel plot of proportion of hip revision arthroplasties within one year after a total hip arthroplasty per hospital in the Netherlands in 2017-2021 (n=153,183)

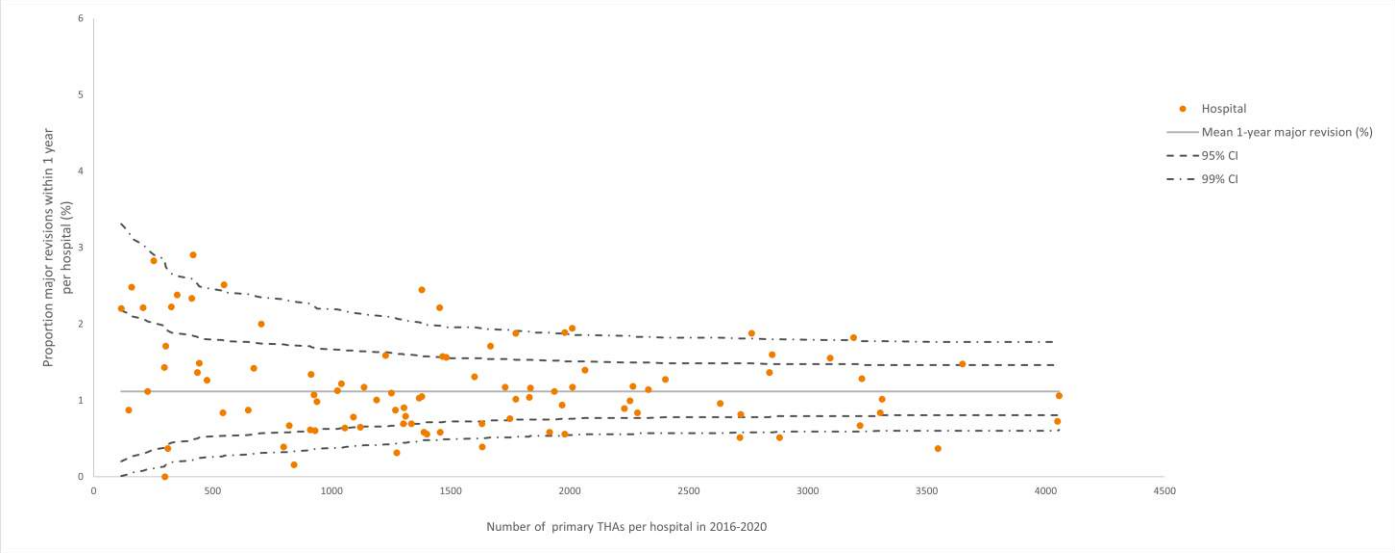


Please note: The proportions of revisions within 1 year per hospital were adjusted for casemix factors age, gender, ASA score, BMI, smoking, charnley score and diagnosis (osteoarthritis versus other).
THA: total hip arthroplasty; CL: control limits; CI: confidence interval.

The mean 1-year revision percentage is 1.8 (95% CI: 1.8-1.9) in the Netherlands in 2017-2021.
Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Major revision per hospital

FIGURE Funnel plot of proportion of hip major revision arthroplasties within one year after a total hip arthroplasty per hospital in the Netherlands in 2017-2021 (n=153,183)



Please note: Major revision is defined as revision of at least acetabulum or femur compenent.
Please note: The proportions of revisions within 1 year per hospital were adjusted for casemix factors age, gender, ASA score, BMI, smoking, charnley score and diagnosis (osteoarthritis versus other).
THA: total hip arthroplasty; CL: control limits; CI: confidence interval.

The mean 1-year major revision percentage is 1.0 (95% CI: 1.0-1.1) in the Netherlands in 2017-2021. Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Reasons for revision by type of revision

TABLE Reasons for revision within one year of primary total hip arthroplasties by type of revision in the Netherlands in 2017-2021

Reasons for revision	Major revision[1] (n=1,605) Proportion[4] (%)	Minor revision[2] (n=1,242) Proportion[4] (%)	Any type of revision[3] (n=2,877) Proportion[4] (%)
Infection	19.3	71.1	39.6
Dislocation	32.2	13.6	24.7
Peri-prosthetic fracture	29.7	1.7	18.3
Loosening of femur component	16.3	0.6	9.8
Loosening of acetabulum component	8.6	0.1	4.9
Girdlestone situation	3.1	0.0	1.4
Inlay wear	0.6	0.6	0.6
Peri-articular ossification	0.6	0.1	0.5
Symptomatic MoM bearing	0.0	0.0	0.0
Other	11.0	13.5	12.3

[1] First revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
[2] Only inlay and/or femoral head exchange (including DAIR procedures).
[3] Any type of revision includes all first revisions, including revision procedures that could not be classified as minor or major revision.
4 One patient may have more than one reason for revision. As such, the total proportion is over 100%.

Time after primary THA

TABLE Time after primary total hip arthroplasty until short-term revision in the Netherlands in 2015-2019 (n=152,915)

Time after primary THA	Percentage revisions (%)
Day 0-29	1.0
Day 30-182	0.7
Day 183-364	0.3
Day 365-730 (second year)	0.5
Day 731-1095 (third year)	0.3

THA: total hip arthroplasty.

Revision by patient characteristics

THA by patient province

FIGURE Cumulative major revision percentages of total hip arthroplasties for osteoarthritis by patient province in the Netherlands in 2014-2022 (n=236,338)

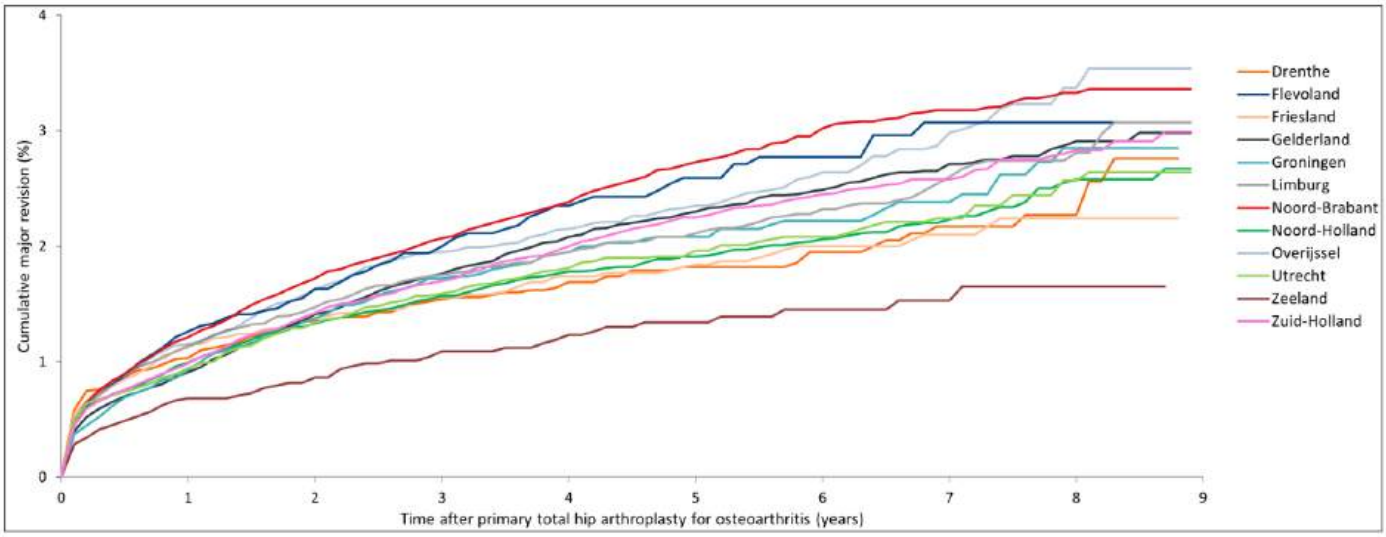


TABLE Cumulative major revision percentages

		Cumulative major revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Patient province						
Drenthe	8,567	1.0 (0.8-1.2)	1.5 (1.2-1.8)	1.8 (1.5-2.1)	2.2 (1.8-2.6)	2.8 (2.0-3.5)
Flevoland	4,830	1.2 (0.9-1.5)	1.9 (1.5-2.4)	2.6 (2.1-3.1)	3.1 (2.4-3.7)	3.1 (2.4-3.7)
Friesland	9,666	1.1 (0.9-1.3)	1.5 (1.3-1.8)	1.8 (1.5-2.1)	2.1 (1.7-2.5)	2.2 (1.8-2.6)
Gelderland	31,454	0.9 (0.8-1.0)	1.7 (1.6-1.9)	2.3 (2.1-2.5)	2.7 (2.4-2.9)	3.0 (2.7-3.3)
Groningen	8,173	0.9 (0.7-1.1)	1.7 (1.4-2.0)	2.1 (1.7-2.4)	2.4 (2.0-2.8)	2.9 (2.3-3.4)
Limburg	16,728	1.1 (0.9-1.3)	1.7 (1.5-2.0)	2.1 (1.8-2.3)	2.5 (2.2-2.9)	3.1 (2.6-3.5)
Noord-Brabant	36,923	1.2 (1.1-1.3)	2.0 (1.9-2.2)	2.7 (2.5-2.9)	3.2 (2.9-3.4)	3.4 (3.1-3.6)
Noord-Holland	36,387	1.0 (0.9-1.1)	1.5 (1.4-1.7)	1.9 (1.7-2.1)	2.2 (2.0-2.4)	2.7 (2.4-3.0)
Overijssel	15,533	1.1 (1.0-1.3)	1.9 (1.7-2.2)	2.3 (2.1-2.6)	2.9 (2.5-3.2)	3.5 (3.0-4.1)
Utrecht	17,059	0.9 (0.7-1.0)	1.6 (1.4-1.8)	1.9 (1.7-2.1)	2.2 (2.0-2.5)	2.6 (2.2-3.0)
Zeeland	5,668	0.7 (0.4-0.9)	1.0 (0.8-1.3)	1.3 (1.0-1.7)	1.5 (1.1-1.9)	1.7 (1.2-2.1)
Zuid-Holland	45,350	0.9 (0.8-1.0)	1.7 (1.6-1.8)	2.3 (2.1-2.4)	2.6 (2.4-2.8)	3.0 (2.7-3.3)

Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
CI: confidence interval

THA by pre-PROM

FIGURE Cumulative revision percentage of total hip arthroplasties by valid pre-operative PROM of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2022 (n=238,517)

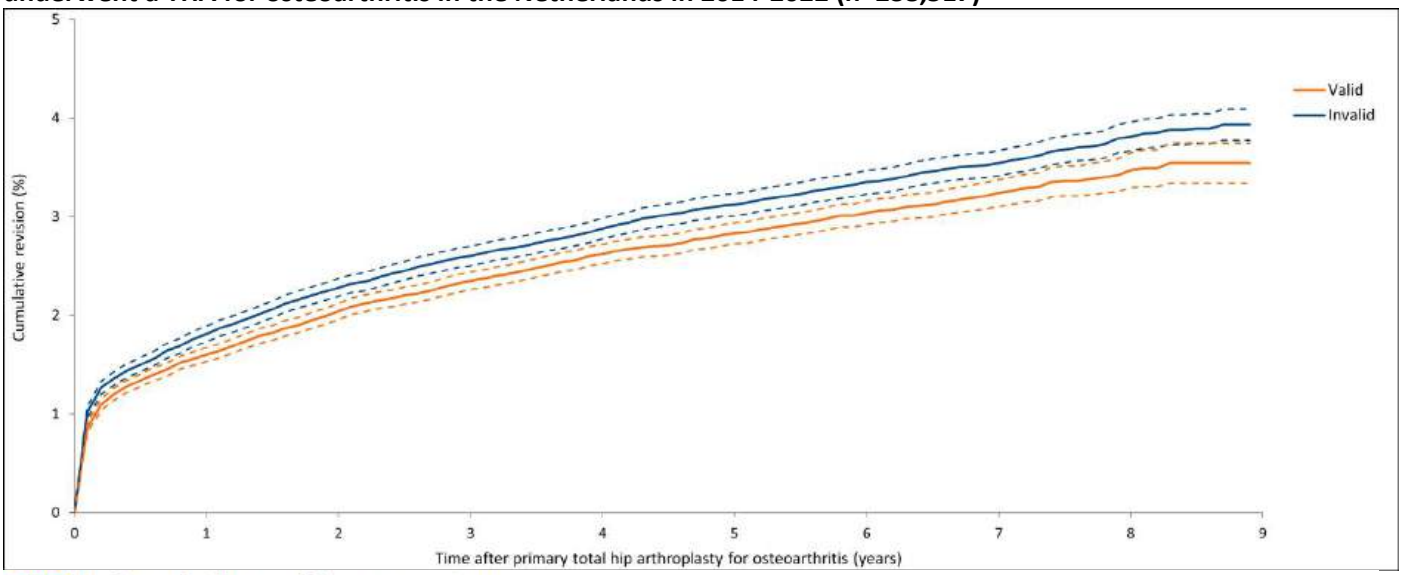


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Pre-PROM						
Valid	126,953	1.6 (1.5-1.6)	2.3 (2.2-2.4)	2.8 (2.7-2.9)	3.2 (3.1-3.3)	3.5 (3.3-3.7)
Invalid	111,564	1.8 (1.7-1.8)	2.6 (2.5-2.7)	3.1 (3.0-3.2)	3.5 (3.4-3.6)	3.9 (3.8-4.1)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Valid: pre-operative PROM reported; Invalid: non-responders to pre-operative PROM; PROM: patient reported outcome measure.
THA: total hip arthroplasty; CI: confidence interval.

THA by complete PROM (pre-, 3mnd, 12 mnd)

FIGURE Cumulative revision percentage of total hip arthroplasties by complete PROM (complete = pre-, 3mnd and 12mnd reported) of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2022 (n=238,517)

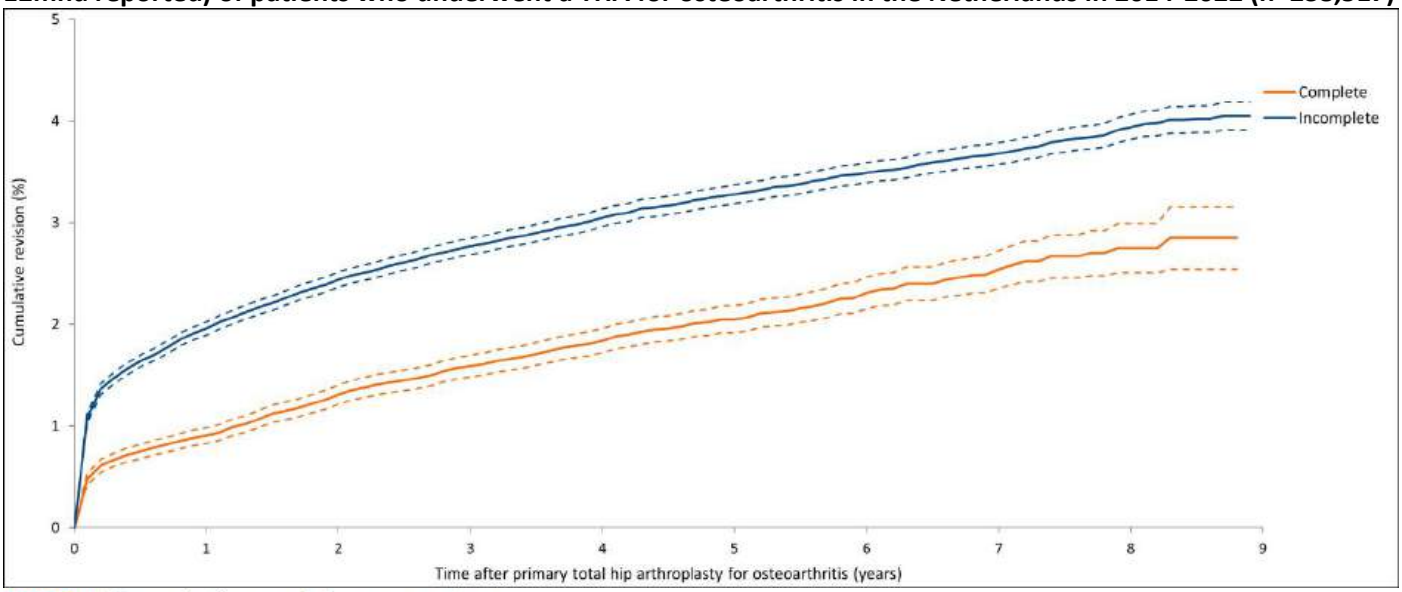


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Reported pre-, 3mnd and 12mnd PROM						
Complete	58,077	0.9 (0.8-1.0)	1.6 (1.5-1.7)	2.1 (1.9-2.2)	2.5 (2.3-2.7)	n.a.
Incomplete	180,440	1.9 (1.8-2.0)	2.7 (2.7-2.8)	3.3 (3.2-3.4)	3.7 (3.6-3.8)	4.1 (3.9-4.2)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: A PROM trajectory is considered complete when preoperative, 3-months postoperative and 12-months postoperative PROMs are reported.
THA: total hip arthroplasty; CI: confidence interval; PROM: patient reported outcome measure.

THA by pre-OHS

FIGURE Cumulative revision percentage of total hip arthroplasties by pre-operative Oxford Hip score of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2022 (n=114,308)

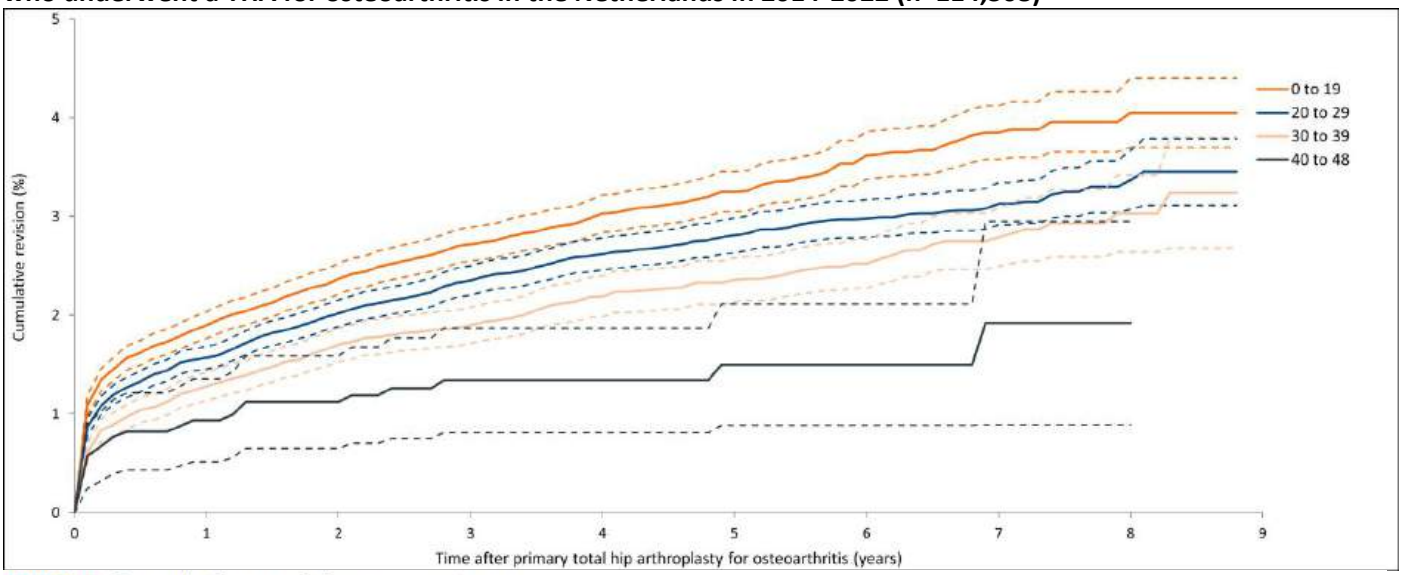


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
Pre-operative Oxford Hip score					
0 to 19	40,639	1.9 (1.7-2.0)	2.7 (2.5-2.9)	3.3 (3.0-3.5)	3.9 (3.6-4.1)
20 to 29	46,940	1.6 (1.4-1.7)	2.3 (2.2-2.5)	2.8 (2.6-3.0)	3.1 (2.9-3.3)
30 to 39	24,615	1.2 (1.1-1.4)	1.9 (1.7-2.1)	2.3 (2.1-2.5)	2.8 (2.5-3.0)
40 to 48	2,114	0.9 (0.5-1.4)	1.3 (0.8-1.9)	1.5 (0.9-2.1)	1.9 (0.9-2.9)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
PROM: patient reported outcome measure; THA: total hip arthroplasty; CI: confidence interval.

The Oxford Hip score measures the physical functioning and pain of patients with osteoarthritis to the hip. The score has a range of 0.0 to 48.0, with 0.0 representing no functional ability and 48.0 the most functional ability.

THA by gender

FIGURE Cumulative revision percentage of total hip arthroplasties by gender in the Netherlands in 2007-2022 (n=421,488)

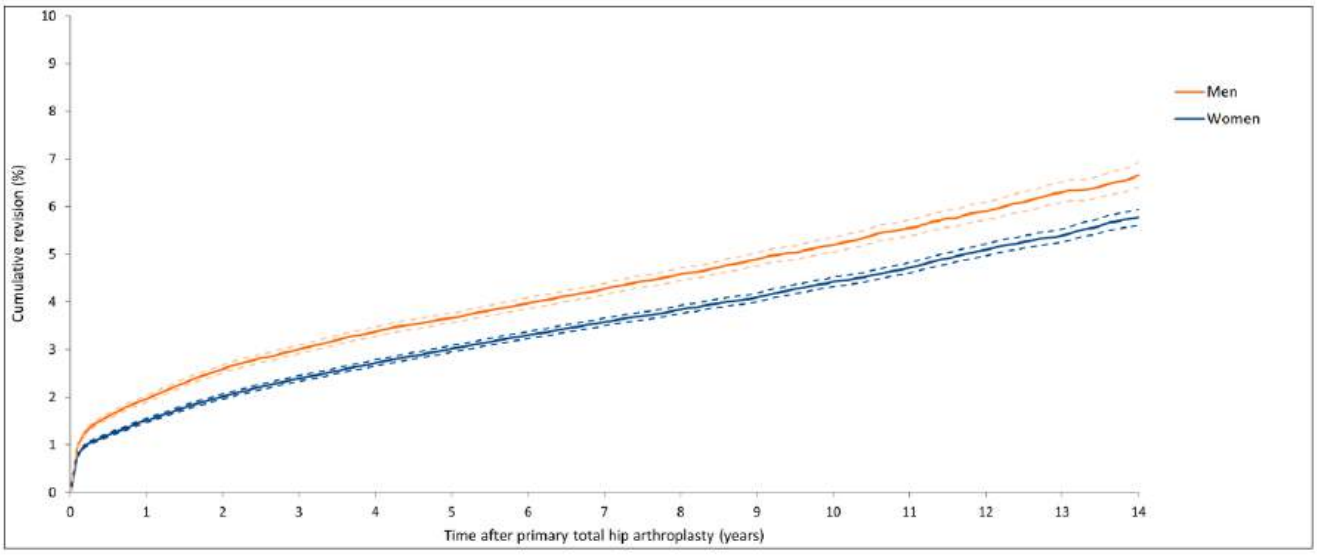


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Gender							
Men	144,135	1.9 (1.8-2.0)	3.0 (2.9-3.1)	3.6 (3.5-3.7)	4.2 (4.1-4.3)	5.2 (5.0-5.3)	6.6 (6.3-6.8)
Women	277,353	1.5 (1.4-1.5)	2.4 (2.3-2.4)	3.0 (2.9-3.0)	3.5 (3.5-3.6)	4.4 (4.3-4.5)	5.7 (5.6-5.9)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by age category

FIGURE Cumulative revision percentage of total hip arthroplasties by age category in the Netherlands in 2007-2022 (n=421,825)

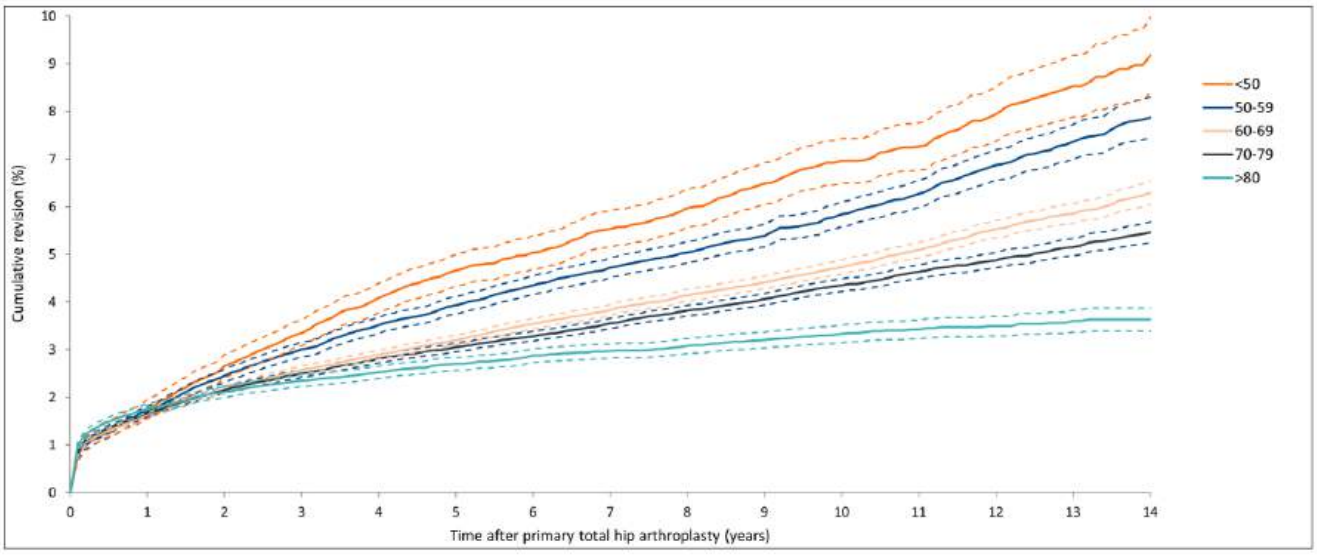


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Age (years)							
<50	18,157	1.6 (1.5-1.8)	3.3 (3.0-3.6)	4.6 (4.3-4.9)	5.5 (5.1-5.9)	6.9 (6.5-7.4)	9.0 (8.2-9.7)
50-59	52,315	1.6 (1.5-1.7)	3.0 (2.8-3.1)	3.9 (3.7-4.1)	4.7 (4.5-4.9)	5.8 (5.5-6.0)	7.8 (7.4-8.3)
60-69	131,393	1.6 (1.5-1.6)	2.5 (2.4-2.6)	3.2 (3.1-3.3)	3.8 (3.7-3.9)	4.7 (4.6-4.8)	6.2 (6.0-6.5)
70-79	157,168	1.6 (1.5-1.7)	2.5 (2.4-2.5)	3.0 (2.9-3.1)	3.5 (3.4-3.6)	4.3 (4.2-4.5)	5.4 (5.2-5.6)
≥80	62,792	1.7 (1.6-1.8)	2.3 (2.2-2.5)	2.7 (2.6-2.8)	3.0 (2.8-3.1)	3.3 (3.1-3.5)	3.6 (3.4-3.9)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by diagnosis

FIGURE Cumulative revision percentage of total hip arthroplasties by diagnosis in the Netherlands in 2007-2022 (n=417,494)

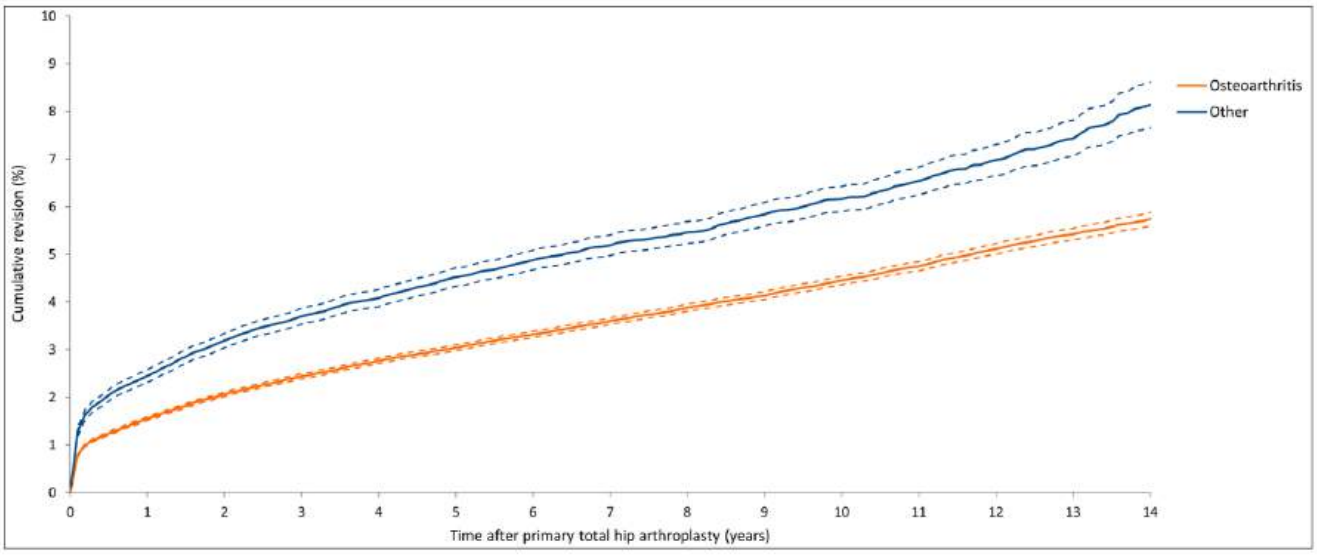


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Diagnosis							
Osteoarthritis	362,602	1.5 (1.5-1.5)	2.4 (2.3-2.5)	3.0 (2.9-3.1)	3.6 (3.5-3.6)	4.4 (4.3-4.5)	5.7 (5.6-5.8)
Other	54,892	2.4 (2.2-2.5)	3.6 (3.5-3.8)	4.5 (4.3-4.7)	5.2 (4.9-5.4)	6.2 (5.9-6.4)	8.1 (7.6-8.6)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by ASA score

FIGURE Cumulative revision percentage of total hip arthroplasties by ASA score in the Netherlands in 2007-2022 (n=409,985)

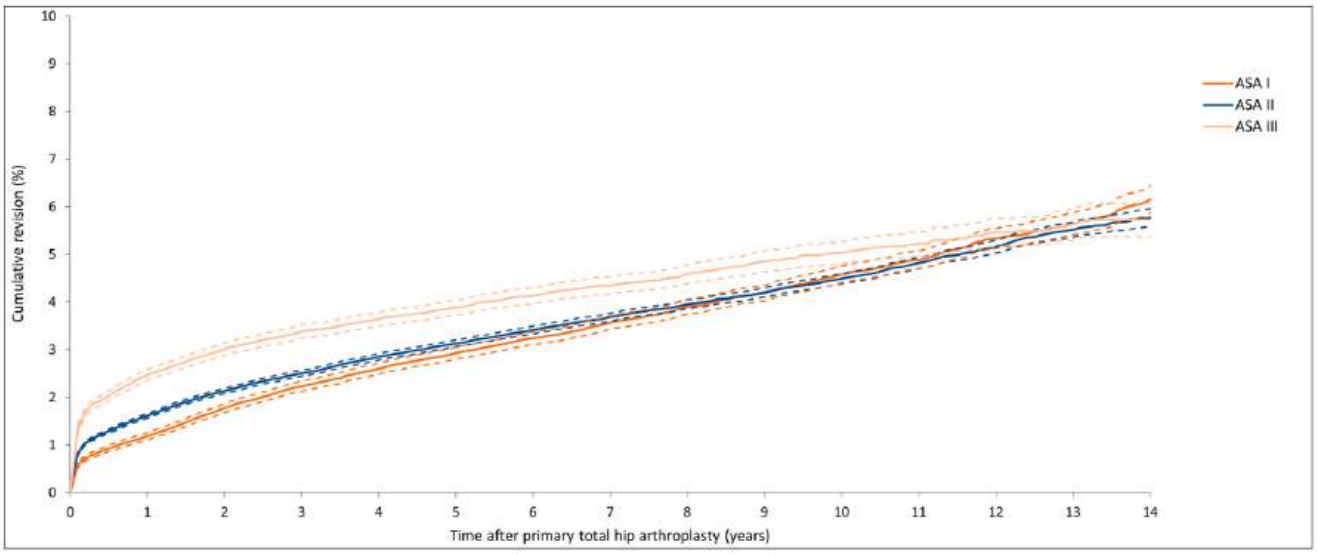


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
ASA score							
I	80,230	1.1 (1.1-1.2)	2.2 (2.1-2.3)	2.9 (2.8-3)	3.5 (3.4-3.7)	4.5 (4.4-4.7)	6.1 (5.8-6.3)
II	256,244	1.6 (1.5-1.6)	2.5 (2.4-2.5)	3.1 (3-3.2)	3.6 (3.6-3.7)	4.5 (4.4-4.6)	5.8 (5.6-5.9)
III-IV	73,511	2.4 (2.3-2.5)	3.3 (3.2-3.5)	3.9 (3.7-4)	4.3 (4.2-4.5)	5.0 (4.8-5.3)	5.7 (5.4-6.1)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by BMI category

FIGURE Cumulative revision percentage of total hip arthroplasties by BMI category in the Netherlands in 2014-2022 (n=271,882)

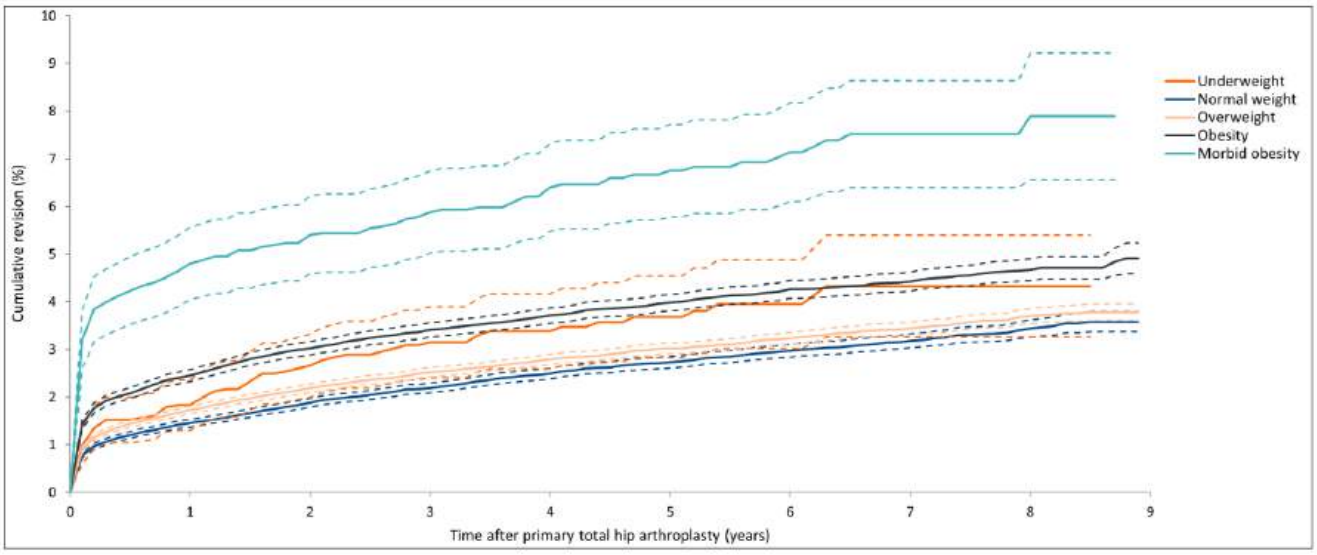


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Body Mass Index (kg/m²)						
Underweight (≤18.5)	2,561	1.8 (1.3-2.4)	3.1 (2.4-3.8)	3.7 (2.8-4.5)	4.3 (3.3-5.4)	n.a.
Normal weight (>18.5-25)	92,940	1.4 (1.3-1.5)	2.2 (2.1-2.3)	2.7 (2.6-2.8)	3.2 (3.0-3.3)	3.6 (3.4-3.8)
Overweight (>25-30)	112,723	1.7 (1.6-1.7)	2.5 (2.4-2.6)	3.0 (2.9-3.1)	3.4 (3.3-3.6)	3.8 (3.6-4.0)
Obesity (>30-40)	60,543	2.4 (2.3-2.5)	3.4 (3.2-3.5)	4.0 (3.8-4.1)	4.4 (4.2-4.6)	4.9 (4.6-5.2)
Morbid obesity (>40)	3,115	4.7 (3.9-5.4)	5.8 (4.9-6.6)	6.7 (5.7-7.6)	7.5 (6.4-8.6)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by Charnley score

FIGURE Cumulative revision percentage of total hip arthroplasties by Charnley score in the Netherlands in 2014-2022 (n=259,642)

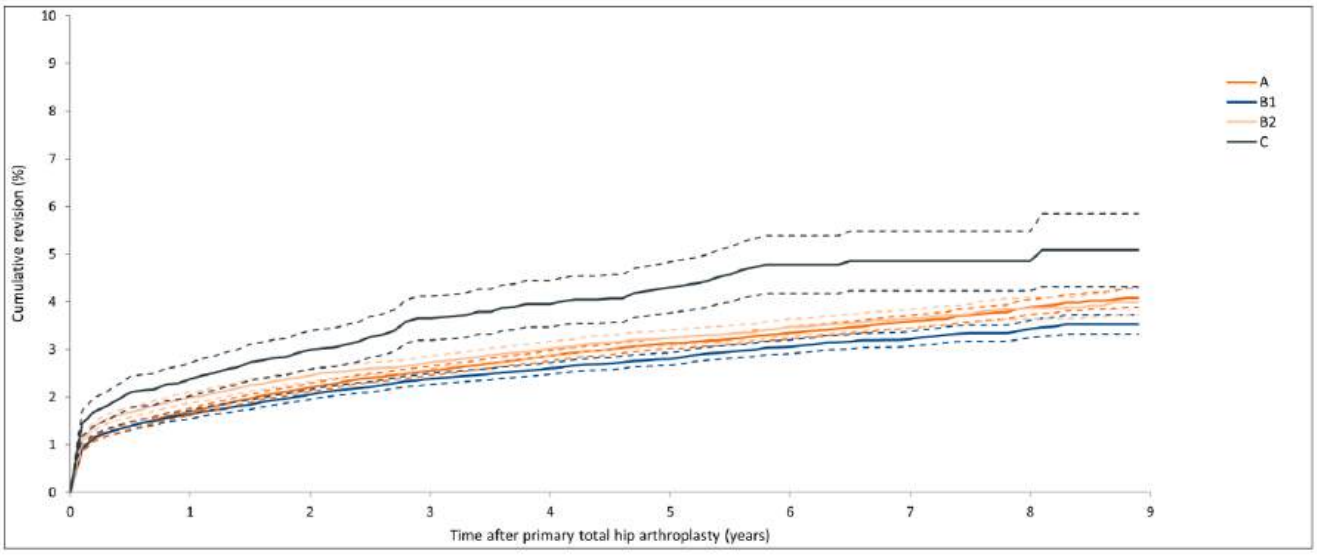


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Charnley-score						
A One hip joint affected	115,839	1.6 (1.6-1.7)	2.5 (2.4-2.6)	3.1 (3.0-3.2)	3.6 (3.4-3.7)	4.1 (3.9-4.3)
B1 Both hip joints affected	77,502	1.6 (1.5-1.7)	2.4 (2.2-2.5)	2.8 (2.7-2.9)	3.2 (3.0-3.4)	3.5 (3.3-3.7)
B2 Contralateral hip joint with a total hip prosthesis	58,775	1.9 (1.8-2.1)	2.7 (2.5-2.8)	3.2 (3.1-3.4)	3.6 (3.4-3.8)	4.0 (3.7-4.3)
C Multiple joints affected or chronic disease that affects quality of life	7,526	2.3 (1.9-2.6)	3.7 (3.2-4.1)	4.3 (3.7-4.8)	4.9 (4.2-5.5)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by Smoking

FIGURE Cumulative revision percentage of total hip arthroplasties by smoking in the Netherlands in 2014-2022 (n=267,455)

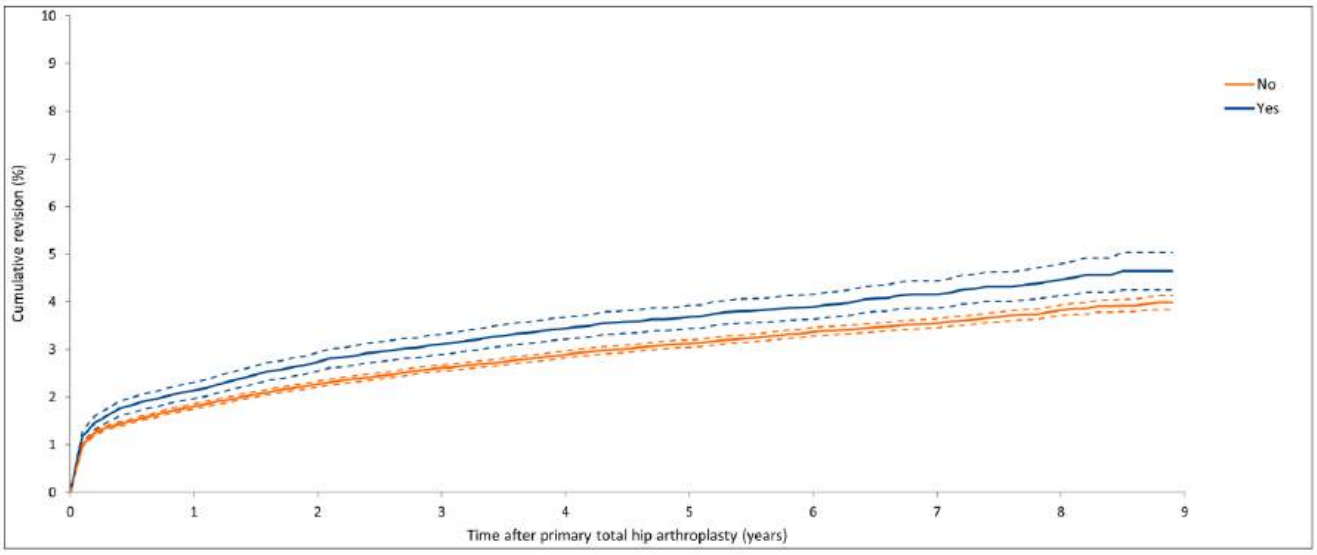


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Smoking						
No	239,071	1.8 (1.7-1.8)	2.6 (2.5-2.6)	3.1 (3.0-3.2)	3.5 (3.4-3.6)	4.0 (3.8-4.1)
Yes	28,384	2.1 (1.9-2.3)	3.1 (2.9-3.3)	3.7 (3.4-3.9)	4.2 (3.9-4.4)	4.6 (4.2-5.0)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

Revision by procedure characteristics

THA by type of revision

FIGURE Cumulative revision percentage of total hip arthroplasties by type of revision in the Netherlands in 2007-2022 (n=422,181)

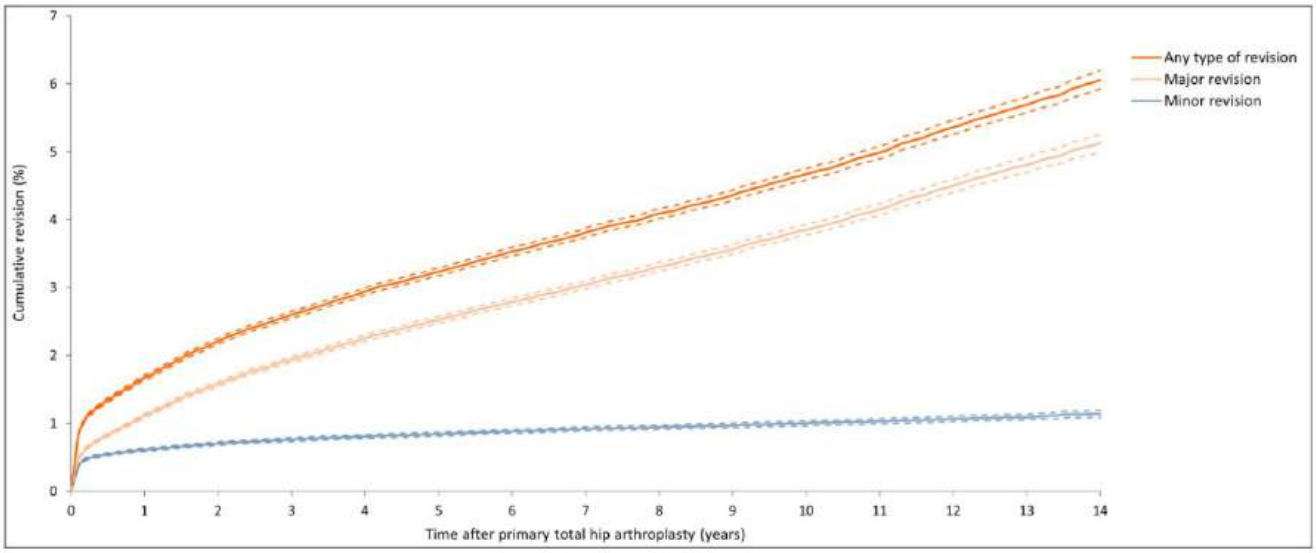


TABLE Cumulative revision percentages

	Number at risk (n)	Competing Risk (95% CI)	Kaplan Meier[1] (95% CI)
Any type of revision			
1-year revision (%)	376,573	1.6 (1.6-1.7)	1.6 (1.6-1.6)
3-year revision (%)	307,019	2.5 (2.5-2.6)	2.6 (2.5-2.6)
5-year revision (%)	234,419	3.1 (3.1-3.2)	3.2 (3.2-3.3)
10-year revision (%)	90,820	4.3 (4.3-4.4)	4.6 (4.6-4.7)
14-year revision (%)	17,037	5.3 (5.2-5.4)	6.0 (5.9-6.2)
Major revision[2]			
1-year revision (%)	378,448	1.1 (1.1-1.1)	1.1 (1.0-1.1)
3-year revision (%)	308,894	1.9 (1.9-1.9)	1.9 (1.9-2.0)
5-year revision (%)	235,988	2.4 (2.4-2.5)	2.5 (2.4-2.6)
10-year revision (%)	91,574	3.6 (3.5-3.6)	3.8 (3.8-3.9)
14-year revision (%)	17,194	4.5 (4.4-4.6)	5.1 (5.0-5.2)
Minor revision[3]			
1-year revision (%)	380,459	0.6 (0.5-0.6)	0.6 (0.6-0.6)
3-year revision (%)	312,992	0.7 (0.7-0.7)	0.8 (0.7-0.8)
5-year revision (%)	240,760	0.8 (0.7-0.8)	0.8 (0.8-0.9)
10-year revision (%)	95,353	0.9 (0.9-0.9)	1.0 (1.0-1.0)
14-year revision (%)	18,353	1.0 (0.9-1.0)	1.1 (1.1-1.2)

[1] The cumulative revision percentage using the Kaplan Meier method is shown in the figure.
[2] First revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
[3] Only inlay and/or femoral head exchange (including DAIR procedures).
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

In 2007-2022, 62,257 (15.3%) primary THAs were implanted in patients who died within fourteen years after the primary diagnosis

THA by procedure year

FIGURE Cumulative major revision percentage of total hip arthroplasties for osteoarthritis by procedure year of primary THA in the Netherlands in 2009-2022 (n=283,342)

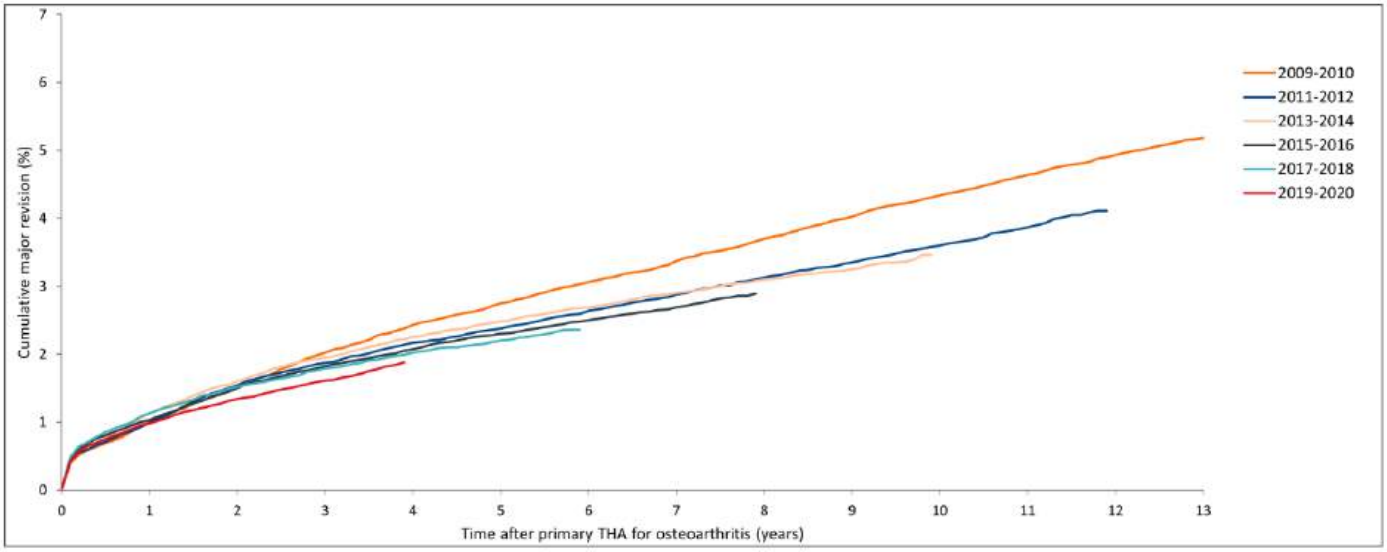


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

Procedure year primary THA for osteoarthritis	Number (n)	1yr	3yr	5yr	7yr	10yr	13yr
2009-2010	38,309	0.94 (0.85-1.04)	1.98 (1.84-2.12)	2.71 (2.55-2.87)	3.31 (3.13-3.49)	4.31 (4.10-4.52)	5.16 (4.92-5.40)
2011-2012	42,811	0.93 (0.83-1.02)	1.85 (1.72-1.98)	2.36 (2.21-2.51)	2.84 (2.68-3.00)	3.58 (3.40-3.76)	n.a.
2013-2014	46,740	1.05 (0.96-1.14)	1.93 (1.80-2.06)	2.46 (2.32-2.60)	2.88 (2.73-3.03)	3.46 (3.27-3.65)	n.a.
2015-2016	50,268	1.00 (0.91-1.09)	1.79 (1.67-1.91)	2.28 (2.15-2.41)	2.66 (2.52-2.80)	n.a.	n.a.
2017-2018	53,690	1.08 (0.99-1.17)	1.76 (1.65-1.87)	2.18 (2.05-2.31)	n.a.	n.a.	n.a.
2019-2020	51,524	0.95 (0.87-1.04)	1.59 (1.48-1.70)	n.a.	n.a.	n.a.	n.a.

Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA cemented by procedure year

FIGURE Cumulative major revision percentage of cemented total hip arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2022 (n=71,728)

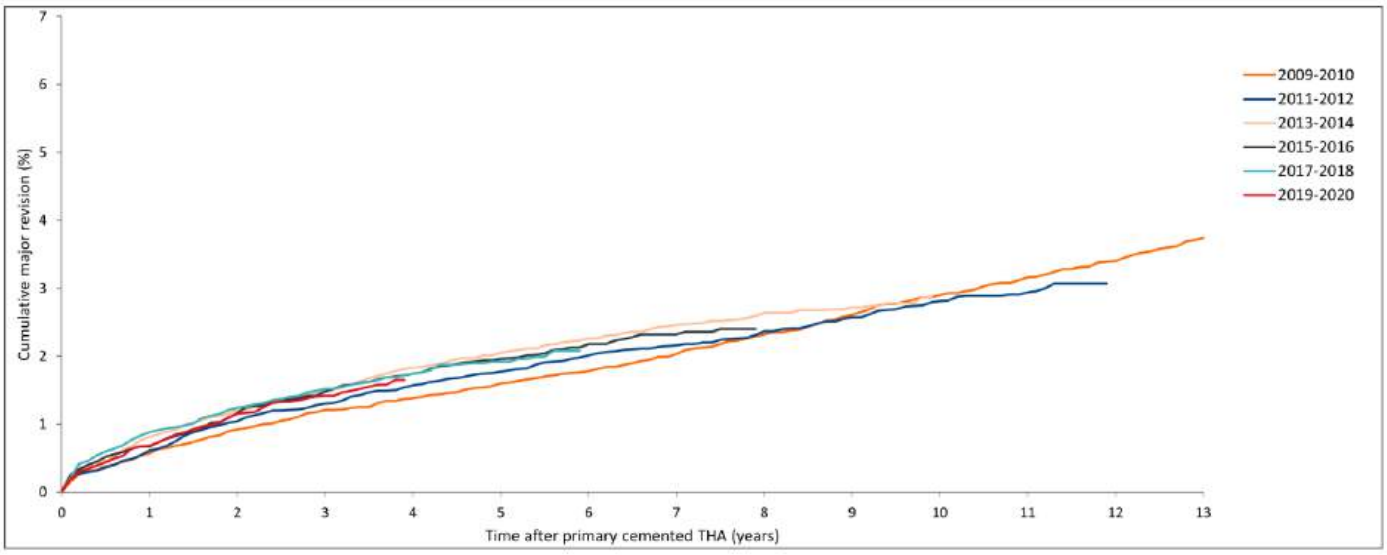


TABLE Cumulative major revision percentages

Procedure year primary cemented THA	Number (n)	Cumulative major revision percentages - Kaplan Meier (95% CI) 1yr	3yr	5yr	7yr	10yr
2009-2010	11,494	0.53 (0.40-0.67)	1.18 (0.98-1.38)	1.56 (1.33-1.79)	1.99 (1.73-2.25)	2.87 (2.54-3.20)
2011-2012	12,167	0.54 (0.41-0.67)	1.28 (1.08-1.48)	1.75 (1.51-1.99)	2.15 (1.88-2.42)	2.79 (2.48-3.10)
2013-2014	12,648	0.76 (0.61-0.92)	1.47 (1.26-1.68)	2.01 (1.76-2.26)	2.44 (2.16-2.72)	2.87 (2.51-3.23)
2015-2016	12,607	0.67 (0.53-0.81)	1.42 (1.21-1.63)	1.94 (1.70-2.19)	2.32 (2.05-2.59)	n.a.
2017-2018	12,449	0.83 (0.67-0.99)	1.49 (1.27-1.71)	1.92 (1.67-2.17)	n.a.	n.a.
2019-2020	10,363	0.67 (0.51-0.83)	1.41 (1.17-1.65)	n.a.	n.a.	n.a.

Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA uncemented by procedure year

FIGURE Cumulative major revision percentage of uncemented total hip arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2022 (n=185,162)

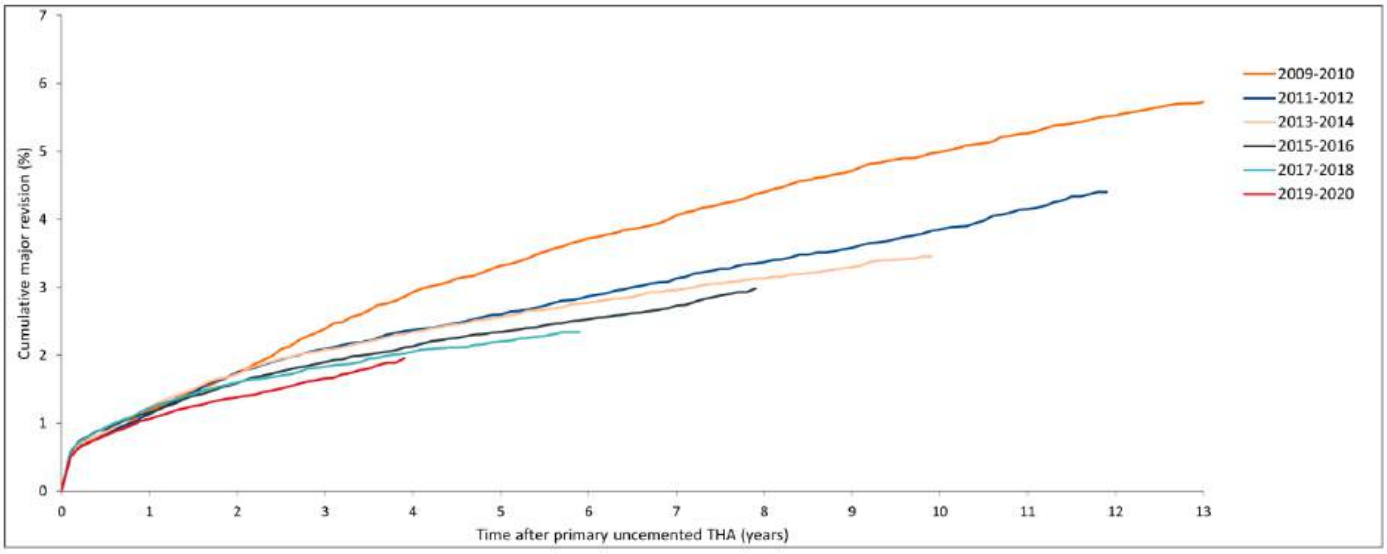


TABLE Cumulative major revision percentages

		Cumulative major revision percentages - Kaplan Meier (95% CI)				
Procedure year primary uncemented THA	Number (n)	1yr	3yr	5yr	7yr	10yr
2009-2010	23,429	1.12 (0.98-1.26)	2.33 (2.14-2.52)	3.27 (3.04-3.50)	3.99 (3.74-4.24)	4.97 (4.68-5.26)
2011-2012	27,054	1.07 (0.95-1.19)	2.07 (1.90-2.24)	2.59 (2.40-2.78)	3.08 (2.87-3.29)	3.83 (3.59-4.07)
2013-2014	29,399	1.15 (1.03-1.27)	2.05 (1.89-2.21)	2.54 (2.36-2.72)	2.95 (2.75-3.15)	3.45 (3.22-3.68)
2015-2016	32,682	1.12 (1.01-1.23)	1.87 (1.72-2.02)	2.33 (2.17-2.49)	2.69 (2.51-2.87)	n.a.
2017-2018	36,209	1.17 (1.06-1.28)	1.81 (1.67-1.95)	2.19 (2.04-2.34)	n.a.	n.a.
2019-2020	36,389	1.03 (0.93-1.13)	1.63 (1.50-1.76)	n.a.	n.a.	n.a.

Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA anterior approach by procedure year

FIGURE Cumulative major revision percentage of the anterior approach for total hip arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2022 (n=58,787)

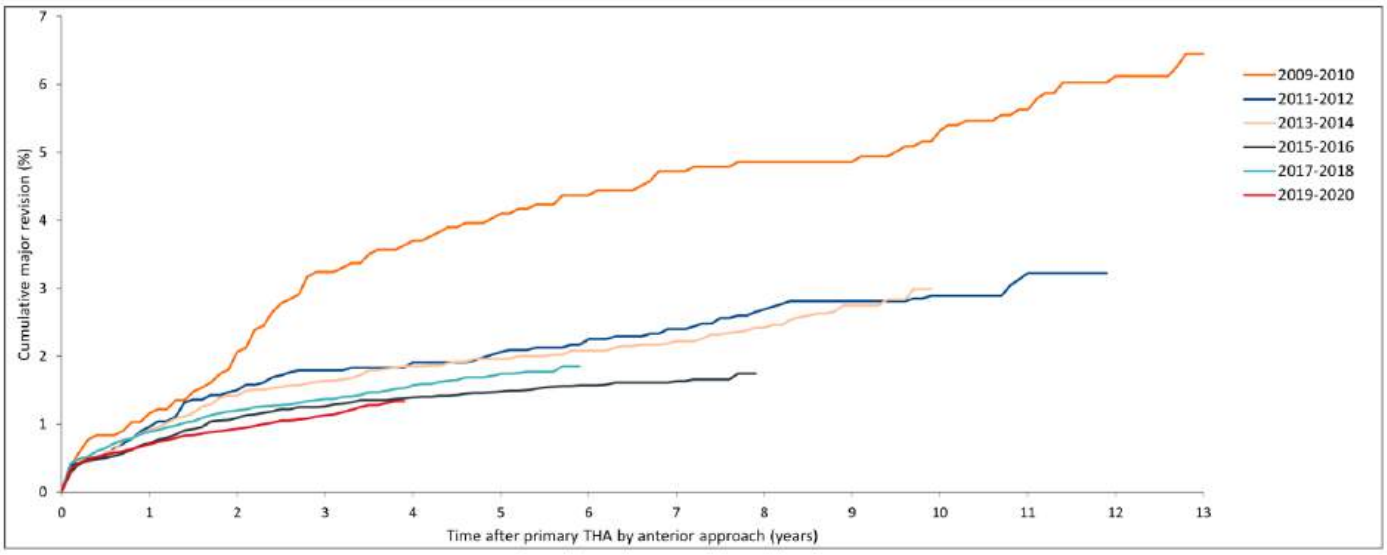


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

Procedure year primary THA by anterior	Number (n)	1yr	3yr	5yr	7yr	10yr
2009-2010	1,556	1.03 (0.53-1.53)	3.24 (2.36-4.12)	4.03 (3.05-5.01)	4.72 (3.66-5.78)	5.16 (4.04-6.28)
2011-2012	2,810	0.89 (0.54-1.24)	1.79 (1.30-2.28)	2.02 (1.50-2.54)	2.40 (1.83-2.97)	2.89 (2.26-3.52)
2013-2014	5,589	0.86 (0.62-1.10)	1.62 (1.29-1.95)	1.96 (1.59-2.33)	2.19 (1.80-2.58)	2.99 (2.42-3.56)
2015-2016	10,172	0.69 (0.53-0.85)	1.25 (1.03-1.47)	1.47 (1.23-1.71)	1.61 (1.36-1.86)	n.a.
2017-2018	17,188	0.85 (0.71-0.99)	1.35 (1.18-1.52)	1.71 (1.51-1.91)	n.a.	n.a.
2019-2020	21,472	0.67 (0.56-0.78)	1.11 (0.97-1.25)	n.a.	n.a.	n.a.

Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA posterior approach by procedure year

FIGURE Cumulative major revision percentage of the posterior approach for total hip arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2022 (n=161,584)

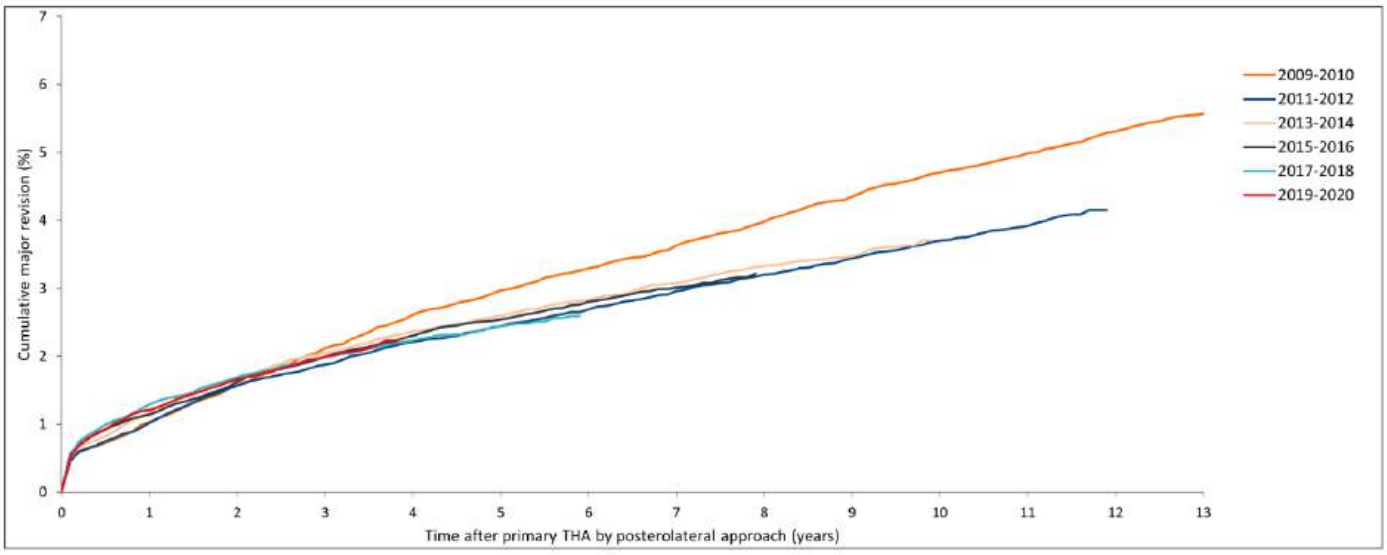


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

Procedure year primary THA by posterolateral	Number (n)	1yr	3yr	5yr	7yr	10yr
2009-2010	22,427	0.98 (0.85-1.11)	2.05 (1.86-2.24)	2.92 (2.70-3.14)	3.56 (3.31-3.81)	4.68 (4.39-4.97)
2011-2012	26,414	0.95 (0.83-1.06)	1.85 (1.69-2.01)	2.42 (2.23-2.61)	2.91 (2.70-3.12)	3.68 (3.44-3.92)
2013-2014	28,669	1.10 (0.98-1.22)	2.02 (1.86-2.18)	2.57 (2.38-2.76)	3.06 (2.86-3.26)	3.70 (3.45-3.95)
2015-2016	29,718	1.11 (0.99-1.23)	1.95 (1.79-2.11)	2.52 (2.34-2.70)	2.99 (2.79-3.19)	n.a.
2017-2018	28,916	1.22 (1.09-1.35)	1.96 (1.80-2.12)	2.43 (2.25-2.61)	n.a.	n.a.
2019-2020	25,440	1.19 (1.06-1.32)	1.96 (1.78-2.14)	n.a.	n.a.	n.a.

Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA by procedure side

FIGURE Cumulative major revision percentage of total hip arthroplasties for osteoarthritis by procedure side in the Netherlands in 2007-2022 (n=362,270)

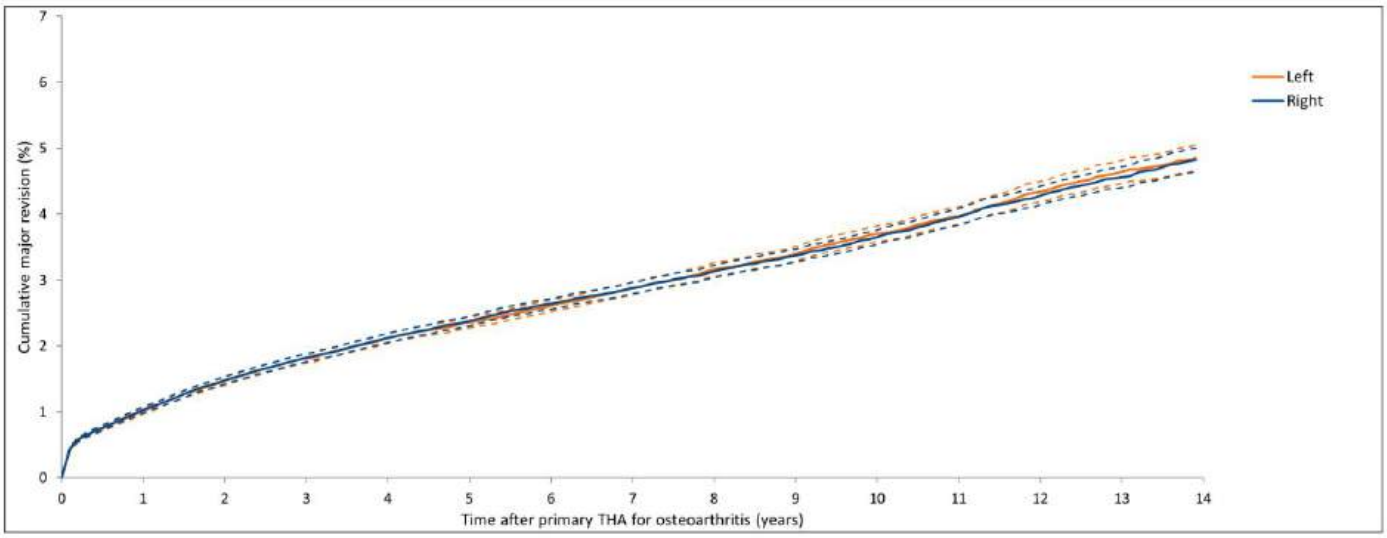


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Procedure side							
Left	165,298	1.0 (0.9-1.0)	1.8 (1.7-1.9)	2.3 (2.3-2.4)	2.8 (2.7-2.9)	3.7 (3.6-3.8)	4.9 (4.7-5.0)
Right	196,972	1.0 (0.9-1.0)	1.8 (1.7-1.9)	2.4 (2.3-2.4)	2.9 (2.8-2.9)	3.6 (3.5-3.7)	4.8 (4.6-5.0)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by approach

FIGURE Cumulative major revision percentage of total hip arthroplasties for osteoarthritis by approach in the Netherlands in 2007-2022 (n=358,792)

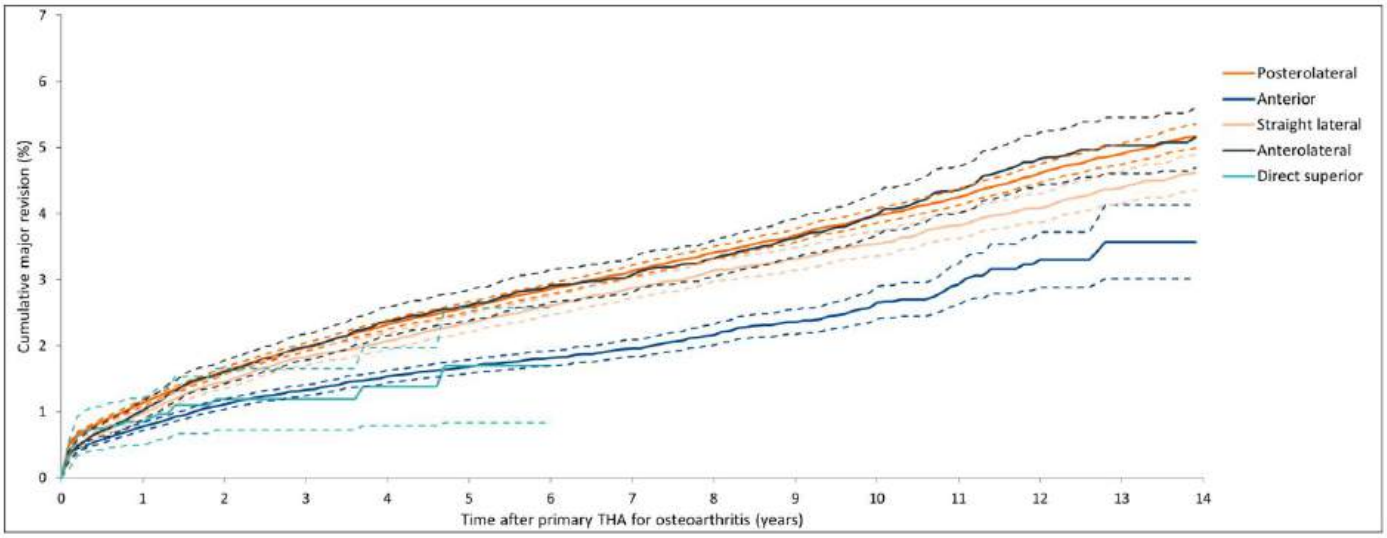


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Approach							
Posterolateral	199,255	1.1 (1.0-1.1)	1.9 (1.9-2.0)	2.6 (2.5-2.6)	3.1 (3.0-3.2)	3.9 (3.8-4.0)	5.2 (5.0-5.4)
Anterior	86,528	0.7 (0.7-0.8)	1.3 (1.2-1.4)	1.7 (1.6-1.8)	2.0 (1.8-2.1)	2.6 (2.3-2.8)	3.6 (3.0-4.1)
Straight lateral	50,193	0.9 (0.8-1.0)	1.8 (1.7-1.9)	2.3 (2.2-2.5)	2.8 (2.7-3.0)	3.5 (3.3-3.7)	4.6 (4.3-4.9)
Anterolateal	19,989	1.0 (0.8-1.1)	2.0 (1.8-2.2)	2.6 (2.4-2.8)	3.0 (2.8-3.3)	3.9 (3.6-4.3)	5.2 (4.7-5.6)
Direct superior	2,827	0.8 (0.5-1.2)	1.2 (0.7-1.7)	1.7 (0.8-2.6)	n.a.	n.a.	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA by femoral head size

FIGURE Cumulative revision percentage for dislocation of total hip arthroplasties for osteoarthritis by femoral head size in the Netherlands in 2007-2022 (n=349,595)

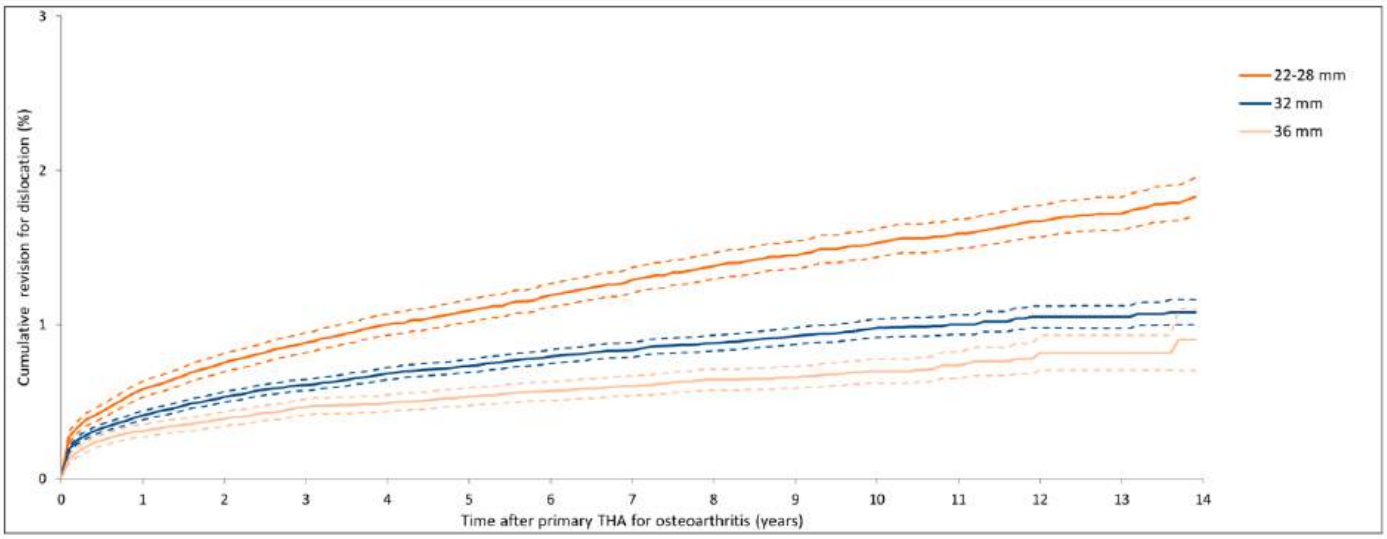


TABLE Cumulative revision percentages for dislocation

Cumulative revision percentages for dislocation - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Femoral head size							
22-28 mm	83,450	0.6 (0.5-0.6)	0.9 (0.8-0.9)	1.1 (1.0-1.2)	1.3 (1.2-1.3)	1.5 (1.4-1.6)	1.8 (1.7-2.0)
32 mm	192,130	0.4 (0.4-0.4)	0.6 (0.6-0.6)	0.7 (0.7-0.8)	0.8 (0.8-0.9)	1.0 (0.9-1.0)	1.1 (1.0-1.2)
36 mm	74,015	0.3 (0.3-0.3)	0.5 (0.4-0.5)	0.5 (0.5-0.6)	0.6 (0.5-0.7)	0.7 (0.6-0.8)	0.9 (0.7-1.1)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by articulation

FIGURE Cumulative major revision percentages of total hip arthroplasties for osteoarthritis by articulation in the Netherlands in 2007-2022 (n=345,444)

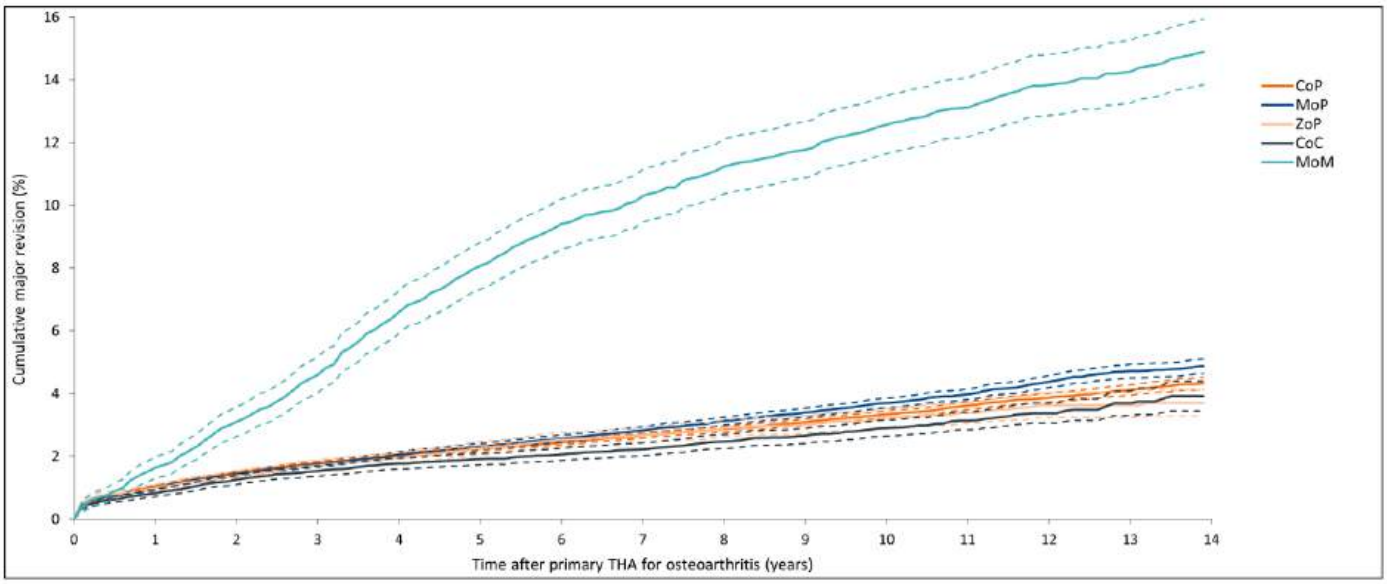


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Articulation							
CoP	200,902	1.0 (0.9-1.0)	1.8 (1.7-1.8)	2.2 (2.2-2.3)	2.6 (2.6-2.7)	3.3 (3.2-3.4)	4.3 (4.1-4.5)
MoP	90,321	0.9 (0.9-1.0)	1.7 (1.6-1.8)	2.3 (2.2-2.4)	2.8 (2.7-2.9)	3.7 (3.5-3.8)	4.9 (4.6-5.1)
ZoP	25,457	0.9 (0.8-1.1)	1.7 (1.5-1.9)	2.2 (2.0-2.4)	2.7 (2.4-2.9)	3.2 (2.9-3.5)	3.7 (3.3-4.1)
CoC	23,506	0.8 (0.7-0.9)	1.5 (1.4-1.7)	1.9 (1.7-2.1)	2.2 (2.0-2.5)	2.9 (2.7-3.2)	4.0 (3.5-4.4)
MoM	5,258	1.5 (1.2-1.8)	4.5 (3.9-5.0)	7.9 (7.2-8.7)	10.1 (9.3-11.0)	12.5 (11.6-13.4)	14.9 (13.8-15.9)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA by PE type

FIGURE Cumulative major revision percentages of total hip arthroplasties for osteoarthritis by inlay material in the Netherlands in 2007-2022 (n=362,608)

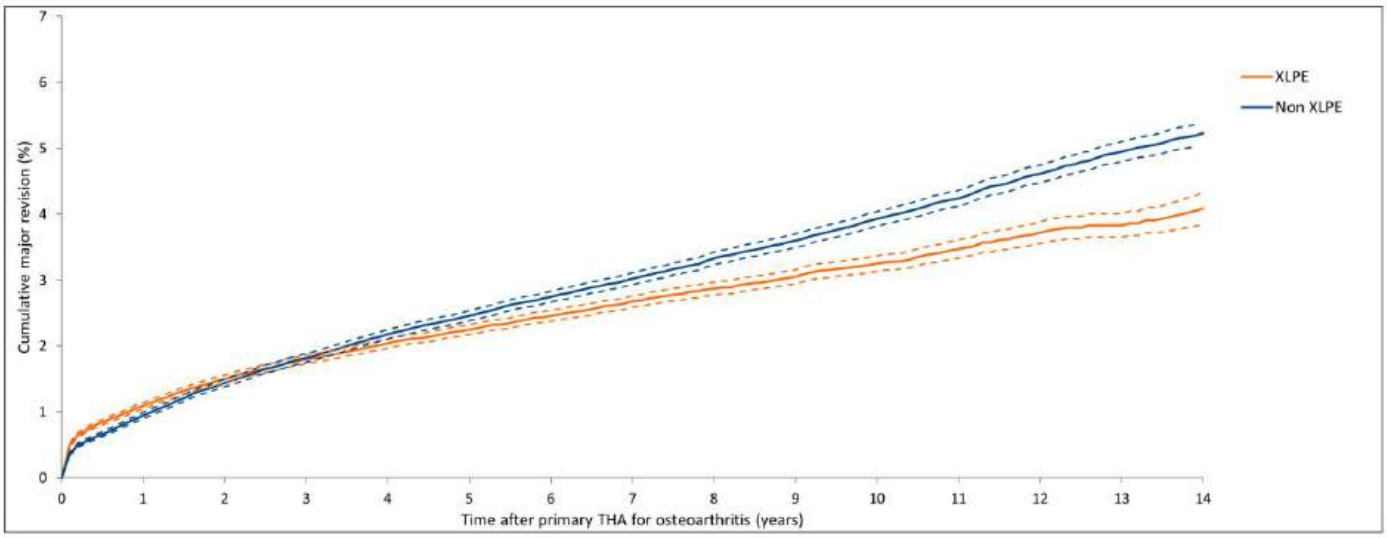


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Inlay material							
XLPE	185,201	1.1 (1.0-1.1)	1.8 (1.7-1.8)	2.2 (2.2-2.3)	2.6 (2.6-2.7)	3.2 (3.1-3.4)	4.1 (3.8-4.3)
Non XLPE	177,407	0.9 (0.9-0.9)	1.8 (1.7-1.9)	2.4 (2.4-2.5)	3.0 (2.9-3.1)	3.9 (3.8-4.0)	5.2 (5.0-5.4)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
XLPE: cross-linked polyethylene; THA: total hip arthroplasty; CI: confidence interval.

THA by modularity

FIGURE Cumulative femur revision percentage of total hip arthroplasties for osteoarthritis by femur modularity in the Netherlands in 2007-2022 (n=352,831)

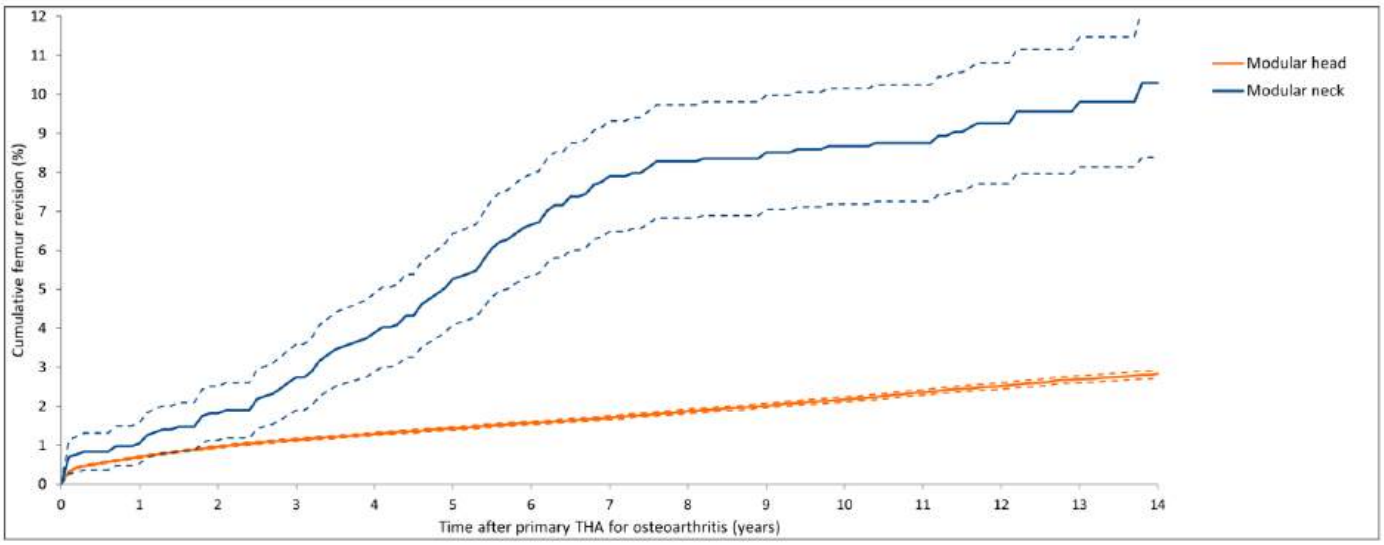


TABLE Cumulative femur revision percentages

		Cumulative femur revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Modularity							
Modular head	351,400	0.7 (0.6-0.7)	1.1 (1.1-1.2)	1.4 (1.4-1.5)	1.7 (1.6-1.7)	2.2 (2.1-2.2)	2.8 (2.7-2.9)
Modular neck	1,431	1.0 (0.5-1.5)	2.6 (1.8-3.4)	5.0 (3.9-6.2)	7.8 (6.3-9.2)	8.7 (7.2-10.2)	10.3 (8.4-12.2)

Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by ODEP 5A or higher acetabulum

FIGURE Cumulative acetabulum revision percentage of total hip arthroplasties for osteoarthritis by ODEP rating acetabulum in the Netherlands in 2007-2022 (n= 356,071)

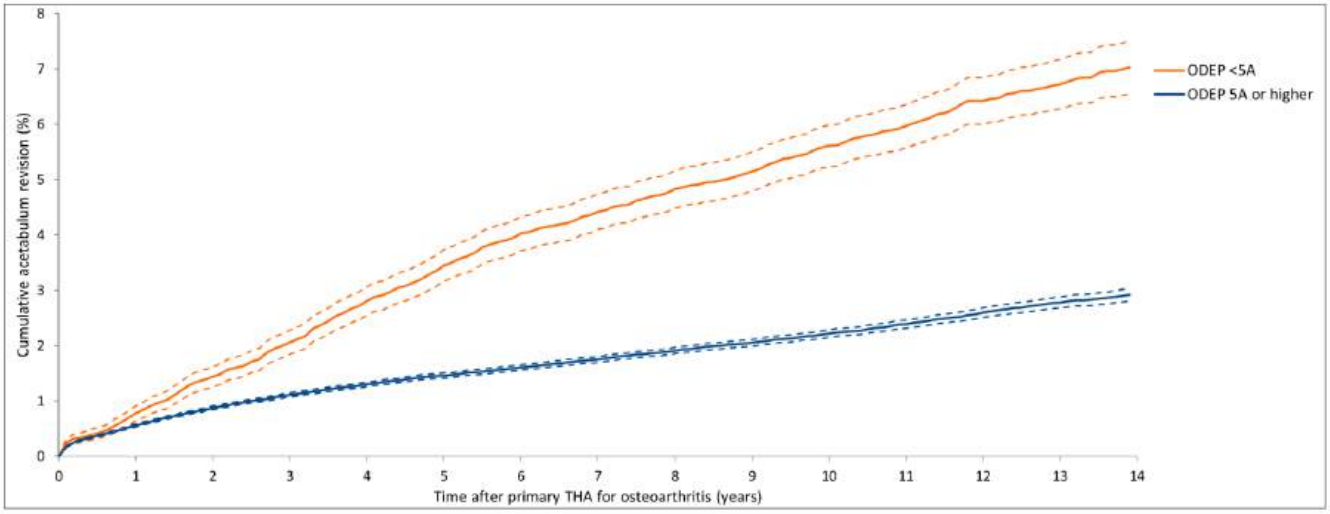


TABLE Cumulative acetabulum revision percentages

Cumulative acetabulum revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
ODEP acetabulum							
<5A	16,432	0.7 (0.6-0.8)	2.0 (1.8-2.2)	3.4 (3.1-3.6)	4.4 (4.0-4.7)	5.6 (5.2-6.0)	7.0 (6.5-7.5)
5A or higher	339,639	0.5 (0.5-0.5)	1.1 (1.1-1.1)	1.5 (1.4-1.5)	1.7 (1.7-1.8)	2.2 (2.1-2.3)	2.9 (2.8-3.0)

Acetabulum revision percentage: first revision of the acetabulum component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
ODEP rating: ODEP provides ratings for hip femoral stems, hip acetabular cups and total knee replacement implants. Detailed information can be found at www.odep.org.uk.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by ODEP 5A or higher femur

FIGURE Cumulative femur revision percentage of total hip arthroplasties for osteoarthritis by ODEP rating femur in the Netherlands in 2007-2022 (n= 353,885)

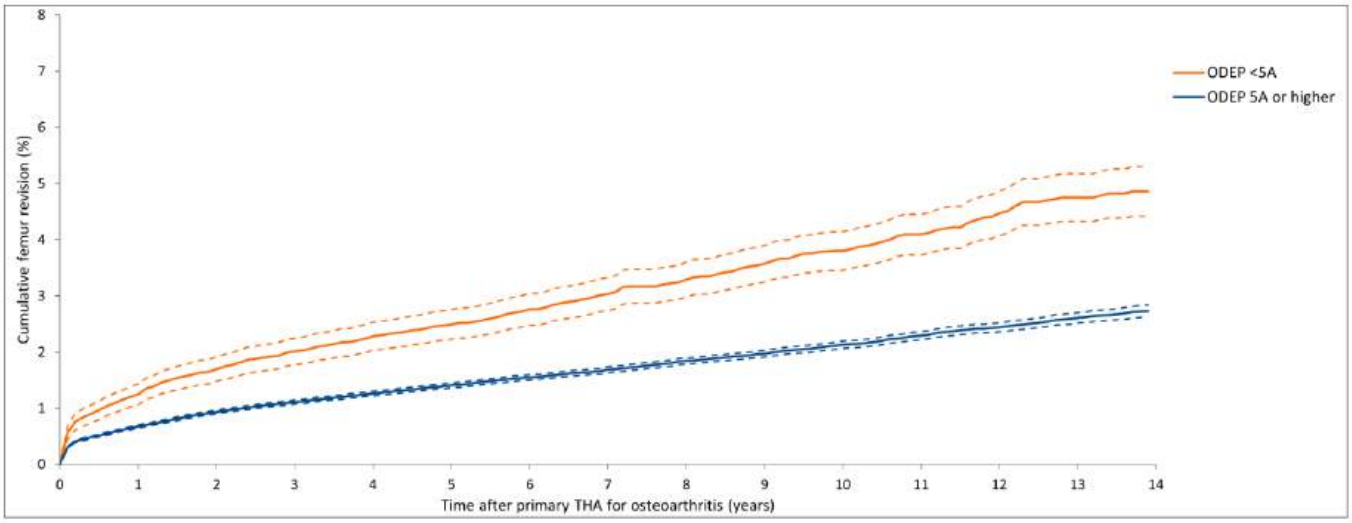


TABLE Cumulative femur revision percentage

Cumulative femur revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
ODEP femur							
<5A	13,730	1.2 (1.0-1.4)	2.0 (1.8-2.2)	2.5 (2.2-2.7)	3.0 (2.7-3.3)	3.8 (3.5-4.1)	4.9 (4.4-5.3)
5A or higher	340,155	0.6 (0.6-0.7)	1.1 (1.1-1.1)	1.4 (1.3-1.4)	1.7 (1.6-1.7)	2.1 (2.0-2.2)	2.7 (2.6-2.8)

Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
ODEP rating: ODEP provides ratings for hip femoral stems, hip acetabular cups and total knee replacement implants. Detailed information can be found at www.odep.org.uk.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by cemented material acetabulum

FIGURE Cumulative acetabulum revision percentage of total hip arthroplasties for osteoarthritis by cemented acetabulum material in the Netherlands in 2007-2022 (n=94,072)

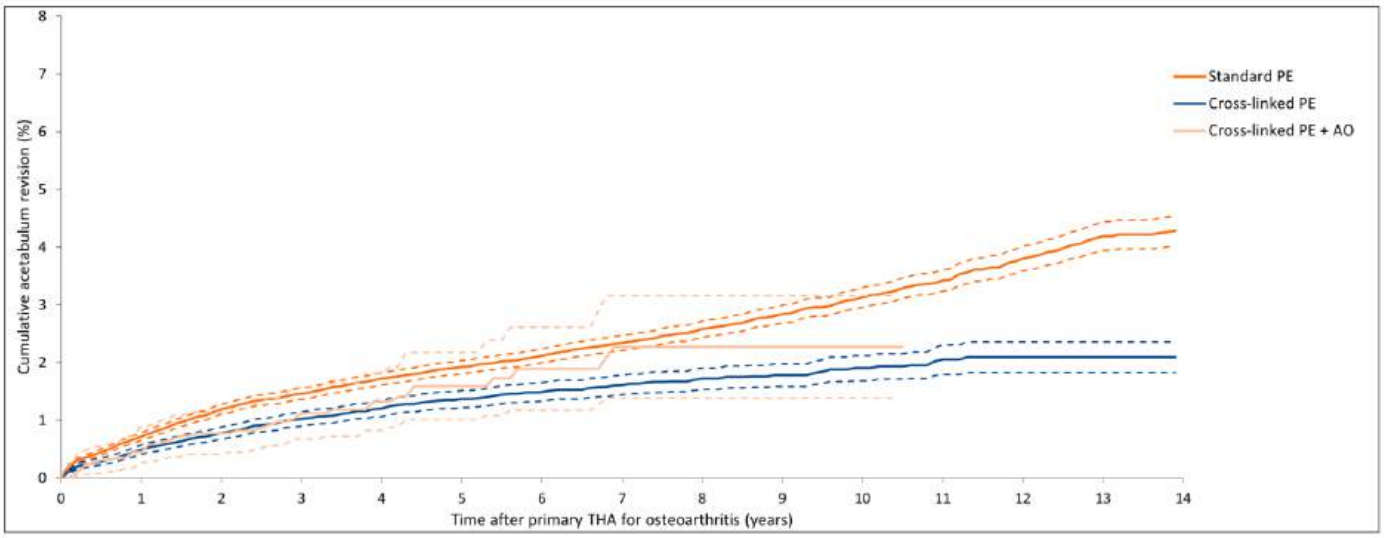


TABLE Cumulative acetabulum revision percentages

		Cumulative acetabulum revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Cemented acetabulum material							
Standard PE	61,878	0.7 (0.6-0.7)	1.4 (1.3-1.5)	1.9 (1.8-2.0)	2.3 (2.2-2.4)	3.1 (2.9-3.3)	4.3 (4.0-4.5)
Cross-linked PE	29,906	0.4 (0.4-0.5)	1.0 (0.9-1.1)	1.4 (1.2-1.5)	1.6 (1.4-1.8)	1.9 (1.7-2.1)	2.1 (1.8-2.4)
Cross-linked PE + Antioxidant	2,288	0.4 (0.2-0.7)	1.1 (0.7-1.6)	1.6 (1.0-2.2)	2.3 (1.4-3.2)	2.3 (1.4-3.2)	n.a.

Acetabulum revision percentage: first revision of the acetabulum component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; PE: polyethylene; CI: confidence interval; n.a. if <50 cases were at risk.

THA by cemented material femur

FIGURE Cumulative femur revision percentage of total hip arthroplasties for osteoarthritis by cemented femur material in the Netherlands in 2007-2022 (n=260,625)

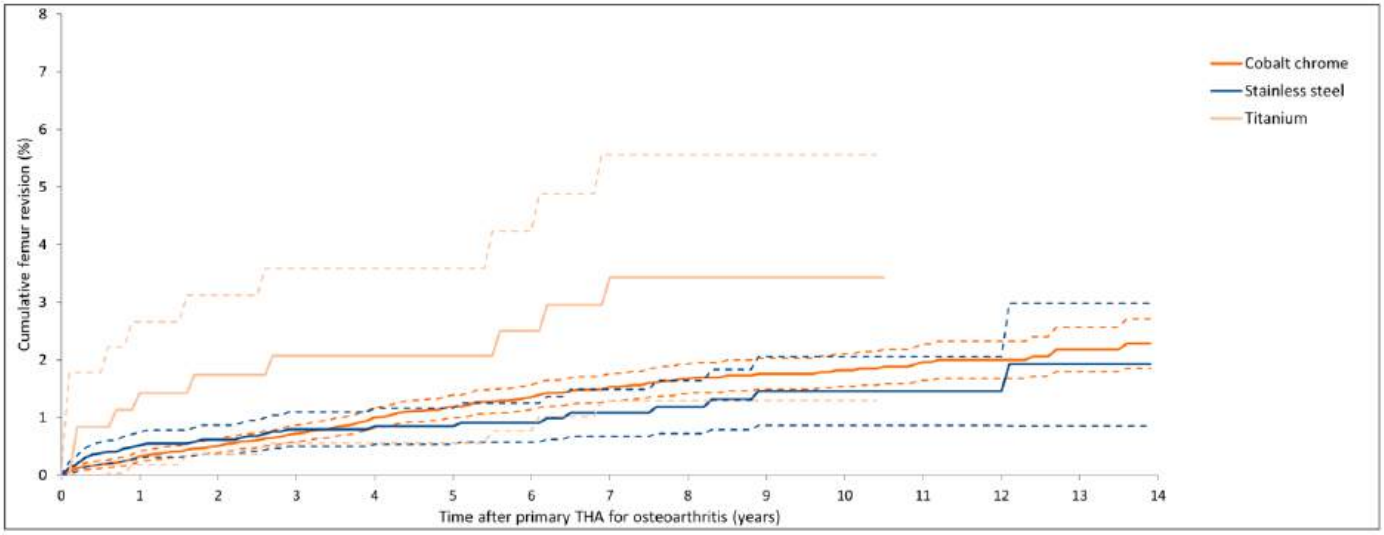


TABLE Cumulative femur revision percentages

		Cumulative femur revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Cemented femur material							
Cobalt chrome	16,152	0.3 (0.2-0.4)	0.7 (0.6-0.8)	1.2 (1.0-1.4)	1.5 (1.3-1.7)	1.8 (1.5-2.1)	2.3 (1.8-2.7)
Stainless steel	4,113	0.5 (0.3-0.7)	0.8 (0.5-1.1)	0.8 (0.5-1.2)	1.1 (0.7-1.5)	1.5 (0.9-2.1)	1.9 (0.9-3.0)
Titanium	360	1.4 (0.2-2.7)	2.1 (0.6-3.6)	2.1 (0.6-3.6)	3.4 (1.3-5.6)	3.4 (1.3-5.6)	n.a.

Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

THA by uncemented material femur

FIGURE Cumulative femur revision percentage of total hip arthroplasties for osteoarthritis by uncemented femur material in the Netherlands in 2007-2021 (n=18,297)

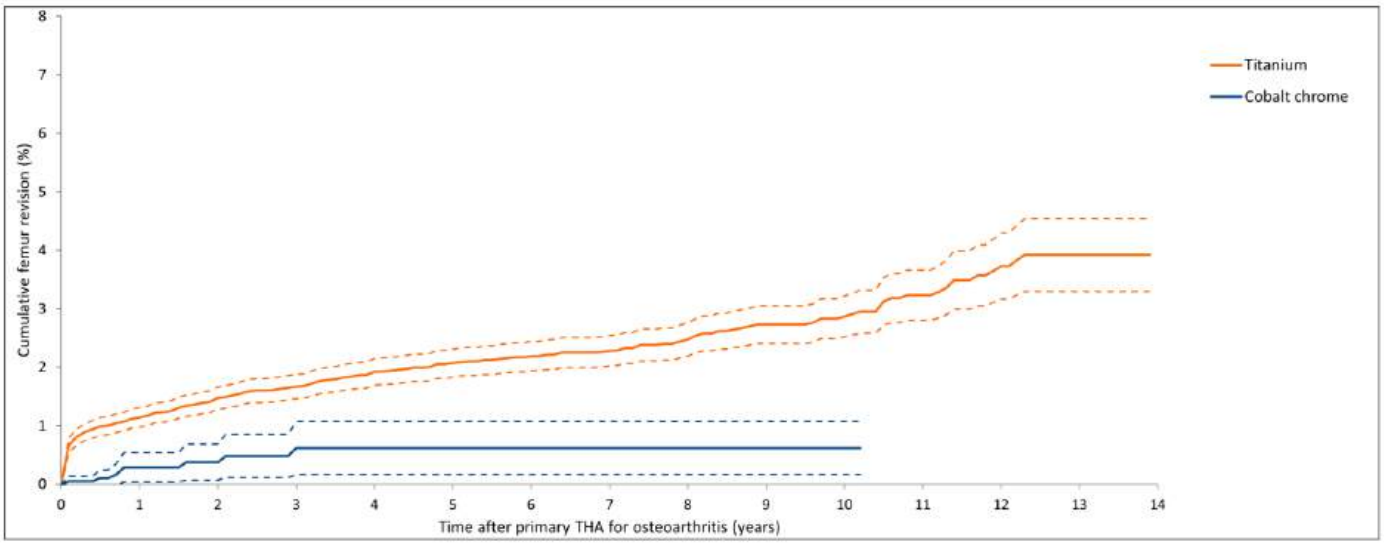


TABLE Cumulative femur revision percentages

		Cumulative femur revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Uncemented femur material							
Titanium	16,101	1.1 (1.0-1.3)	1.7 (1.4-1.9)	2.1 (1.8-2.3)	2.3 (2.0-2.5)	2.8 (2.5-3.2)	3.9 (3.3-4.5)
Cobalt chrome	2,196	0.3 (0.0-0.5)	0.5 (0.1-0.9)	0.6 (0.2-1.1)	0.6 (0.2-1.1)	0.6 (0.2-1.1)	n.a.

Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA by uncemented material inlay

FIGURE Cumulative acetabulum revision percentage of total hip arthroplasties for osteoarthritis by uncemented inlay material in the Netherlands in 2007-2022 (n=229,639)

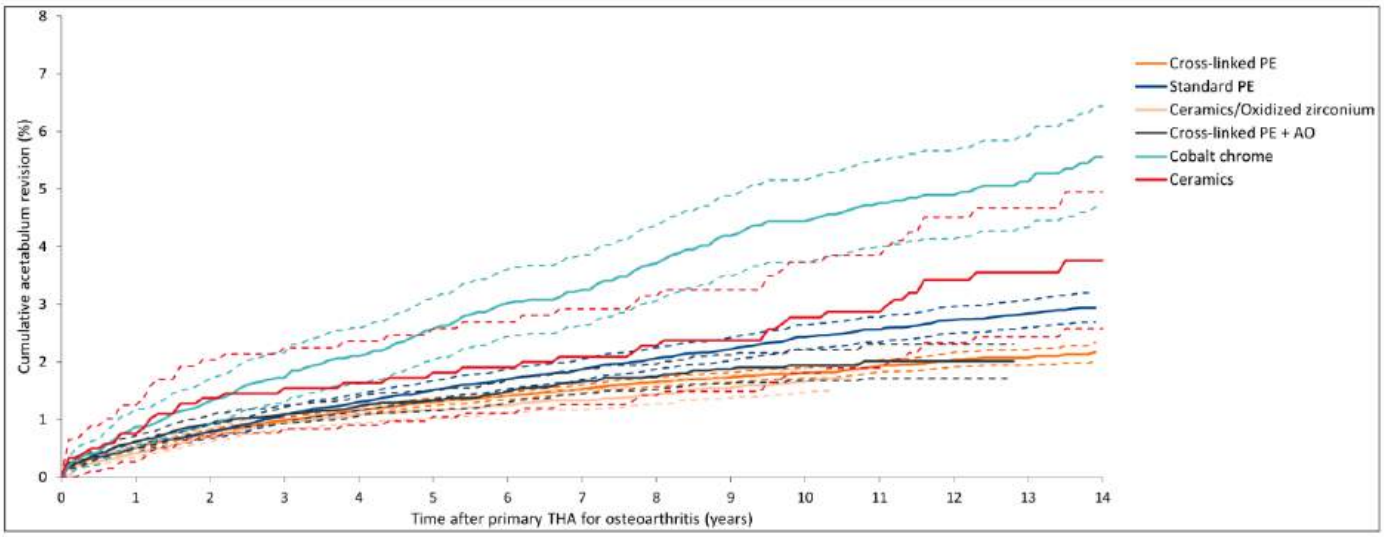


TABLE Cumulative acetabulum revision percentages

		Cumulative acetabulum revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Uncemented inlay material							
Cross-linked PE	161,064	0.5 (0.4-0.5)	1.0 (0.9-1.0)	1.3 (1.2-1.4)	1.5 (1.4-1.6)	1.8 (1.7-1.9)	2.2 (2.0-2.3)
Standard PE	22,825	0.5 (0.4-0.6)	1.0 (0.9-1.2)	1.5 (1.3-1.6)	1.8 (1.7-2.0)	2.4 (2.2-2.6)	2.9 (2.7-3.2)
Ceramics/Oxidized Zirconium	21,639	0.4 (0.3-0.5)	0.9 (0.8-1.1)	1.2 (1.0-1.3)	1.3 (1.2-1.5)	1.7 (1.5-1.9)	2.0 (1.7-2.4)
Cross-linked PE + Antioxidant	19,413	0.6 (0.5-0.7)	1.1 (0.9-1.2)	1.3 (1.1-1.5)	1.6 (1.4-1.8)	1.9 (1.7-2.2)	n.a.
Cobalt chrome	3,476	0.8 (0.5-1.1)	1.7 (1.3-2.2)	2.5 (2.0-3.1)	3.2 (2.6-3.8)	4.4 (3.7-5.2)	5.6 (4.7-6.4)
Ceramics	1,222	0.8 (0.3-1.2)	1.5 (0.8-2.1)	1.7 (1.0-2.5)	2.1 (1.3-2.9)	2.8 (1.8-3.7)	3.8 (2.6-4.9)

Acetabulum revision percentage: first revision of the acetabulum component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; PE: polyethylene; CI: confidence interval; n.a. if <50 cases were at risk.

Revision per component name

Cemented primary THA – overall revision

TABLE Cumulative revision percentages of cemented primary total hip arthroplasties by prosthesis component combination of patients who underwent a THA for osteoarthritis in the Netherlands in 2007-2022 (n=89,014)

					Type of revision (n)					Cumulative revision percentage (95% CI)					
Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Total revision arthroplasties (n)	Total hip (complete revision)	Only femur component	Only acetabulum component	Only femoral head/inlay	Missing/ unknown	1yr	3yr	5yr	7yr	10yr	14yr
All cemented THAs for osteoarthritis		**89,014**	**76 (71-81)**	**2,607**	**512**	**269**	**1,056**	**723**	**47**	**1.3 (1.2-1.4)**	**2.1 (2.0-2.2)**	**2.6 (2.5-2.7)**	**3.0 (2.9-3.1)**	**3.7 (3.6-3.9)**	**4.7 (4.4-4.9)**
Lubinus SPII	IP Cup	15,008	77 (72-81)	395	61	48	176	104	6	1.1 (1.0-1.3)	2.0 (1.7-2.2)	2.5 (2.2-2.8)	2.8 (2.5-3.1)	3.2 (2.8-3.5)	4.1 (3.5-4.6)
Original ME Muller	Muller low profile Durasul	9,450	75 (70-80)	258	30	5	65	155	3	1.8 (1.5-2.1)	2.4 (2.0-2.7)	2.8 (2.4-3.2)	3.1 (2.7-3.5)	3.6 (3.1-4.1)	4.0 (3.3-4.6)
Lubinus SPII	FAL Cup	6,450	75 (70-80)	213	49	13	77	69	5	1.9 (1.6-2.2)	2.6 (2.2-3.0)	3.2 (2.7-3.6)	3.8 (3.3-4.3)	4.5 (3.8-5.2)	5.5 (4.4-6.5)
Original ME Muller	Muller low profile	6,443	77 (73-81)	188	24	2	113	43	6	1.4 (1.1-1.7)	2.3 (2.0-2.7)	2.7 (2.3-3.1)	3.1 (2.7-3.6)	3.2 (2.7-3.6)	3.6 (3.0-4.2)
Exeter	Exeter Rimfit X3	5,098	76 (69-80)	114	28	25	24	37	0	1.3 (1.0-1.6)	1.9 (1.5-2.3)	2.3 (1.9-2.8)	2.5 (2.0-3.0)	3.2 (2.4-3.9)	n.a.
Spectron EF	Reflection All Poly XLPE	4,976	77 (73-82)	121	42	14	41	24	0	0.7 (0.4-0.9)	1.4 (1.1-1.8)	1.9 (1.5-2.2)	2.5 (2.1-3.0)	2.9 (2.4-3.5)	3.1 (2.6-3.7)
Stanmore	Stanmore	3,381	75 (70-80)	77	25	2	41	6	3	0.7 (0.4-1.0)	1.5 (1.0-1.9)	1.9 (1.4-2.3)	2.1 (1.6-2.6)	2.5 (1.9-3.1)	3.1 (2.2-4.0)
Exeter	Exeter Contemporary Hooded	2,827*	77 (72-81)	101	23	23	38	14	3	1.2 (0.8-1.6)	1.7 (1.2-2.2)	2.3 (1.7-2.9)	2.9 (2.3-3.6)	4.3 (3.4-5.2)	5.1 (3.9-6.2)
Lubinus SPII	SHP	2,506*	75 (71-80)	48	9	3	35	1	0	0.2 (0.0-0.4)	0.7 (0.3-1.0)	1.0 (0.6-1.3)	1.7 (1.2-2.2)	2.0 (1.4-2.6)	2.5 (1.6-3.4)
Exeter	Exeter	2,447*	73 (68-79)	150	24	14	77	30	5	2.8 (2.1-3.4)	3.6 (2.8-4.3)	4.1 (3.3-4.9)	4.9 (4.1-5.8)	6.3 (5.2-7.3)	7.2 (6.0-8.4)
Exeter	Exeter Contemporary Flanged	2,439	75 (67-80)	79	17	9	42	9	2	0.8 (0.4-1.1)	1.4 (0.9-1.9)	2.0 (1.4-2.6)	2.3 (1.7-2.9)	3.2 (2.4-4.0)	5.2 (3.8-6.6)
Stanmore	SHP	2,097*	75 (71-79)	116	39	5	60	10	2	1.6 (1.0-2.1)	3.1 (2.3-3.8)	4.0 (3.1-4.9)	4.7 (3.7-5.6)	5.6 (4.5-6.7)	7.7 (6.1-9.3)
CCA stem	CCB cup Low Profile	1,788	77 (73-80)	60	9	6	15	29	1	2.0 (1.4-2.7)	2.7 (1.9-3.4)	3.0 (2.1-3.8)	3.3 (2.4-4.1)	4.3 (3.0-5.5)	5.5 (3.3-7.6)
Original ME Muller	Avantage Cemented	1,530	77 (71-82)	55	0	1	5	45	1	3.1 (2.2-4.0)	3.7 (2.7-4.8)	4.9 (3.3-6.5)	5.5 (3.6-7.4)	n.a.	n.a.
C-Stem AMT	Marathon	1,485	79 (74-83)	19	3	3	0	16	0	1.1 (0.6-1.6)	1.4 (0.8-2.1)	1.4 (0.8-2.1)	n.a.	n.a.	n.a.
Stanmore	Exceed ABT Cemented	1,338	76 (71-81)	28	6	1	11	10	0	1.1 (0.5-1.6)	1.6 (0.9-2.2)	2.3 (1.4-3.3)	3.3 (1.8-4.8)	n.a.	n.a.
Lubinus SPII	IP Cup X-Linked	1,321	78 (73-82)	31	7	3	8	13	0	1.4 (0.8-2.1)	2.3 (1.4-3.2)	3.1 (2.0-4.2)	3.1 (2.0-4.2)	n.a.	n.a.
Twinsys stem Cemented	CCB cup Low Profile	1,158	80 (76-83)	16	1	3	6	5	1	0.8 (0.3-1.4)	1.4 (0.6-2.1)	1.7 (0.8-2.6)	2.0(1.0-3.0)	2.0 (1.0-3.0)	n.a.
Stanmore	All Poly Arcom Cup	1,056*	74 (69-79)	22	3	4	14	0	1	0.3 (0.0-0.6)	1.3 (0.6-2.0)	1.7 (0.9-2.5)	1.8 (1.0-2.7)	2.7 (1.5-3.9)	n.a.
Lubinus SPII	Avantage Cemented	930	78 (72-83)	34	6	1	4	23	0	3.1 (2.0-4.2)	3.4 (2.2-4.6)	4.4 (2.8-6.1)	5.2 (3.0-7.3)	n.a.	n.a.
Stanmore	Muller	879	76 (71-81)	12	3	2	6	1	0	0.7 (0.1-1.2)	1.3 (0.5-2.0)	1.3 (0.5-2.0)	1.3 (0.5-2.0)	1.6 (0.6-2.6)	n.a.
Spectron EF	Muller cup	831*	77 (72-81)	12	3	2	4	3	0	0.4 (0.0-0.8)	0.7 (0.1-1.3)	1.0 (0.3-1.6)	1.1 (0.4-1.8)	1.4 (0.6-2.1)	1.5 (0.7-2.4)
Spectron EF	Reflection All Poly	617*	77 (74-82)	50	11	0	35	4	0	0.8 (0.1-1.5)	1.8 (0.7-2.9)	2.7 (1.4-4.0)	3.3 (1.8-4.7)	6.6 (4.5-8.8)	10.5 (7.7-13.3)
Spectron EF	Muller low profile Durasul	503*	78 (74-83)	13	5	0	2	6	0	0.8 (0.0-1.6)	1.6 (0.5-2.8)	2.1 (0.8-3.4)	3.4 (1.5-5.3)	n.a.	n.a.
MS30	Muller low profile	497*	78 (74-82)	17	0	8	9	0	0	0.8 (0.0-1.6)	1.7 (0.5-2.8)	2.3 (1.0-3.7)	2.9 (1.3-4.5)	4.8 (2.4-7.1)	n.a.
Lubinus SPII	FAL Cup X-Linked	442	78 (74-81)	5	0	1	3	1	0	0.5 (0.0-1.2)	1.3 (0.0-2.7)	2.5 (0.0-5.0)	n.a.	n.a.	n.a.
Exeter	Avantage Cemented	436	74 (66-81)	9	3	2	0	4	0	1.4 (0.3-2.6)	2.2 (0.7-3.8)	2.8 (0.9-4.7)	2.8 (0.9-4.7)	n.a.	n.a.
Stanmore	Apollo	381*	75 (70-79)	6	3	1	1	0	1	0.3 (0.0-0.8)	0.8 (0.0-1.7)	1.4 (0.2-2.6)	1.4 (0.2-2.6)	1.7 (0.4-3.1)	n.a.
Stanmore	Avantage Cemented	369	79 (74-84)	11	0	1	0	10	0	2.2 (0.7-3.7)	3.0 (1.3-4.8)	3.0 (1.3-4.8)	n.a.	n.a.	n.a.
CHE-huftstiel	Huftpfanne	273*	75 (71-80)	23	5	3	15	0	0	0.4 (0.0-1.1)	1.5 (0.0-3.0)	2.7 (0.7-4.7)	4.4 (1.8-6.9)	7.2 (3.9-10.6)	n.a.
Charnley Modular	Marathon	255*	71 (65-79)	10	3	5	2	0	0	0.4 (0.0-1.2)	1.2 (0.0-2.6)	1.6 (0.0-3.2)	4.0 (1.4-6.5)	4.5 (1.8-7.3)	n.a.

* Denotes prosthesis combinations with no reported use in primary THAs in 2022.
Please note: n.a. if <50 cases were at risk; THA: total hip arthroplasty; RA: revision arthroplasty; CI: confidence interval; IQR: interquartile range.

Only combinations with over 250 procedures have been listed.
Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure, femoral head size and articulation of the prosthesis may have influenced the cumulative revision percentages.

Uncemented primary THA – overall revision

TABLE Cumulative revision percentages of uncemented primary total hip arthroplasties by prosthesis component combination of patients who underwent a THA for osteoarthritis in the Netherlands in 2007-2022 (n=230,573)

					Type of revision (n)					Cumulative revision percentage (95% CI)					
Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Total RAs (n)	Total hip (complete revision)	Only femur component	Only acetabulum component	Only femoral head/inlay	Missing/ unknown	1yr	3yr	5yr	7yr	10yr	14yr
All uncemented THAs for osteoarthritis		**230,573**	**68 (62-74)**	**8,232**	**1,349**	**2,880**	**2,155**	**1,709**	**139**	**1.5 (1.5-1.6)**	**2.5 (2.4-2.5)**	**3.1 (3.0-3.2)**	**3.7 (3.6-3.8)**	**4.6 (4.5-4.7)**	**5.9 (5.7-6.1)**
Corail	Pinnacle	41,174	69 (63-75)	928	173	286	194	264	11	1.1 (1.0-1.2)	1.8 (1.6-1.9)	2.2 (2.1-2.4)	2.5 (2.4-2.7)	3.3 (3.1-3.6)	3.7 (3.3-4.0)
Taperloc Complete	Allofit	24,355	67 (61-73)	473	87	168	88	123	7	1.4 (1.3-1.6)	2.1 (1.9-2.2)	2.5 (2.3-2.7)	2.6 (2.3-2.8)	n.a.	n.a.
Alloclassic Zweymuller SL	Allofit	14,806	70 (64-77)	538	85	208	130	110	5	1.2 (1.0-1.4)	2.0 (1.8-2.2)	2.6 (2.4-2.9)	3.2 (2.9-3.5)	4.3 (3.9-4.6)	5.3 (4.7-5.8)
Polarstem	R3	12,311	70 (63-75)	267	26	87	36	116	2	1.8 (1.5-2.0)	2.3 (2.0-2.6)	2.8 (2.4-3.3)	3.0 (2.4-3.6)	n.a.	n.a.
CLS Spotorno	Allofit	11,557	64 (58-69)	537	54	203	153	109	18	2.6 (2.3-2.9)	3.7 (3.3-4.0)	4.2 (3.8-4.5)	4.7 (4.3-5.1)	5.3 (4.8-5.8)	6.0 (5.2-6.7)
Taperloc Complete	Exceed ABT	8,825	69 (63-75)	201	37	73	38	49	4	1.4 (1.2-1.7)	1.9 (1.6-2.2)	2.2 (1.9-2.5)	2.5 (2.1-2.8)	2.8 (2.4-3.3)	n.a.
Accolade	Trident	7,605	69 (62-76)	344	47	178	49	68	2	1.4 (1.1-1.7)	2.8 (2.5-3.2)	3.7 (3.3-4.1)	4.5 (4.0-5.0)	5.5 (4.9-6.2)	8.3 (6.3-10.4)
Mallory Head Stems	Mallory Head	6,019	65 (60-69)	228	28	23	101	70	6	1.4 (1.1-1.7)	2.3 (1.9-2.6)	2.7 (2.3-3.1)	3.2 (2.8-3.7)	3.8 (3.2-4.3)	4.9 (4.1-5.7)
Accolade II	Trident	5,021	69 (62-75)	94	15	36	12	29	2	1.7 (1.3-2.0)	2.3 (1.7-2.8)	2.5 (1.8-3.3)	4.3 (0.8-7.7)	n.a.	n.a.
Twinsys stem Cementless	RM Pressfit Vitamys cup	4,888	66 (60-72)	145	16	65	37	24	3	1.8 (1.4-2.2)	2.5 (2.0-2.9)	2.9 (2.3-3.4)	3.2 (2.6-3.8)	4.8 (3.8-5.8)	n.a.
Accolade	Trident Trinanium	4,539*	68 (62-74)	139	13	48	31	44	3	1.1 (0.8-1.4)	2.2 (1.8-2.6)	2.8 (2.3-3.3)	3.3 (2.7-3.8)	3.9 (3.1-4.6)	n.a.
Taperloc Hip system	Exceed ABT	3,893*	68 (62-75)	127	22	35	37	25	8	1.2 (0.8-1.5)	2.3 (1.8-2.8)	2.7 (2.2-3.2)	2.9 (2.4-3.5)	3.4 (2.8-4.0)	n.a.
SL Plus	Bicon Plus	3,777	70 (64-76)	274	40	138	75	18	3	1.7 (1.3-2.1)	4.0 (3.3-4.6)	5.4 (4.7-6.1)	6.4 (5.6-7.2)	7.6 (6.7-8.5)	8.8 (7.6-9.9)
Taperloc Hip system	Mallory Head	3,670*	67 (61-71)	137	26	38	49	23	1	1.5 (1.1-1.8)	2.6 (2.1-3.1)	2.9 (2.4-3.5)	3.4 (2.8-4.0)	3.7 (3.1-4.4)	4.7 (3.7-5.6)
Twinsys stem Cementless	RM Pressfit cup	3,402	73 (68-78)	131	18	61	25	26	1	2.5 (2.0-3.0)	3.1 (2.5-3.7)	3.4 (2.8-4.1)	3.9 (3.2-4.6)	4.6 (3.7-5.5)	n.a.
Taperloc Complete	Mallory Head	3,113	67 (61-72)	117	20	25	32	39	1	2.1 (1.6-2.6)	3.1 (2.5-3.7)	3.4 (2.7-4.0)	3.7 (3.0-4.4)	4.4 (3.4-5.4)	n.a.
Alloclassic offset	Allofit	2,966	71 (65-77)	89	19	35	16	16	3	1.4 (0.9-1.8)	2.0 (1.5-2.5)	2.6 (2.0-3.2)	2.9 (2.2-3.5)	3.8 (2.9-4.7)	4.5 (3.4-5.6)
Synergy	Reflection	2,930*	66 (60-72)	146	12	69	30	34	1	2.1 (1.6-2.6)	2.7 (2.1-3.3)	3.1 (2.5-3.7)	3.6 (2.9-4.3)	4.4 (3.6-5.2)	6.7 (5.4-8.0)
Alloclassic Zweymuller SL	Alloclassic Zweymuller CSF	2,903*	69 (63-75)	136	18	55	26	35	2	1.1 (0.7-1.5)	2.7 (2.1-3.2)	3.3 (2.6-3.9)	3.5 (2.8-4.2)	4.4 (3.6-5.1)	5.6 (4.6-6.6)
Taperloc Complete	G7 PPS	2,884	69 (63-75)	42	11	11	10	10	0	1.7 (1.1-2.2)	n.a.	n.a.	n.a.	n.a.	n.a.
M/L Taper	Allofit IT	2,437	71 (65-77)	81	10	32	28	10	1	2.2 (1.6-2.8)	3.2 (2.4-3.9)	3.6 (2.8-4.4)	3.9 (3.0-4.7)	4.1 (3.1-5.0)	n.a.
Corail AMT	Pinnacle	2,432	69 (61-74)	24	3	6	6	9	0	0.8 (0.4-1.1)	1.1 (0.6-1.5)	n.a.	n.a.	n.a.	n.a.
Avenir Muller	Allofit	2,245	68 (62-74)	28	3	12	3	10	0	1.2 (0.7-1.6)	1.5 (0.8-2.1)	1.7 (0.9-2.5)	2.2 (1.1-3.3)	2.2 (1.1-3.3)	n.a.
Synergy	R3	2,102	66 (60-72)	67	11	35	11	8	2	1.8 (1.2-2.4)	2.3 (1.7-2.9)	2.9 (2.1-3.6)	3.2 (2.4-4.0)	3.4 (2.6-4.3)	n.a.
Symax	Trident	2,073*	69 (63-75)	74	7	19	20	28	0	0.6 (0.3-0.9)	1.7 (1.1-2.2)	2.2 (1.5-2.8)	2.8 (2.0-3.5)	3.2 (2.4-4.0)	4.1 (3.1-5.0)
Fitmore	Allofit	1,946	67 (62-72)	27	7	9	2	8	1	1.2 (0.7-1.7)	1.7 (0.9-2.5)	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary THAs in 2022.
Please note: n.a. if <50 cases were at risk; THA: total hip arthroplasty; RA: revision arthroplasty; CI: confidence interval; IQR: interquartile range.

TABLE Continued - Cumulative revision percentages of uncemented primary total hip arthroplasties by prosthesis component combination of patients who underwent a THA for osteoarthritis in the Netherlands in 2007-2022 (n=230,573)

					Type of revision (n)					Cumulative revision percentage (95% CI)					
Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Total RAs (n)	Total hip (complete revision)	Only femur component	Only acetabulum component	Only femoral head/inlay	Missing/ unknown	1yr	3yr	5yr	7yr	10yr	14yr
Anthology	R3	1,843	65 (59-69)	61	9	20	17	15	0	2.1 (1.4-2.7)	2.6 (1.9-3.4)	3.3 (2.4-4.1)	3.5 (2.6-4.3)	3.7 (2.7-4.6)	n.a.
Symax	Trident Tritanium	1,743*	67 (61-73)	92	11	41	26	13	1	2.3 (1.6-3.0)	3.6 (2.7-4.5)	4.0 (3.0-4.9)	4.8 (3.8-5.8)	5.4 (4.3-6.5)	n.a.
Mallory Head Stems	Exceed ABT	1,637*	65 (59-71)	38	3	16	17	2	0	0.7 (0.3-1.1)	1.6 (1.0-2.2)	1.7 (1.1-2.4)	2.1 (1.4-2.8)	2.4 (1.6-3.2)	n.a.
Omnifit HA	Trident	1,501*	63 (57-67)	148	19	71	24	30	4	3.1 (2.2-3.9)	4.5 (3.4-5.5)	6.3 (5.0-7.5)	7.7 (6.4-9.1)	9.5 (8.0-11.0)	10.8 (9.1-12.4)
M/L Taper	Continuum	1,472	68 (63-73)	30	3	20	4	3	0	1.6 (0.9-2.3)	2.2 (1.4-2.9)	2.3 (1.5-3.2)	2.3 (1.5-3.2)	n.a.	n.a.
Alloclassic Zweymuller SL	Continuum	1,246	71 (64-77)	36	7	14	4	10	1	1.6 (0.9-2.3)	2.2 (1.4-3.0)	2.6 (1.7-3.5)	2.9 (2.0-3.9)	3.4 (2.2-4.5)	n.a.
CLS Spotorno	RM Classic cup	1,178*	63 (58-68)	78	14	22	34	7	1	1.9 (1.1-2.6)	2.6 (1.7-3.6)	3.3 (2.3-4.4)	3.9 (2.8-5.0)	5.1 (3.8-6.3)	7.0 (5.5-8.6)
CLS Spotorno	Pinnacle	1,165*	67 (62-72)	59	8	22	13	16	0	1.3 (0.6-1.9)	2.3 (1.4-3.1)	2.8 (1.8-3.8)	3.5 (2.4-4.6)	4.9 (3.5-6.3)	n.a.
Summit Tapered	Pinnacle Gription	1,117	68 (62-74)	28	2	7	5	13	1	2.2 (1.3-3.0)	2.4 (1.5-3.3)	3.0 (1.7-4.4)	n.a.	n.a.	n.a.
SL Plus Mia	R3	1,109*	71 (65-77)	34	3	16	7	8	0	1.9 (1.1-2.7)	2.7 (1.8-3.7)	3.0 (2.0-4.1)	3.0 (2.0-4.1)	3.3 (2.2-4.4)	n.a.
SL Plus	Reflection	1,020*	67 (61-73)	43	6	14	14	9	0	1.8 (1.0-2.6)	3.3 (2.2-4.4)	3.8 (2.6-5.0)	4.3 (3.0-5.5)	4.4 (3.1-5.7)	n.a.
SL Plus	Hofer-Imhoff Lubrimet	978*	70 (64-76)	61	13	30	10	6	2	1.1 (0.5-1.8)	2.3 (1.3-3.2)	3.6 (2.4-4.7)	4.4 (3.1-5.8)	5.6 (4.1-7.1)	7.5 (5.6-9.4)
Alloclassic Zweymuller SL	Trilogy	967*	68 (63-75)	35	10	10	7	8	0	1.4 (0.6-2.1)	2.2 (1.3-3.1)	2.6 (1.6-3.6)	2.9 (1.9-4.0)	3.6 (2.4-4.8)	3.7 (2.5-4.9)
Polarstem	Reflection	927*	70 (64-76)	18	5	4	2	7	0	1.1 (0.4-1.7)	1.6 (0.8-2.4)	2.1 (1.1-3.0)	2.1 (1.1-3.0)	n.a.	n.a.
Accolade II	Trident Tritanium	904	68 (61-73)	20	2	7	3	8	0	2.6 (1.3-3.8)	3.3 (1.7-4.9)	n.a.	n.a.	n.a.	n.a.
Optimys stem	RM Pressfit Vitamys cup	896	62 (55-68)	17	2	9	3	2	1	1.8 (0.9-2.7)	2.1 (1.1-3.1)	2.1 (1.1-3.1)	2.1 (1.1-3.1)	n.a.	n.a.
Taperloc Complete	Continuum	814	68 (59-74)	18	5	7	1	5	0	2.0 (1.0-2.9)	2.3 (1.3-3.4)	n.a.	n.a.	n.a.	n.a.
SL Plus	EP-Fit Plus	790*	68 (63-75)	45	10	24	10	1	0	1.3 (0.5-2.1)	3.1 (1.9-4.3)	3.8 (2.4-5.1)	4.9 (3.3-6.4)	5.7 (4.0-7.3)	6.3 (4.5-8.0)
Alloclassic Zweymuller SL	Alloclassic Variall	778*	71 (64-77)	23	4	10	3	5	1	1.0 (0.3-1.7)	1.9 (1.0-2.9)	2.4 (1.3-3.4)	2.6 (1.5-3.8)	3.0 (1.7-4.2)	3.3 (1.9-4.7)
CLS Spotorno	Fitmore	758*	66 (61-71)	37	3	17	6	10	1	1.9 (0.9-2.8)	2.4 (1.3-3.5)	2.6 (1.5-3.8)	3.3 (2.0-4.6)	4.3 (2.9-5.8)	5.3 (3.6-7.0)
DB10	Spidercup	755*	71 (64-77)	40	2	20	10	7	1	1.5 (0.6-2.3)	2.3 (1.2-3.3)	2.9 (1.6-4.1)	3.7 (2.4-5.1)	4.8 (3.2-6.4)	6.6 (4.5-8.8)
CLS Spotorno	Morscher	712*	73 (68-78)	37	6	19	12	0	0	1.3 (0.4-2.1)	2.6 (1.4-3.7)	3.2 (1.9-4.5)	4.2 (2.7-5.7)	5.6 (3.8-7.5)	n.a.
CLS Spotorno	RM Pressfit cup	625*	66 (60-71)	54	5	21	19	5	4	3.1 (1.7-4.4)	4.4 (2.8-6.0)	5.7 (3.9-7.5)	6.6 (4.6-8.6)	7.9 (5.7-10.1)	9.8 (7.3-12.3)
Corail	Pinnacle Gription	599	71 (64-77)	5	0	4	1	0	0	0.6 (0.0-1.2)	n.a.	n.a.	n.a.	n.a.	n.a.
CBH stem	RM Pressfit Vitamys cup	593*	65 (60-70)	24	8	7	7	2	0	1.0 (0.2-1.8)	2.4 (1.1-3.6)	3.3 (1.8-4.7)	4.0 (2.4-5.5)	4.2 (2.5-5.8)	n.a.
CBH stem	RM Pressfit cup	551*	75 (69-79)	23	4	6	11	2	0	2.2 (1.0-3.4)	3.7 (2.1-5.3)	3.9 (2.3-5.5)	4.3 (2.6-6.0)	4.3 (2.6-6.0)	n.a.
Alloclassic Zweymuller SL	Trabecular Metal	547*	68 (62-75)	27	2	8	9	7	1	0.6 (0.0-1.2)	1.9 (0.7-3.0)	2.6 (1.3-4.0)	3.4 (1.8-4.9)	3.6 (2.0-5.2)	5.5 (3.3-7.6)

* Denotes prosthesis combinations with no reported use in primary THAs in 2022.
Please note: n.a. if <50 cases were at risk; THA: total hip arthroplasty; CI: confidence interval; IQR: interquartile range.

Only combinations with over 500 procedures have been listed.

Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure, femoral head size and articulation of the prosthesis may have influenced the cumulative revision percentages.

Cemented primary THA – major revision

TABLE Cumulative major revision percentages of the most frequently used cemented primary total hip arthroplasties by prosthesis component combination of patients who underwent a THA for osteoarthritis in the Netherlands in 2007-2022 (n=89,014)

					Cumulative revision percentage Kaplan Meier (95% CI)					
Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Major revision[1] arthroplasties (n)	1yr	3yr	5yr	7yr	10yr	14yr
All cemented THAs for osteoarthritis		**89,014**	**76 (71-81)**	**1,944**	**0.7 (0.6-0.7)**	**1.4 (1.3-1.4)**	**1.8 (1.7-1.9)**	**2.3 (2.1-2.4)**	**2.9 (2.8-3.1)**	**3.8 (3.6-4.1)**
Lubinus SPII	IP Cup	15,008	77 (72-81)	313	0.6 (0.4-0.7)	1.4 (1.2-1.6)	1.9 (1.7-2.2)	2.2 (2.0-2.5)	2.7 (2.3-3.0)	3.6 (3.0-4.2)
Original ME Muller	Muller low profile Durasul	9,450	75 (70-80)	113	0.5 (0.4-0.7)	1.0 (0.8-1.2)	1.3 (1.0-1.6)	1.4 (1.1-1.7)	1.8 (1.4-2.1)	2.0 (1.5-2.5)
Lubinus SPII	FAL Cup	6,450	75 (70-80)	150	0.9 (0.7-1.2)	1.6 (1.3-1.9)	2.2 (1.8-2.6)	2.9 (2.4-3.4)	3.6 (2.9-4.2)	4.4 (3.4-5.4)
Original ME Muller	Muller low profile	6,443	77 (73-81)	146	0.9 (0.7-1.1)	1.8 (1.4-2.1)	2.1 (1.7-2.4)	2.4 (2.0-2.8)	2.5 (2.1-2.9)	2.8 (2.3-3.3)
Exeter	Exeter Rimfit X3	5,098	76 (69-80)	80	0.7 (0.4-0.9)	1.2 (0.9-1.5)	1.7 (1.3-2.0)	1.8 (1.4-2.3)	2.4 (1.7-3.0)	n.a.
Spectron EF	Reflection All Poly XLPE	4,976	77 (73-82)	99	0.4 (0.2-0.5)	1.0 (0.7-1.3)	1.5 (1.1-1.8)	2.1 (1.6-2.5)	2.5 (2.0-2.9)	2.7 (2.1-3.2)
Stanmore	Stanmore	3,381	75 (70-80)	69	0.5 (0.3-0.8)	1.3 (0.9-1.7)	1.7 (1.2-2.1)	1.9 (1.4-2.3)	2.3 (1.7-2.8)	2.8 (2.0-3.7)
Exeter	Exeter Contemporary Hooded	2,827*	77 (72-81)	87	0.7 (0.4-1.0)	1.2 (0.8-1.6)	1.8 (1.3-2.3)	2.3 (1.8-2.9)	3.9 (3.0-4.7)	4.6 (3.5-5.8)
Lubinus SPII	SHP	2,506*	75 (71-80)	47	0.2 (0.0-0.4)	0.6 (0.3-0.9)	0.9 (0.5-1.3)	1.7 (1.1-2.2)	2.0 (1.4-2.6)	2.5 (1.6-3.4)
Exeter	Exeter	2,447*	73 (68-79)	123	1.8 (1.2-2.3)	2.5 (1.9-3.1)	3.1 (2.4-3.8)	3.9 (3.1-4.6)	5.2 (4.2-6.1)	6.0 (4.9-7.0)

[1] Revision of at least the acetabulum or femur component.

* Denotes prosthesis combinations with no reported use in primary THAs in 2022.

Please note: n.a. if <50 cases were at risk; THA: total hip arthroplasty; CI: confidence interval; IQR: interquartile range.

Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure, femoral head size and articulation of the prosthesis may have influenced the cumulative revision percentages.

Uncemented primary THA – major revision

TABLE Cumulative major revision percentages of the most frequently used uncemented primary total hip arthroplasties by prosthesis component combination of patients who underwent a THA for osteoarthritis in the Netherlands in 2007-2022 (n=230,573)

					Cumulative revision percentage (95% CI)					
Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Major revision[1] arthroplasties (n)	1yr	3yr	5yr	7yr	10yr	14yr
All uncemented THAs for osteoarthritis		**230,573**	**68 (62-74)**	**6,646**	**1.1 (1.0-1.1)**	**1.9 (1.9-2.0)**	**2.5 (2.4-2.5)**	**3.0 (2.9-3.1)**	**3.8 (3.7-3.9)**	**5.1 (4.9-5.2)**
Corail	Pinnacle	41,174	69 (63-75)	701	0.7 (0.6-0.8)	1.3 (1.2-1.4)	1.7 (1.5-1.8)	1.9 (1.8-2.1)	2.6 (2.4-2.8)	3.1 (2.7-3.5)
Taperloc Complete	Allofit	24,355	67 (61-73)	362	1.0 (0.9-1.1)	1.6 (1.4-1.8)	2.0 (1.8-2.2)	2.1 (1.8-2.4)	n.a.	n.a.
Alloclassic Zweymuller SL	Allofit	14,806	70 (64-77)	438	0.9 (0.7-1.0)	1.6 (1.4-1.8)	2.1 (1.9-2.3)	2.5 (2.2-2.8)	3.5 (3.1-3.8)	4.4 (3.9-5.0)
Polarstem	R3	12,311	70 (63-75)	159	0.9 (0.8-1.1)	1.4 (1.1-1.6)	1.9 (1.5-2.2)	2.1 (1.5-2.6)	n.a.	n.a.
CLS Spotorno	Allofit	11,557	64 (58-69)	434	1.9 (1.7-2.2)	2.8 (2.5-3.1)	3.3 (3.0-3.6)	3.8 (3.4-4.1)	4.4 (4.0-4.8)	5.1 (4.3-5.8)
Taperloc Complete	Exceed ABT	8,825	69 (63-75)	157	1.1 (0.9-1.3)	1.5 (1.2-1.7)	1.7 (1.4-1.9)	2.0 (1.6-2.3)	2.3 (1.9-2.7)	n.a.
Accolade	Trident	7,605	69 (62-76)	285	1.0 (0.8-1.3)	2.2 (1.9-2.6)	3.0 (2.6-3.4)	3.7 (3.2-4.1)	4.6 (4.0-5.2)	7.5 (5.4-9.6)
Mallory Head Stems	Mallory Head	6,019	65 (60-69)	167	0.9 (0.7-1.2)	1.6 (1.3-1.9)	2.0 (1.6-2.4)	2.4 (2.0-2.8)	2.8 (2.3-3.2)	3.5 (2.8-4.1)
Accolade II	Trident	5,021	69 (62-75)	64	1.1 (0.8-1.4)	1.5 (1.1-1.9)	1.8 (1.1-2.5)	3.5 (0.1-6.9)	n.a.	n.a.
Twinsys stem Cementless	RM Pressfit Vitamys cup	4,888	66 (60-72)	124	1.4 (1.1-1.8)	2.1 (1.6-2.5)	2.4 (1.9-2.8)	2.8 (2.3-3.3)	4.3 (3.3-5.3)	n.a.

[1] Revision of at least the acetabulum or femur component.
Please note: n.a. if <50 cases were at risk; THA: total hip arthroplasty; CI: confidence interval; IQR: interquartile range.

Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure, femoral head size and articulation of the prosthesis may have influenced the cumulative revision percentages.

Bone cement

TABLE Cumulative revision percentages of the most frequently types of bone cement by type of mixing system in primary total hip arthroplasties in the Netherlands in 2007-2022

			Cumulative revision percentage Kaplan Meier (95% CI)					
Bone cement	Total primary THAs (n)	Total RAs (n)	1yr	3yr	5yr	7yr	10yr	14yr
Separately packed	**95,252**	**3,388**	**1.5 (1.4-1.5)**	**2.4 (2.3-2.5)**	**3.0 (2.9-3.1)**	**3.5 (3.4-3.6)**	**4.4 (4.2-4.5)**	**5.6 (5.3-5.9)**
Palacos R+G	73,479	2,516	1.5 (1.4-1.6)	2.5 (2.4-2.6)	3.1 (2.9-3.2)	3.5 (3.4-3.6)	4.2 (4.1-4.4)	5.3 (5.0-5.6)
Refobacin Bone Cement R	6,387	194	1.0 (0.8-1.3)	1.9 (1.5-2.2)	2.3 (1.9-2.6)	2.8 (2.4-3.3)	3.7 (3.1-4.2)	4.0 (3.4-4.6)
Palacos MV+G	3,916	106	0.9 (0.6-1.2)	1.5 (1.1-1.9)	2.2 (1.7-2.7)	3.2 (2.6-3.8)	3.6 (2.9-4.4)	n.a.
Simplex ABC EC	2,685	158	2.2 (1.7-2.8)	3.5 (2.8-4.2)	4.4 (3.6-5.2)	5.1 (4.2-6.0)	6.6 (5.5-7.8)	10.4 (7.9-13.0)
Simplex ABC Tobra	2,341	155	2.0 (1.4-2.5)	3.2 (2.5-4.0)	4.0 (3.2-4.8)	4.7 (3.8-5.6)	6.6 (5.5-7.6)	8.6 (7.1-10.2)
Simplex P	1,323*	30	0.8 (0.3-1.2)	1.8 (1.1-2.5)	1.9 (1.1-2.6)	2.1 (1.3-2.8)	2.8 (1.7-3.8)	2.8 (1.7-3.8)
Simplex HV	574*	13	0.7 (0.0-1.4)	0.9 (0.1-1.7)	2.1 (0.9-3.3)	2.6 (1.2-4.0)	n.a.	n.a.
Refobacin Plus Bone Cement	561*	26	1.8 (0.7-2.9)	2.9 (1.5-4.3)	3.7 (2.1-5.3)	4.1 (2.4-5.8)	4.8 (2.9-6.7)	5.7 (3.4-8.0)
Palamed G	493*	15	0.4 (0.0-1.0)	0.8 (0.0-1.6)	1.3 (0.3-2.3)	2.0 (0.7-3.2)	3.0 (1.4-4.6)	4.0 (1.8-6.1)
Biomet Plus Bone Cement	453*	26	0.4 (0.0-1.1)	1.4 (0.3-2.4)	2.5 (1.1-4.0)	3.3 (1.6-5.0)	4.4 (2.4-6.3)	7.1 (4.4-9.7)
Subiton G	434	8	1.2 (0.2-2.2)	2.2 (0.6-3.7)	n.a.	n.a.	n.a.	n.a.
CMW 1 Gentamicin Bone Cement	327*	14	1.8 (0.4-3.3)	2.8 (1.0-4.6)	3.1 (1.2-5.0)	3.1 (1.2-5.0)	4.0 (1.8-6.2)	4.9 (2.4-7.5)
Palacos R	312*	17	1.6 (0.2-3.0)	2.7 (0.8-4.5)	4.2 (1.8-6.5)	5.0 (2.4-7.6)	6.8 (3.5-10.0)	n.a.
Palamed	277*	26	1.1 (0.0-2.3)	2.5 (0.7-4.4)	3.7 (1.4-5.9)	3.7 (1.4-5.9)	6.1 (3.2-9.0)	10.6 (6.7-14.5)
Pre-packed in a vacuum mixing system	**38,541**	**1,101**	**2.0 (1.8-2.1)**	**2.7 (2.6-2.9)**	**3.3 (3.1-3.5)**	**3.8 (3.5-4.0)**	**4.5 (4.1-4.8)**	**4.8 (4.3-5.4)**
Refobacin Bone Cement R	18,013	558	2.1 (1.8-2.3)	2.8 (2.6-3.1)	3.4 (3.1-3.7)	3.9 (3.6-4.3)	4.8 (4.2-5.4)	n.a.
Palacos R+G	15,065	390	2.0 (1.8-2.3)	2.8 (2.5-3.1)	3.4 (3.0-3.8)	3.7 (3.2-4.2)	n.a.	n.a.
Refobacin Plus Bone Cement	4,701	128	1.3 (0.9-1.6)	2.2 (1.7-2.6)	2.6 (2.1-3.1)	3.1 (2.5-3.6)	3.5 (2.8-4.2)	n.a.
Cemex Genta	432	10	1.2 (0.2-2.2)	1.9 (0.6-3.2)	2.2 (0.8-3.5)	2.2 (0.8-3.5)	3.3 (0.7-6.0)	n.a.

* Denotes types of bone cement with no reported use in primary THAs in 2022.
Please note: n.a. if <50 cases were at risk; THA: total hip arthroplasty; RA: revision arthroplasty; CI: confidence interval; IQR: interquartile range.

Only types of bone cement with over 250 procedures have been listed.
Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure, femoral head size and articulation of the prosthesis may have influenced the cumulative revision percentages.

Rerevision

Overall second revision

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision in the Netherlands in 2007-2022 (n=13,847)

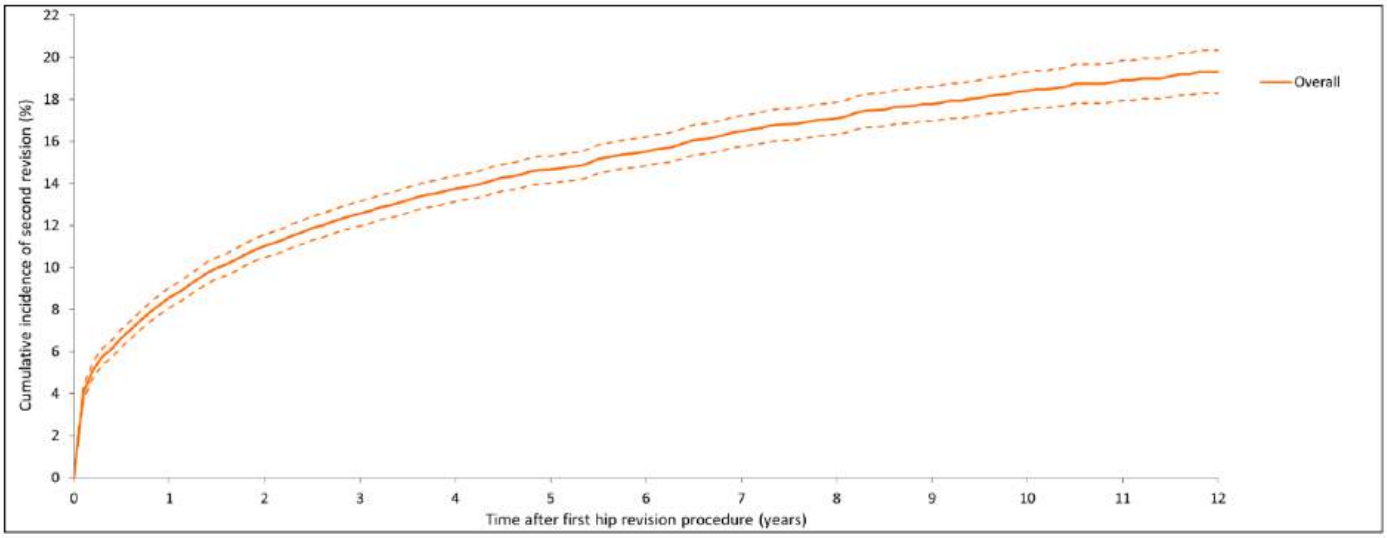


TABLE Cumulative second revision percentages

	Number at risk (n)	Competing Risk (95% CI)	Kaplan Meier[1] (95% CI)
1-year second revision (%)	11,231	8.4 (8.0-8.9)	8.2 (7.8-8.7)
3-year second revision (%)	8,283	12.3 (11.7-12.8)	12.4 (11.9-13.0)
5-year second revision (%)	5,656	14.1 (13.5-14.7)	14.6 (14.0-15.3)
7-year second revision (%)	3,588	15.7 (15.0-16.4)	16.4 (15.7-17.1)
10-year second revision (%)	1,514	17.2 (16.4-18.0)	18.4 (17.5-19.2)

[1] The cumulative revision percentage using the Kaplan Meier method is shown in the figure.
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

By procedure year of first major revision

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision by procedure year of first major revision in the Netherlands in 2012-2022 (n=7,579)

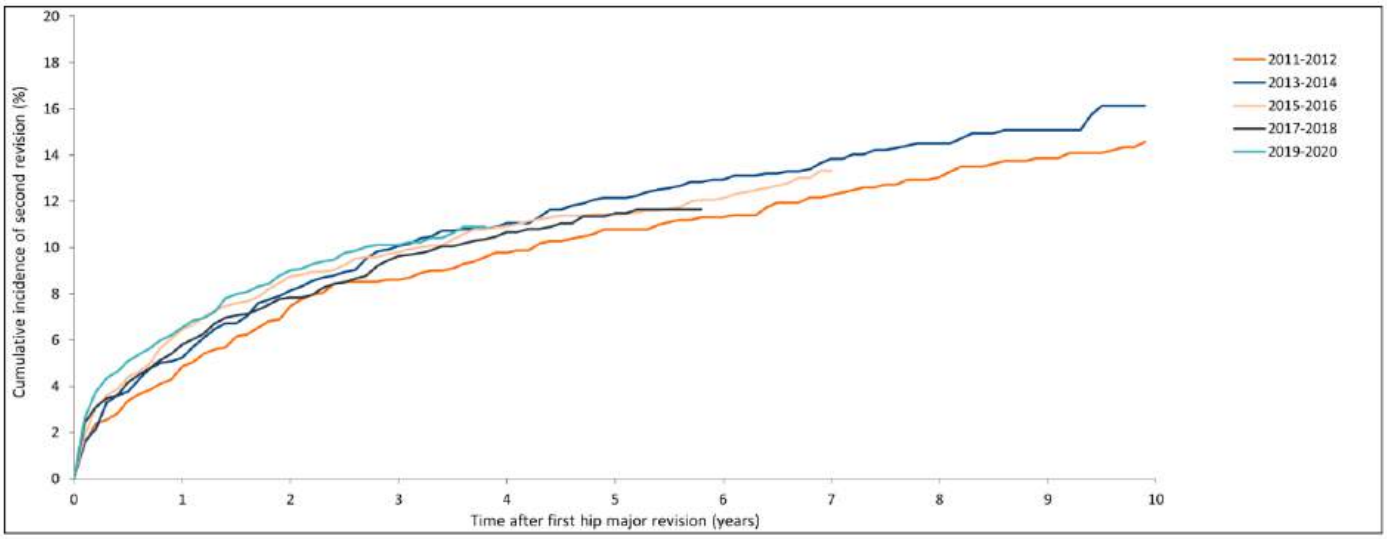


TABLE Cumulative second revision percentages

Cumulative second revision percentages - Kaplan Meier (95% CI)

Procedure year first major revision	Number (n)	1yr	3yr	5yr	7yr
2011-2012	1,097	4.30 (3.10-5.50)	8.61 (6.94-10.28)	10.79 (8.93-12.65)	12.17 (10.19-14.15)
2013-2014	1,309	5.08 (3.88-6.28)	9.91 (8.27-11.55)	12.15 (10.35-13.95)	13.66 (11.75-15.57)
2015-2016	1,537	6.06 (4.86-7.26)	9.73 (8.23-11.23)	11.45 (9.83-13.07)	13.32 (11.53-15.11)
2017-2018	1,812	5.41 (4.36-6.46)	9.44 (8.07-10.81)	11.35 (9.83-12.87)	n.a.
2019-2020	1,824	6.21 (5.09-7.33)	10.12 (8.69-11.55)	n.a.	n.a.

Please note: n.a. if <50 cases were at risk.
Major revision: revision of at least the acetabulum or femur component.
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.
CI: confidence interval.

By type of first revision

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision by type of first revision in the Netherlands in 2007-2022 (n=13,847)

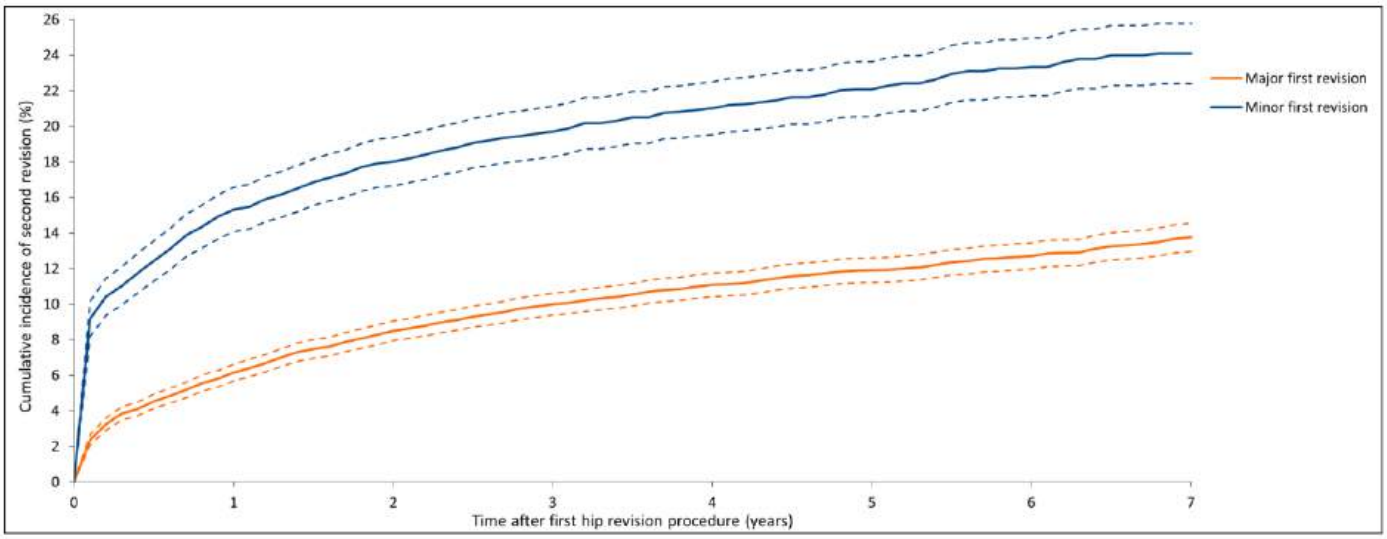


TABLE Cumulative second revision percentages

	Number (n)	Cumulative second revision percentages - Kaplan Meier (95% CI) 1yr	3yr	5yr	7yr
Major first revision	10,350	5.8 (5.3-6.3)	9.9 (9.3-10.5)	11.9 (11.2-12.6)	13.7 (12.9-14.5)
Minor first revision	3,322	14.9 (13.7-16.1)	19.6 (18.2-21.0)	22.1 (20.5-23.6)	24.1 (22.4-25.8)

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.
Major revision: revision of at least the acetabulum or femur component.
Minor revision: only inlay and/or femoral head exchange (including DAIR procedures).
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

By time to first revision

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision by time to first revision in the Netherlands in 2007-2022 (n=13,847)

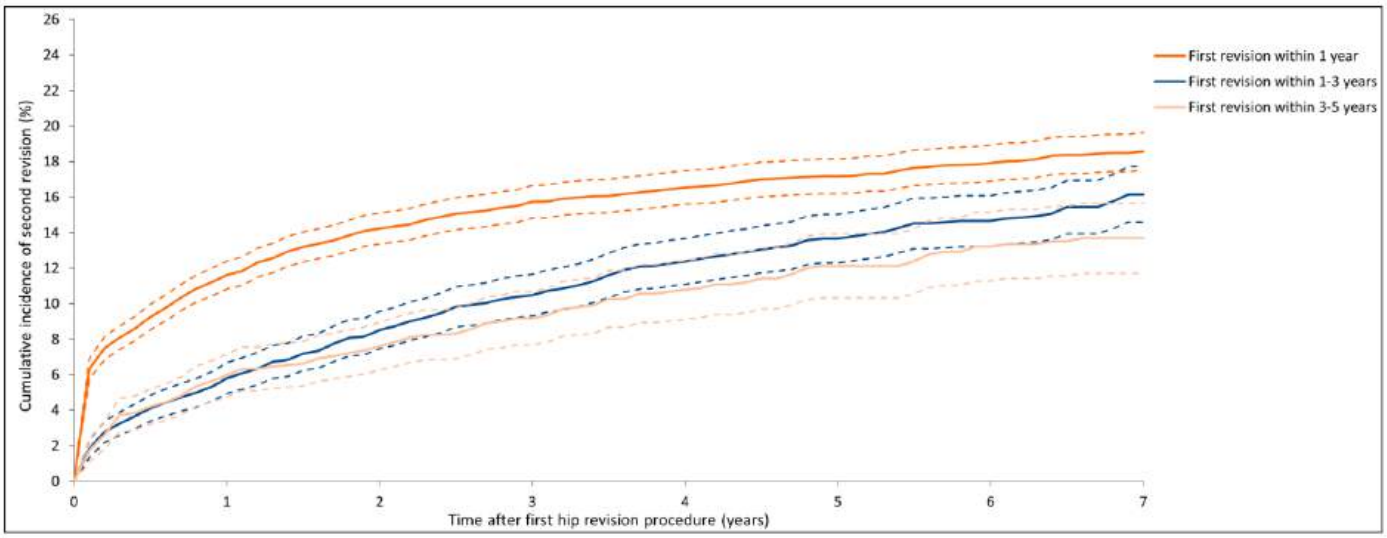


TABLE Cumulative second revision percentages

		Cumulative second revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
First revision within 1 year	6,546	11.2 (10.4-12.0)	15.5 (14.6-16.4)	17.2 (16.2-18.1)	18.5 (17.4-19.5)
First revision within 1-3 years	2,865	5.3 (4.5-6.2)	10.4 (9.2-11.6)	13.7 (12.3-15.0)	16.2 (14.6-17.7)
First revision within 3-5 years	1,584	5.6 (4.5-6.8)	9.2 (7.7-10.7)	12.1 (10.3-13.9)	13.7 (11.7-15.7)

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

By fixation of primary THA

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision by fixation of the primary procedure in the Netherlands in 2007-2022 (n=13,546)

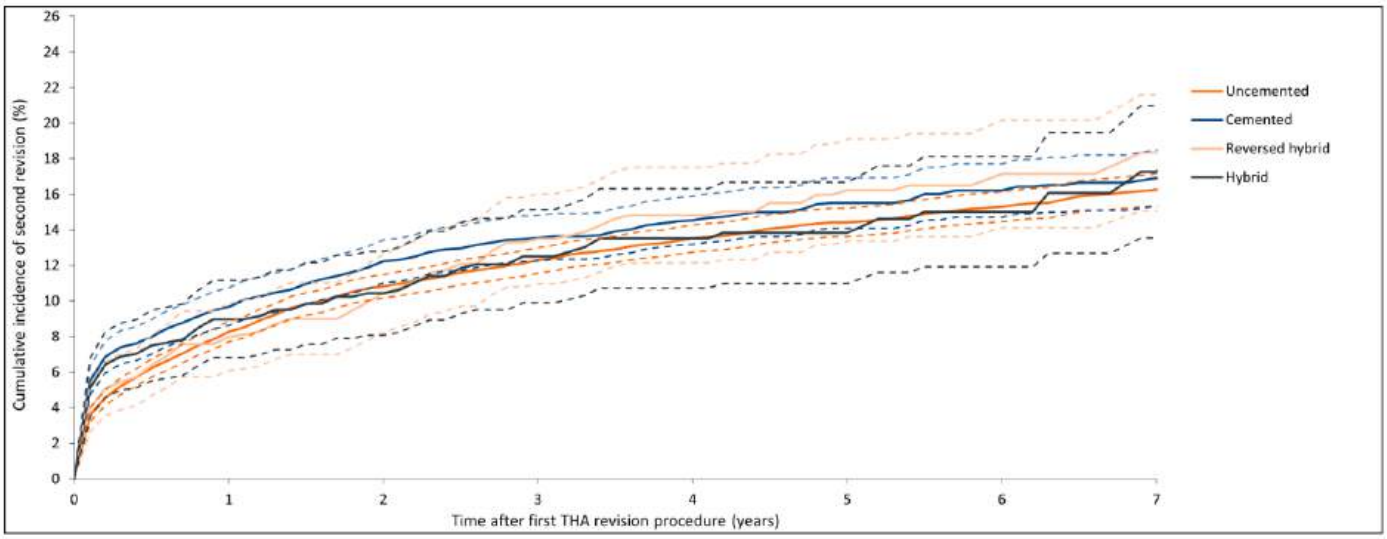


TABLE Cumulative second revision percentages

		Cumulative second revision percentages - Kaplan Meier (95% CI)			
Fixation of primary THA	Number (n)	1yr	3yr	5yr	7yr
Uncemented	8,953	7.8 (7.3-8.4)	12.1 (11.4-12.8)	14.4 (13.6-15.2)	16.2 (15.3-17.1)
Cemented	3,080	9.5 (8.4-10.5)	13.5 (12.2-14.8)	15.5 (14.1-16.9)	16.8 (15.2-18.4)
Reversed hybrid	815	7.6 (5.7-9.4)	13.3 (10.8-15.8)	16.0 (13.2-18.8)	18.3 (15.1-21.6)
Hybrid	698	9.0 (6.8-11.2)	12.5 (9.9-15.1)	13.8 (11.0-16.7)	17.3 (13.6-21.0)

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
THA: total hip arthroplasty; CI: confidence interval.

Reasons for seconds revision by type of first revision

TABLE Reasons for second revision within seven years in patients who underwent a second revision after a one-stage first revision of a total hip arthroplasty by type of first revision in the Netherlands in 2007-2022

	Major first revision[1] (n=1,116)	Minor first revision[2] (n=676)	Any type of first revision[3] (n=1,858)
Reasons for second revision	Proportion[4] (%)	Proportion[4] (%)	Proportion[4] (%)
Infection	30.6	59.6	41.6
Dislocation	26.7	26.5	26.1
Loosening of acetabulum component	19.8	5.0	14.0
Loosening of femur component	17.7	4.9	12.8
Peri-prosthetic fracture	10.2	2.7	7.3
Inlay wear	3.2	2.8	3.0
Symptomatic MoM bearing	1.5	0.4	1.1
Peri-articular ossification	1.0	0.3	0.7
Other	12.6	7.4	1.0

[1] Revision of at least the acetabulum or femur component.
[2] Only inlay and/or femoral head exchange (including DAIR procedures).
[3] Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
4 One patient may have more than one reason for revision or re-surgery. As such, the total proportion is over 100%.
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

Survival resurfacing hip arthroplasty

FIGURE Cumulative revision percentages of resurfacing hip arthroplasties by prosthesis component in the Netherlands in 2007-2022 (n=2,884)

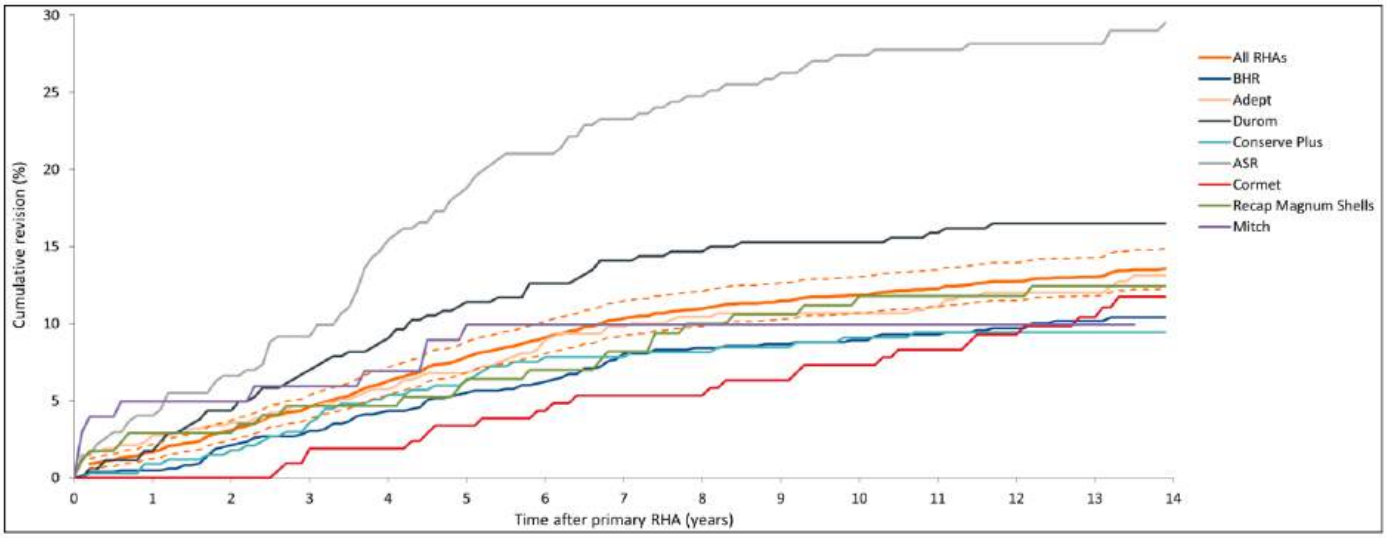


TABLE Cumulative revision percentages of resurfacing hip arthroplasties by prosthesis component in the Netherlands in 2007-2021 (n=2,893)

				Cumulative revision percentage (95% CI)					
Type of prosthesis	Total primary RHAs (n)	Median (IQR) age (yr)	Total RAs (n)	1yr	3yr	5yr	7yr	10yr	13yr
All resurfacing hip arthroplasties	**2,893**	**54 (49-59)**	**373**	**1.6 (1.2-2.1)**	**4.4 (3.6-5.1)**	**7.6 (6.6-8.6)**	**10.3 (9.1-11.4)**	**11.8 (10.7-13.0)**	**13.0 (11.8-14.3)**
BHR	854	54 (48-58)	82	0.5 (0.0-0.9)	2.8 (1.7-3.9)	5.4 (3.9-6.9)	7.7 (5.9-9.5)	9.0 (7.0-10.9)	10.2 (8.1-12.4)
Adept	474	54 (48-59)	59	2.3 (1.0-3.7)	4.7 (2.8-6.5)	6.8 (4.5-9.1)	9.8 (7.1-12.5)	10.7 (7.9-13.5)	12.2 (9.2-15.2)
Durom	344	54 (50-59)	56	1.7 (0.4-3.1)	6.7 (4.1-9.4)	11.1 (7.8-14.5)	14.1 (10.4-17.8)	15.3 (11.5-19.1)	16.5 (12.5-20.5)
Conserve Plus	338	55 (50-60)	31	0.9 (0.0-1.9)	3.0 (1.2-4.8)	6.0 (3.4-8.5)	7.8 (4.9-10.7)	9.1 (6.0-12.2)	9.5 (6.3-12.6)
ASR	272	53 (47-56)	81	4.0 (1.7-6.4)	9.2 (5.8-12.6)	18.4 (13.8-23)	23.3 (18.2-28.3)	27.4 (22.1-32.7)	28.2 (22.8-33.5)
Cormet	215	57 (50-61)	21	0.0 (0.0-0.0)	0.9 (0.0-2.3)	3.4 (0.9-5.8)	5.3 (2.3-8.4)	7.3 (3.7-10.8)	10.0 (5.8-14.2)
Recap Magnum Shells	172	55 (48-59)	21	2.9 (0.4-5.4)	4.7 (1.5-7.8)	5.8 (2.3-9.3)	8.2 (4.1-12.3)	11.2 (6.5-15.9)	12.7 (7.6-17.9)
Mitch	101	57 (51-61)	10	5.0 (0.7-9.2)	5.9 (1.3-10.5)	8.9 (3.4-14.5)	9.9 (4.1-15.8)	9.9 (4.1-15.8)	n.a.

Please note: RHA: recurfacing hip arthroplasty; RA: revision arthroplasty; n.a. if <50 cases were at risk; CI: confidence interval; IQR: interquartile range.

PROMs

Response

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a THA for osteoarthritis per pre-operative PROMs registering hospital (n=91) in the Netherlands in 2014-2021

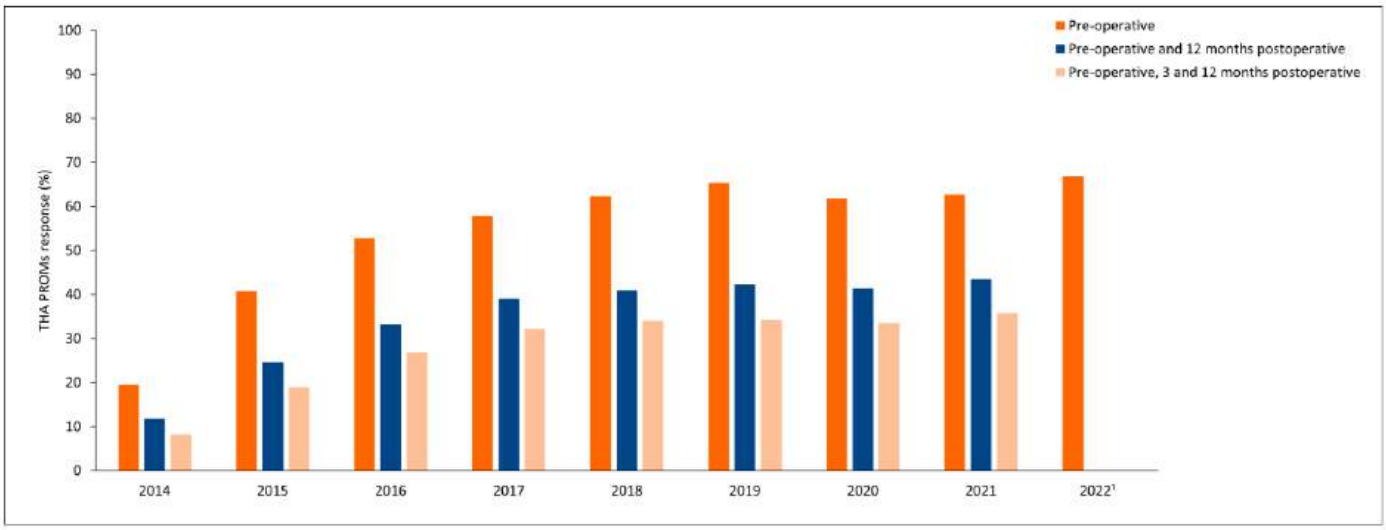


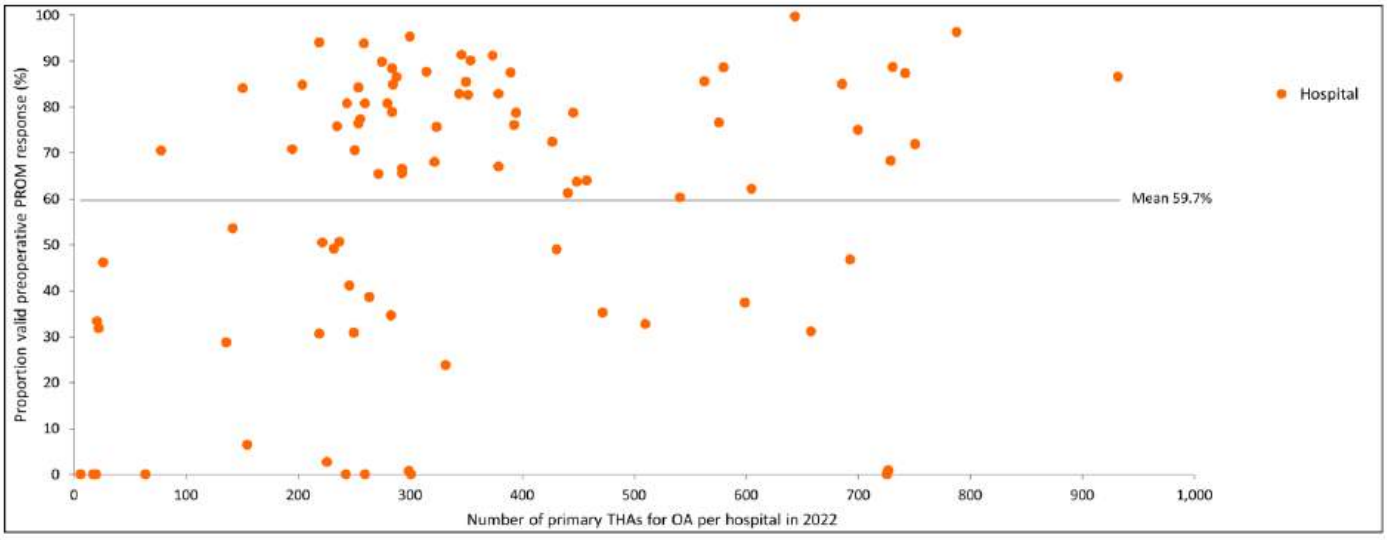
TABLE PROMs response percentages

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022¹
THA for osteoarthritis (n)	23,465	24,090	24,593	25,423	26,734	27,722	22,353	26,304	30,486
THA PROMs response (%)									
Pre-operative	19.3	40.4	51.8	58	62.4	65.3	61.2	62.5	66.7
Pre-operative and 12 months postoperative	11.7	24.5	33.1	39.2	41.1	41.8	41.1	43.3	n.a.
Pre-operative, 3 and 12 months postoperative	8.1	18.8	26.7	32.3	34.2	33.8	33.2	35.7	n.a.

¹ The 12 months postoperative PROMs response percentage is not (yet) available for 2022.
THA: total hip arthroplasty; PROM: patient reported outcome measure.

Response pre-PROM per hospital

FIGURE Scatterplot of pre-operative response percentage of patients who underwent a primary THA for osteoarthritis per hospital (n=88) in the Netherlands in 2022

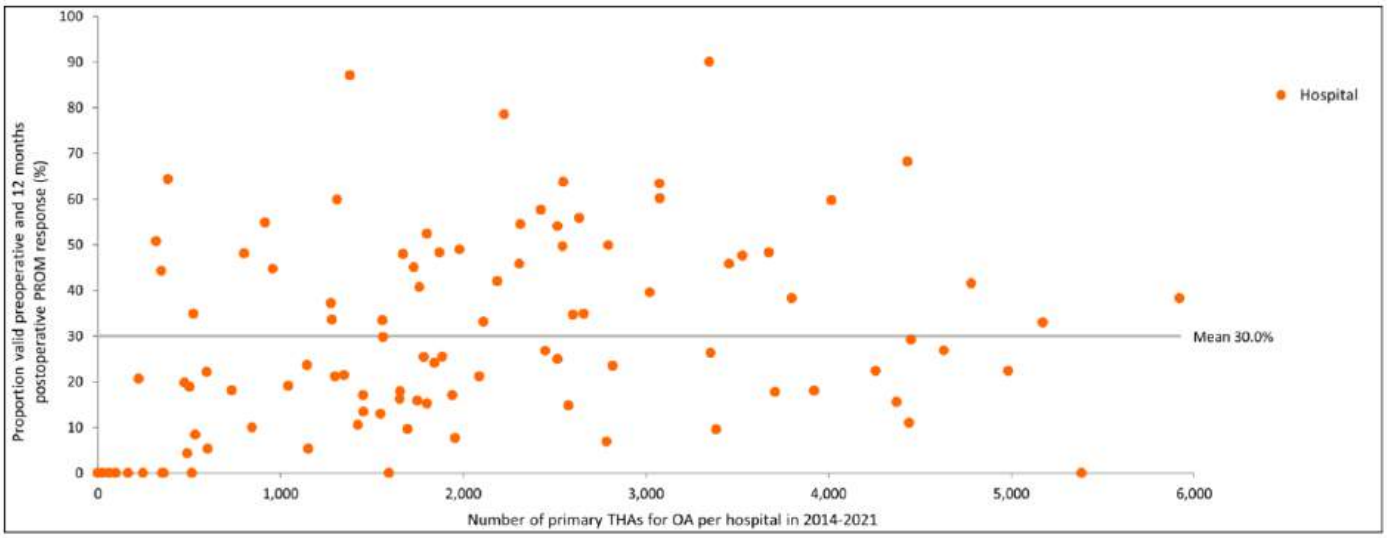


Please note: THA: total hip arthroplasty; OA: osteoarthritis; PROM: patient reported outcome measure.

The mean pre-operative response rate is 59.7% in the Netherlands in 2022.
56 out of 88 (63.6%) hospitals scored above the national mean.

Response PROM trajectory per hospital

FIGURE Scatterplot of PROM trajectory (pre-operative and 12 months postoperative) response percentage of patients who underwent a primary THA for osteoarthritis per hospital (n=100) in the Netherlands in 2014-2021



Please note: THA: total hip arthroplasty; OA: osteoarthritis; PROM: patient reported outcome measure.

The mean PROM trajectory response rate was 30.0% in the Netherlands between 2014-2021. 43 out of 100 (43.0%) hospitals scored above the national mean.

Mean scores

NRS (rest)

FIGURE Mean pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2021

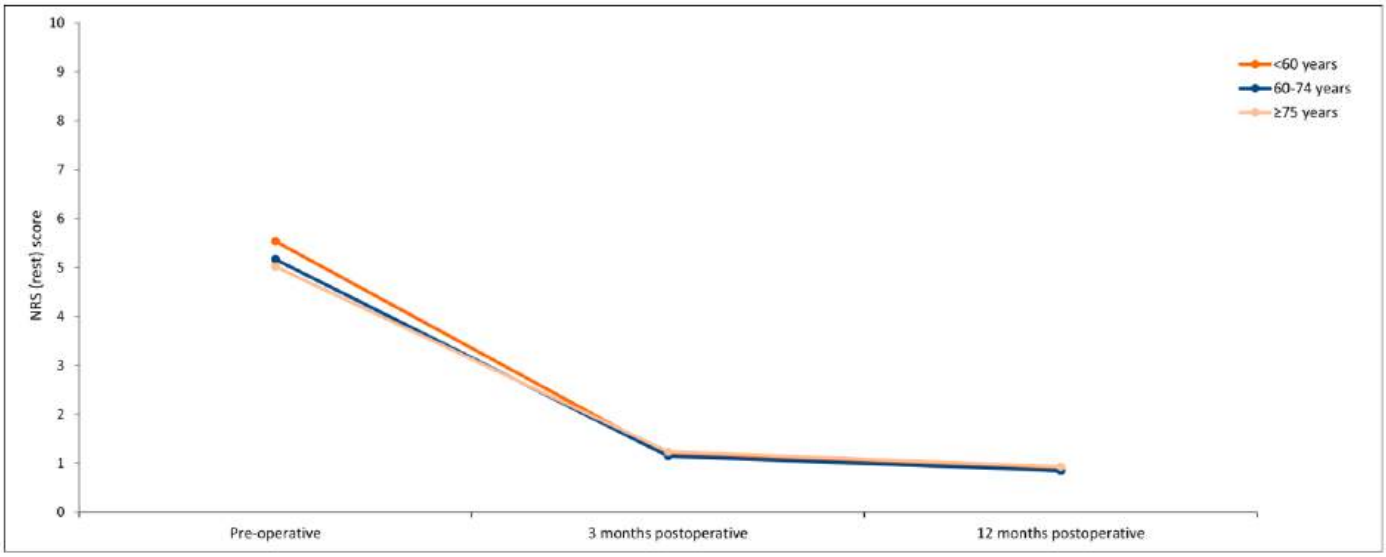


TABLE Mean NRS (rest) scores

NRS (rest) score	Pre-operative		3 months postoperative		12 months postoperative	
Age category	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	8,389	5.54 (5.48-5.59)	8,411	1.16 (1.13-1.20)	8,354	0.90 (0.86-0.93)
60-74 years	31,946	5.17 (5.14-5.19)	32,023	1.15 (1.13-1.17)	31,797	0.85 (0.83-0.86)
≥75 years	15,556	5.01 (4.97-5.06)	15,520	1.23 (1.20-1.26)	15,388	0.92 (0.89-0.95)
Total	55,897	5.18 (5.16-5.20)	55,960	1.17 (1.16-1.19)	55,545	0.88 (0.86-0.89)

THA: total hip arthroplasty

The NRS (rest) score measures pain during rest. The score has a range of 0.0 to 10.0, with 0.0 representing no pain and 10.0 representing the most possible pain.

NRS (activity)

FIGURE Mean pre-operative, 3 months and 12 months postoperative NRS (activity) scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2021

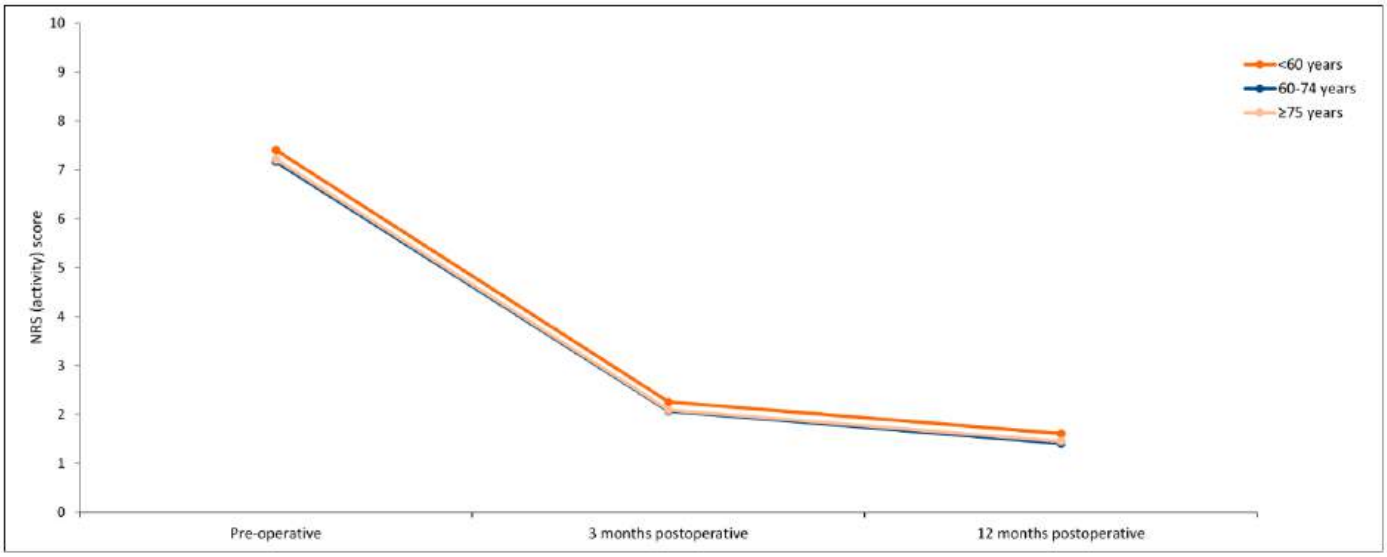


TABLE Mean NRS (activity) scores

NRS (activity) score	Pre-operative		3 months postoperative		12 months postoperative	
Age category	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	8,391	7.40 (7.36-7.44)	8,414	2.25 (2.21-2.30)	8,360	1.61 (1.56-1.65)
60-74 years	31,960	7.17 (7.14-7.19)	32,066	2.07 (2.04-2.09)	31,815	1.41 (1.38-1.43)
≥75 years	15,553	7.21 (7.18-7.24)	15,515	2.09 (2.05-2.13)	15,397	1.45 (1.41-1.48)
Total	55,910	7.21 (7.20-7.23)	56,001	2.10 (2.08-2.12)	55,578	1.45 (1.43-1.47)

THA: total hip arthroplasty

The NRS (activity) score measures pain during activity. The score has a range of 0.0 to 10.0, with 0.0 representing no pain and 10.0 representing the most possible pain.

EQ5D index score

FIGURE Mean pre-operative, 3 months and 12 months postoperative EQ-5D index scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2021

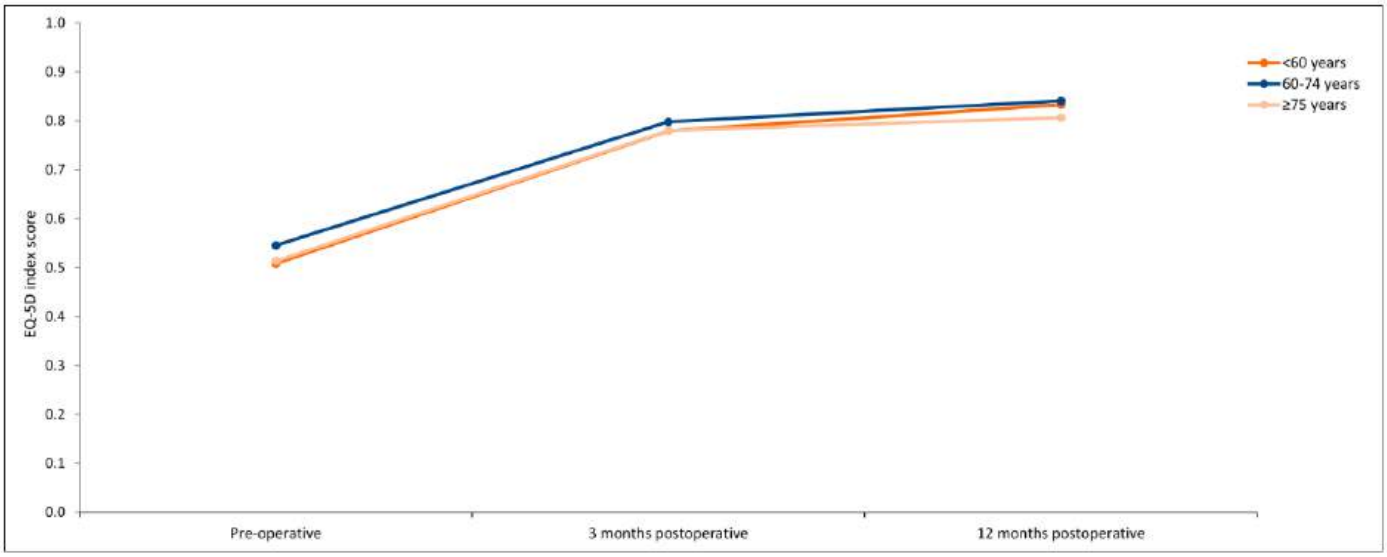


TABLE Mean EQ-5D index scores

EQ-5D Index score	Pre-operative		3 months postoperative		12 months postoperative	
Age category	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	8,390	0.51 (0.50-0.51)	8,328	0.78 (0.78-0.78)	8,268	0.83 (0.83-0.84)
60-74 years	31,922	0.55 (0.54-0.55)	31,661	0.80 (0.80-0.80)	31,385	0.84 (0.84-0.84)
≥75 years	15,445	0.51 (0.51-0.52)	15,209	0.78 (0.78-0.78)	15,068	0.81 (0.80-0.81)
Total	55,763	0.53 (0.53-0.53)	55,204	0.79 (0.79-0.79)	54,727	0.83 (0.83-0.83)

THA: total hip arthroplasty

The EQ-5D index score measures quality of life. The score has a range of -0.329 to 1.0, with 1.0 representing the best possible quality of life.

EQ5D thermometer

FIGURE Mean pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2021

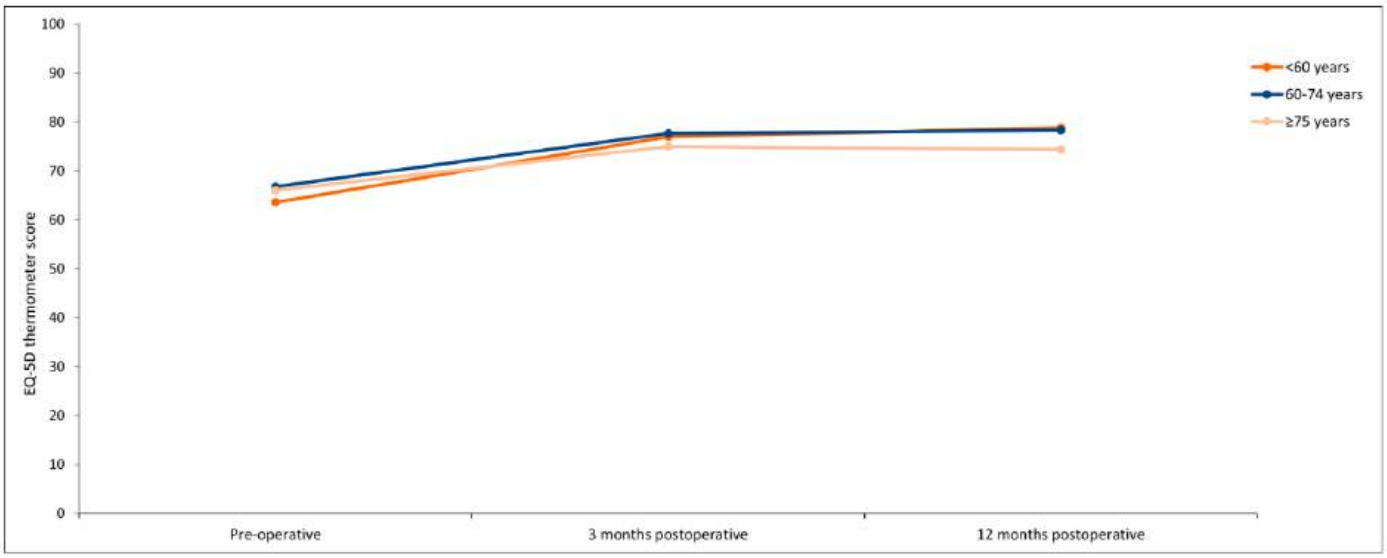


TABLE Mean EQ-5D thermometer scores

EQ-5D thermometer score	Pre-operative		3 months postoperative		12 months postoperative	
Age category	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	8,413	63.6 (63.1-64.0)	8,381	76.9 (76.6-77.3)	8,340	78.8 (78.4-79.2)
60-74 years	31,997	66.8 (66.5-67.0)	31,946	77.6 (77.4-77.8)	31,701	78.3 (78.1-78.5)
≥75 years	15,453	66.0 (65.7-66.3)	15,354	75.0 (74.7-75.3)	15,223	74.4 (74.1-74.7)
Total	55,869	66.1 (65.9-66.2)	55,687	76.8 (76.7-77.0)	55,270	77.3 (77.1-77.5)

THA: total hip arthroplasty

The EQ-5D thermometer score measures the health situation. The score has a range of 0.0 to 100.0, with 0.0 representing the worst possible health situation and 100.0 the best possible health situation.

HOOS-PS score

FIGURE Mean pre-operative, 3 months and 12 months postoperative HOOS-PS scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2021

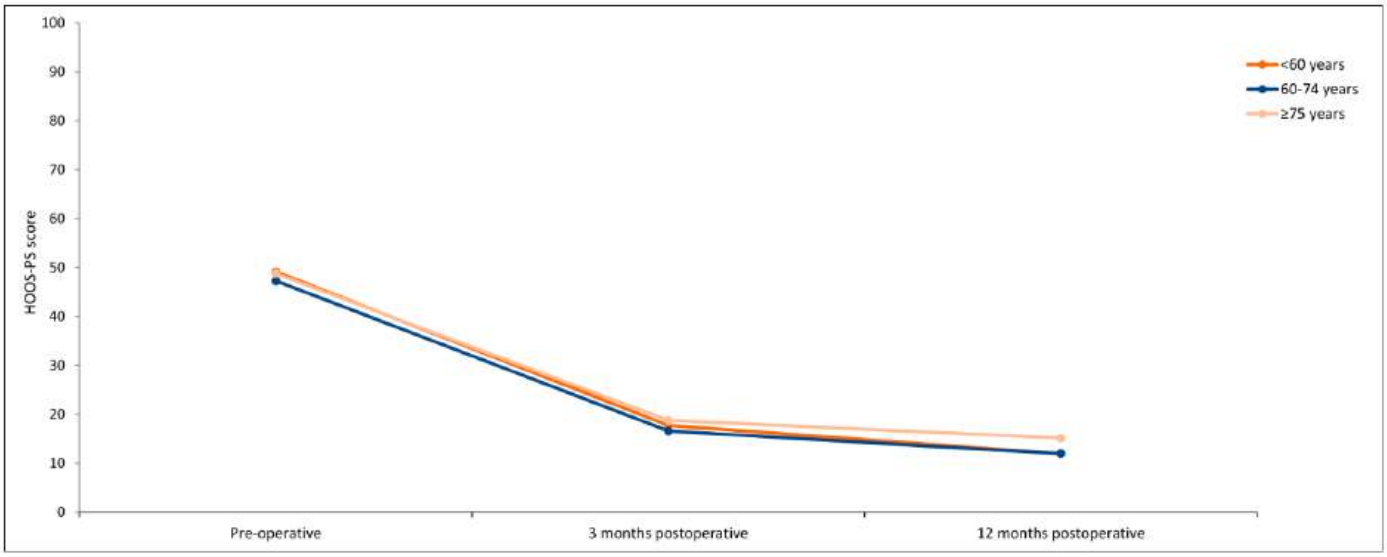


TABLE Mean HOOS-PS scores

HOOS-PS score	Pre-operative		3 months postoperative		12 months postoperative	
Age category	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	8,185	49.1 (48.8-49.5)	8,006	17.7 (17.4-18.0)	8,093	12.0 (11.7-12.3)
60-74 years	30,759	47.2 (47.0-47.4)	30,034	16.6 (16.4-16.7)	30,133	12.0 (11.8-12.1)
≥75 years	14,283	48.7 (48.4-49.0)	13,408	18.7 (18.5-19.0)	13,454	15.1 (14.9-15.4)
Total	53,233	47.9 (47.8-48.1)	51,454	17.3 (17.2-17.4)	51,686	12.8 (12.7-12.9)

THA: total hip arthroplasty

The HOOS-PS score measures the physical functioning of patients with osteoarthritis to the hip. The score has a range of 0.0 to 100.0, with 0.0 representing no effort and 100.0 the most possible effort.

Oxford Hip score

FIGURE Mean pre-operative, 3 months and 12 months postoperative Oxford Hip scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2021

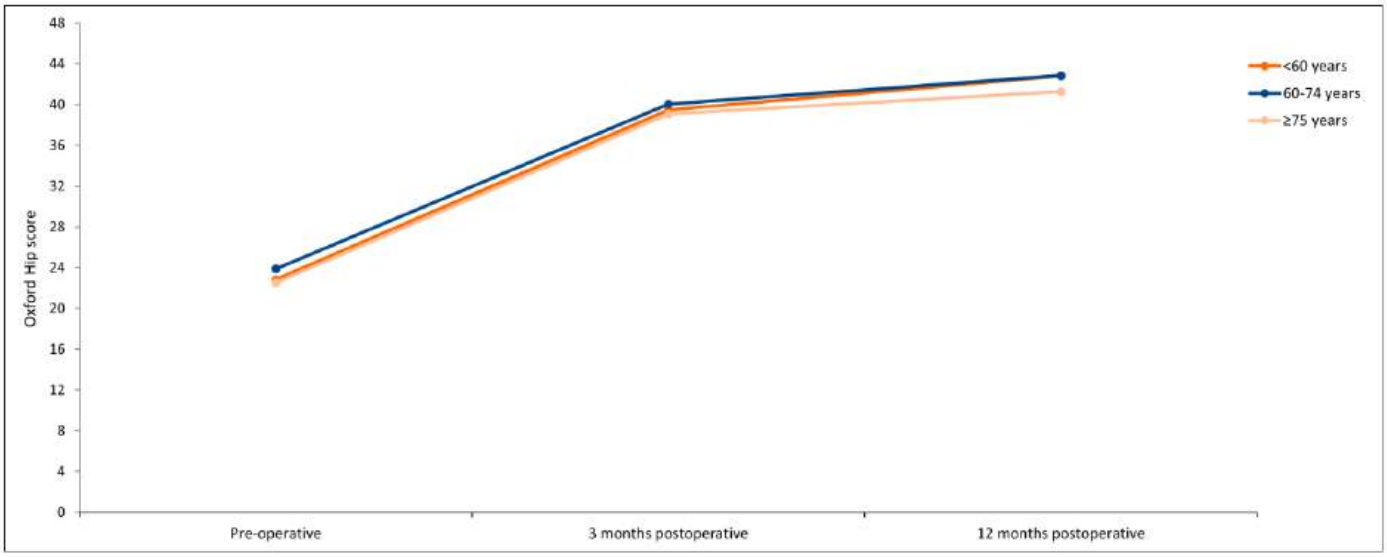


TABLE Mean Oxford Hip scores

Oxford Hip score	Pre-operative		3 months postoperative		12 months postoperative[1]	
Age category	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	7,873	22.8 (22.6-23.0)	7,802	39.5 (39.3-39.7)	7,753	42.8 (42.6-43.0)
60-74 years	30,128	23.9 (23.8-24.0)	29,902	40.0 (40.0-40.1)	29,639	42.8 (42.7-42.9)
≥75 years	14,526	22.5 (22.4-22.7)	14,183	39.1 (38.9-39.2)	14,052	41.3 (41.1-41.4)
Total	52,533	23.4 (23.2-23.4)	51,893	39.7 (39.6-39.8)	51,450	42.4 (42.3-42.5)

THA: total hip arthroplasty

The Oxford Hip score measures the physical functioning and pain of patients with osteoarthritis to the hip. The score has a range of 0.0 to 48.0, with 0.0 representing no functional ability and 48.0 the most functional ability.

Anchor question: Daily functioning

FIGURE Mean 3 months and 12 months postoperative Anchor scores: change in daily functioning of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2021

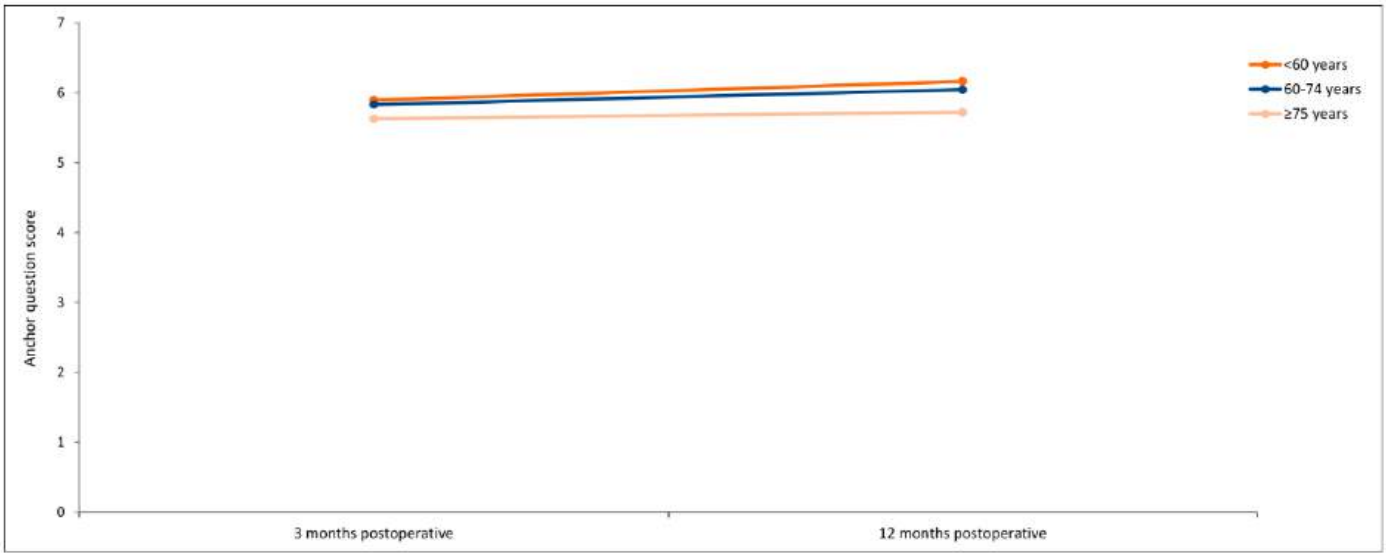


TABLE Mean anchor question: Daily functioning

Anchor question score	3 months postoperative		12 months postoperative[1]	
Age category	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	8,138	5.90 (5.87-5.92)	8,177	6.16 (6.14-6.19)
60-74 years	31,110	5.83 (5.82-5.84)	31,042	6.04 (6.03-6.06)
≥75 years	15,076	5.63 (5.61-5.65)	14,950	5.72 (5.70-5.74)
Total	54,340	5.78 (5.77-5.80)	54,175	5.97 (5.96-5.98)

THA: total hip arthroplasty

The anchor question measures change in daily functioning after joint replacement. The score has a range of 1.0 to 7.0, with 1.0 representing very deteriorated and 7.0 representing very improved.

Knee arthroplasty

Numbers

Registered procedures

TABLE Number of registered knee arthroplasties per year of surgery (2007-2022) in the LROI in April 2023

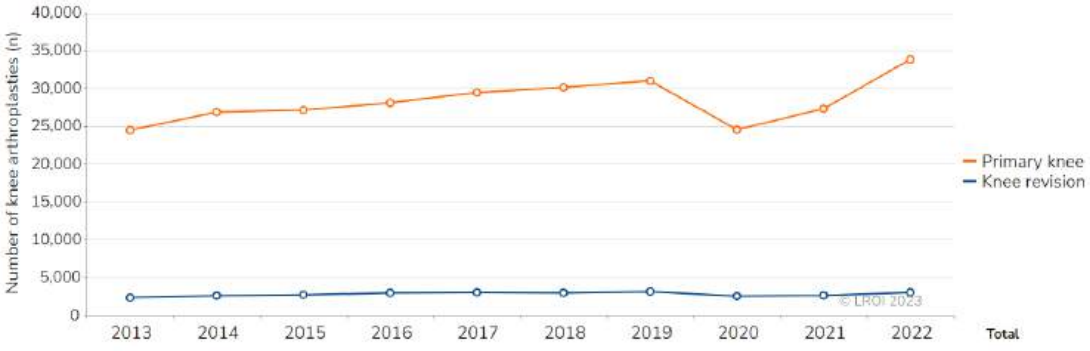
Year of surgery	Type of knee arthroplasty: Total arthroplasty (n)	Unicondylar arthroplasty (n)	Patellofemoral arthroplasty (n)	Unknown/ missing (n)	Revision arthroplasty (n)	Total (n)
2007	7,035	780	47	878	595	9,335
2008	11,747	1,221	92	405	908	14,373
2009	16,792	1,547	139	175	1,300	19,953
2010	18,507	1,716	143	241	1,624	22,231
2011	19,521	1,586	116	207	1,794	23,224
2012	21,727	1,578	171	255	2,117	25,848
2013	22,302	1,805	135	207	2,309	26,758
2014	24,242	2,364	116	118	2,556	29,396
2015	24,246	2,693	156	48	2,686	29,829
2016	24,884	2,947	144	100	2,926	31,001
2017	25,555	3,662	168	43	2,997	32,425
2018	25,835	4,073	183	29	2,930	33,050
2019	25,886	4,888	175	43	3,101	34,093
2020	19,615	4,725	158	22	2,496	27,016
2021	21,514	5,666	108	15	2,601	29,904
2022	26,708	6,972	116	26	2,985	36,807
Total	336,116	48,223	2,167	2,812	35,925	425,243

© LROI 2023

The LROI is nearly complete as of 2010. Therefore, a dotted line was inserted between 2009 and 2010.

Type of procedures

FIGURE Number of primary knee arthroplasties and knee revision arthroplasties registered in the LROI in the Netherlands in 2013-2022

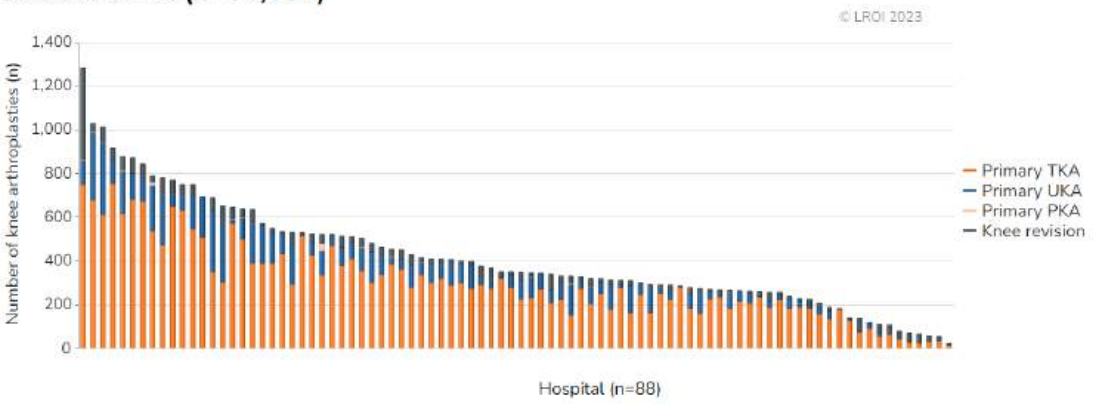


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Type of procedure (n)											
Primary knee	24,449	26,840	27,143	28,075	29,428	30,120	30,992	24,520	27,303	33,822	**282,692**
Knee revision	2,309	2,556	2,686	2,926	2,997	2,930	3,101	2,496	2,601	2,985	**27,587**
Total:	**26,758**	**29,396**	**29,829**	**31,001**	**32,425**	**33,050**	**34,093**	**27,016**	**29,904**	**36,807**	**310,279**

Out of 33,822 primary knee arthroplasties that were performed in 2022, 3% (n=1022) was performed bilaterally.

Type of procedure per hospital

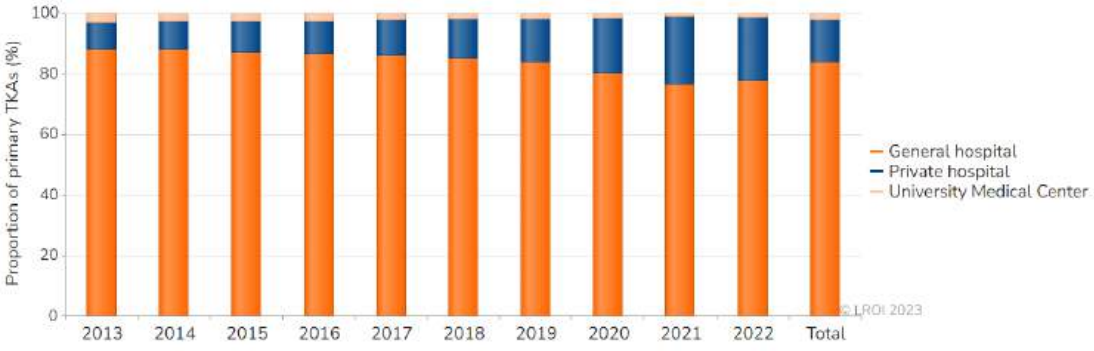
FIGURE Number of primary knee arthroplasties and knee revision arthroplasties per hospital in the Netherlands in 2022 (n=36,781)



TKA: total knee arthroplasty; UKA: unicondylar knee arthroplasty; PKA: patellofemoral knee arthroplasty.

Type of hospital - primary

FIGURE Trend (proportion [%] per year) in type of hospital performing primary total knee arthroplasties in the Netherlands in 2013-2022

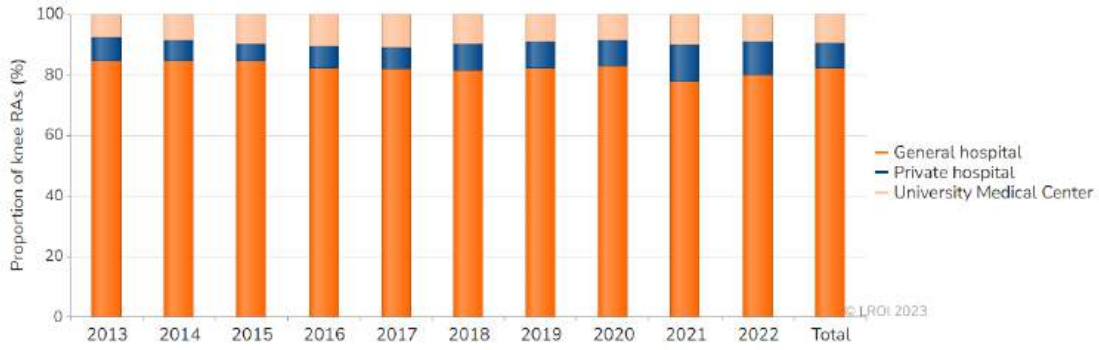


Type of hospital (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
General hospital	88.01	88.03	87.08	86.67	86.05	85.07	84.08	80.15	76.51	77.69	**84.02**
Private hospital	8.90	9.19	10.24	10.71	11.67	13.05	13.96	18.41	22.43	21.12	**13.87**
University Medical Center	3.09	2.78	2.68	2.62	2.28	1.88	1.96	1.44	1.06	1.19	**2.11**
Total (n):	**22,302**	**24,242**	**24,246**	**24,884**	**25,555**	**25,835**	**25,886**	**19,615**	**21,514**	**26,708**	**240,787**

Please note: The number of general hospitals that performed primary total knee arthroplasties decreased from 72 to 64 between 2013-2022; the number of private hospitals increased from 11 to 17 and the number of University Medical Centers remained 7 between 2013-2022.
TKA: total knee arthroplasty.

Type of hospital - revision

FIGURE Trend (proportion [%] per year) in type of hospital performing knee revision arthroplasties in the Netherlands in 2013-2022

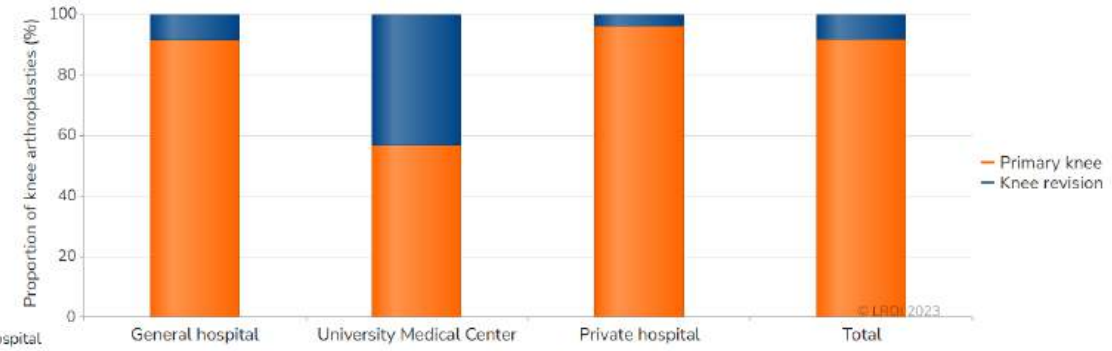


Type of hospital (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
General hospital	84.58	84.74	84.51	82.19	82.15	81.54	82.36	82.93	77.66	80.13	**82.22**
Private hospital	7.80	6.69	5.81	7.38	7.14	8.81	8.51	8.49	12.46	10.85	**8.41**
University Medical Center	7.62	8.57	9.68	10.42	10.71	9.66	9.13	8.57	9.88	9.01	**9.38**
Total (n):	**2,309**	**2,556**	**2,686**	**2,926**	**2,997**	**2,930**	**3,101**	**2,496**	**2,601**	**2,985**	**27,587**

Please note: The number of general hospitals that performed knee revision arthroplasties decreased from 72 to 63 between 2013-2022; the number of private hospitals increased from 7 to 13 and the number of University Medical Centers remained 7 between 2013-2022.
RA: revision arthroplasty.

Type of procedure by type of hospital

FIGURE Primary knee arthroplasties and knee revision arthroplasties (proportion [%] per category) by type of hospital in the Netherlands in 2022

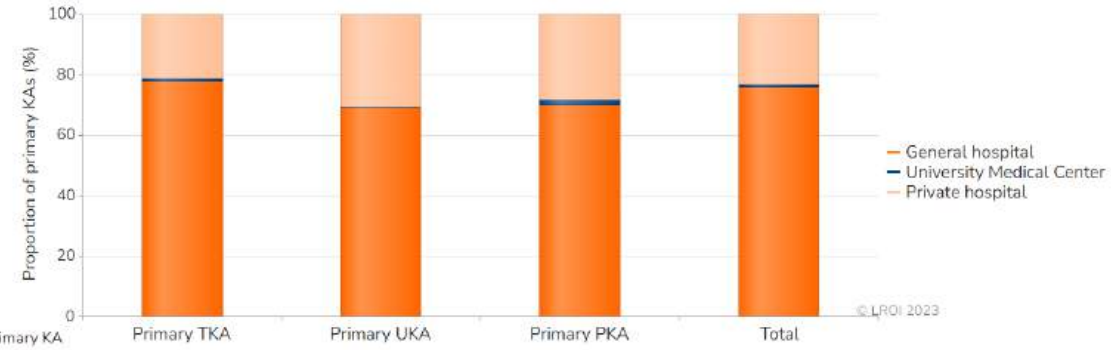


Type of procedure (%)	General hospital	University Medical Center	Private hospital	Total
Primary knee	91.47	56.75	96.02	**91.89**
Knee revision	8.53	43.25	3.98	**8.11**
Total (n):	**28,053**	**622**	**8,132**	**36,807**

Please note: in 2022, 64 general hospitals, 7 UMCs and 17 private hospitals performed knee arthroplasties.
General: general hospital; UMC: university medical centre; Private: private hospital.

Type of primary knee prosthesis by type of hospital

FIGURE Type of hospital (proportion [%] per catergory) by type of primary knee arthroplasty in the Netherlands in 2022

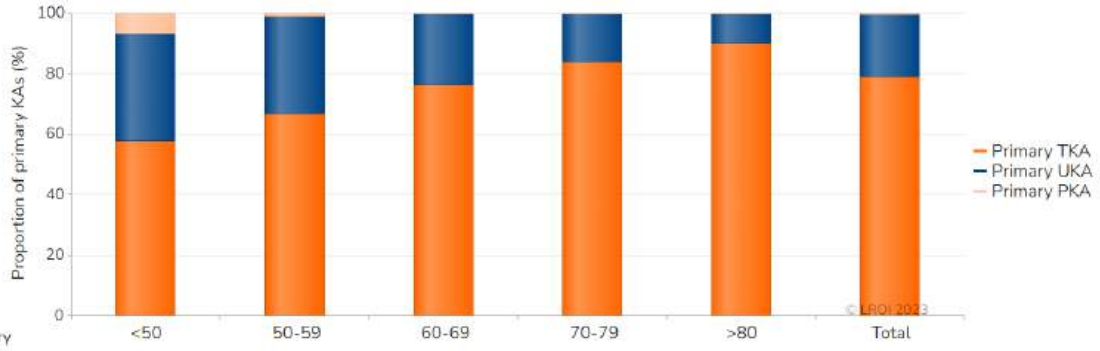


Type of primary KA	Primary TKA	Primary UKA	Primary PKA	Total
Type of hospital (%)				
General hospital	77.69	69.03	69.83	**75.88**
University Medical Center	1.19	0.43	1.72	**1.04**
Private hospital	21.12	30.54	28.45	**23.09**
Total (n):	**26,708**	**6,972**	**116**	33,796

Please note: KA: knee arthroplasty; TKA: total knee arthroplasty; UKA: unicondylar knee arthroplasty; PKA: patellofemoral knee arthroplasty.
General: general hospital; UMC: university medical centre; Private: private hospital.

Type of primary knee prosthesis by age category

FIGURE Type of primary knee arthroplasty (proportion [%] per category) of patients who underwent a primary knee arthroplasty by age category in the Netherlands in 2022



Age category	<50	50-59	60-69	70-79	>80	Total
Type of primary knee arthroplasty (%)						
Primary TKA	57.75	66.86	76.20	83.92	90.14	**79.03**
Primary UKA	35.47	32.19	23.60	16.02	9.80	**20.63**
Primary PKA	6.78	0.94	0.20	0.06	0.06	**0.34**
Total (n):	**516**	**5,091**	**11,330**	**13,248**	**3,611**	33,796

KA: knee arthroplasty; TKA: total knee arthroplasty; UKA: unicondylar knee arthroplasty; PKA: patellofemoral knee arthroplasty.

Patient characteristics

By type of knee prosthesis

TABLE Patient characteristics of all patients with a registered primary knee arthroplasty by type of knee arthroplasty in the Netherlands in 2022

	TKA	UKA	PFA	Total[1]
N (%)	**26,708 (79)**	**6,972 (21)**	**116 (0)**	**33,822**
Mean age (years) (SD)	69.6 (8.7)	65.6 (8.7)	55.0 (9.9)	68.7 (8.9)
Age (years) (%)				
<50	1	3	30	2
50-59	13	24	41	15
60-69	32	38	20	33
70-79	42	30	7	39
≥80	12	5	2	11
Gender (%)				
Men	38	46	26	40
Women	62	54	74	60
ASA score (%)				
I	10	16	32	11
II	64	67	58	65
III-IV	26	17	10	24
Type of hospital (%)				
General	78	69	70	76
UMC	1	0	2	1
Private	21	31	28	23
Diagnosis (%)				
Osteoarthritis	97	99	98	97
Post-traumatic	2	0	2	1
Rheumatoid arthritis	1	0	0	1
Osteonecrosis	0	1	0	1
Other	0	0	0	0
Charnley-score (%)				
A One knee joint affected	36	44	37	38
B1 Both knee joints affected	36	35	42	36
B2 Contralateral knee joint with a total knee prosthesis	24	19	17	23
C Multiple joints affected or chronic disease that affects quality of life	4	2	4	3
Mean Body Mass Index (kg/m²) (SD)	29.4 (4.9)	29.0 (4.4)	28.2 (4.5)	29.3 (4.8)
Body Mass Index (kg/m²) (%)				
Underweight (≤18.5)	0	0	0	0
Normal weight (>18,5-25)	19	19	25	19
Overweight (>25-30)	41	45	44	42
Obesity (>30-40)	37	34	30	36
Morbid obesity (>40)	3	2	1	3
Smoking (%)				
No	93	92	90	93
Yes	7	8	10	7

[1] Contains 26 (0.1%) primary knee arthroplasties of which the type of prosthesis was not registered.
TKA: total knee arthroplasty; UKA: unicondylar knee arthropalsty; PFA: patellofemoral knee arthroplasty; General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

By diagnosis

TABLE Patient characteristics of all patients with a registered primary knee arthroplasty by type of diagnosis in the Netherlands in 2022

N (%)	Osteoarthritis 32,712 (97)	Post-traumatic 396 (1)	Rheumatoid arthritis 275 (1)	Osteonecrosis 165 (0)	Total[1] 33.822
Mean age (years) (SD)	68.8 (8.8)	64.1 (10.3)	65.6 (10.1)	69.7 (10.7)	68.7 (8.9)
Age (years) (%)					
<50	1	6	6	4	2
50-59	15	31	20	16	15
60-69	34	31	37	22	33
70-79	39	24	32	42	39
≥80	11	8	5	16	11
Gender (%)					
Men	40	50	27	35	40
Women	60	50	73	65	60
ASA score (%)					
I	12	15	2	9	11
II	64	66	68	60	65
III-IV	24	19	30	31	24
Type of hospital (%)					
General	76	77	81	80	76
UMC	1	4	7	0	1
Private	23	19	12	20	23
Charnley-score (%)					
A One knee joint affected	38	70	24	74	38
B1 Both knee joints affected	36	19	36	12	36
B2 Contralateral knee joint with a total knee prosthesis	23	7	21	9	23
C Multiple joints affected or chronic disease that affects quality of life	3	4	19	5	3
Mean Body Mass Index (kg/m²) (SD)	29.4 (4.8)	28.4 (4.8)	28.0 (4.6)	28.4 (4.6)	29.3 (4.8)
Body Mass Index (kg/m²) (%)					
Underweight (≤18,5)	0	1	1	0	0
Normal weight (>18,5-25)	19	26	31	24	19
Overweight (>25-30)	42	40	38	47	42
Obesity (>30-40)	36	31	29	26	36
Morbid obesity (>40)	3	2	1	3	3
Smoking (%)					
No	93	88	89	91	93
Yes	7	12	11	9	7

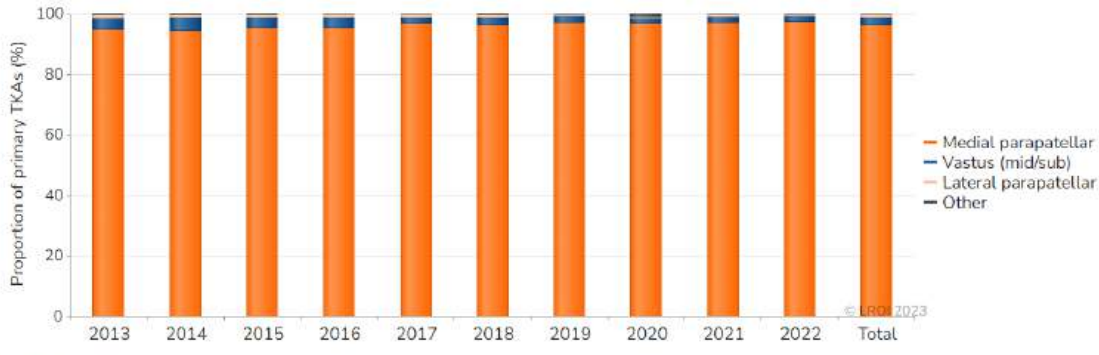
Please note: in 2022, 144 (0.4%) patients had a primary knee arthroplasty after a diagnosis that is not listed in the table. Of 130 (0.4%) primary knee arthroplasties the diagnosis was not registered.
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

Total knee arthroplasty

Surgical techniques

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary total knee arthroplasty in the Netherlands in 2013-2022

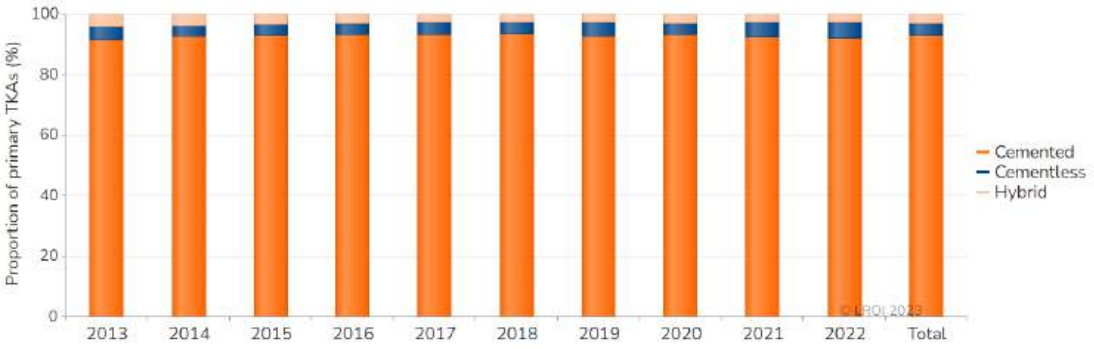


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Surgical approach (%)											
Medial parapatellar	95.09	94.68	95.62	95.54	96.85	96.31	97.31	96.84	97.25	97.44	**96.30**
Vastus (mid/sub)	3.71	4.17	3.38	3.52	2.17	2.76	2.16	1.95	2.10	2.01	**2.79**
Lateral parapatellar	1.05	0.96	0.96	0.86	0.86	0.84	0.46	0.51	0.59	0.42	**0.75**
Other	0.16	0.20	0.05	0.08	0.12	0.10	0.06	0.71	0.06	0.12	**0.15**
Total (n):	**21,997**	**24,099**	**24,159**	**24,864**	**25,550**	**25,829**	**25,835**	**19,559**	**21,441**	**26,653**	**239,986**

TKA: total knee arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary total knee arthroplasties in the Netherlands in 2013-2022



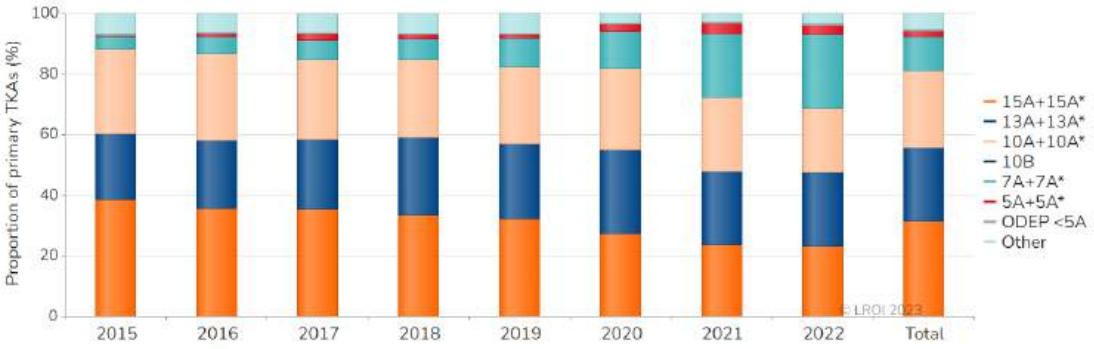
Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Fixation (%)											
Cemented	91.47	92.68	92.98	93.27	93.33	93.53	92.79	93.28	92.47	92.23	**92.81**
Cementless	4.45	3.37	3.59	3.64	3.93	3.71	4.48	3.62	4.81	5.12	**4.08**
Hybrid	4.07	3.95	3.43	3.10	2.74	2.76	2.73	3.10	2.72	2.65	**3.11**
Total (n):	**22,051**	**24,057**	**24,089**	**24,779**	**25,458**	**25,719**	**25,705**	**19,547**	**21,413**	**26,590**	**239,408**

TKA: total knee arthroplasty.

Prosthesis characteristics

ODEP rating

FIGURE Trend (proportion [%] per year) in ODEP rating in primary total knee arthroplasties in the Netherlands in 2015-2021

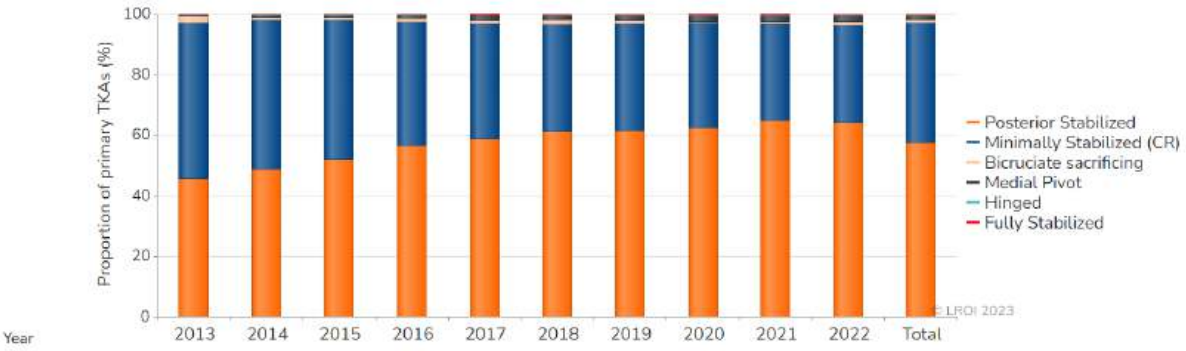


Year	2015	2016	2017	2018	2019	2020	2021	2022	Total
ODEP rating (%)									
15A+15A*	38.70	35.54	35.40	33.27	32.34	27.47	23.52	23.10	**31.31**
13A+13A*	21.52	22.62	22.99	25.65	24.56	27.51	24.38	24.52	**24.13**
10A+10A*	27.91	28.53	26.25	25.57	25.45	26.62	24.22	20.92	**25.61**
10B	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	**0.01**
7A+7A*	4.25	5.55	6.69	7.11	9.40	12.51	21.08	24.50	**11.35**
5A+5A*	0.32	0.91	1.93	1.33	1.29	2.23	3.42	2.76	**1.74**
ODEP <5A	0.64	0.73	0.38	0.28	0.28	0.38	0.72	0.82	**0.53**
Other	6.66	6.10	6.34	6.79	6.68	3.28	2.65	3.38	**5.33**
Total (n):	**23,333**	**23,391**	**23,701**	**24,550**	**24,536**	**17,710**	**20,855**	**25,830**	**183,906**

Please note: More information on ODEP rating can be found on www.odep.org.uk.
Other: All TKAs of which no ODEP rating is available.
TKA: total knee arthroplasty.

Type of femur component

FIGURE Trend (proportion [%] per year) in type of femur component in primary total knee arthroplasties in the Netherlands in 2013-2022



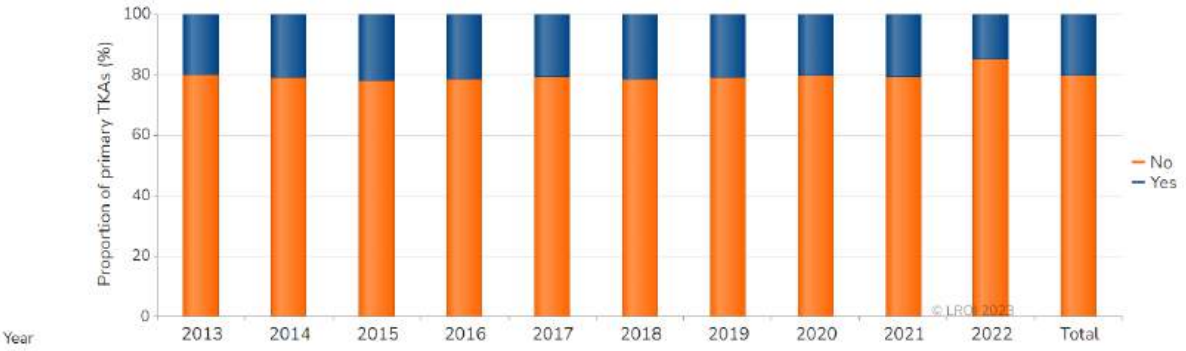
Type of femur component (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Posterior Stabilized	45.78	48.87	52.16	56.65	58.74	61.18	61.68	62.52	64.91	64.21	**57.65**
Minimally Stabilized (CR)	51.55	49.20	45.90	40.97	38.20	35.60	35.32	34.65	32.18	32.30	**39.60**
Bicruciate sacrificing	1.87	1.04	0.88	1.06	0.97	1.33	0.77	0.50	0.51	1.09	**1.01**
Medial Pivot	0.32	0.42	0.59	0.82	1.54	1.24	1.44	1.64	1.67	1.76	**1.14**
Hinged	0.28	0.27	0.24	0.24	0.25	0.31	0.35	0.40	0.42	0.33	**0.31**
Fully Stabilized	0.20	0.19	0.23	0.26	0.30	0.34	0.44	0.30	0.31	0.31	**0.29**
Total (n):	**22,133**	**24,051**	**23,870**	**23,758**	**23,980**	**24,994**	**24,866**	**18,180**	**21,137**	**26,293**	**233,262**

TKA: total knee arthroplasty.

Implantation of patella

FIGURE Trend (proportion [%] per year) in implantation of patella in primary total knee arthroplasties in the Netherlands in 2013-2022



Implantation of patella (%)

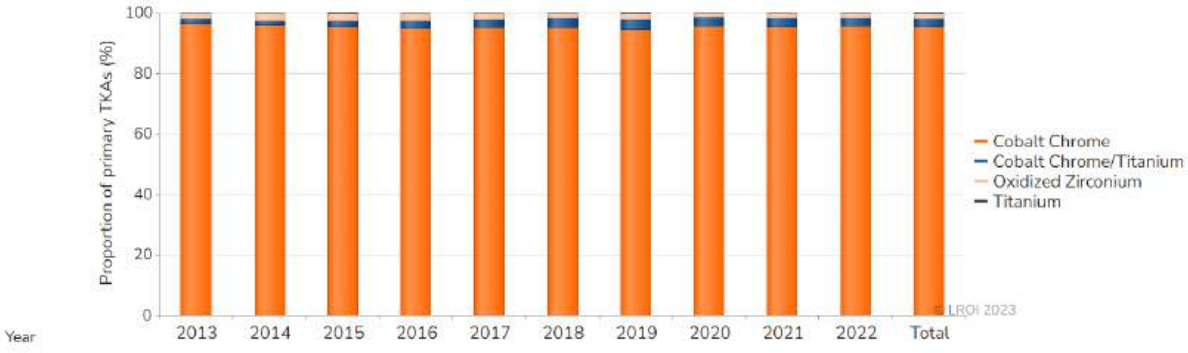
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
No	79.91	79.04	78.01	78.51	79.42	78.55	79.21	79.75	79.49	85.06	**79.73**
Yes	20.09	20.96	21.99	21.49	20.58	21.45	20.79	20.25	20.51	14.94	**20.27**
Total (n):	**22,229**	**24,155**	**24,082**	**24,711**	**25,334**	**25,661**	**25,652**	**19,340**	**21,358**	**26,521**	**239,043**

TKA: total knee arthroplasty.

Materials

Femur component

FIGURE Trend (proportion [%] per year) in femur material in primary total knee arthroplasties in the Netherlands in 2013-2022



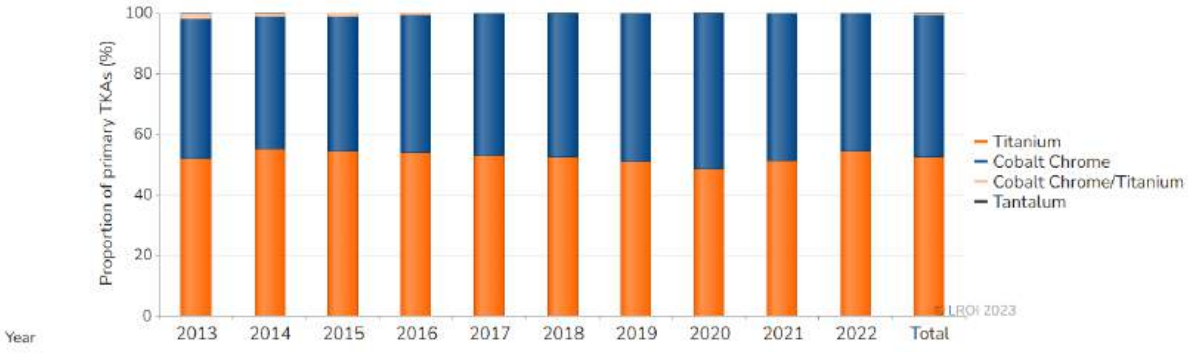
Femur material (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Cobalt Chrome	96.54	96.19	95.41	95.06	95.14	95.36	94.69	95.94	95.56	95.76	**95.55**
Cobalt Chrome/Titanium	1.45	1.44	2.22	2.60	2.72	2.96	3.27	2.70	2.91	2.75	**2.51**
Oxidized Zirconium	1.94	2.31	2.22	2.18	1.98	1.50	1.81	1.26	1.42	1.42	**1.82**
Titanium	0.07	0.06	0.16	0.16	0.15	0.18	0.24	0.10	0.11	0.06	**0.13**
Total (n):	**22,133**	**24,051**	**23,870**	**23,758**	**23,980**	**24,994**	**24,866**	**18,173**	**21,118**	**26,247**	**233,190**

TKA: total knee arthroplasty.

Tibia component

FIGURE Trend (proportion [%] per year) in tibia material in primary total knee arthroplasties in the Netherlands in 2013-2022



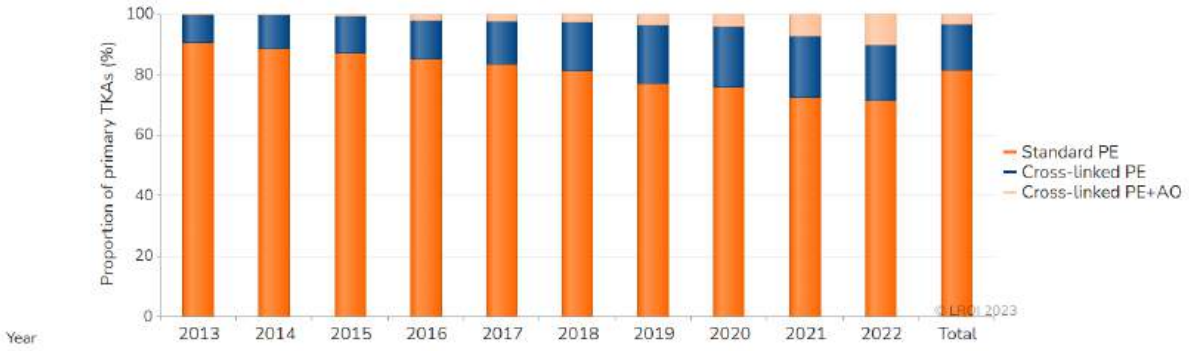
Tibia material (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Titanium	52.07	55.15	54.49	54.08	53.03	52.67	50.83	48.52	51.15	54.48	**52.78**
Cobalt Chrome	46.20	43.70	44.47	45.59	46.97	47.32	49.15	51.48	48.84	45.52	**46.79**
Cobalt Chrome/Titanium	1.71	1.14	1.03	0.34	0.00	0.00	0.00	0.00	0.00	0.00	**0.42**
Tantalum	0.02	0.01	0.00	0.00	0.00	0.02	0.02	0.01	0.00	0.00	**0.01**
Total (n):	**22,114**	**24,046**	**23,901**	**24,127**	**24,154**	**25,012**	**25,050**	**18,185**	**21,135**	**26,159**	**233,883**

Please note: A standard PE tibia component was implanted in 2 (<0.01%) primary TKAs in 2013-2016.
TKA: total knee arthroplasty; PE:polyethylene.

Insert

FIGURE Trend (proportion [%] per year) in insert material in primary total knee arthroplasties in the Netherlands in 2013-2022



Insert material (%)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Standard PE	90.79	88.65	87.07	85.23	83.55	81.24	77.04	76.00	72.55	71.37	**81.37**
Cross-linked PE	9.20	11.28	12.08	12.70	13.95	15.99	19.36	19.87	20.23	18.42	**15.25**
Cross-linked PE+AO	0.01	0.07	0.85	2.07	2.50	2.78	3.60	4.13	7.22	10.21	**3.38**
Total (n):	**21,592**	**23,610**	**23,552**	**24,018**	**24,476**	**25,210**	**24,928**	**18,099**	**21,150**	**26,135**	**232,770**

TKA: total knee arthroplasty; PE: polyethylene; AO: antioxidant.

Patella component

FIGURE Trend (proportion [%] per year) in patella material in primary total knee arthroplasties in the Netherlands in 2013-2022

Patella material (%)

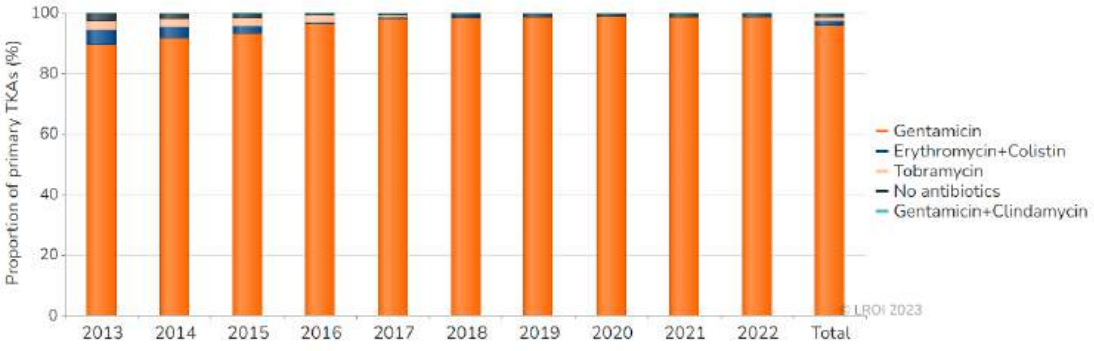
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Standard PE	97.22	97.04	94.73	93.39	94.32	95.31	94.65	93.69	89.89	88.75	**94.06**
Cross-linked PE	2.78	2.96	4.97	4.18	3.66	2.62	3.13	3.50	4.13	2.78	**3.49**
Cross-linked PE+AO	0.00	0.00	0.30	2.43	2.01	2.07	2.21	2.81	5.98	8.48	**2.46**
Total (n):	**4,466**	**5,062**	**5,296**	**5,311**	**5,215**	**5,505**	**5,332**	**3,917**	**4,380**	**3,963**	**48,447**

TKA: total knee arthroplasty; PE: polyethylene; AO: antioxidant.

Bone cement

Antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in primary total knee arthroplasties in the Netherlands in 2013-2022

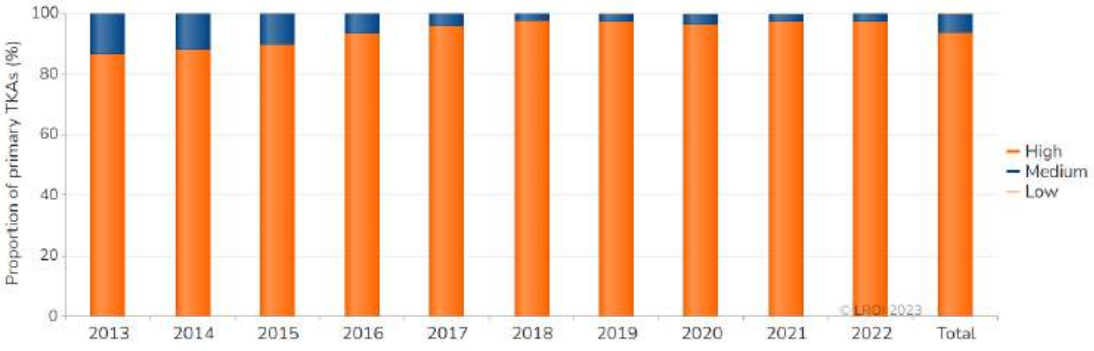


Bone cement antibiotics (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gentamicin	89.81	91.70	93.22	96.29	98.13	98.56	98.72	98.89	98.64	98.54	**96.21**
Erythromycin+Colistin	4.48	3.89	2.51	0.69	0.47	0.31	0.00	0.00	0.00	0.00	**1.25**
Tobramycin	3.39	2.63	2.81	2.20	0.62	0.00	0.00	0.00	0.03	0.18	**1.21**
No antibiotics	2.17	1.67	1.36	0.68	0.69	0.98	1.18	1.06	1.17	1.23	**1.21**
Gentamicin+Clindamycin	0.15	0.11	0.11	0.15	0.09	0.15	0.10	0.05	0.17	0.06	**0.11**
Total (n):	**20,036**	**22,281**	**22,475**	**22,636**	**22,282**	**22,374**	**22,032**	**16,201**	**18,781**	**23,366**	**212,464**

Please note: Bone cement with gentamicin and vancomycin was used in 14 (<0.01%) primary TKAs in 2015-2021.
TKA: total knee arthroplasty.

Viscosity

FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary total knee arthroplasties in the Netherlands in 2013-2022

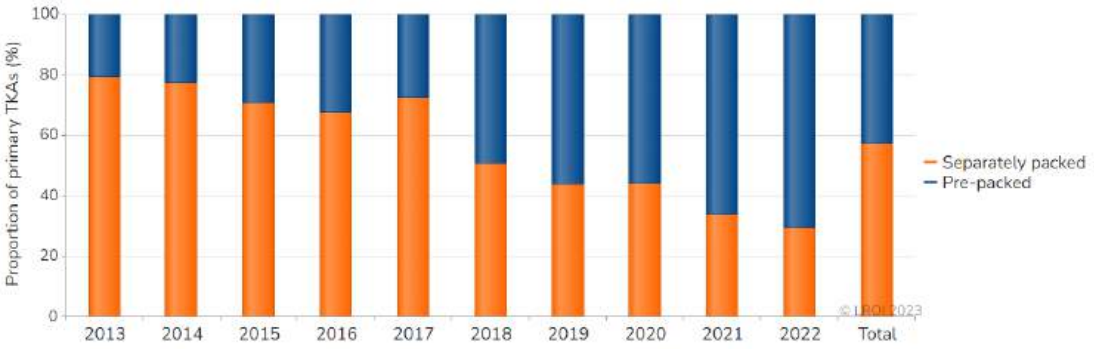


Bone cement viscosity (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
High	86.61	87.94	89.66	93.53	95.79	97.66	97.20	96.41	97.16	97.25	**93.89**
Medium	13.38	12.06	10.34	6.47	4.21	2.34	2.78	3.57	2.78	2.75	**6.11**
Low	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.05	0.00	**0.01**
Total (n):	**20,036**	**22,281**	**22,477**	**22,637**	**22,282**	**22,380**	**22,036**	**16,202**	**18,781**	**23,368**	**212,480**

TKA: total knee arthroplasty.

Vacuum mixing system

FIGURE Trend (proportion [%] per year) in use of bone cement pre-packed in a vacuum mixing system in primary total knee arthroplasties in the Netherlands in 2013-2022



Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Vacuum mixing system (%)											
Separately packed	79.54	77.31	70.75	67.62	72.54	50.61	43.87	44.08	33.56	29.48	**57.35**
Pre-packed	20.46	22.69	29.25	32.38	27.46	49.39	56.13	55.92	66.44	70.52	**42.65**
Total (n):	**20,036**	**22,281**	**22,477**	**22,637**	**22,282**	**22,380**	**22,036**	**16,202**	**18,781**	**23,368**	**212,480**

TKA: total knee arthroplasty; Separately packed: separately packed bone cement components; Pre-packed: Bone cement pre-packed in a vacuum mixing system.

Most frequently registered

Total knee prostheses

TABLE The most frequently registered primary total knee arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Total knee arthroplasties (n)	**24,992**	**24,866**	**18,180**	**21,137**	**26,294**
Femur name; Proportion (%)					
Genesis II	24.8	23.5	22.2	21.2	20.3
NexGen	22.3	22.0	19.5	17.3	17.6
Vanguard Complete Knee	21.5	21.8	20.7	19.1	16.4
Persona	0.1	0.8	3.4	9.4	11.5
Attune	1.1	1.8	3.7	7.0	9.8
Triathlon	5.0	6.0	8.5	9.6	9.5
PFC/Sigma	9.6	9.1	8.5	7.3	6.7
balanSys	1.3	1.3	1.9	1.7	1.8
MRK	0.4	0.8	0.9	1.0	1.1
LCS	8.9	9.3	7.2	3.1	1.1

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Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during primary total knee arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**11,038**	**12,327**	**9,041**	**12,429**	**16,427**
Cement name; Proportion (%)					
Palacos R+G	41.1	48.2	51.7	49.2	49.6
Refobacin Bone Cement R	49.0	44.0	39.4	45.2	43.8
Refobacin Plus Bone Cement	9.9	7.8	8.9	5.6	6.5

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**11,298**	**9,644**	**7,119**	**6,281**	**6,868**
Cement name; Proportion (%)					
Palacos R+G	89.2	83.4	70.1	81.7	80.1
Refobacin Bone Cement R	2.3	5.9	16.7	5.8	6.2
Subiton G	1.1	3.4	5.0	5.8	5.7
Biomet Bone Cement R	0.5	1.0	1.6	3.5	4.2
Palacos MV+G	3.0	2.9	3.1	2.4	3.1

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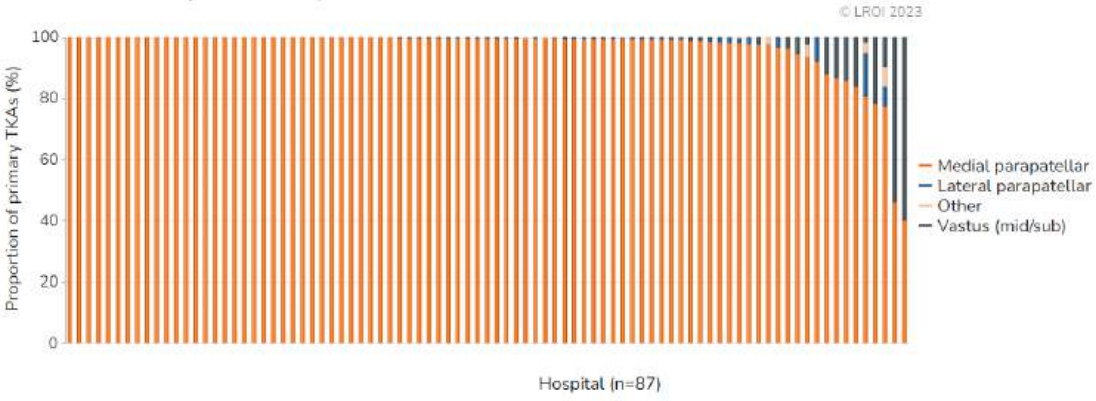
Practice variation

Surgical approach

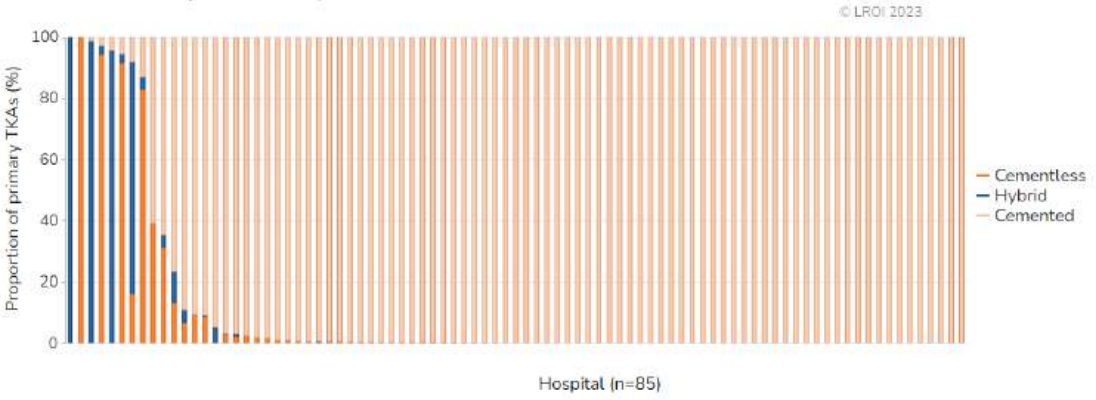
FIGURE Distribution of surgical approach used during primary total knee arthroplasties per hospital in the Netherlands in 2022 (n=26,653)



TKA: total knee arthroplasty.

Fixation

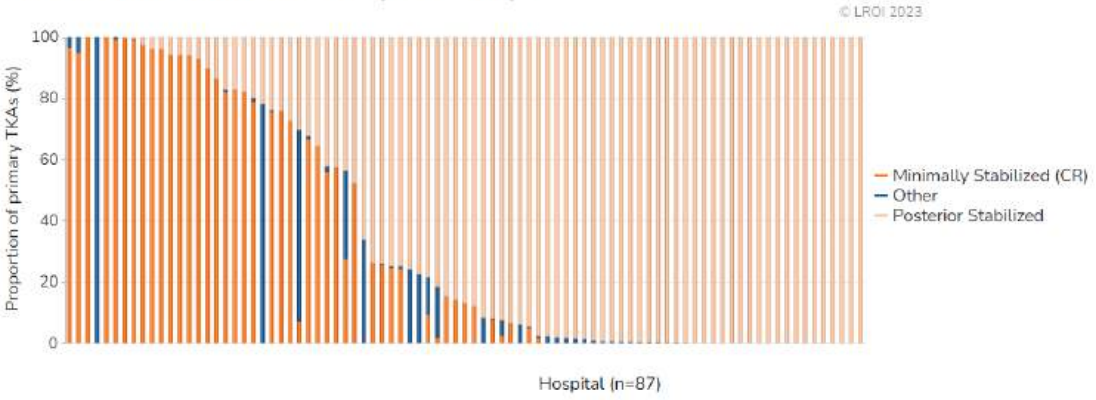
FIGURE Distribution of type of fixation used during primary total knee arthroplasties per hospital in the Netherlands in 2022 (n=26,694)



TKA: total knee arthroplasty.

Type of femur component

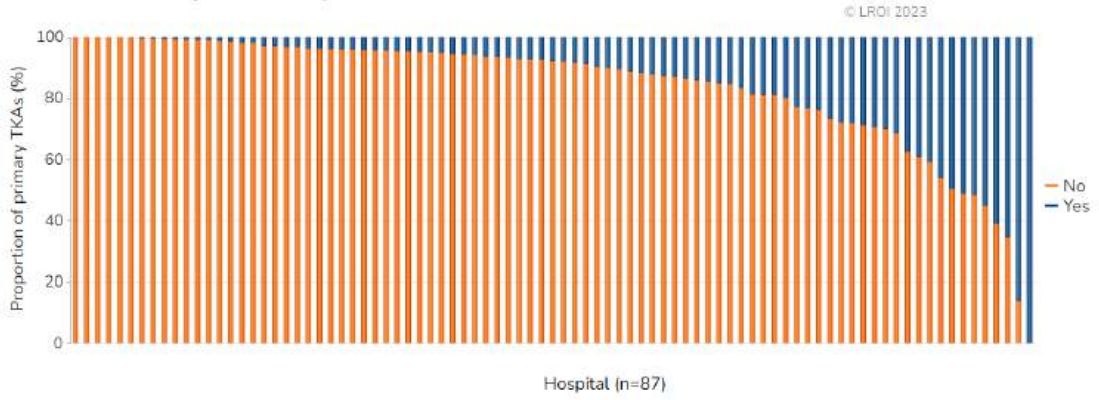
FIGURE Distribution of type of femur component used during primary total knee arthroplasties per hospital in the Netherlands in 2022 (n=26,708)



TKA: total knee arthroplasty.

Implantation of patella

FIGURE Distribution of implantation of patella during primary total knee arthroplasties per hospital in the Netherlands in 2022 (n=26,521)



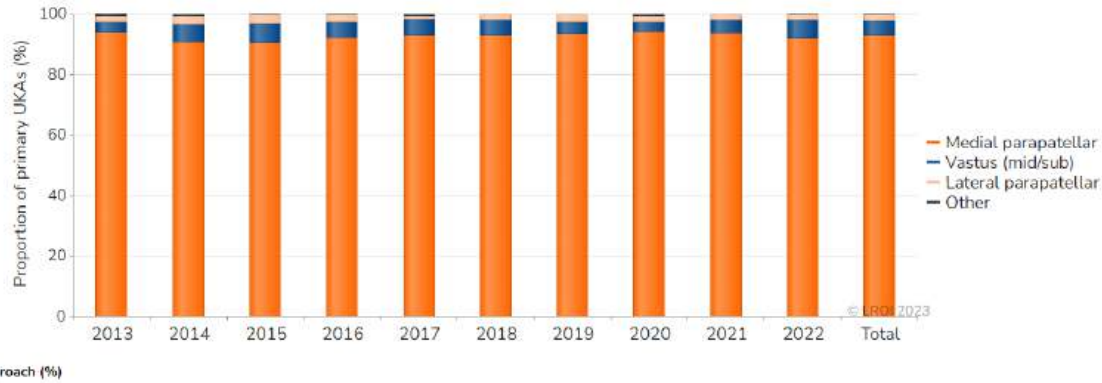
TKA: total knee arthroplasty.

Unicondylar knee arthroplasty

Surgical techniques

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary unicondylar knee arthroplasty in the Netherlands in 2013-2022

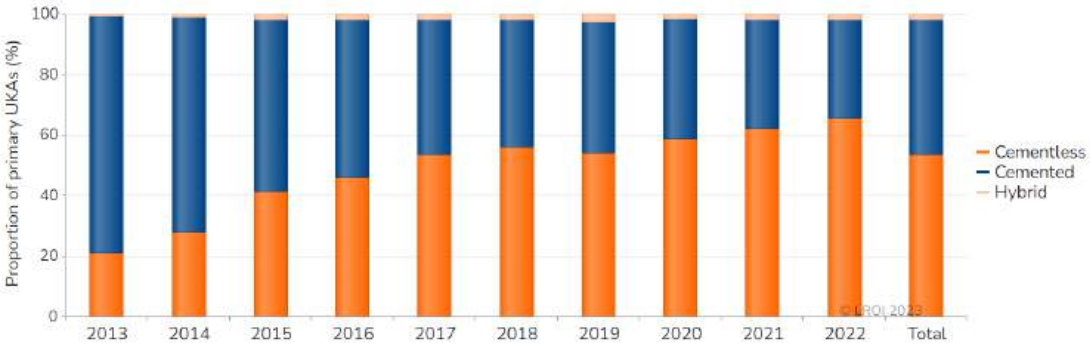


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Surgical approach (%)											
Medial parapatellar	94.01	91.03	90.70	92.28	92.98	92.87	93.60	94.38	93.74	92.14	**92.90**
Vastus (mid/sub)	3.65	5.55	6.30	5.37	5.41	5.33	4.06	3.10	4.32	5.86	**4.87**
Lateral parapatellar	1.94	3.12	2.89	2.11	1.23	1.79	2.34	2.16	1.94	1.87	**2.07**
Other	0.40	0.30	0.11	0.24	0.38	0.00	0.00	0.36	0.00	0.13	**0.16**
Total (n):	**1,754**	**2,342**	**2,668**	**2,940**	**3,662**	**4,070**	**4,877**	**4,714**	**5,627**	**6,947**	**39,601**

UKA: unicondylar knee arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary unicondylar knee arthroplasties in the Netherlands in 2013-2022



Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Fixation (%)											
Cementless	20.91	27.85	41.43	46.08	53.64	56.19	54.24	58.70	62.30	65.71	**53.53**
Cemented	78.25	71.25	56.63	51.99	44.59	41.91	42.99	39.64	35.76	32.56	**44.63**
Hybrid	0.83	0.89	1.94	1.94	1.78	1.89	2.78	1.65	1.95	1.72	**1.84**
Total (n):	**1,798**	**2,348**	**2,677**	**2,943**	**3,658**	**4,068**	**4,862**	**4,717**	**5,655**	**6,959**	**39,685**

UKA: unicondylar knee arthroplasty.

Most frequently registered

Unicondylar knee prostheses

TABLE The most frequently registered primary unicondylar knee arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Unicondylar knee arthroplasties (n)	**3,687**	**4,443**	**4,071**	**5,465**	**6,838**
Name; Proportion (%)					
Oxford PKR cementless	57.6	54.8	58.9	65.8	68.5
Physica Zimmer Unicompartmental High Flex Knee	9.8	13.2	17.4	16.6	15.2
Oxford PKR cemented	27.9	27.4	19.9	14.0	11.7
Restoris MCK	0.1	0.1	0.1	1.5	2.0
Journey Uni	1.8	1.7	1.6	0.7	1.3

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Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during primary unicondylar knee arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**701**	**895**	**629**	**934**	**1,112**
Cement name; Proportion (%)					
Palacos R+G	19.1	32.0	50.9	63.4	59.1
Refobacin Bone Cement R	77.3	63.8	43.4	35.0	38.8
Refobacin Plus Bone Cement	3.6	4.2	5.7	1.6	2.1

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**942**	**1,156**	**1,066**	**965**	**1,010**
Cement name; Proportion (%)					
Palacos R+G	84.5	79.5	70.2	78.9	79.4
Biomet Bone Cement R	0.0	0.1	5.4	7.4	10.8
Palacos MV+G	9.2	9.6	8.6	7.8	6.6
Subiton G	0.8	1.6	2.9	2.5	2.5
Simplex ABC Tobra	0.0	0.0	0.0	0.2	0.4

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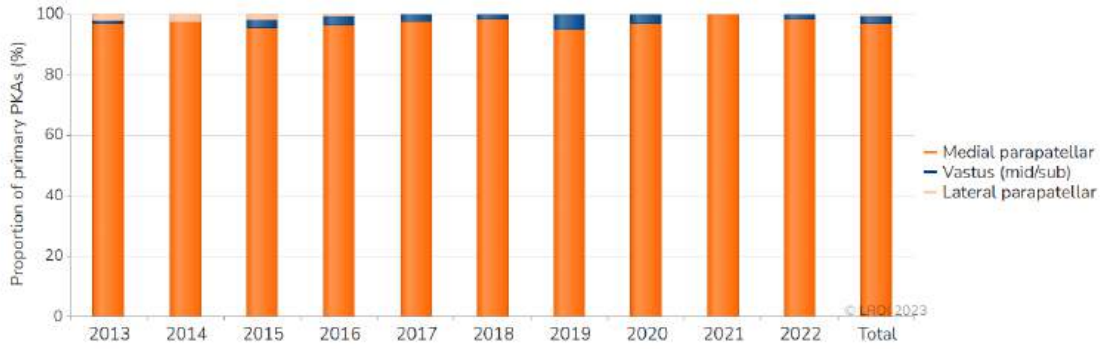
Patellofemoral knee arthroplasty

Surgical techniques

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary patellofemoral knee arthroplasty in the Netherlands in 2013-2022

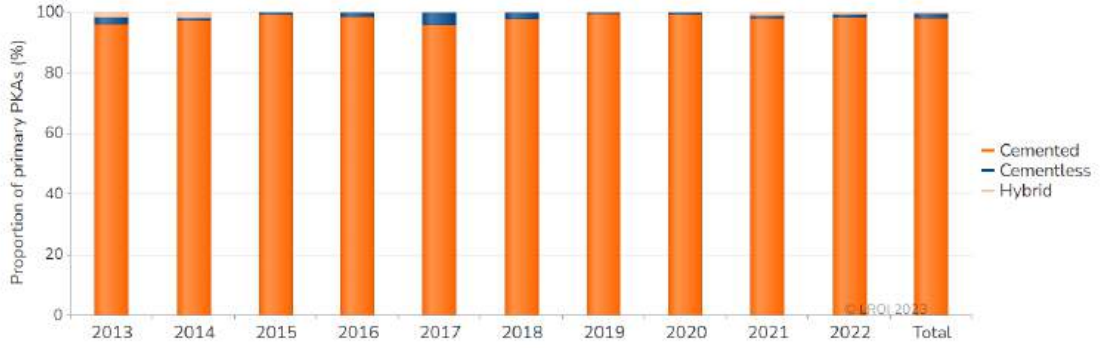


Surgical approach (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Medial parapatellar	96.95	97.37	95.48	96.50	97.60	98.34	94.86	96.84	100.00	98.28	**97.10**
Vastus (mid/sub)	0.76	0.00	2.58	2.80	2.40	1.66	5.14	3.16	0.00	1.72	**2.21**
Lateral parapatellar	2.29	2.63	1.94	0.70	0.00	0.00	0.00	0.00	0.00	0.00	**0.69**
Total (n):	**131**	**114**	**155**	**143**	**167**	**181**	**175**	**158**	**107**	**116**	**1,447**

Please note: In 2018, the surgical approach of 1 (<0.01%) primary PKA was registered as other.
PKA: patellofemoral knee arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary patellofemoral knee arthroplasties in the Netherlands in 2013-2022



Fixation (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Cemented	96.24	97.39	99.35	98.61	95.83	97.80	99.43	99.37	98.13	98.28	**98.07**
Cementless	2.26	0.87	0.65	1.39	4.17	2.20	0.57	0.63	0.93	0.86	**1.51**
Hybrid	1.50	1.74	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.86	**0.41**
Total (n):	**133**	**115**	**155**	**144**	**168**	**182**	**175**	**158**	**107**	**116**	**1,453**

PKA: patellofemoral knee arthroplasty.

Most frequently registered

Patellofemoral knee prostheses

TABLE The most frequently registered primary patellofemoral knee arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Patellofemoral knee arthroplasties (n)	**147**	**158**	**142**	**101**	**97**
Name; Proportion (%)					
Gender Solutions® Patello-Femoral Joint	60.5	53.2	57.7	49.5	71.1
Journey PFJ	19.7	25.9	23.9	24.8	12.4
Avon	15.0	14.6	13.4	20.8	12.4
Restoris MCK	0.0	0.0	0.0	2.0	4.1

Types of bone cement

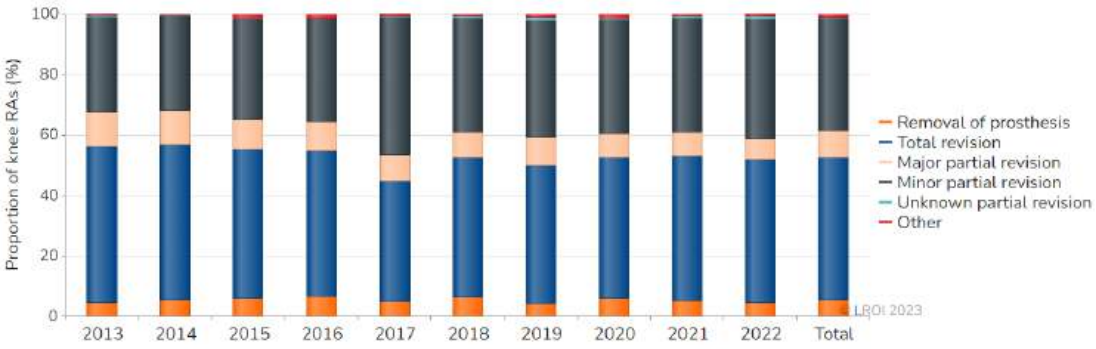
TABLE The most frequently registered types of bone cement used during primary patellofemoral knee arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement (n)	**105**	**104**	**128**	**93**	**93**
Cement name; Proportion (%)					
Palacos R+G	71.4	72.1	82.8	80.6	80.6
Refobacin Bone Cement R	17.1	14.4	11.7	12.9	12.9
Refobacin Plus Bone Cement	5.7	8.7	4.7	5.4	5.4
Subiton G	1.0	3.8	0.8	1.1	1.1

Knee revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in knee revision arthroplasties in the Netherlands in 2013-2022



Type of revision (%)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Removal of prosthesis	4.52	5.37	6.16	6.67	4.80	6.20	4.40	5.98	5.28	4.68	**5.40**
Total revision	51.95	51.62	49.03	48.43	39.95	46.47	45.55	46.55	47.98	47.46	**47.31**
Major partial revision	11.16	11.10	9.93	9.46	8.81	8.46	9.29	8.03	7.82	6.49	**8.99**
Minor partial revision	31.49	31.20	33.23	34.02	45.39	37.50	38.63	37.56	37.65	39.83	**36.88**
Unknown partial revision	0.31	0.20	0.26	0.21	0.24	0.65	1.13	0.64	0.42	0.81	**0.50**
Other	0.58	0.51	1.38	1.20	0.82	0.72	1.00	1.24	0.85	0.74	**0.91**
Total (n):	**2,258**	**2,532**	**2,678**	**2,907**	**2,939**	**2,920**	**3,091**	**2,492**	**2,595**	**2,973**	**27,385**

RA: revision arthroplasty.
Major partial revision: revision of at least femur or tibia component.
Minor partial revision: Only insert and/or patella exchange (including patella addition).
Unknown partial revision: partial revision of which the revised components were unknown.

in 2022, the femur component was revised in 53 (27.5%) major partial knee revision arthroplasties and the tibia component was revised in 103 (53.4%) major partial knee revision arthroplasties.

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a knee revision arthropalsty in the Netherlands in 2014-2022

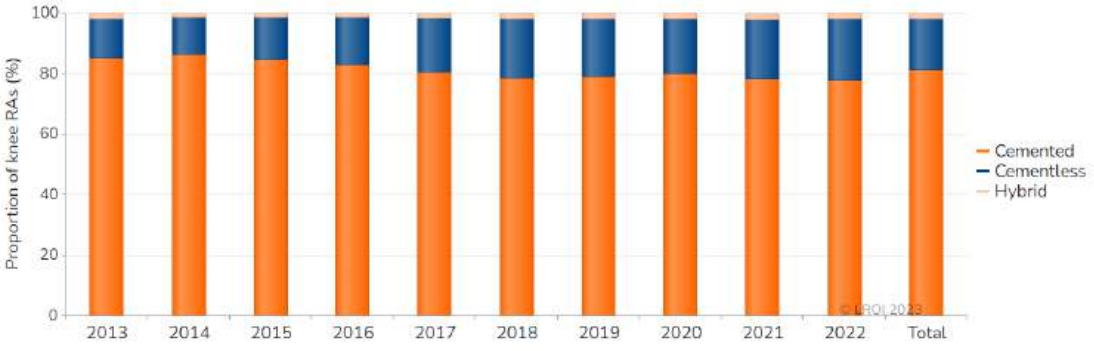
Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Knee revision arthroplasty (n)	2,556	2,686	2,926	2,997	2,930	3,101	2,496	2,601	2,985	25,278
Reasons for revision; Proportion[1] (%)										
Instability	25.3	26.4	25.1	27.7	25.8	27.4	26.2	26.3	24.6	26.1
Patellar pain	22.9	23.1	21.5	19.7	18.9	20.2	18.7	17.8	23.9	20.8
Loosening of tibia component	22.3	20.6	21.9	20.9	19.5	20.7	19.5	19.0	18.7	20.4
Infection	14.8	16.5	19.6	20.3	20.8	20.2	23.7	22.0	22.4	20.1
Malalignment	15.7	14.7	13.9	11.3	10.7	10.2	10.6	11.0	8.9	11.8
Progression of osteoarthritis	9.1	8.3	9.3	8.2	8.7	8.0	7.6	8.9	11.9	8.9
Loosening of femur component	10.0	9.5	9.0	8.9	8.4	8.6	8.0	8.8	8.4	8.8
Insert wear	8.4	7.8	7.6	6.8	6.6	7.1	7.0	7.7	10.3	7.7
Revision after knee removal	6.9	5.7	6.3	5.6	4.9	4.2	5.1	4.3	4.9	5.3
Arthrofibrosis	4.7	5.1	4.3	4.9	4.6	5.3	3.9	4.3	3.9	4.6
Patellar dislocation	2.5	2.8	2.1	2.4	2.2	2.5	2.8	2.2	2.6	2.4
Periprosthetic fracture	2.2	2.3	1.7	1.8	1.5	1.9	2.6	2.7	2.5	2.1
Loosening of patella component	2.0	1.5	1.9	1.8	1.4	1.7	1.8	1.7	1.6	1.7
Bearing dislocation[2]									3.7	
Other	8.1	8.6	8.3	7.4	7.7	7.8	7.5	8.7	8.7	8.1

[1] One patient may have more than one reason for revision. As such, the total proportion is over 100%.
[2] Please note: Bearing dislocation was not registered before 2022.

Surgical techniques

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in knee revision arthroplasties in the Netherlands in 2013-2022

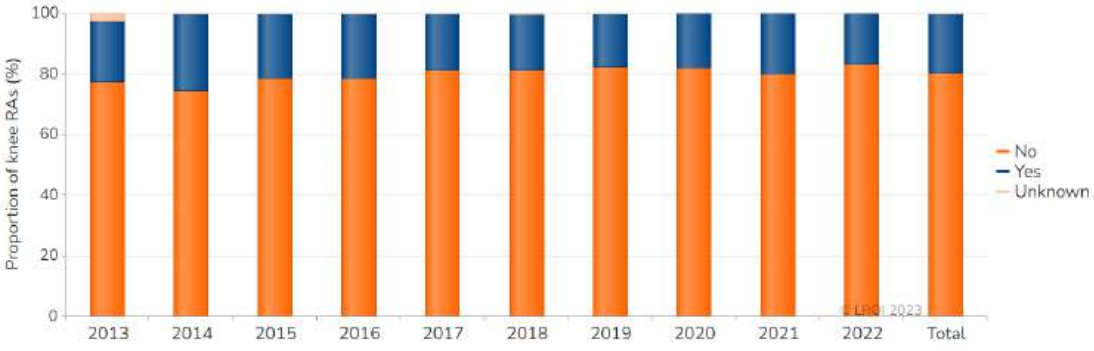


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Fixation (%)											
Cemented	85.15	86.45	84.68	83.02	80.51	78.57	79.22	79.90	78.40	77.62	**81.18**
Cementless	13.04	12.21	13.89	15.55	17.89	19.49	18.83	18.37	19.33	20.46	**17.07**
Hybrid	1.81	1.34	1.44	1.42	1.59	1.94	1.96	1.73	2.27	1.93	**1.75**
Total (n):	**2,047**	**2,318**	**2,434**	**2,668**	**2,761**	**2,678**	**2,863**	**2,259**	**2,375**	**2,752**	**25,155**

RA: revision arthroplasty.

Conversion to TKA

FIGURE Trend (proportion [%] per year) in conversion of a unicondylar or patellofemoral knee arthroplasty to a total knee arthroplasty in the Netherlands in 2013-2022

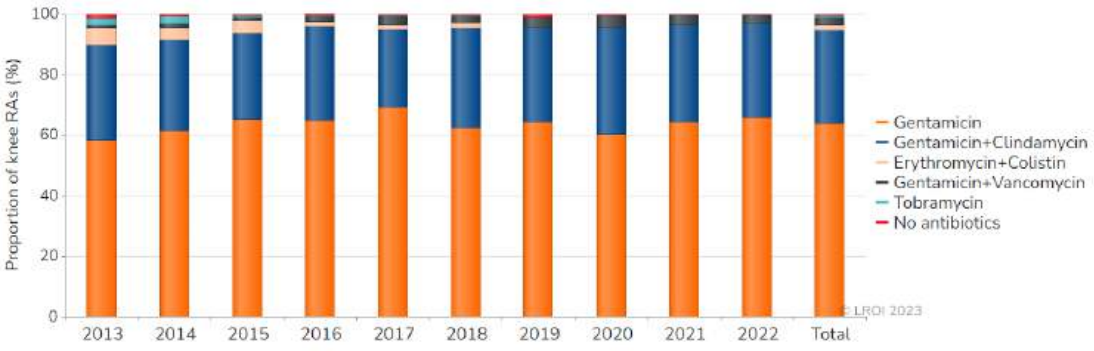


Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Conversion to TKA (%)											
No	77.29	74.54	78.59	78.56	81.15	81.22	82.37	82.01	80.08	83.08	**80.15**
Yes	19.91	25.41	21.36	21.36	18.71	18.44	17.55	17.99	19.92	16.92	**19.58**
Unknown	2.80	0.05	0.04	0.08	0.14	0.34	0.07	0.00	0.00	0.00	**0.27**
Total (n):	**1,713**	**2,062**	**2,247**	**2,640**	**2,774**	**2,646**	**2,780**	**2,285**	**2,400**	**2,831**	**24,378**

RA: revision arthroplasty; TKA: total knee arthroplasty.

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in knee revision arthroplasties in the Netherlands in 2013-2022



Bone cement antibiotics (%)

Gentamicin	58.51	61.61	65.24	65.06	69.28	62.39	64.53	60.51	64.46	65.77	**63.87**
Gentamicin+Clindamycin	31.25	29.79	28.56	31.09	25.57	33.05	31.00	35.10	31.91	31.26	**30.75**
Erythromycin+Colistin	5.65	4.06	4.18	1.32	1.54	1.77	0.00	0.00	0.00	0.00	**1.86**
Gentamicin+Vancomycin	1.01	1.60	1.03	1.71	3.02	2.20	3.56	3.93	3.40	2.81	**2.40**
Tobramycin	2.32	2.08	0.67	0.34	0.05	0.05	0.00	0.00	0.00	0.11	**0.56**
No antibiotics	1.25	0.85	0.31	0.49	0.53	0.54	0.91	0.46	0.23	0.05	**0.56**
Total (n):	**1,680**	**1,873**	**1,936**	**2,052**	**1,885**	**1,861**	**1,968**	**1,527**	**1,705**	**1,849**	**18,336**

RA: revision arthroplasty

Most frequently registered

Components

TABLE The most frequently registered femur, tibia, insert and patella components in knee revision arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Femur(n)	**1,334**	**1,314**	**1,027**	**1,157**	**1,272**
Name; Proportion (%)					
NexGen	18.9	20.1	18.5	18.6	19.7
Legion	26.1	23.7	23.9	20.1	17.9
Genesis II	7.9	8.0	8.7	7.5	9.7
Attune	0.3	1.2	2.5	4.1	8.9
Triathlon	4.9	5.9	8.6	8.5	8.0
Vanguard Complete Knee	7.3	6.8	5.6	8.0	6.8
Vanguard 360	4.3	5.1	6.3	6.1	6.3
PFC / SIGMA	6.8	4.7	6.0	5.5	4.0
RT Plus	1.3	3.0	3.4	4.0	4.0
Legion Hinged	5.6	5.2	3.8	3.5	3.5

Year	2018	2019	2020	2021	2022
Tibia (n)	**1,376**	**1,417**	**1,115**	**1,245**	**1,371**
Name; Proportion (%)					
Legion	27.1	25.7	24.1	20.3	17.7
NexGen	18.9	19.8	16.0	15.5	17.6
Triathlon	5.2	6.3	9.0	9.1	8.7
Attune	0.4	1.9	3.0	4.7	8.4
Genesis II	5.2	5.2	4.9	4.8	7.1
Vanguard 360	6.3	6.9	7.0	7.4	6.7
Vanguard Complete Knee	5.1	4.9	4.0	5.5	5.6
RT Plus	1.2	2.8	4.4	5.8	5.3
Rotation Hinged Knee	3.1	2.9	3.4	3.3	4.2
S-ROM	12.6	10.6	9.5	7.5	4.1

Year	2018	2019	2020	2021	2022
Insert (n)	**2,192**	**2,282**	**1,752**	**1,970**	**2,214**
Name; Proportion (%)					
Genesis II	26.2	26.1	26.3	24.5	24.1
NexGen	18.8	18.3	16.3	14.2	14.7
Vanguard Complete Knee	8.6	10.2	7.9	8.7	8.8
Triathlon	4.3	5.8	7.2	8.0	8.2
Oxford PKR	4.5	4.1	5.3	5.9	7.3
Attune	0.5	1.2	2.2	2.9	5.3
Vanguard SSK	3.5	3.5	4.2	4.0	4.4
PFC / SIGMA	7.1	5.6	5.8	5.4	4.0
Legion	2.9	4.3	4.5	4.6	3.5
RT Plus	0.8	1.9	2.9	3.5	3.5

Year	2018	2019	2020	2021	2022
Patella (n)	**1,088**	**1,185**	**947**	**941**	**983**
Name; Proportion (%)					
Genesis II	44.4	45.7	50.6	45.2	44.8
Vanguard	14.7	15.3	13.2	15.1	17.4
NexGen	14.2	15.6	12.8	12.0	10.5
Attune	2.4	2.0	2.6	3.8	6.0
Triathlon	4.0	4.5	5.5	7.5	4.9
PFC / SIGMA	9.2	7.2	5.4	6.1	4.8
Persona	0.0	0.1	1.3	2.1	3.9
balanSys	0.6	1.3	2.0	2.8	2.3
LCS	4.1	2.8	2.7	2.1	1.9
AGC	0.6	1.6	0.5	0.9	0.6

Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during knee revision arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**582**	**705**	**488**	**674**	**801**
Cement name; Proportion (%)					
Palacos R+G	41.8	38.9	50.2	48.7	48.4
Refobacin Bone Cement R	49.1	53.0	39.8	41.1	43.4
Refobacin Plus Bone Cement	8.9	7.7	6.1	8.0	6.6
Refobacin Revision	0.2	0.4	3.9	2.1	1.5

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**1,263**	**1,232**	**1,009**	**1,002**	**1,009**
Cement name; Proportion (%)					
Copal G+C	38.1	36.4	38.2	39.1	40.0
Palacos R+G	38.6	38.0	30.6	33.9	32.6
Refobacin Revision	9.8	11.0	12.7	12.4	14.3
Copal G+V	2.2	4.6	4.5	5.2	4.3
Subiton G	0.5	2.7	4.3	4.7	4.2

Survival total knee arthroplasty

Revision within 1 and 3 years

By type of revision within 1 year

TABLE Cumulative 1-year revision percentage of primary total knee arthroplasties by type of revision in the Netherlands in 2017-2021 (n=117,934)

	Cumulative 1-year revision percentage Kaplan Meier (95% CI)
Any type of revision[1]	1.0 (1.0-1.1)
Major revision[2]	0.3 (0.2-0.3)
Only femur	0.0 (0.0-0.1)
Only tibia	0.1 (0.0-0.1)
Femur and tibia	0.2 (0.1-0.2)
Minor revision[3]	0.7 (0.7-0.8)
DAIR	0.5 (0.4-0.5)
No DAIR	0.2 (0.2-0.2)
Patella addition	0.1 (0.0-0.1)

[1] Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
[2] Revision of at least the femur or tibia component.
[3] Only insert and/or patella exchange (including DAIR procedures).
TKA: total knee arthroplasty; CI: confidence interval.

In 2017-2021, 895 (0.8%) primary TKAs were implanted in patients who died within one year after the primary procedure.

By type of revision within 3 year

TABLE Cumulative 3-year revision percentage of primary total knee arthroplasties by type of revision in the Netherlands in 2015-2019 (n=125,934)

	Cumulative 3-year revision percentage Kaplan Meier (95% CI)
Any type of revision[1]	3.3 (3.2-3.4)
Major revision[2]	1.3 (1.3-1.4)
Only femur	0.1 (0.1-0.2)
Only tibia	0.3 (0.2-0.3)
Femur and tibia	0.9 (0.9-1.0)
Minor revision[3]	1.9 (1.8-2.0)
DAIR	0.5 (0.5-0.6)
No DAIR	0.8 (0.8-0.9)
Patella addition	0.6 (0.5-0.6)

[1] Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
[2] Revision of at least the acetabulum or femur component.
[3] Only insert and/or patella exchange (including DAIR procedures).
TKA: total knee arthroplasty; CI: confidence interval.

In 2015-2019, 3,954 (3.1%) primary TKAs were implanted in patients who died within three years after the primary procedure.

First major or minor revision

TABLE Cumulative 3-year first revision percentage of primary total knee arthroplasties by type of first major or first minor revision in the Netherlands in 2015-2019 (n=125,934)

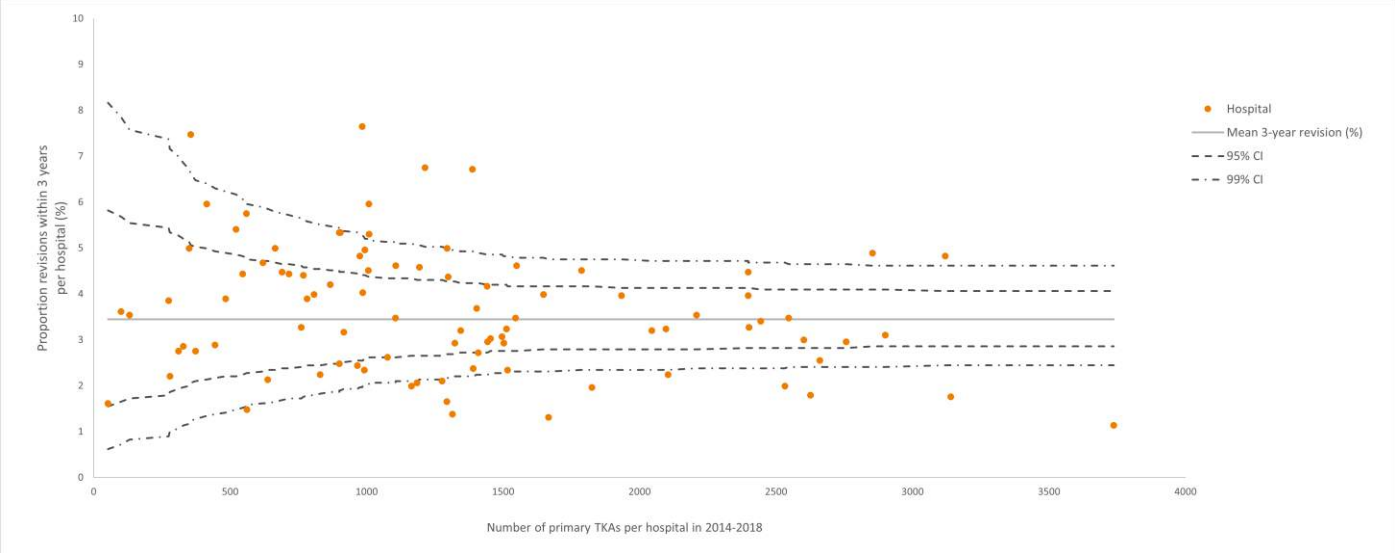
	Cumulative 3-year first revision percentage Kaplan Meier (95% CI)
First major revision[1]	1.5 (1.4-1.5)
Femur	1.2 (1.1-1.3)
Tibia	1.3 (1.3-1.4)
First minor revision[2]	1.9 (1.8-2.0)
Insert	1.3 (1.2-1.4)
Patella	0.9 (0.8-0.9)

[1] First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
[2] Only insert and/or patella exchange (including DAIR procedures).
TKA: total

In 2015-2019, 3,954 (3.1%) primary TKAs were implanted in patients who died within three years after the primary procedure.

Overall revision per hospital

FIGURE Funnel plot of proportion of knee revision arthroplasties within three years after a total knee arthroplasty per hospital in the Netherlands in 2015-2019 (n=125,934)

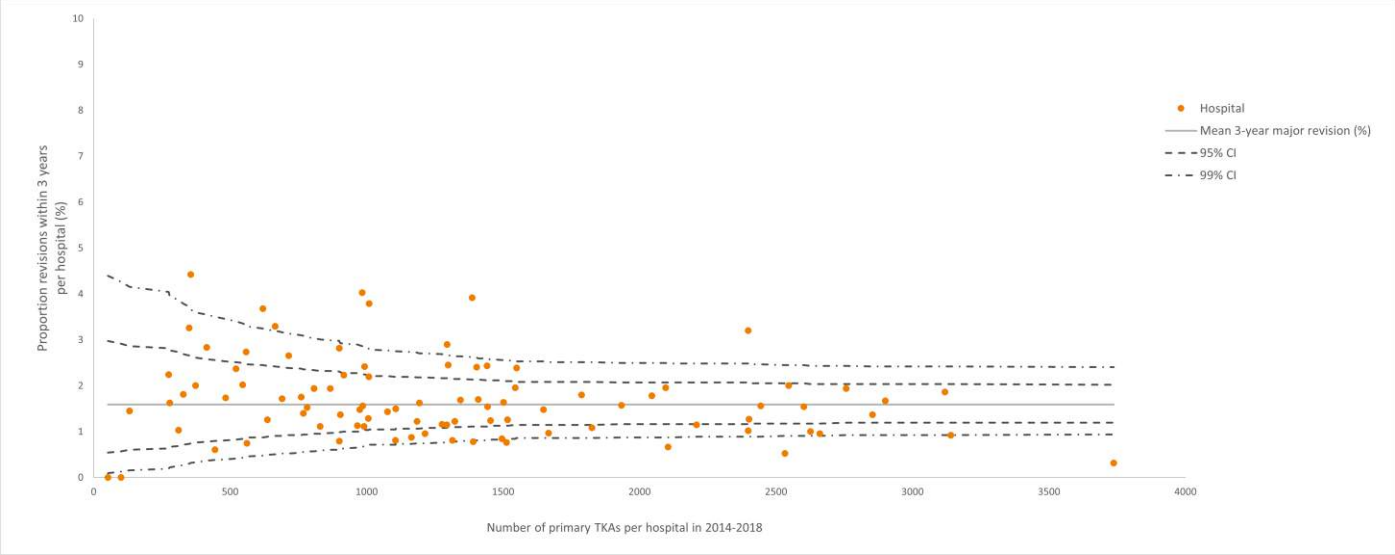


Please note: The proportion of revisions within 3 years per hospital were adjusted for casemix factors age, gender, ASA score and diagnosis (osteoarthritis versus other). TKA: total knee arthroplasty; CL: control limits; CI: confidence interval.

The mean 3-years revision percentage is 3.3 (95% CI: 3.2-3.4) in the Netherlands in 2015-2019.
Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Major revision per hospital

FIGURE Funnel plot of proportion of knee major revision arthroplasties within three years after a total knee arthroplasty per hospital in the Netherlands in 2015-2019 (n=125,934)



Please note: Major revision is defined as revision of at least femur or tibia component.Please note: The proportion of revisions within 3 years per hospital were adjusted for casemix factors age, gender, ASA score and diagnosis (osteoarthritis versus other). TKA: total knee arthroplasty; CL: control limits; CI: confidence interval.

The mean 3-years major revision percentage is 1.3 (95% CI: 1.3-1.4) in the Netherlands in 2015-2019. Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Reasons for revision by type of revision

TABLE Reasons for revision within three years of primary total knee arthroplasties by type of revision in the Netherlands in 2015-2019

	Major revision[1] (n=1,858)	Minor revision[2] (n=2,400)	Any type of revision[3] (n=4,176)
Reasons for revision	Proportion[4] (%)	Proportion[4] (%)	Proportion[4] (%)
Patellar pain	8.0	39.8	27.0
Instability	32.2	23.0	26.7
Infection	21.5	28.7	24.1
Loosening of tibia component	32.1	0.6	14.1
Malalignment	26.6	1.6	12.3
Arthrofibrosis	10.0	7.0	8.4
Loosening of femur component	8.1	0.3	3.6
Patellar dislocation	3.8	4.3	4.0
Periprosthetic fracture	4.6	0.2	2.2
Revision after knee removal	3.5	0.3	1.3
Insert wear	0.3	1.5	1.0
Loosening of patella component	0.6	0.8	0.7
Progression of osteoarthritis	0.2	0.7	0.5
Other	6.8	9.8	8.7

[1] First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
[2] Only insert and/or patella exchange (including DAIR procedures).
[3] Any type of revision includes all first revisions, including revision procedures that could not be classified as minor or major revision.
4 One patient may have more than one reason for revision. As such, the total proportion is over 100%.

Time after primary TKA

TABLE Time after primary total knee arthroplasty until short-term revision in the Netherlands in 2015-2019 (n=125,934)

Time after primary TKA	Percentage revisions (%)
Day 0-29	0.3
Day 30-182	0.4
Day 183-364	0.5
Day 365-730 (second year)	1.4
Day 731-1095 (third year)	0.8

TKA: total knee arthroplasty.

Revision by patient characteristics

TKA by patient province

FIGURE Cumulative major revision percentages of total knee arthroplasties for osteoarthritis by patient province in the Netherlands in 2014-2022 (n=206,726)

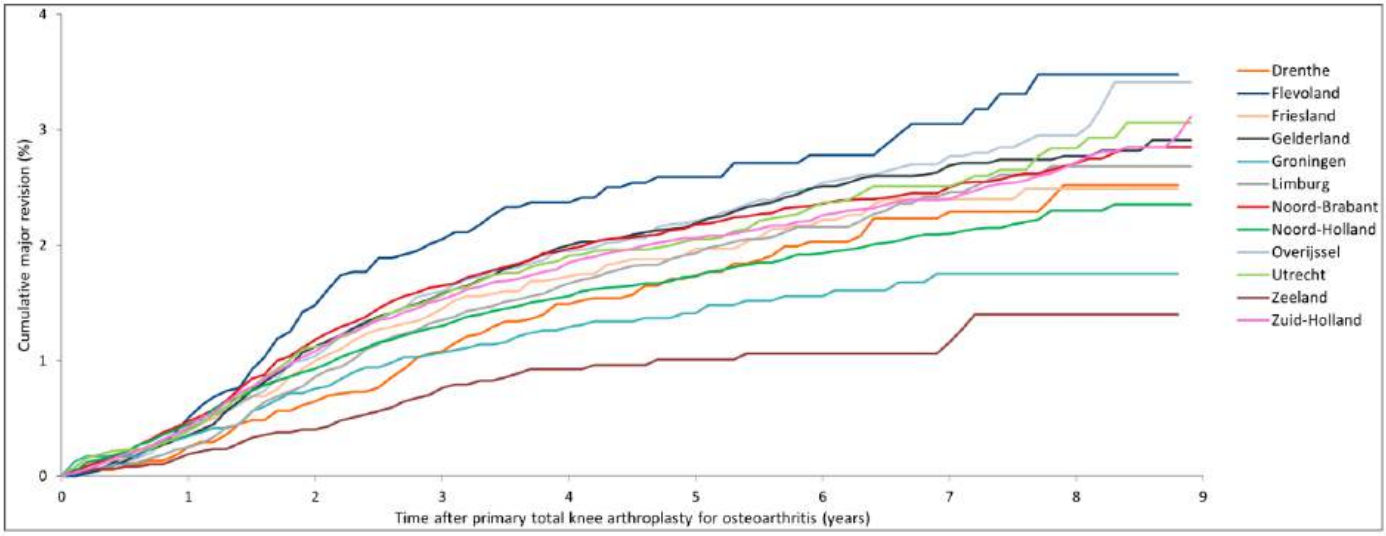


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	9yr
Patient province						
Drenthe	7,937	0.2 (0.1-0.3)	1.1 (0.8-1.3)	1.7 (1.4-2.1)	2.2 (1.8-2.7)	2.5 (2.0-3.1)
Flevoland	4,513	0.4 (0.2-0.6)	2.0 (1.6-2.5)	2.6 (2.1-3.1)	3.1 (2.4-3.7)	3.5 (2.7-4.3)
Friesland	8,170	0.4 (0.2-0.5)	1.4 (1.1-1.7)	1.9 (1.6-2.3)	2.4 (2.0-2.8)	2.5 (2.0-3.0)
Gelderland	27,420	0.3 (0.2-0.4)	1.5 (1.4-1.7)	2.2 (1.9-2.4)	2.6 (2.4-2.9)	2.9 (2.6-3.2)
Groningen	6,520	0.3 (0.2-0.4)	1.1 (0.8-1.3)	1.4 (1.1-1.7)	1.8 (1.3-2.2)	1.8 (1.3-2.2)
Limburg	15,183	0.2 (0.1-0.3)	1.3 (1.1-1.5)	1.9 (1.6-2.2)	2.4 (2.1-2.8)	2.7 (2.3-3.1)
Noord-Brabant	30,952	0.4 (0.3-0.5)	1.6 (1.5-1.8)	2.1 (2.0-2.3)	2.5 (2.2-2.7)	2.9 (2.5-3.2)
Noord-Holland	31,193	0.4 (0.3-0.5)	1.3 (1.1-1.4)	1.7 (1.6-1.9)	2.1 (1.9-2.3)	2.4 (2.1-2.6)
Overijssel	14,805	0.3 (0.2-0.4)	1.6 (1.4-1.8)	2.2 (1.9-2.5)	2.7 (2.4-3.0)	3.4 (2.8-4.0)
Utrecht	13,639	0.3 (0.2-0.4)	1.5 (1.3-1.7)	2.0 (1.8-2.3)	2.5 (2.2-2.9)	3.1 (2.5-3.6)
Zeeland	5,084	0.1 (0.0-0.3)	0.7 (0.4-1.0)	1.0 (0.7-1.3)	1.1 (0.7-1.4)	1.4 (0.9-1.9)
Zuid-Holland	41,310	0.4 (0.3-0.4)	1.5 (1.4-1.6)	2.1 (1.9-2.2)	2.4 (2.2-2.6)	3.1 (2.6-3.6)

Major revision percentage: First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
CI: confidence interval.

TKA by pre-PROM

FIGURE Cumulative revision percentage of total knee arthroplasties by valid pre-operative PROM of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2022 (n=209,153)

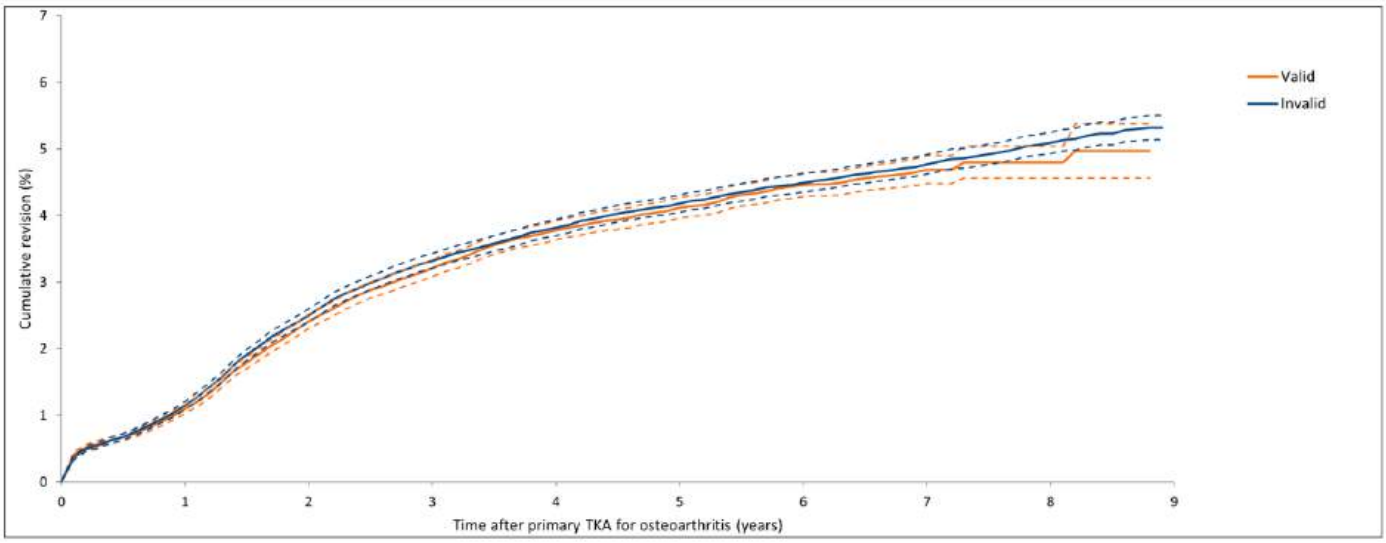


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Pre-PROM						
Valid	93,414	1.0 (0.9-1.1)	3.1 (3.0-3.3)	4.1 (3.9-4.2)	4.7 (4.5-4.8)	n.a.
Invalid	115,739	1.0 (1.0-1.1)	3.3 (3.2-3.4)	4.1 (4.0-4.3)	4.7 (4.6-4.9)	5.3 (5.1-5.5)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Valid: pre-operative PROM reported; Invalid: non-responders to pre-operative PROM; PROM: patient reported outcome measure.
TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

TKA by complete PROM (pre-, 6mnd, 12 mnd)

FIGURE Cumulative revision percentage of total knee arthroplasties by complete PROM (pre-, 6mnd, 12mnd) of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2022 (n=209,153)

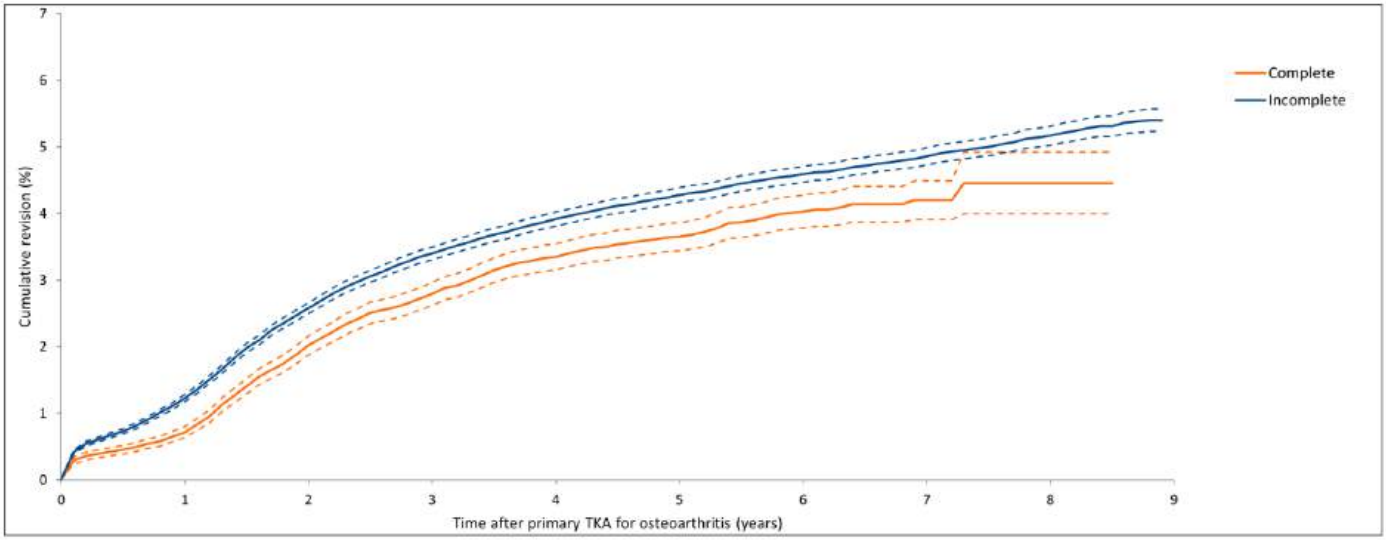


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Reported pre-, 6mnd and 12mnd PROM						
Complete	40,843	0.7 (0.6-0.7)	2.7 (2.6-2.9)	3.6 (3.4-3.9)	4.2 (3.9-4.5)	n.a.
Incomplete	168,310	1.1 (1.1-1.2)	3.4 (3.3-3.4)	4.2 (4.1-4.4)	4.8 (4.7-4.9)	5.4 (5.2-5.6)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Complete: pre-operative, 6 and 12 months postoperative PROM reported; Incomplete: one or more PROMs missing; PROM: patient reported outcome measure.
TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk..

TKA by pre-OKS

FIGURE Cumulative revision percentage of total knee arthroplasties by pre-operative Oxford Knee score of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2022 (n=82,169)

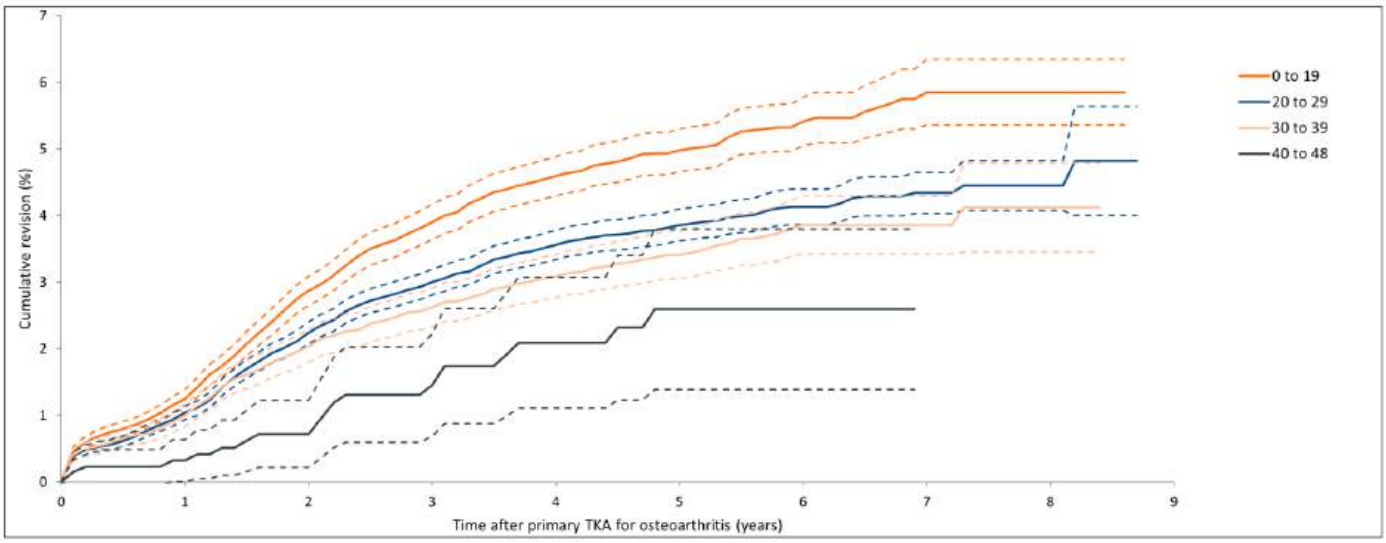


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
Pre-operative Oxford Knee score					
0 to 19	27,098	1.2 (1.0-1.3)	3.8 (3.6-4.1)	4.9 (4.6-5.2)	5.8 (5.3-6.2)
20 to 29	38,295	0.9 (0.8-1.0)	2.9 (2.7-3.1)	3.8 (3.6-4.1)	4.3 (4.0-4.6)
30 to 39	15,447	0.9 (0.7-1.1)	2.6 (2.3-2.8)	3.4 (3.1-3.8)	3.9 (3.4-4.3)
40 to 48	1,329	0.3 (0.0-0.6)	1.3 (0.6-2.0)	2.6 (1.4-3.8)	2.6 (1.4-3.8)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

The Oxford Knee score measures the physical functioning and pain of patients with osteoarthritis to the knee. The score has a range of 0.0 to 48.0, with 0.0 representing no functional ability and 48.0 the most functional ability.

TKA by gender

FIGURE Cumulative revision percentage of total knee arthroplasties by gender in the Netherlands in 2007-2022 (n=334,562)

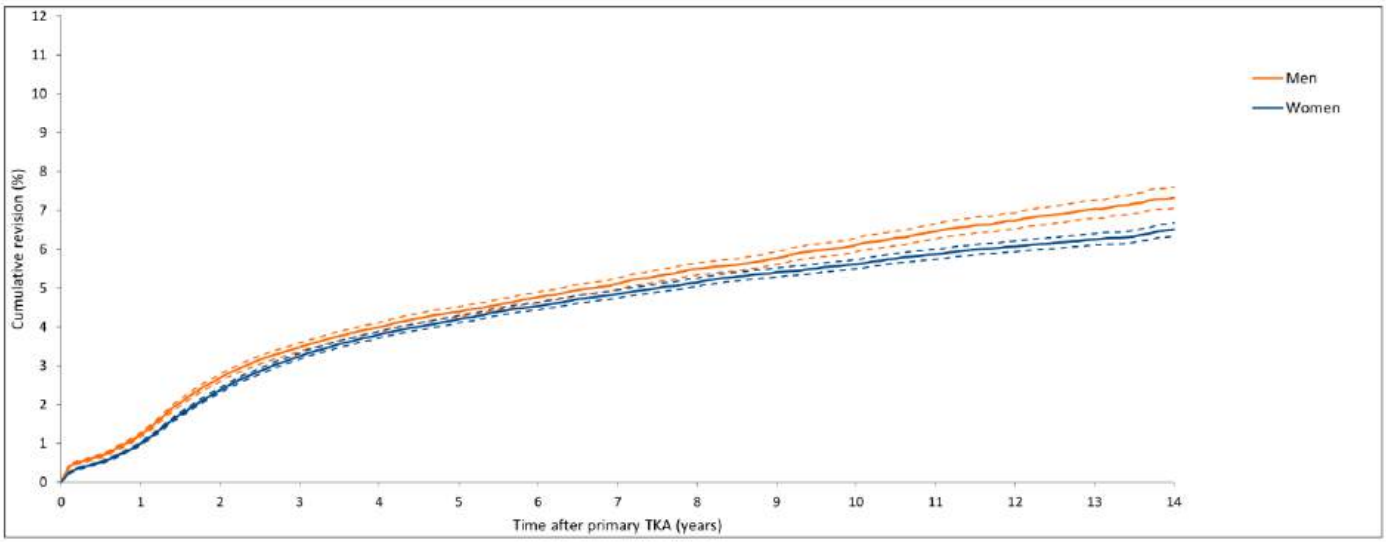


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Gender							
Men	118,431	1.1 (1.0-1.1)	3.4 (3.3-3.5)	4.4 (4.2-4.5)	5.1 (4.9-5.2)	6.1 (5.9-6.2)	7.3 (7.0-7.6)
Women	216,131	0.9 (0.8-0.9)	3.2 (3.1-3.2)	4.2 (4.1-4.2)	4.8 (4.7-4.9)	5.6 (5.5-5.7)	6.5 (6.3-6.6)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

TKA by age category

FIGURE Cumulative revision percentage of total knee arthroplasties by age category in the Netherlands in 2007-2022 (n=334,768)

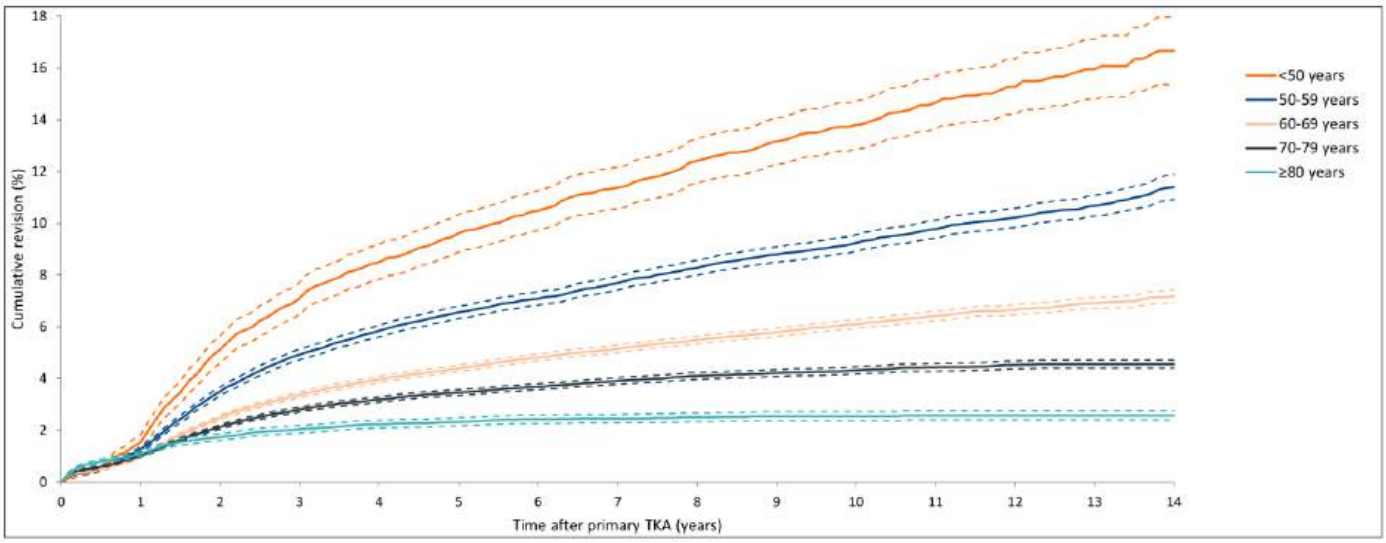


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Age (years)							
<50	7,092	1.4 (1.1-1.6)	6.9 (6.3-7.5)	9.5 (8.7-10.2)	11.3 (10.5-12.1)	13.7 (12.8-14.7)	16.7 (15.4-18.0)
50-59	47,820	1.1 (1.0-1.2)	4.8 (4.6-5.0)	6.5 (6.3-6.7)	7.6 (7.4-7.9)	9.2 (8.8-9.5)	11.4 (10.9-11.8)
60-69	116,413	0.9 (0.8-0.9)	3.3 (3.2-3.4)	4.4 (4.2-4.5)	5.1 (5.0-5.2)	6.1 (5.9-6.2)	7.1 (6.9-7.4)
70-79	122,783	0.9 (0.9-1.0)	2.7 (2.6-2.8)	3.4 (3.3-3.6)	3.9 (3.8-4.0)	4.3 (4.2-4.4)	4.6 (4.4-4.7)
≥80	40,660	1.0 (0.9-1.1)	2.0 (1.9-2.2)	2.3 (2.2-2.5)	2.5 (2.3-2.6)	2.6 (2.4-2.7)	2.6 (2.4-2.8)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

TKA by diagnosis

FIGURE Cumulative revision percentage of total knee arthroplasties by diagnosis in the Netherlands in 2007-2022 (n=332,243)

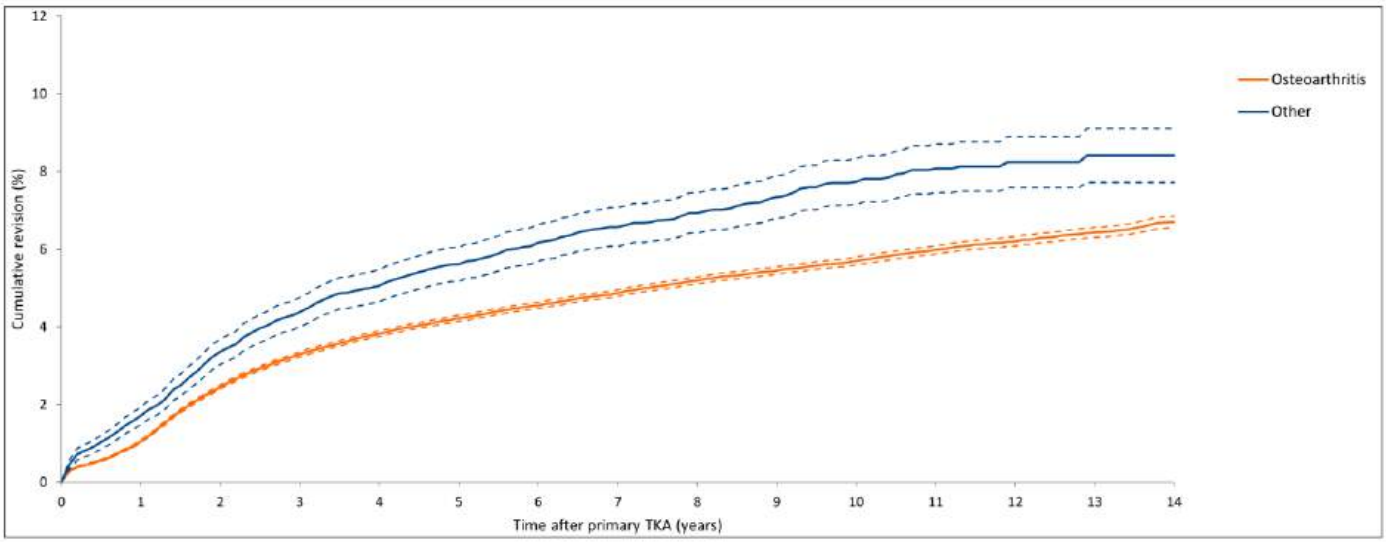


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Diagnosis							
Osteoarthritis	319,800	0.9 (0.9-1.0)	3.2 (3.2-3.3)	4.2 (4.1-4.3)	4.8 (4.7-4.9)	5.7 (5.6-5.8)	6.7 (6.5-6.8)
Other	12,443	1.6 (1.4-1.8)	4.3 (3.9-4.7)	5.6 (5.2-6.0)	6.6 (6.1-7.1)	7.7 (7.1-8.3)	8.4 (7.7-9.1)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

TKA by ASA score

FIGURE Cumulative revision percentage of total knee arthroplasties by ASA score in the Netherlands in 2007-2022 (n=325,686)

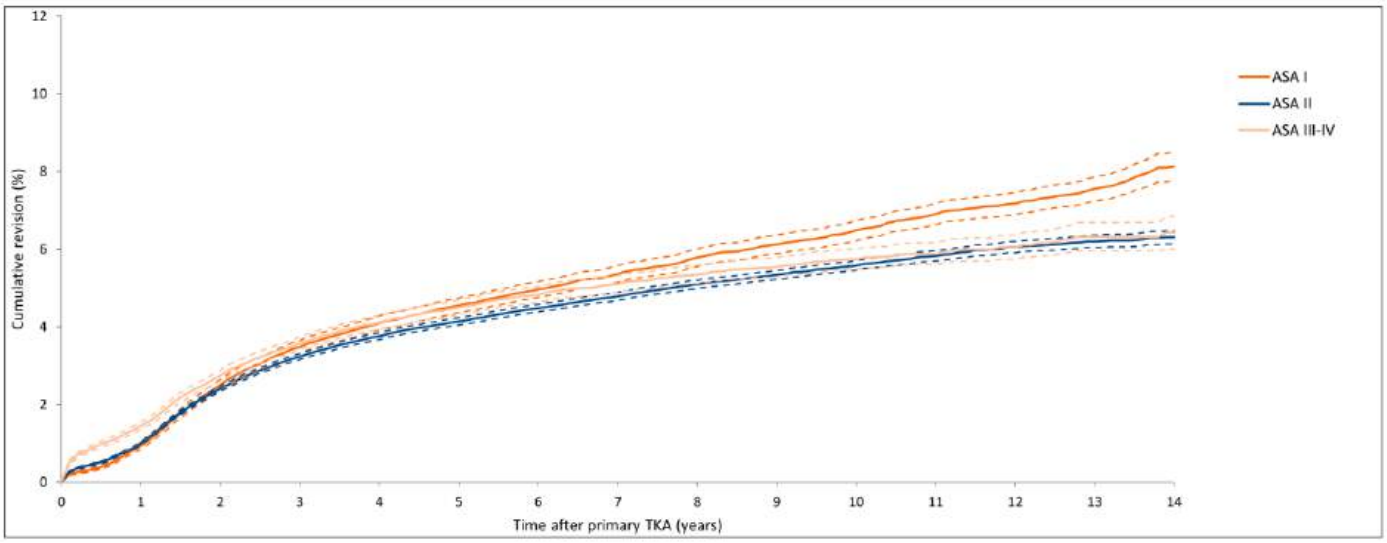


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
ASA score							
I	50,427	0.8 (0.7-0.9)	3.4 (3.3-3.6)	4.5 (4.3-4.7)	5.3 (5.1-5.5)	6.4 (6.2-6.7)	8.1 (7.7-8.5)
II	215,604	0.9 (0.8-0.9)	3.2 (3.1-3.2)	4.1 (4.0-4.2)	4.8 (4.6-4.9)	5.6 (5.4-5.7)	6.3 (6.1-6.5)
III-IV	59,655	1.3 (1.2-1.4)	3.5 (3.3-3.7)	4.5 (4.3-4.7)	5.1 (4.9-5.3)	5.7 (5.5-6.0)	6.4 (6.0-6.8)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

TKA by BMI category

FIGURE Cumulative revision percentage of total knee arthroplasties by BMI category in the Netherlands in 2014-2022 (n=214,605)

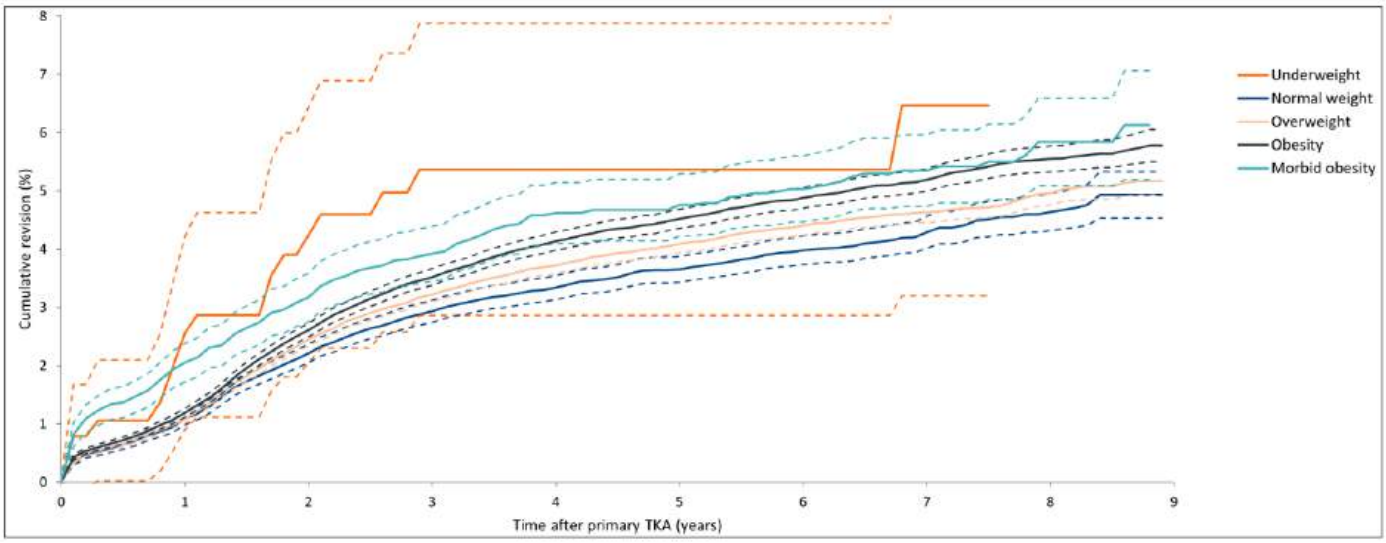


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Body Mass Index (kg/m²)						
Underweight (≤18.5)	383	2.0 (0.5-3.4)	5.4 (2.9-7.9)	5.4 (2.9-7.9)	6.5 (3.2-9.7)	n.a.
Normal weight (>18.5-25)	37,692	0.9 (0.8-1.0)	2.9 (2.7-3.1)	3.6 (3.4-3.9)	4.3 (4.0-4.6)	4.9 (4.5-5.3)
Overweight (>25-30)	88,356	1.0 (0.9-1.1)	3.2 (3.0-3.3)	4.1 (3.9-4.2)	4.6 (4.5-4.8)	5.2 (4.9-5.4)
Obesity (>30-40)	80,774	1.1 (1.0-1.1)	3.5 (3.3-3.6)	4.5 (4.3-4.6)	5.2 (5.0-5.4)	5.8 (5.5-6.1)
Morbid obesity (>40)	7,400	1.9 (1.6-2.2)	3.9 (3.4-4.3)	4.7 (4.1-5.2)	5.4 (4.7-6.0)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

TKA by Charnley score

FIGURE Cumulative revision percentage of total knee arthroplasties by charnley score in the Netherlands in 2014-2022 (n=213,908)

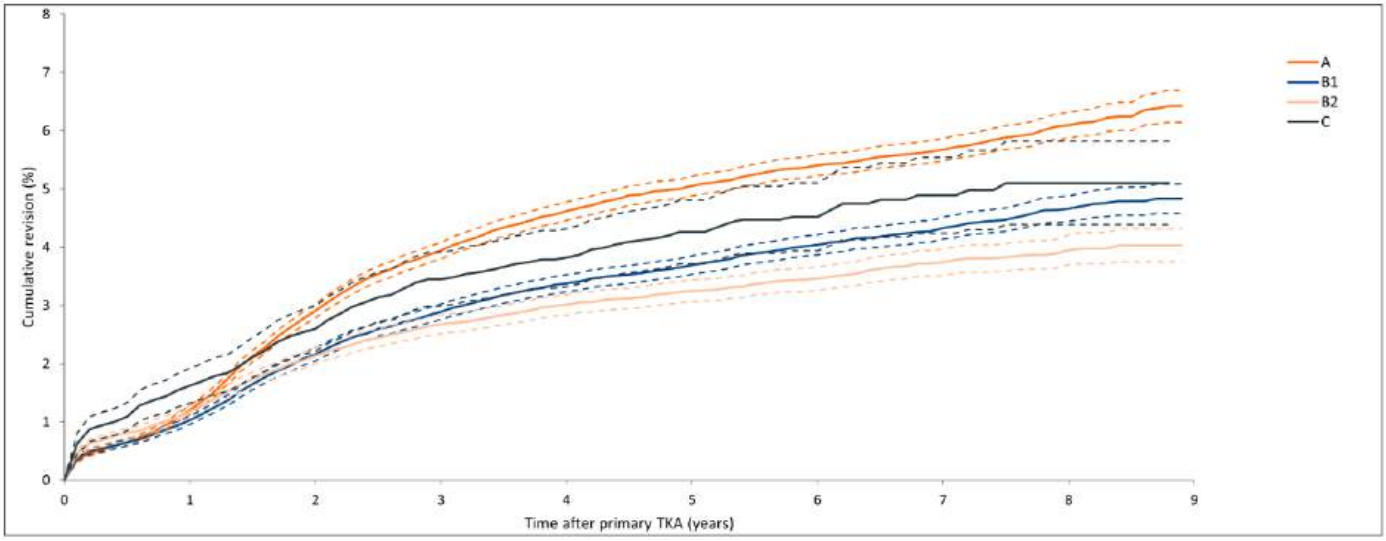


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Charnley-score						
A One knee joint affected	85,877	1.1 (1.0-1.1)	3.9 (3.7-4.0)	5.0 (4.8-5.2)	5.7 (5.5-5.9)	6.4 (6.1-6.7)
B1 Both knee joints affected	73,927	0.9 (0.9-1.0)	2.8 (2.7-3.0)	3.7 (3.5-3.8)	4.3 (4.1-4.5)	4.8 (4.6-5.1)
B2 Contralateral knee joint with a total knee prosthesis	46,800	1.1 (1.0-1.2)	2.6 (2.5-2.8)	3.2 (3.0-3.4)	3.7 (3.5-4.0)	4.0 (3.7-4.3)
C Multiple joints affected or chronic disease that affects quality of life	7,304	1.5 (1.2-1.8)	3.5 (3.0-3.9)	4.3 (3.7-4.8)	4.9 (4.2-5.5)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

TKA by smoking

FIGURE Cumulative revision percentage of total knee arthroplasties by smoking in the Netherlands in 2014-2022 (n=210,312)

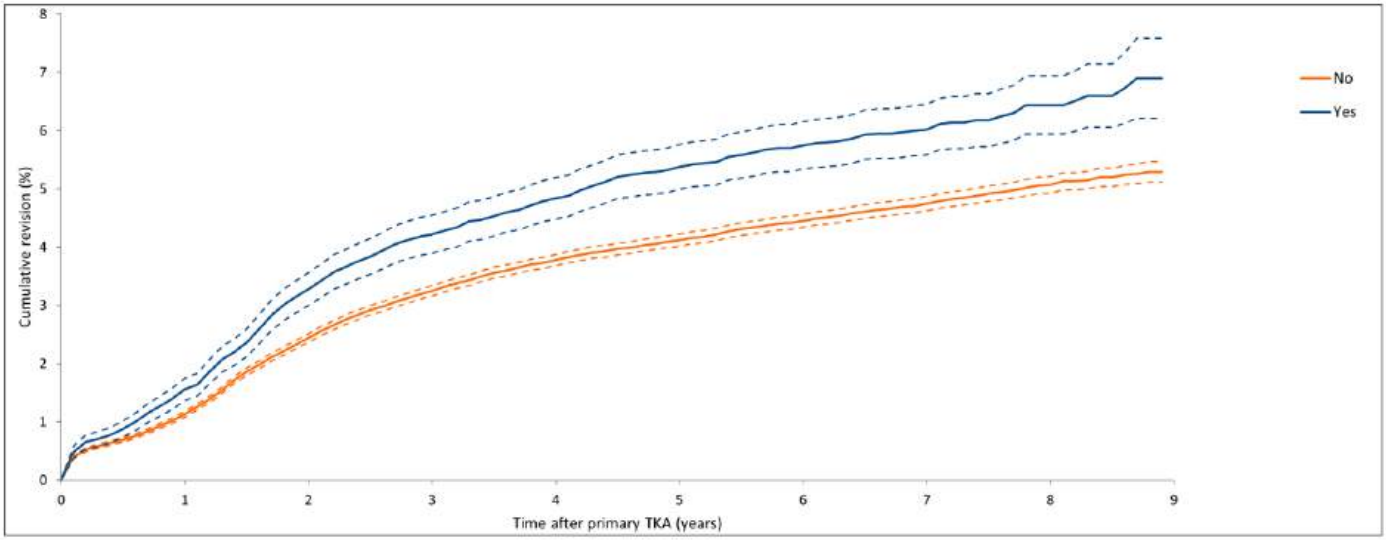


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	9yr
Smoking						
No	193,046	1.0 (1.0-1.1)	3.2 (3.1-3.3)	4.1 (4.0-4.2)	4.8 (4.6-4.9)	5.3 (5.1-5.5)
Yes	17,266	1.4 (1.2-1.6)	4.2 (3.9-4.5)	5.3 (4.9-5.7)	6.0 (5.6-6.5)	6.9 (6.2-7.6)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

Revision by procedure characteristics

TKA by type of revision

FIGURE Cumulative revision percentage of total knee arthroplasties by type of revision in the Netherlands in 2007-2022 (n=335,039)

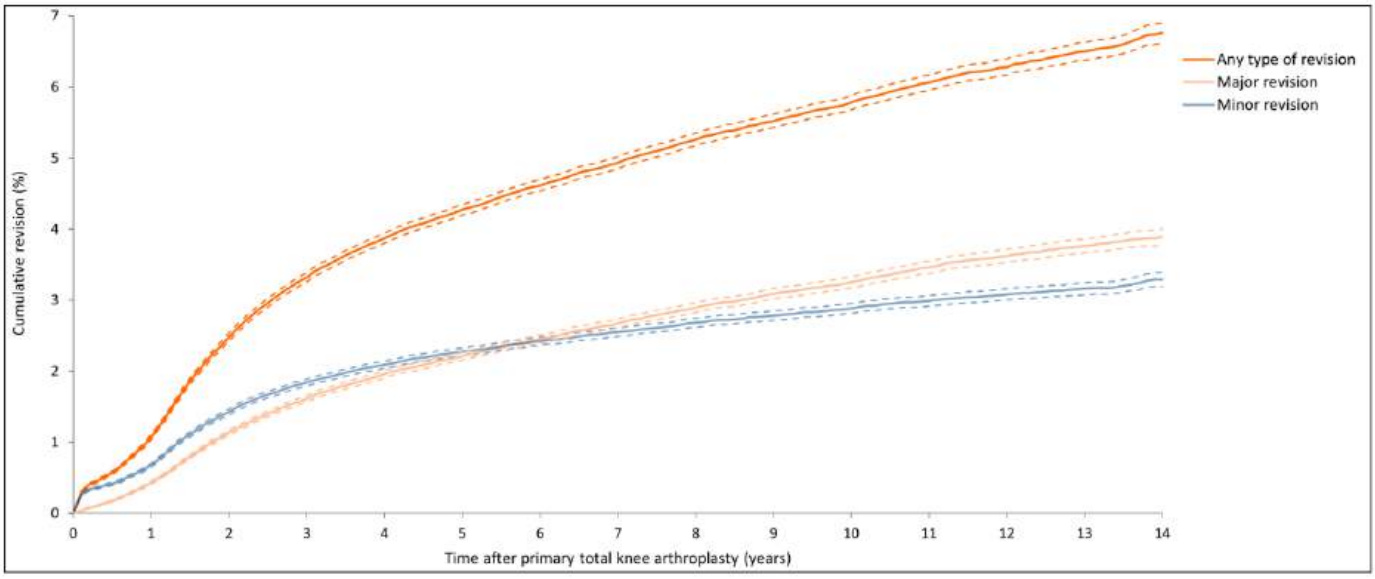


TABLE Cumulative revision percentages

	Number at risk (n)	Competing Risk (95% CI)	Kaplan Meier[1] (95% CI)
Any type of revision			
1-year revision (%)	304,549	1.0 (1.0-1.1)	0.9 (0.9-1.0)
3-year revision (%)	252,296	3.3 (3.2-3.3)	3.3 (3.2-3.3)
5-year revision (%)	194,494	4.2 (4.1-4.2)	4.2 (4.2-4.3)
10-year revision (%)	73,177	5.5 (5.4-5.6)	5.7 (5.6-5.8)
14-year revision (%)	13,062	6.2 (6.1-6.3)	6.7 (6.6-6.9)
Major revision[2]			
1-year revision (%)	305,942	0.4 (0.4-0.5)	0.4 (0.3-0.4)
3-year revision (%)	256,416	1.6 (1.5-1.6)	1.6 (1.5-1.6)
5-year revision (%)	198,506	2.2 (2.1-2.2)	2.2 (2.1-2.2)
10-year revision (%)	75,118	3.1 (3.0-3.1)	3.2 (3.2-3.3)
14-year revision (%)	13,463	3.5 (3.4-3.6)	3.9 (3.8-4.0)
Minor revision[3]			
1-year revision (%)	305,581	0.6 (0.6-0.7)	0.6 (0.6-0.6)
3-year revision (%)	256,236	1.7 (1.7-1.8)	1.8 (1.8-1.9)
5-year revision (%)	198,965	2.1 (2.1-2.2)	2.3 (2.2-2.3)
10-year revision (%)	76,046	2.6 (2.6-2.7)	2.9 (2.8-2.9)
14-year revision (%)	13,665	2.9 (2.8-3.0)	3.3 (3.2-3.4)

[1] The cumulative revision percentage using the Kaplan Meier method is shown in the figure.
[2] First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
[3] Only insert and/or patella exchange (including patella addition).
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

In 2007-2022, 44,088 (13.2%) primary TKAs were implanted in patients who died within fourteen years after the primary diagnosis

TKA by procedure year

FIGURE Cumulative major revision percentage of total knee arthroplasties by procedure year of primary TKA in the Netherlands in 2009-2022 (n=256,136)

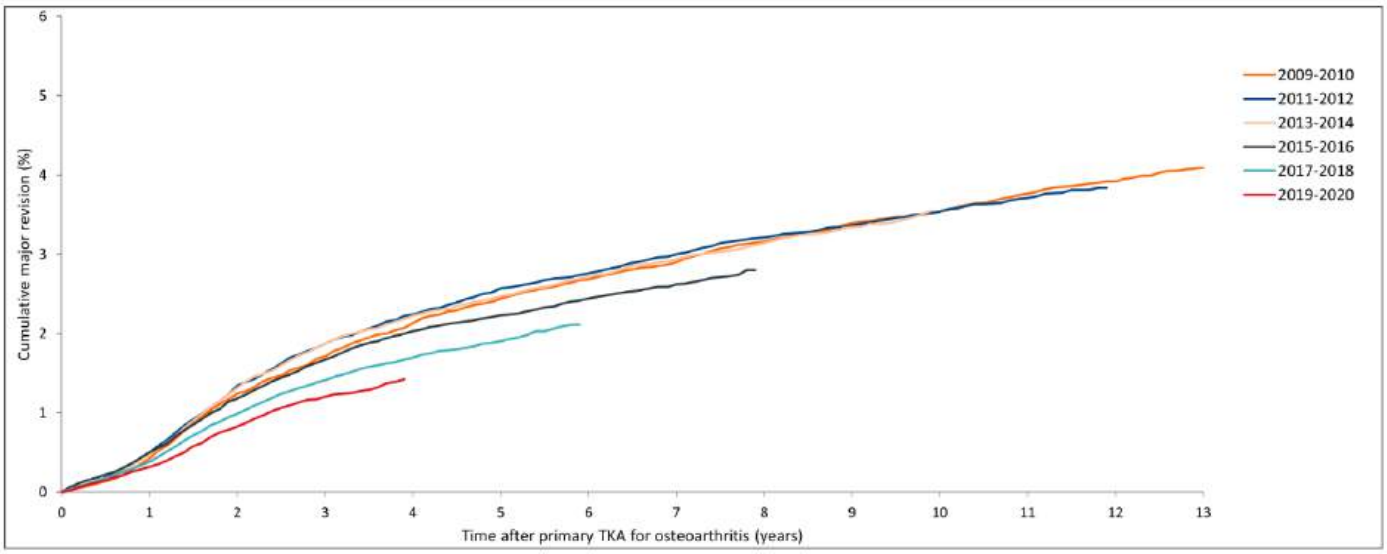


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

Procedure year primary TKA for osteoarthritis	Number (n)	1yr	3yr	5yr	7yr	10yr	13yr
2009-2010	33,148	0.35 (0.28-0.41)	1.68 (1.54-1.82)	2.40 (2.23-2.57)	2.87 (2.69-3.05)	3.52 (3.32-3.72)	4.08 (3.85-4.31)
2011-2012	39,145	0.41 (0.34-0.47)	1.82 (1.69-1.95)	2.52 (2.36-2.68)	2.97 (2.80-3.14)	3.52 (3.33-3.71)	n.a.
2013-2014	44,035	0.40 (0.34-0.46)	1.82 (1.69-1.95)	2.44 (2.29-2.59)	2.91 (2.75-3.07)	3.55 (3.34-3.76)	n.a.
2015-2016	46,940	0.43 (0.37-0.49)	1.63 (1.51-1.75)	2.21 (2.08-2.34)	2.59 (2.44-2.74)	n.a.	n.a.
2017-2018	49,370	0.33 (0.28-0.38)	1.38 (1.28-1.48)	1.88 (1.76-2.00)	n.a.	n.a.	n.a.
2019-2020	43,498	0.28 (0.23-0.33)	1.17 (1.06-1.28)	n.a.	n.a.	n.a.	n.a.

Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

TKA cemented by procedure year

Cumulative major revision percentage of cemented total knee arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2022 (n=232,070)

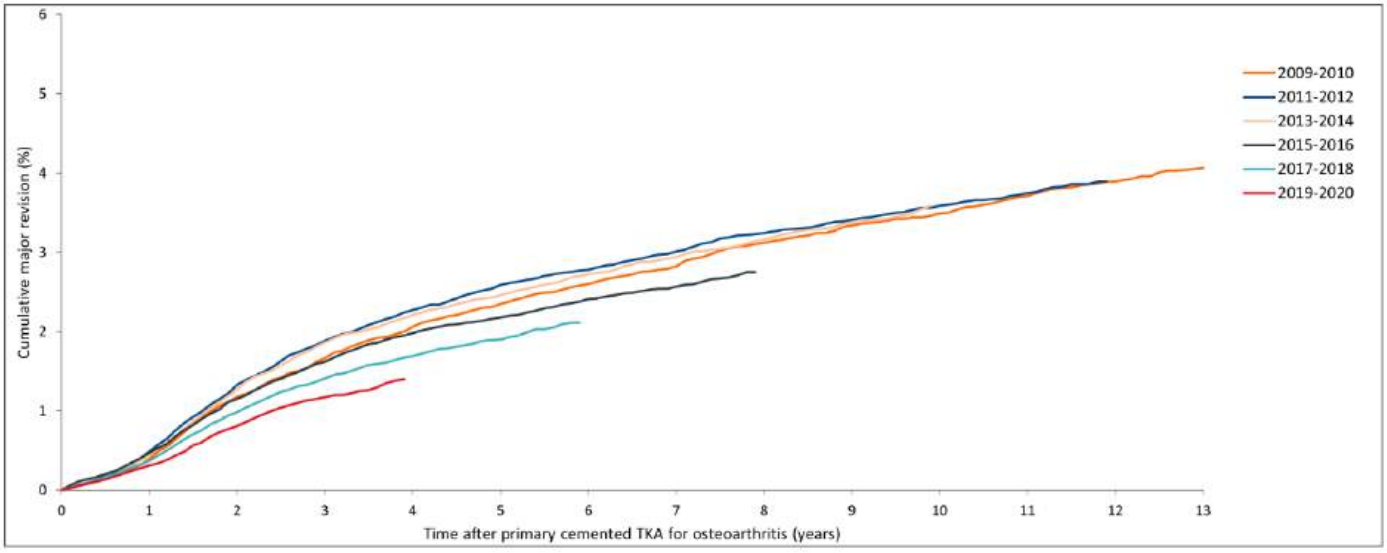


TABLE Cumulative major revision percentages

Procedure year primary cemented TKA for osteoarthritis	Number (n)	Cumulative major revision percentages - Kaplan Meier (95% CI) 1yr	3yr	5yr	7yr	10yr	13yr
2009-2010	28,010	0.32 (0.25-0.38)	1.62 (1.47-1.77)	2.31 (2.13-2.49)	2.79 (2.59-2.99)	3.46 (3.24-3.68)	4.05 (3.81-4.29)
2011-2012	34,137	0.40 (0.33-0.47)	1.83 (1.69-1.97)	2.54 (2.37-2.71)	2.98 (2.80-3.16)	3.56 (3.36-3.76)	n.a.
2013-2014	40,178	0.37 (0.31-0.43)	1.81 (1.68-1.94)	2.43 (2.28-2.58)	2.92 (2.75-3.09)	3.59 (3.37-3.81)	n.a.
2015-2016	43,515	0.40 (0.34-0.46)	1.59 (1.47-1.71)	2.16 (2.02-2.30)	2.54 (2.39-2.69)	n.a.	n.a.
2017-2018	45,958	0.32 (0.27-0.37)	1.37 (1.26-1.48)	1.89 (1.76-2.02)	n.a.	n.a.	n.a.
2019-2020	40,272	0.27 (0.22-0.33)	1.15 (1.04-1.26)	n.a.	n.a.	n.a.	n.a.

Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

TKA uncemented by procedure year

Cumulative major revision percentage of uncemented total knee arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2022 (n=11,235)

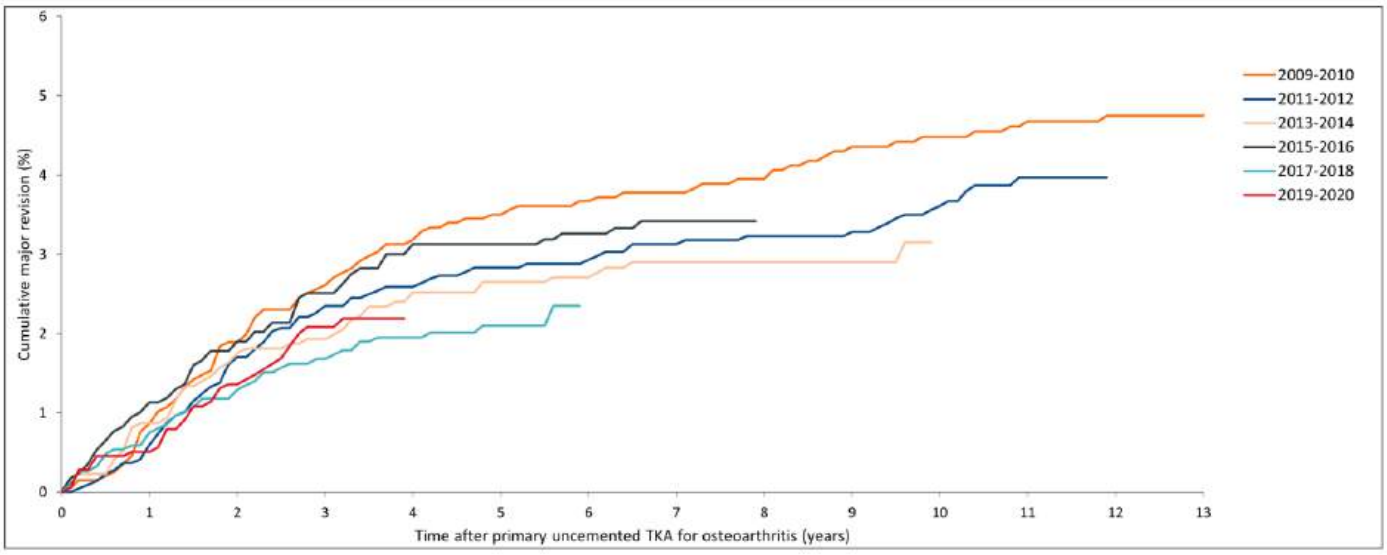


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

Procedure year primary uncemented TKA for osteoarthritis	Number (n)	1yr	3yr	5yr	7yr	10yr	13yr
2009-2010	1,982	0.76 (0.38-1.15)	2.56 (1.86-3.26)	3.50 (2.68-4.32)	3.78 (2.93-4.63)	4.48 (3.55-5.41)	4.75 (3.78-5.72)
2011-2012	2,189	0.41 (0.14-0.68)	2.26 (1.63-2.89)	2.83 (2.13-3.53)	3.13 (2.39-3.87)	3.56 (2.77-4.35)	n.a.
2013-2014	1,727	0.87 (0.43-1.31)	1.93 (1.28-2.58)	2.65 (1.89-3.41)	2.90 (2.10-3.70)	3.15 (2.22-4.08)	n.a.
2015-2016	1,692	1.01 (0.53-1.49)	2.51 (1.76-3.26)	3.13 (2.29-3.97)	3.42 (2.54-4.30)	n.a.	n.a.
2017-2018	1,874	0.59 (0.24-0.94)	1.68 (1.10-2.26)	2.10 (1.44-2.76)	n.a.	n.a.	n.a.
2019-2020	1,771	0.51 (0.18-0.84)	2.08 (1.38-2.78)	n.a.	n.a.	n.a.	n.a.

Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

TKA by procedure side

FIGURE Cumulative major revision percentage of total knee arthroplasties for osteoarthritis by procedure side in the Netherlands in 2007-2022 (n=319,487)

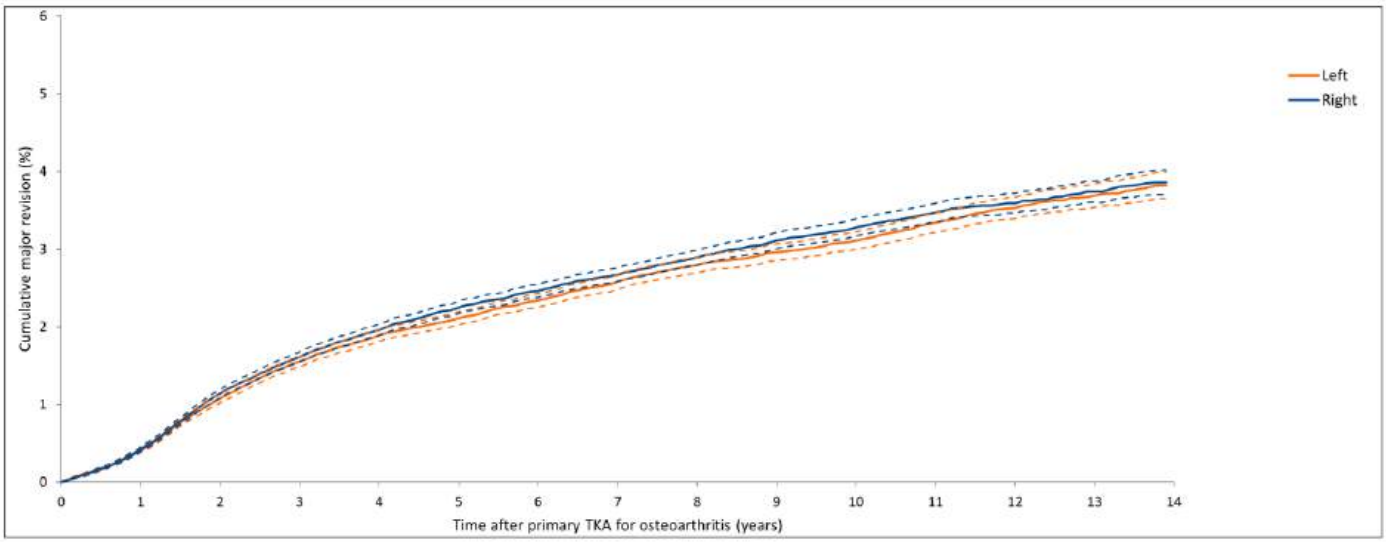


TABLE Cumulative major revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Procedure side							
Left	150,733	0.4 (0.3-0.4)	1.5 (1.5-1.6)	2.1 (2.0-2.2)	2.5 (2.4-2.6)	3.1 (3.0-3.2)	3.8 (3.6-4.0)
Right	168,754	0.4 (0.3-0.4)	1.6 (1.5-1.6)	2.2 (2.1-2.3)	2.7 (2.6-2.7)	3.3 (3.1-3.4)	3.9 (3.7-4.0)

Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

TKA by ODEP 5A or higher

FIGURE Cumulative major revision percentage of total knee arthroplasties for osteoarthritis by ODEP classification 5A or higher in the Netherlands in 2007-2022 (n= 301,773)

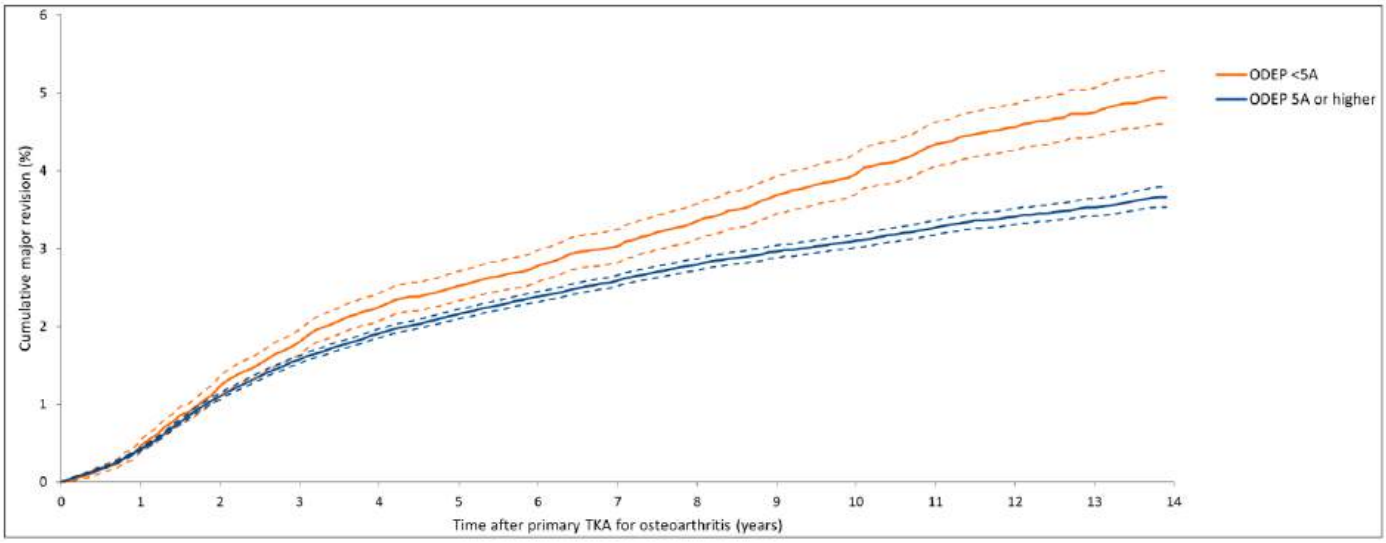


TABLE Cumulative major revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
ODEP							
<5A	28,880	0.3 (0.3-0.4)	1.7 (1.6-1.9)	2.5 (2.3-2.7)	3.0 (2.8-3.2)	3.9 (3.7-4.2)	4.9 (4.6-5.3)
5A or higher	272,893	0.4 (0.3-0.4)	1.5 (1.5-1.6)	2.1 (2.1-2.2)	2.6 (2.5-2.6)	3.1 (3.0-3.2)	3.7 (3.5-3.8)

Major revision percentage: First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
ODEP rating: ODEP provides ratings for hip femoral stems, hip acetabular cups and total knee replacement implants. Detailed information can be found at www.odep.org.uk.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; CI: confidence interval.

TKA by type of femur

FIGURE Cumulative major revision percentage of total knee arthroplasties for osteoarthritis by prosthesis design in the Netherlands in 2007-2022 (n=300,909)

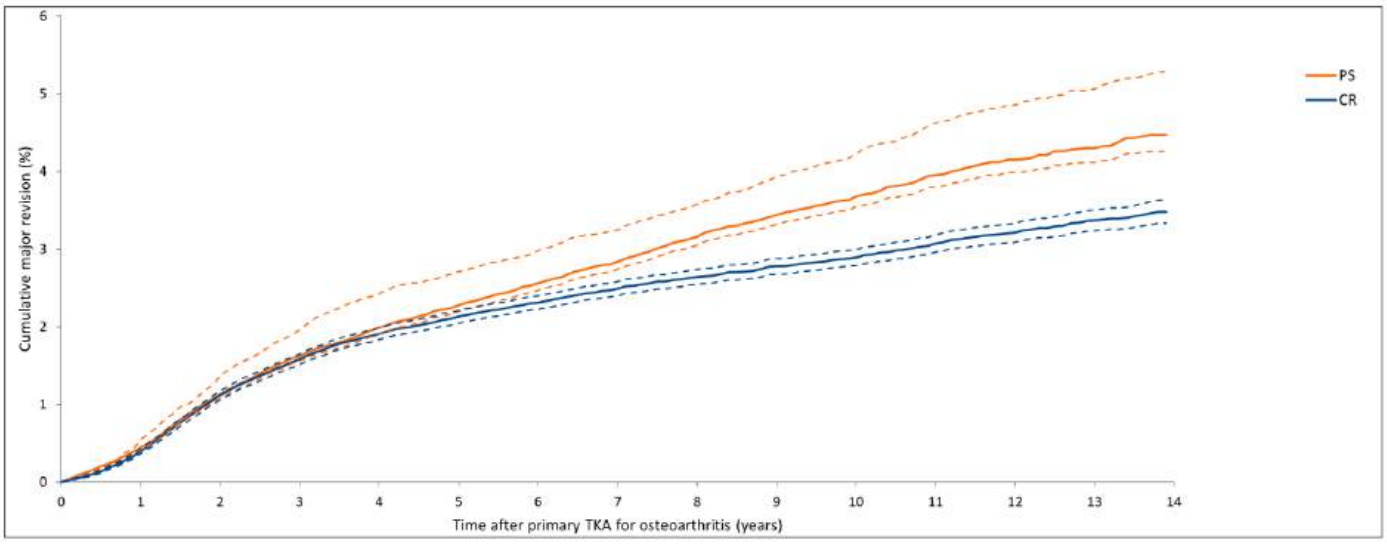


TABLE Cumulative major revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)					
	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Prosthesis design							
Posterior stabilised (PS)	160,121	0.4 (0.4-0.4)	1.6 (1.5-1.7)	2.2 (2.2-2.3)	2.8 (2.7-2.9)	3.6 (3.5-3.8)	4.5 (4.3-4.7)
Cruciate retaining (CR)	140,788	0.3 (0.3-0.4)	1.5 (1.5-1.6)	2.1 (2.0-2.2)	2.5 (2.4-2.6)	2.9 (2.8-3.0)	3.5 (3.3-3.6)

Major revision percentage: First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; PS: posterior stabilised; CR: cruciate retaining; CI: confidence interval.

TKA by PE type

Cumulative major revision percentages of total knee arthroplasties for osteoarthritis by inlay material in the Netherlands in 2007-2022 (306,279)

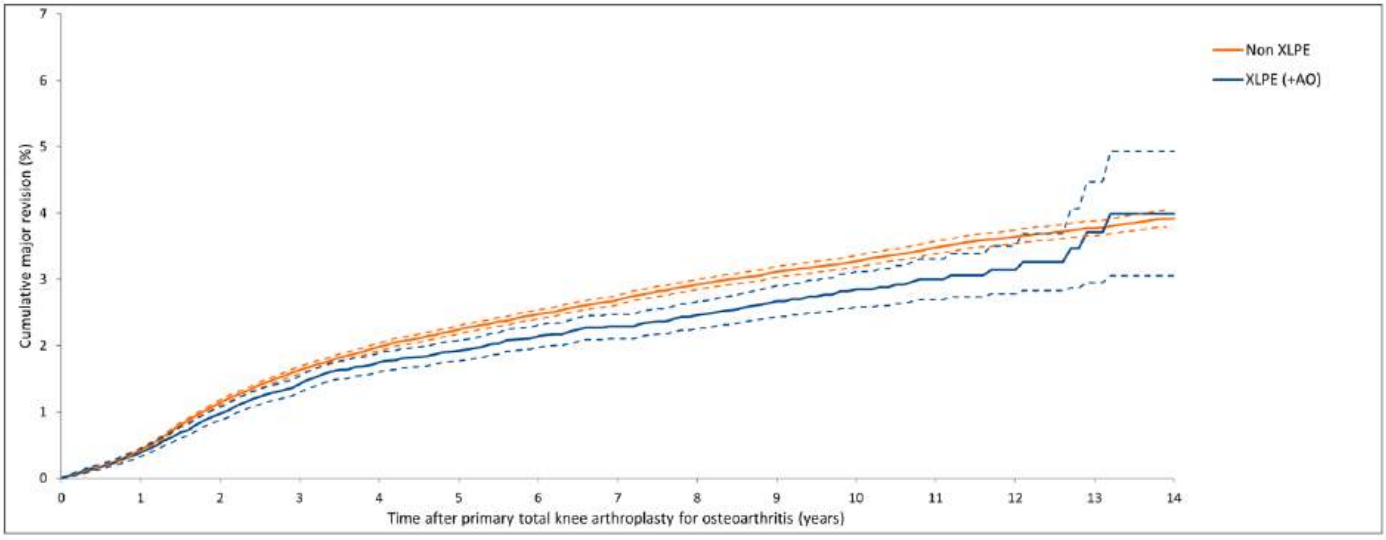


TABLE Cumulative major revision percentages

		Cumulative second revision percentages - Kaplan Meier (95% CI)			
Fixation of primary THA	Number (n)	1yr	3yr	5yr	7yr
Uncemented	8,953	7.8 (7.3-8.4)	12.1 (11.4-12.8)	14.4 (13.6-15.2)	16.2 (15.3-17.1)
Cemented	3,080	9.5 (8.4-10.5)	13.5 (12.2-14.8)	15.5 (14.1-16.9)	16.8 (15.2-18.4)
Reversed hybrid	815	7.6 (5.7-9.4)	13.3 (10.8-15.8)	16.0 (13.2-18.8)	18.3 (15.1-21.6)
Hybrid	698	9.0 (6.8-11.2)	12.5 (9.9-15.1)	13.8 (11.0-16.7)	17.3 (13.6-21.0)

Major revision percentage: First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
TKA: total knee arthroplasty; XLPE: cross-linked polyethylene; AO: antioxidant; CI: confidence interval.

Revision per component name

Cemented primary TKA – overall revision

TABLE Cumulative revision percentages of cemented primary total knee arthroplasties by prosthesis component combination of patients who underwent a TKA for osteoarthritis in the Netherlands in 2007-2022 (n=287,967)

					Type of revision (n)						Cumulative revision percentage Kaplan Meier (95% CI)					
Femur component	Tibia component	Total primary TKAs (n)	Median (IQR) age (yr)	Total RAs (n)	Total knee (complete revision)	Patella addition	Only femur component	Only tibia component	Only insert/ patella	Missing/ unknown	1yr	3yr	5yr	7yr	10yr	14yr
All cemented TKAs for osteoarthritis		**287,967**	**69 (63-76)**	**12,339**	**4,322**	**2,332**	**501**	**1,079**	**3,799**	**306**	**0.9 (0.9-1.0)**	**3.2 (3.1-3.3)**	**4.2 (4.1-4.3)**	**4.8 (4.8-4.9)**	**5.7 (5.6-5.8)**	**6.8 (6.6-7.0)**
Genesis II	Genesis II	63,915	69 (63-75)	3,101	739	679	235	215	1,160	73	1.2 (1.1-1.3)	3.9 (3.7-4.0)	5.0 (4.8-5.1)	5.6 (5.3-5.8)	6.3 (6.1-6.5)	7.3 (6.9-7.7)
NexGen	NexGen	60,333	69 (63-75)	2,559	1,060	277	74	308	773	67	0.9 (0.8-0.9)	2.8 (2.6-2.9)	3.8 (3.6-3.9)	4.7 (4.5-4.9)	5.9 (5.6-6.1)	7.2 (6.8-7.6)
Vanguard Complete Knee	Vanguard Complete Knee	48,103	69 (62-75)	1,793	622	332	45	134	617	43	0.9 (0.8-1.0)	3.0 (2.8-3.1)	3.7 (3.5-3.9)	4.3 (4.1-4.5)	4.9 (4.7-5.2)	6.0 (5.5-6.5)
PFC / SIGMA	PFC / SIGMA	31,886	70 (63-76)	1,221	376	276	31	89	418	31	0.9 (0.8-1.0)	3.0 (2.8-3.2)	3.7 (3.5-4.0)	4.1 (3.8-4.3)	4.6 (4.4-4.9)	5.1 (4.7-5.4)
LCS	LCS	17,251	70 (63-76)	789	413	84	34	145	102	11	0.6 (0.5-0.7)	3.1 (2.9-3.4)	4.2 (3.9-4.5)	4.7 (4.4-5.1)	5.3 (4.9-5.7)	5.8 (5.4-6.3)
Triathlon	Triathlon	10,507	70 (64-76)	365	102	60	16	34	148	5	1.3 (1.1-1.5)	3.5 (3.1-3.9)	4.4 (3.9-4.8)	4.9 (4.4-5.5)	5.4 (4.8-6.1)	n.a.
Persona	Persona	5,811	69 (62-74)	79	14	10	0	7	47	1	0.8 (0.6-1.1)	3.1 (2.1-4.0)	4.9 (3.1-6.6)	5.3 (3.4-7.2)	n.a.	n.a.
Attune	Attune	5,546	70 (63-75)	73	17	16	3	10	26	1	0.6 (0.3-0.8)	2.3 (1.7-2.9)	2.9 (2.1-3.6)	3.1 (2.2-3.9)	n.a.	n.a.
AGC V2	AGC V2	4,420*	71 (65-77)	185	106	58	1	2	12	6	0.3 (0.1-0.5)	2.0 (1.6-2.4)	2.6 (2.1-3.1)	3.2 (2.7-3.7)	3.9 (3.3-4.5)	5.1 (4.3-5.8)
balanSys	balanSys	4,087	69 (62-76)	191	64	72	4	11	36	4	0.9 (0.6-1.1)	3.8 (3.1-4.4)	4.9 (4.2-5.7)	5.8 (4.9-6.7)	6.8 (5.7-7.9)	8.4 (6.7-10.1)
TC Plus	TC Plus	3,729	70 (63-76)	119	58	32	2	5	17	5	0.7 (0.4-0.9)	2.3 (1.8-2.8)	3.0 (2.4-3.6)	3.4 (2.8-4.0)	4.1 (3.3-4.9)	4.6 (3.6-5.6)
Optetrak	Optetrak	3,073*	70 (62-76)	385	231	90	3	33	21	7	1.1 (0.7-1.4)	5.3 (4.5-6.1)	7.1 (6.2-8.0)	9.1 (8.1-10.2)	12.4 (11.2-13.7)	17.5 (15.4-19.6)
ACS	ACS	2,684	67 (60-73)	141	35	22	9	12	55	8	0.7 (0.4-1.0)	3.8 (3.0-4.5)	4.8 (3.9-5.6)	5.1 (4.3-6.0)	5.5 (4.6-6.4)	n.a.
Scorpio NRG	Scorpio	2,631*	70 (63-76)	140	49	47	10	4	29	1	0.8 (0.5-1.2)	3.2 (2.5-3.8)	4.5 (3.7-5.3)	5.1 (4.2-6.0)	5.7 (4.7-6.6)	n.a.
Scorpio	Scorpio	2,240*	71 (63-76)	117	62	22	3	6	20	4	0.3 (0.1-0.5)	2.4 (1.7-3.0)	3.2 (2.5-3.9)	3.7 (2.9-4.5)	4.7 (3.8-5.6)	6.0 (4.9-7.1)
MRK	MRK	1,610	70 (63-76)	31	14	8	0	0	8	1	0.1 (0.0-0.3)	1.4 (0.7-2.0)	2.7 (1.6-3.8)	3.7 (2.3-5.1)	n.a.	n.a.
Journey BCS	Journey BCS	1,566	69 (62-75)	138	19	64	1	3	49	2	1.0 (0.5-1.5)	5.5 (4.3-6.8)	6.8 (5.4-8.2)	8.7 (7-10.3)	10.9 (8.9-12.8)	16.9 (13.4-20.4)
NexGen GSF	NexGen	1,252	68 (61-74)	33	19	5	0	1	7	1	0.5 (0.1-0.9)	1.5 (0.8-2.2)	2.5 (1.6-3.4)	2.7 (1.8-3.7)	3.2 (2.1-4.4)	n.a.
PFC / SIGMA	LCS	1,212*	66 (58-75)	55	28	11	3	1	10	2	0.3 (0.0-0.7)	1.9 (1.1-2.7)	2.9 (1.9-3.8)	3.9 (2.7-5.0)	4.6 (3.3-5.8)	5.8 (4.1-7.4)
Journey II BCS	Journey BCS	1,137	65 (60-72)	72	15	28	0	0	27	2	0.4 (0.0-0.7)	4.5 (3.2-5.8)	6.0 (4.5-7.4)	7.0 (5.3-8.7)	n.a.	n.a.
Innex	Innex	1,126*	70 (62-77)	39	14	10	0	4	11	0	1.0 (0.4-1.6)	2.2 (1.3-3.0)	2.8 (1.8-3.8)	3.2 (2.1-4.2)	3.4 (2.3-4.5)	3.7 (2.6-4.9)
Evolution MP	Evolution MP	946	69 (63-74)	24	6	9	0	0	8	1	0.7 (0.1-1.2)	2.1 (1.1-3.1)	3.5 (2.0-5.0)	n.a.	n.a.	n.a.
Profix	Profix	772*	68 (61-76)	60	41	7	2	2	7	1	0.5 (0.0-1.0)	3.7 (2.3-5.0)	5.6 (3.9-7.2)	6.6 (4.8-8.3)	7.7 (5.8-9.6)	8.5 (6.4-10.6)
Genesis II	Profix / Genesis MB baseplate	622*	67 (60-75)	66	27	30	0	1	7	1	1.0 (0.2-1.8)	6.9 (4.9-8.9)	9.0 (6.7-11.3)	10.3 (7.8-12.7)	11.2 (8.7-13.8)	11.2 (8.7-13.8)
Rotaglide	Rotaglide	428*	72 (65-78)	43	29	3	2	0	9	0	0.9 (0.0-1.9)	4.5 (2.5-6.5)	5.9 (3.7-8.2)	7.2 (4.7-9.6)	10.3 (7.3-13.3)	12.8 (7.8-17.7)
Advance MP	Advance	314*	71 (65-78)	33	7	7	1	5	10	3	1.9 (0.4-3.4)	7.7 (4.7-10.6)	9.0 (5.8-12.1)	9.3 (6.1-12.5)	9.7 (6.4-12.9)	n.a.
Maxim	Vanguard Complete Knee	272*	70 (63-77)	14	3	3	1	2	5	0	1.5 (0.0-2.9)	2.9 (0.9-4.9)	3.3 (1.2-5.4)	4.1 (1.7-6.4)	4.8 (2.3-7.4)	5.2 (2.5-7.8)

* Denotes prosthesis combinations with no reported use in primary TKAs in 2022.
Please note: n.a. if <50 cases were at risk; TKA: total knee arthroplasty; RA: revision arthroplasty; CI: confidence interval; IQR: interquartile range.

Only combinations with over 250 procedures have been listed.
Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure of the prosthesis may have influenced the cumulative revision percentages.

Uncemented primary TKA – overall revision

TABLE Cumulative revision percentages of uncemented primary total knee arthroplasties by prosthesis component combination of patients who underwent a TKA for osteoarthritis in the Netherlands in 2007-2022 (n=14,982)

					Type of revision (n)						Cumulative revision percentage Kaplan Meier (95% CI)					
Femur component	Tibia component	Total primary TKAs (n)	Median (IQR) age (yr)	Total RAs (n)	Total knee (complete revision)	Patella addition	Only femur component	Only tibia component	Only insert/ patella	Missing/ unknown	1yr	3yr	5yr	7yr	10yr	14yr
All uncemented TKAs for osteoarthritis		**14,982**	**69 (62-75)**	**673**	**242**	**99**	**13**	**121**	**190**	**18**	**1.0 (0.8-1.1)**	**3.6 (3.3-3.9)**	**4.5 (4.1-4.8)**	**5.0 (4.6-5.4)**	**5.6 (5.2-6.1)**	**6.4 (5.8-7.0)**
LCS	LCS	9,032	69 (63-76)	403	115	45	9	94	120	4	0.9 (0.7-1.1)	3.5 (3.1-3.9)	4.2 (3.7-4.6)	4.5 (4.0-5.0)	5.0 (4.5-5.5)	5.4 (4.8-6.0)
Triathlon	Triathlon	2,293	68 (62-74)	43	14	6	0	3	16	0	0.5 (0.2-0.9)	1.7 (1.0-2.3)	2.4 (1.5-3.3)	2.9 (1.9-3.9)	3.6 (2.2-4.9)	n.a.
ACS	ACS	702	69 (61-75)	32	11	7	1	4	8	0	2.0 (0.9-3.1)	4.6 (2.9-6.3)	5.1 (3.3-7.0)	5.4 (3.5-7.3)	n.a.	n.a.
Attune	Attune	467	67 (61-73)	12	3	2	0	0	7	0	1.2 (0.1-2.3)	6.1 (2.4-9.8)	n.a.	n.a.	n.a.	n.a.
Duracon	Duracon	296*	69 (61-77)	10	4	1	0	0	4	0	0.4 (0.0-1.0)	0.7 (0.0-1.7)	1.4 (0.0-2.8)	1.4 (0.0-2.8)	3.1 (1.0-5.1)	3.5 (1.2-5.7)
Rotaglide	Rotaglide	271*	69 (61-77)	63	40	11	1	1	7	1	1.5 (0.0-3.0)	10.3 (6.6-14.0)	16.3 (11.8-20.8)	19.8 (14.8-24.7)	22.7 (17.4-28.0)	n.a.
NexGen	NexGen	241	69 (63-77)	18	8	1	1	3	5	0	1.7 (0.1-3.4)	5.3 (2.4-8.3)	7.1 (3.6-10.5)	8.0 (4.1-11.9)	9.0 (4.7-13.4)	n.a.
ACS LD	ACS LD	249*	70 (61-76)	18	6	3	0	2	3	0	1.3 (0.0-2.8)	5.7 (2.7-8.7)	6.3 (3.1-9.5)	n.a.	n.a.	n.a.
Genesis II	Genesis II	234	69 (62-75)	11	5	2	0	1	1	1	0.9 (0.0-2.2)	4.9 (1.9-7.9)	4.9 (1.9-7.9)	4.9 (1.9-7.9)	4.9 (1.9-7.9)	n.a.
Vanguard Complete Knee	Vanguard Complete Knee	168	67 (61-74)	15	7	2	0	4	1	0	2.5 (0.1-4.9)	5.7 (2.1-9.4)	5.7 (2.1-9.4)	7.6 (3.2-12)	10.1 (4.6-15.6)	n.a.
Triathlon	Triathlon Tritanium	112	69 (64-72)	0	0	0	0	0	0	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2022.
Please note: n.a. if <50 cases were at risk; TKA: total knee arthroplasty; RA: revision arthroplasty; CI: confidence interval; IQR: interquartile range.

Only combinations with over 100 procedures have been listed.

Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure of the prosthesis may have influenced the cumulative revision percentages.

Cemented primary TKA – major revision

TABLE Cumulative major revision percentages of cemented primary total knee arthroplasties by prosthesis component combination of patients who underwent a TKA for osteoarthritis in the Netherlands in 2007-2022 (n=287,967)

					Cumulative major revision percentage Kaplan Meier (95% CI)					
Femur component	Tibia component	Total primary TKAs (n)	Median (IQR) age (yr)	Major revision[1] arthroplasties (n)	1yr	3yr	5yr	7yr	10yr	14yr
All cemented TKAs for osteoarthritis		**287,967**	**69 (63-76)**	**6,576**	**0.3 (0.3-0.4)**	**1.5 (1.5-1.6)**	**2.1 (2.1-2.2)**	**2.6 (2.5-2.7)**	**3.2 (3.1-3.3)**	**3.9 (3.8-4.0)**
Genesis II	Genesis II	63,915	69 (63-75)	1,359	0.4 (0.3-0.4)	1.6 (1.5-1.7)	2.2 (2.0-2.3)	2.5 (2.4-2.6)	2.9 (2.7-3.0)	3.2 (2.9-3.4)
NexGen	NexGen	60,333	69 (63-75)	1,578	0.3 (0.3-0.4)	1.4 (1.3-1.5)	2.1 (2.0-2.2)	2.9 (2.7-3.0)	3.9 (3.7-4.1)	4.9 (4.6-5.3)
Vanguard Complete Knee	Vanguard Complete Knee	48,103	69 (62-75)	913	0.4 (0.3-0.4)	1.4 (1.3-1.5)	1.9 (1.7-2.0)	2.2 (2.0-2.3)	2.6 (2.4-2.8)	3.2 (2.9-3.6)
PFC / SIGMA	PFC / SIGMA	31,886	70 (63-76)	560	0.3 (0.2-0.3)	1.2 (1.1-1.3)	1.7 (1.5-1.8)	1.9 (1.7-2.0)	2.2 (2.0-2.3)	2.4 (2.2-2.6)
LCS	LCS	17,251	70 (63-76)	627	0.4 (0.3-0.5)	2.3 (2.1-2.5)	3.2 (2.9-3.5)	3.8 (3.5-4.1)	4.3 (4.0-4.7)	4.8 (4.4-5.2)
Triathlon	Triathlon	10,507	70 (64-76)	167	0.4 (0.3-0.6)	1.5 (1.2-1.8)	2.1 (1.8-2.5)	2.4 (2.0-2.8)	2.7 (2.2-3.2)	n.a.
Persona	Persona	5,811	69 (62-74)	25	0.3 (0.1-0.4)	1.0 (0.4-1.6)	2.3 (0.9-3.7)	2.8 (1.1-4.6)	n.a.	n.a.
Attune	Attune	5,546	70 (63-75)	32	0.2 (0.1-0.3)	1.0 (0.6-1.4)	1.4 (0.9-1.9)	1.4 (0.9-1.9)	n.a.	n.a.
AGC V2	AGC V2	4,420*	71 (65-77)	116	0.1 (0.0-0.2)	1.1 (0.8-1.4)	1.5 (1.1-1.9)	1.9 (1.5-2.4)	2.4 (1.9-2.9)	3.2 (2.6-3.8)
balanSys	balanSys	4,087	69 (62-76)	86	0.3 (0.1-0.4)	1.4 (1.0-1.8)	2.2 (1.7-2.7)	2.8 (2.2-3.5)	3.3 (2.5-4.0)	3.7 (2.7-4.7)

[1] Revision of at least the femur or tibia component.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2022.

Please note: n.a. if <50 cases were at risk; TKA: total knee arthroplasty; CI: confidence interval; IQR: interquartile range.

Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure of the prosthesis may have influenced the cumulative revision percentages.

Uncemented primary TKA – major revision

TABLE Cumulative major revision percentages of uncemented primary total knee arthroplasties by prosthesis component combination of patients who underwent a TKA for osteoarthritis in the Netherlands in 2007-2022 (n=14,982)

					Cumulative major revision percentage Kaplan Meier (95% CI)					
Femur component	Tibia component	Total primary TKAs (n)	Median (IQR) age (yr)	Major revision[1] arthroplasties (n)	1yr	3yr	5yr	7yr	10yr	14yr
All uncemented TKAs for osteoarthritis		**14,982**	**69 (62-75)**	**414**	**0.6 (0.5-0.7)**	**2.1 (1.9-2.4)**	**2.7 (2.4-3.0)**	**3.1 (2.8-3.4)**	**3.5 (3.2-3.9)**	**4.0 (3.5-4.5)**
LCS	LCS	9,032	69 (63-76)	237	0.6 (0.4-0.7)	2.2 (1.8-2.5)	2.7 (2.3-3.0)	2.8 (2.4-3.2)	3.0 (2.6-3.4)	3.3 (2.8-3.7)
Triathlon	Triathlon	2,293	68 (62-74)	20	0.3 (0.0-0.5)	0.6 (0.2-1.0)	1.1 (0.5-1.7)	1.5 (0.7-2.2)	2.5 (1.1-3.8)	n.a.
ACS	ACS	702	69 (61-75)	18	1.4 (0.5-2.4)	2.7 (1.4-4.1)	3 (1.6-4.4)	3.3 (1.8-4.8)	n.a.	n.a.
Attune	Attune	467	67 (61-73)	3	0.2 (0.0-0.7)	1.4 (0.0-3.1)	n.a.	n.a.	n.a.	n.a.
Duracon	Duracon	296*	69 (61-77)	4	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.4 (0.0-1.1)	0.4 (0.0-1.1)	1.6 (0.0-3.1)	1.6 (0.0-3.1)
Rotaglide	Rotaglide	271*	69 (61-77)	49	0.4 (0.0-1.1)	6.5 (3.5-9.5)	11.3 (7.4-15.2)	15.2 (10.7-19.6)	18.1 (13.2-23)	n.a.
NexGen	NexGen	241	69 (63-77)	13	1.3 (0.0-2.8)	4.0 (1.4-6.6)	5.0 (2.1-7.9)	5.9 (2.5-9.3)	5.9 (2.5-9.3)	n.a.
ACS LD	ACS LD	249*	70 (61-76)	9	1.3 (0.0-2.8)	3.5 (1.1-5.9)	4.1 (1.5-6.7)	n.a.	n.a.	n.a.
Genesis II	Genesis II	234	69 (62-75)	6	0.5 (0.0-1.3)	3.0 (0.6-5.3)	3.0 (0.6-5.3)	3.0 (0.6-5.3)	3.0 (0.6-5.3)	n.a.
Vanguard Complete Knee	Vanguard Complete Knee	168	67 (61-74)	11	1.9 (0.0-4.0)	4.5 (1.2-7.7)	4.5 (1.2-7.7)	5.5 (1.7-9.2)	8.0 (3.0-13.1)	n.a.

[1] Revision of at least the femur or tibia component.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2022.

Please note: n.a. if <50 cases were at risk; TKA: total knee arthroplasty; CI: confidence interval; IQR: interquartile range.

Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure of the prosthesis may have influenced the cumulative revision percentages.

Bone cement TKA

TABLE Cumulative revision percentages of the most frequently registered types of bone cement by type of mixing system in primary total knee arthroplasties in the Netherlands in 2007-2022

Bone cement	Total primary TKAs (n)	Total RAs (n)	Cumulative revision percentage Kaplan Meier (95% CI) 1yr	3yr	5yr	7yr	10yr	14yr
Separately packed	**186,441**	**9,094**	**0.9 (0.9-1.0)**	**3.3 (3.2-3.4)**	**4.3 (4.2-4.4)**	**5.0 (4.9-5.1)**	**5.9 (5.7-6.0)**	**6.9 (6.7-7.1)**
Palacos R+G	139,537	6,691	0.9 (0.9-1.0)	3.3 (3.2-3.4)	4.3 (4.2-4.4)	5.0 (4.8-5.1)	5.8 (5.7-6.0)	6.9 (6.6-7.1)
Refobacin Bone Cement R	13,142	680	0.8 (0.6-0.9)	3.0 (2.7-3.3)	4.0 (3.7-4.4)	5.1 (4.7-5.5)	6.6 (6.1-7.1)	8.0 (7.3-8.7)
Palacos MV+G	8,394	382	0.8 (0.6-1.0)	3.1 (2.7-3.4)	4.1 (3.6-4.5)	4.8 (4.4-5.3)	5.3 (4.7-5.8)	n.a.
Simplex ABC EC	5,374	367	1.0 (0.8-1.3)	3.9 (3.4-4.4)	5.2 (4.6-5.8)	6.2 (5.6-6.9)	7.3 (6.5-8.0)	8.7 (7.4-10.0)
Simplex ABC TOBRA	5,165	232	0.8 (0.5-1.0)	2.2 (1.8-2.6)	3.0 (2.5-3.5)	3.6 (3.1-4.1)	4.7 (4.0-5.3)	6.5 (5.2-7.8)
Refobacin Plus Bone Cement	3,163	205	1.1 (0.7-1.4)	4.4 (3.6-5.1)	5.4 (4.6-6.2)	5.9 (5.1-6.8)	6.5 (5.6-7.3)	7.1 (6.1-8.1)
Palacos R	1,753	80	0.6 (0.2-0.9)	2.6 (1.8-3.4)	3.3 (2.4-4.1)	3.9 (3.0-4.8)	4.7 (3.6-5.7)	5.3 (4.1-6.5)
Subiton G	1,550	53	1.4 (0.8-2.1)	4.9 (3.5-6.3)	n.a.	n.a.	n.a.	n.a.
Biomet Plus Bone Cement	1,472	66	1.0 (0.5-1.5)	3.5 (2.5-4.4)	4.4 (3.3-5.5)	4.6 (3.5-5.7)	5.0 (3.7-6.2)	n.a.
Palamed G	1,430	60	0.2 (0.0-0.4)	2.3 (1.5-3.0)	3.1 (2.2-4.1)	3.5 (2.6-4.5)	4.0 (3.0-5.0)	4.7 (3.5-5.9)
Biomet Bone Cement R	884	23	0.8 (0.2-1.4)	3.6 (1.9-5.4)	4.7 (2.4-6.9)	5.6 (2.7-8.5)	5.6 (2.7-8.5)	n.a.
Versabond	647	51	0.6 (0.0-1.2)	5.3 (3.6-7.0)	6.3 (4.4-8.1)	6.8 (4.8-8.7)	7.3 (5.3-9.3)	n.a.
cemSys 1G	636	46	1.4 (0.5-2.3)	3.8 (2.3-5.3)	6.2 (4.3-8.1)	7.2 (5.1-9.3)	n.a.	n.a.
Simplex P	409	22	0 (0-0)	2.8 (1.2-4.4)	3.8 (1.9-5.7)	4.4 (2.3-6.4)	5.3 (3.0-7.5)	6.1 (3.6-8.6)
Simplex HV	382	8	0.8 (0.0-1.7)	2.0 (0.5-3.5)	3.2 (0.4-6.0)	n.a.	n.a.	n.a.
Synicem1G	339	12	0.6 (0.0-1.4)	3.6 (1.6-5.6)	3.6 (1.6-5.6)	n.a.	n.a.	n.a.
Palamed	250	14	0.8 (0.0-1.9)	2.8 (0.8-4.8)	4.0 (1.6-6.4)	4.9 (2.2-7.5)	5.3 (2.5-8.1)	5.8 (2.8-8.8)
Pre-packed in a vacuum mixing system	**96,573**	**3,230**	**1.0 (1.0-1.1)**	**3.3 (3.2-3.4)**	**4.2 (4-4.3)**	**4.8 (4.6-5.0)**	**5.6 (5.3-5.8)**	**6.8 (5.9-7.6)**
Refobacin Bone Cement R	43,169	1,453	1.1 (1.0-1.2)	3.2 (3.1-3.4)	4.2 (3.9-4.4)	4.9 (4.6-5.2)	5.6 (5.3-6.0)	n.a.
Palacos R+G	35,186	974	1.1 (1.0-1.2)	3.3 (3.1-3.6)	4.1 (3.9-4.4)	4.7 (4.3-5.1)	n.a.	n.a.
Refobacin Plus Bone Cement	16,356	687	0.7 (0.6-0.9)	3.2 (2.9-3.5)	4.0 (3.7-4.3)	4.5 (4.2-4.9)	5.3 (4.9-5.7)	6.7 (5.5-7.9)
Cemex Genta	1,444*	100	1.0 (0.5-1.6)	4.9 (3.8-6.0)	5.6 (4.4-6.8)	6.2 (5.0-7.5)	7.2 (5.8-8.6)	n.a.

* Denotes types of bone cement with no reported use in primary TKAs in 2022.
Please note: n.a. if <50 cases were at risk; TKA: total knee arthroplasty; RA: revision arthroplasy; CI: confidence interval; IQR: interquartile range.

Only types of bone cement with over 250 procedures have been listed.
Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure of the prosthesis may have influenced the cumulative revision percentages.

Rerevision

Overall second revision

FIGURE Cumulative second revision percentage of total knee arthroplasty after a one-stage first revision in the Netherlands in 2007-2022 (n=10,751)

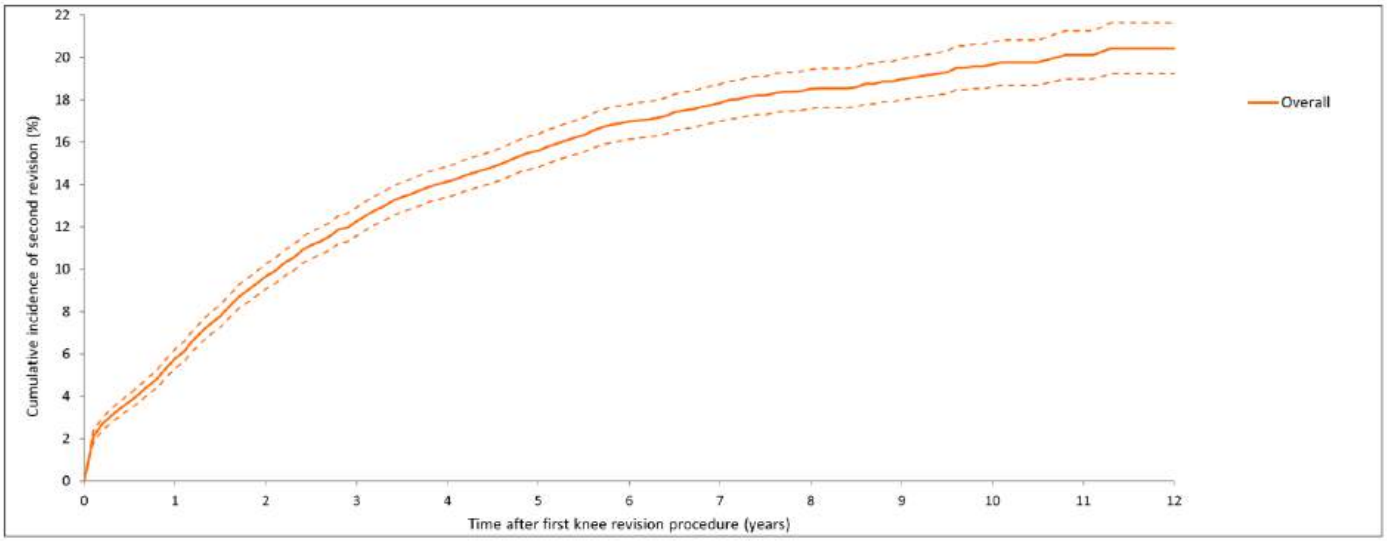


TABLE Cumulative second revision percentages

	Number at risk (n)	Competing Risk(95% CI)	Kaplan Meier[1] (95% CI)
1-year second revision (%)	9,103	5.7 (5.3-6.2)	5.3 (4.9-5.8)
3-year second revision (%)	6,669	12.0 (11.4-12.7)	12.0 (11.3-12.6)
5-year second revision (%)	4,383	15.2 (14.4-15.9)	15.5 (14.7-16.3)
7-year second revision (%)	2,594	17.2 (16.3-18.0)	17.8 (16.9-18.6)
10-year second revision (%)	954	18.7 (17.8-19.7)	19.6 (18.5-20.6)

[1] The cumulative revision percentage using the Kaplan Meier method is shown in the figure.
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

By procedure year of first major revision

FIGURE Cumulative second revision percentage of total knee arthroplasty after a one-stage first revision in the Netherlands in 2007-2022 (n=10,751)

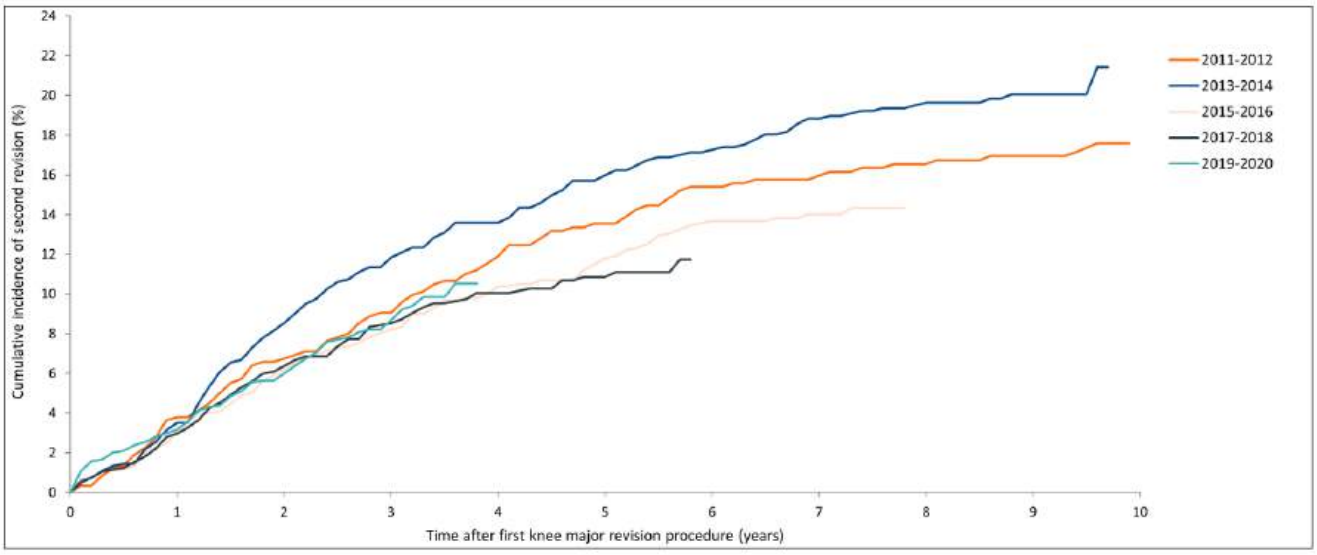


TABLE Cumulative second revision percentages

Cumulative second revision percentages - Kaplan Meier (95% CI)

Procedure year major revision	Number (n)	1yr	3yr	5yr	7yr	10yr
2011-2012	585	3.62 (2.10-5.14)	9.05 (6.70-11.4)	13.55 (10.73-16.37)	15.77 (12.75-18.79)	17.58 (14.4-20.76)
2013-2013	832	3.14 (1.95-4.33)	11.35 (9.17-13.53)	15.72 (13.21-18.23)	18.83 (16.13-21.53)	n.a.
2015-2016	1.052	2.47 (1.53-3.41)	8.03 (6.38-9.68)	11.50 (9.55-13.45)	14.01 (11.85-16.17)	n.a.
2017-2018	1.047	2.78 (1.78-3.78)	8.43 (6.73-10.13)	10.85 (8.91-12.79)	n.a.	n.a.
2019-2020	1.143	2.98 (1.99-3.97)	8.22 (6.57-9.87)	n.a.	n.a.	n.a.

Major revision: Revision of at least the femur or tibia component.
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).
Please note: n.a. if <50 cases were at risk.
CI: confidence interval.

By type of first revision

FIGURE Cumulative second revision percentage of total knee arthroplasty after a one-stage first revision by type of first revision in the Netherlands in 2007-2022 (n=10,751)

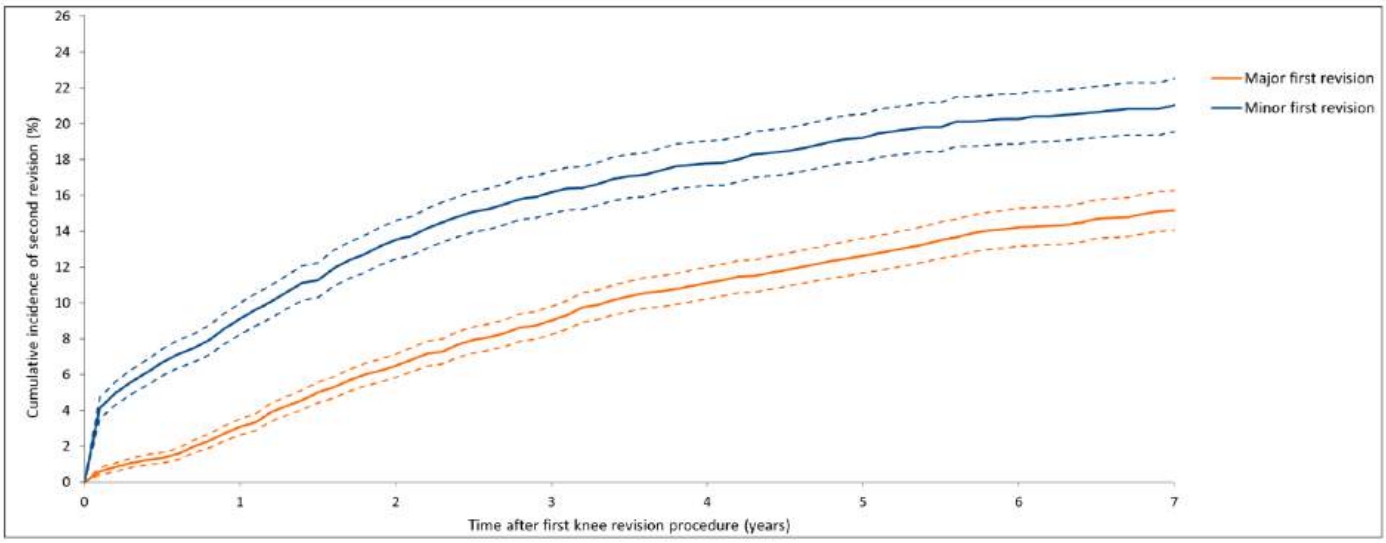


TABLE Cumulative second revision percentages

		Cumulative second revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
Major first revision	6,029	2.7 (2.3-3.1)	8.7 (8-9.5)	12.5 (11.5-13.4)	15.1 (14-16.2)
Minor first revision	4,387	8.6 (7.7-9.4)	15.9 (14.7-17.1)	19.2 (17.8-20.5)	20.8 (19.4-22.3)

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).
Major revision: revision of at least the femur or tibia component.
Minor revision: only insert and/or patella exchange (excluding patella addition).
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

By time to first revision

FIGURE Cumulative second revision percentage of total knee arthroplasty after a one-stage first revision by time to first revision in the Netherlands in 2007-2022 (n=10,751)

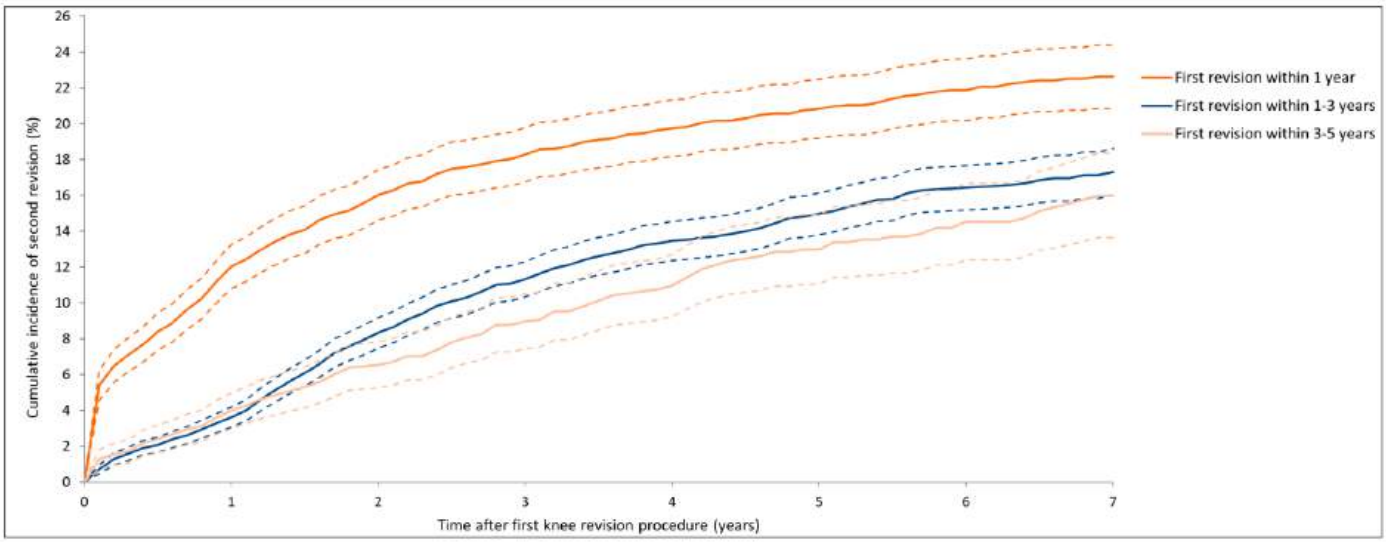


TABLE Cumulative second revision percentages

		Cumulative second revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
First revision within 1 year	2,804	11.2 (10.0-12.4)	18.0 (16.5-19.5)	20.8 (19.1-22.4)	22.6 (20.9-24.4)
First revision within 1-3 years	4,397	3.3 (2.8-3.8)	11.1 (10.1-12.1)	14.8 (13.7-16.0)	17.1 (15.8-18.4)
First revision within 3-5 years	1,571	3.6 (2.7-4.6)	8.8 (7.3-10.3)	13.0 (11.0-14.9)	16.0 (13.6-18.3)

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

Reasons for seconds revision by type of first revision

TABLE Reasons for second revision within seven years in patients who underwent a second revision after a one-stage first revision of a total knee arthroplasty by type of first revision in the Netherlands in 2007-2022

	Major first revision[1] (n=670)	Minor first revision[2] (n=724)	Any type of first revision[3] (n=1,465)
Reasons for second revision	Proportion[4] (%)	Proportion[4] (%)	Proportion[4] (%)
Infection	24.6	47.5	37.1
Instability	31.0	27.2	28.8
Loosening of tibia component	20.3	13.0	16.3
Patellar pain	18.2	8.2	13.1
Malalignment	10.6	9.8	10.3
Loosening of femur component	11.6	4.1	7.9
Arthrofibrosis	7.6	4.3	5.9
Patellar dislocation	4.2	4.0	4.0
Loosening of patella component	2.2	1.5	2.0
Insert wear	2.2	1.9	2.2
Periprosthetic fracture	0.8	0.6	0.6
Progression of osteoarthritis	0.9	0.1	0.1
Other	7.9	5.7	6.7

[1] Revision of at least the femur or tibia component.
[2] Only insert and/or patella exchange.
[3] Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
4 One patient may have more than one reason for revision or re-surgery. As such, the total proportion is over 100%.
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).

Survival unicondylar knee arthroplasty

UKA by type pf revision

FIGURE Cumulative revision percentage of unicondylar knee arthroplasties by type of revision in the Netherlands in 2007-2022 (n=38,992)

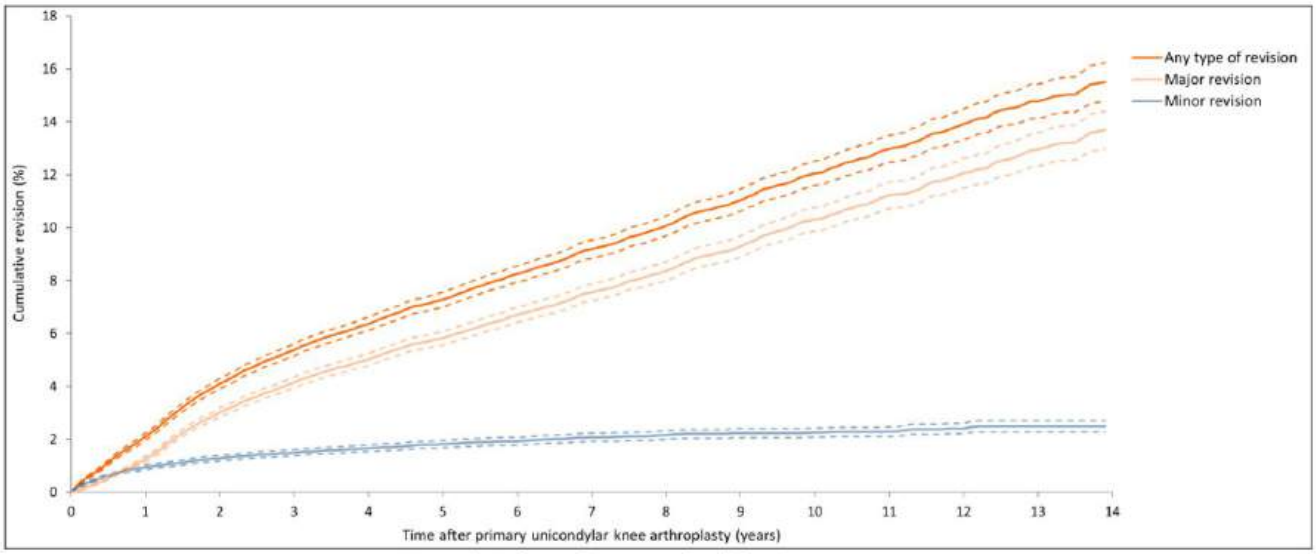


TABLE Cumulative revision percentages

	Number at risk (n)	Competing Risk (95% CI)	Kaplan Meier[1] (95% CI)
Any type of revision			
1-year revision (%)	40,463	2.1 (1.9-2.2)	1.9 (1.8-2.0)
3-year revision (%)	28,856	5.3 (5.1-5.4)	5.3 (5.0-5.5)
5-year revision (%)	19,562	7.2 (6.9-7.4)	7.2 (6.9-7.5)
10-year revision (%)	6,547	11.6 (11.2-12.1)	12.0 (11.5-12.4)
14-year revision (%)	1,437	14.8 (14.1-15.4)	15.5 (14.8-16.2)
Major revision[2]			
1-year revision (%)	40,748	1.2 (1.1-1.3)	1.1 (1.0-1.2)
3-year revision (%)	29,186	4.1 (3.9-4.3)	4.1 (3.9-4.2)
5-year revision (%)	19,839	5.7 (5.5-6.0)	5.8 (5.5-6.0)
10-year revision (%)	6,636	9.9 (9.5-10.4)	10.3 (9.8-10.7)
14-year revision (%)	1,456	13.0 (12.4-13.7)	13.7 (13.0-14.4)
Minor revision[3]			
1-year revision (%)	40,889	0.9 (0.8-1.0)	0.9 (0.8-1.0)
3-year revision (%)	30,142	1.4 (1.3-1.5)	1.5 (1.4-1.6)
5-year revision (%)	21,000	1.7 (1.6-1.9)	1.8 (1.7-1.9)
10-year revision (%)	7,665	2.1 (2.0-2.3)	2.2 (2.1-2.4)
14-year revision (%)	1,760	2.3 (2.1-2.5)	2.5 (2.3-2.7)

[1] The cumulative revision percentage using the Kaplan Meier method is shown in the figure.
[2] First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
[3] Only insert and/or patella exchange (including patella addition).
UKA: unicondylarl knee arthroplasty; CI: confidence interval.

In 2007-2022, 2,153 (4.5%) primary UKAs were implanted in patients who died within fourteen years after the primary diagnosis

UKA by procedure year

FIGURE Cumulative major revision percentage of unicondylar knee arthroplasties for osteoarthritis by procedure year of primary UKA in the Netherlands in 2009-2022 (n=32,727)

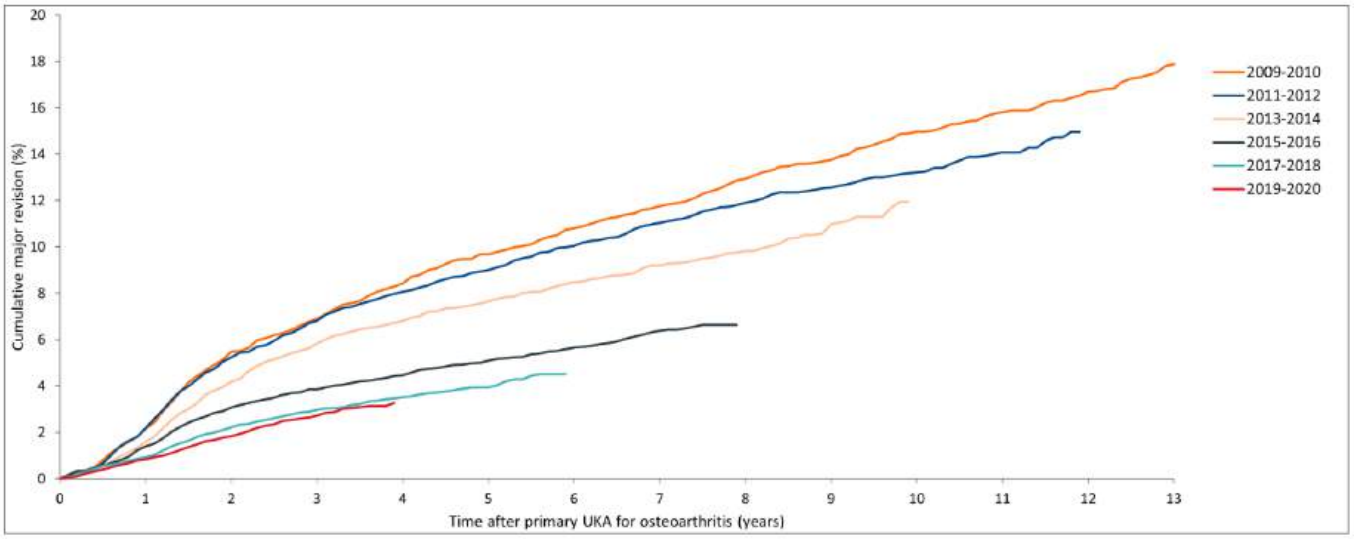


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

Procedure year primary UKA for osteoarthritis	Number (n)	1yr	3yr	5yr	7yr	10yr	13yr
2009-2010	3,151	1.81 (1.34-2.28)	6.77 (5.89-7.65)	9.68 (8.64-10.72)	11.66 (10.53-12.79)	14.89 (13.63-16.15)	17.8 (16.41-19.19)
2011-2012	3,069	1.80 (1.33-2.27)	6.71 (5.82-7.60)	8.94 (7.93-9.95)	10.97 (9.86-12.08)	13.17 (11.96-14.38)	n.a.
2013-2014	4,033	1.34 (0.99-1.69)	5.63 (4.92-6.34)	7.55 (6.73-8.37)	9.20 (8.30-10.10)	11.94 (10.66-13.22)	n.a.
2015-2016	5,509	1.22 (0.93-1.51)	3.85 (3.34-4.36)	5.00 (4.42-5.58)	6.31 (5.65-6.97)	n.a.	n.a.
2017-2018	7,583	0.86 (0.65-1.07)	2.88 (2.50-3.26)	3.93 (3.48-4.38)	n.a.	n.a.	n.a.
2019-2020	9,382	0.78 (0.60-0.96)	2.63 (2.29-2.97)	n.a.	n.a.	n.a.	n.a.

Major revision: First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

UKA cemented by procedure year

Cumulative major revision percentage of cemented unicondylar knee arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2022 (n=18,728)

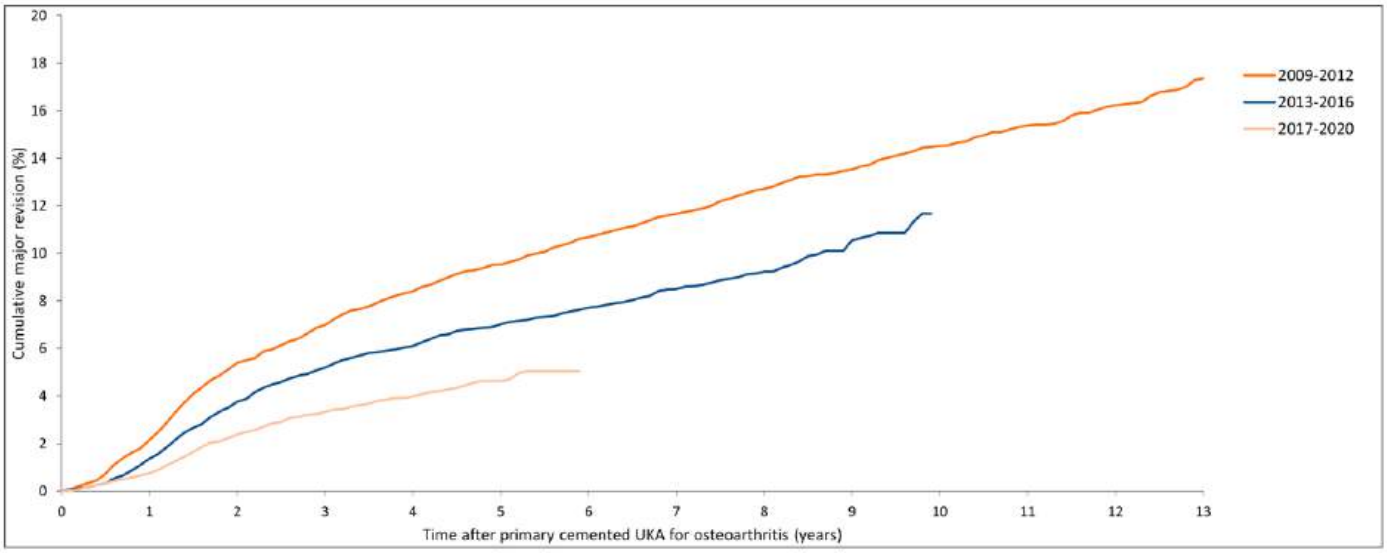


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

Procedure year primary cemented UKA for osteoarthritis	Number (n)	1yr	3yr	5yr	7yr	10yr	13yr
2009-2012	5,643	1.79 (1.44-2.14)	6.86 (6.20-7.52)	9.51 (8.74-10.28)	11.59 (10.75-12.43)	14.48 (13.55-15.41)	17.28 (16.18-18.38)
2013-2016	5,959	1.09 (0.83-1.35)	5.07 (4.51-5.63)	6.90 (6.25-7.55)	8.48 (7.76-9.20)	11.67 (10.32-13.02)	n.a.
2017-2020	7,126	0.66 (0.47-0.85)	3.23 (2.81-3.65)	4.63 (4.05-5.21)	n.a.	n.a.	n.a.

Major revision: First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

UKA uncemented by procedure year

Cumulative major revision percentage of uncemented unicondylar knee arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2022 (n=13,292)

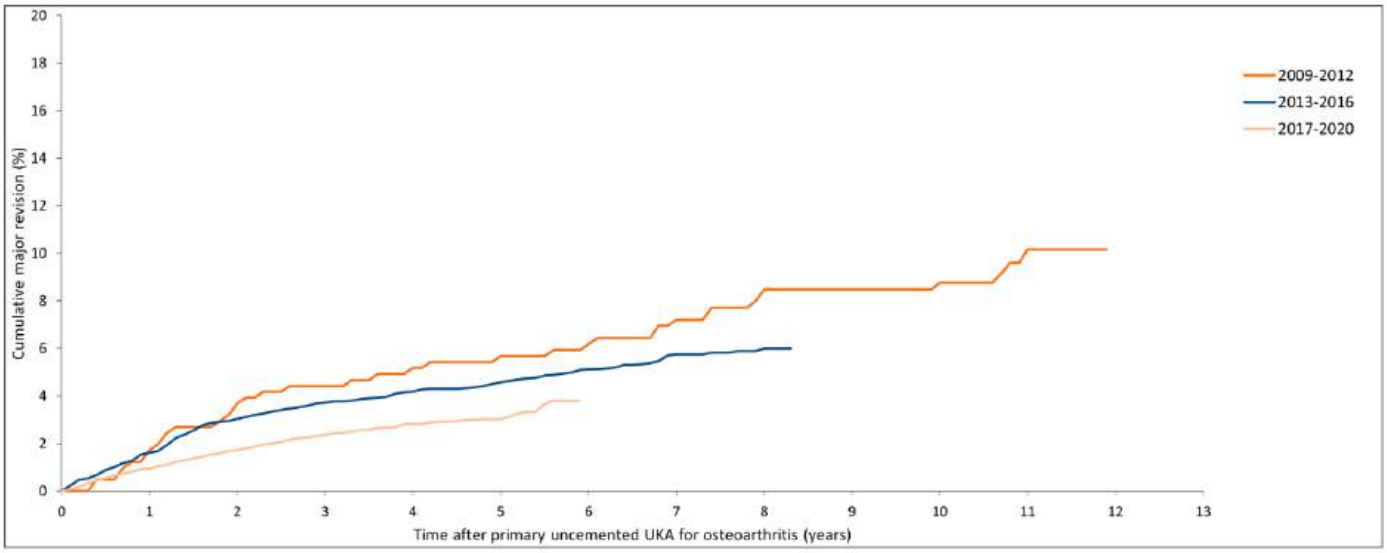


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Kaplan Meier (95% CI)

Procedure year primary uncemented UKA for osteoarthritis	Number (n)	1yr	3yr	5yr	7yr	10yr	13yr
2009-2012	411	1.22 (0.16-2.28)	4.42 (2.42-6.42)	5.42 (3.22-7.62)	6.95 (4.46-9.44)	8.49 (5.77-11.21)	n.a.
2013-2016	3,412	1.53 (1.12-1.94)	3.68 (3.05-4.31)	4.51 (3.81-5.21)	5.70 (4.90-6.50)	n.a.	n.a.
2017-2020	9,469	0.92 (0.73-1.11)	2.31 (2.00-2.62)	3.02 (2.63-3.41)	n.a.	n.a.	n.a.

Major revision: First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

TABLE Cumulative revision percentages of primary unicondylar knee arthroplasties by prosthesis component combination of patients who underwent a UKA for osteoarthritis in the Netherlands in 2007-2022 (n=47,050)

					Type of revision (n)						Cumulative revision percentage Kaplan Meier (95% CI)					
Femur component	Tibia component	Total primary UKAs (n)	Median (IQR) age (yr)	Total RAs (n)	Total knee (complete revision)	Patella addition	Only femur component	Only tibia component	Only insert/ patella	Missing/ unknown	1yr	3yr	5yr	7yr	10yr	14yr
All UKAs for osteoarthritis		**47,050**	**64 (58-70)**	**3,318**	**2,455**	**8**	**15**	**71**	**738**	**31**	**1.9 (1.8-2.0)**	**5.2 (5.0-5.5)**	**7.2 (6.9-7.5)**	**9.1 (8.8-9.5)**	**12.0 (11.5-12.5)**	**15.6 (14.9-16.3)**
Oxford PKR Uncemented	Oxford PKR Uncemented	19,524	65 (58-71)	796	416	1	2	20	352	5	2.0 (1.8-2.2)	4.3 (3.9-4.6)	5.4 (5.0-5.8)	6.9 (6.3-7.4)	8.3 (7.3-9.2)	n.a.
Oxford PKR Cemented	Oxford PKR Cemented	15,224	63 (57-70)	1,635	1,306	5	10	31	263	20	1.8 (1.6-2.1)	5.9 (5.5-6.3)	8.3 (7.8-8.7)	10.2 (9.6-10.7)	13.2 (12.6-13.9)	16.8 (15.9-17.8)
Physica ZUK	Physica ZUK	4,745	63 (58-69)	148	122	0	0	1	25	0	0.7 (0.4-0.9)	3.0 (2.4-3.5)	4.0 (3.3-4.8)	5.6 (4.5-6.7)	8.0 (6.3-9.7)	10.7 (7.9-13.5)
Genesis Uni	Genesis Uni	1,278*	62 (56-68)	223	211	1	0	2	6	3	2.7 (1.8-3.6)	8.9 (7.3-10.5)	12.5 (10.6-14.3)	15.0 (13-17)	17.5 (15.4-19.7)	n.a.
BalanSys Uni	BalanSys Uni	588	61 (56-68)	65	55	1	0	4	5	0	2.7 (1.4-4.0)	9.1 (6.5-11.7)	10.5 (7.7-13.4)	12.1 (9.0-15.2)	16.0 (12.1-19.9)	n.a.
Journey Uni	Journey Uni	534	62 (56-69)	33	29	0	2	1	0	1	1.2 (0.2-2.1)	5.2 (3.1-7.3)	8.5 (5.5-11.4)	10.1 (6.3-13.8)	n.a.	n.a.
Oxford PKR Uncemented	Oxford PKR Cemented	530	66 (57-73)	34	22	0	0	0	12	0	3.0 (1.5-4.5)	5.2 (3.1-7.3)	7.5 (4.8-10.2)	10.9 (6.9-14.8)	n.a.	n.a.
Oxford PKR Cemented	Oxford PKR Uncemented	231	66 (59-73)	20	9	0	1	0	10	0	3.6 (1.1-6.0)	7.9 (4.1-11.6)	9.1 (4.7-13.6)	n.a.	n.a.	n.a.
Restoris MCK	Restoris MCK	219	69 (61-75)	2	2	0	0	0	0	0	1.3 (0.0-3.0)	n.a.	n.a.	n.a.	n.a.	n.a.
Triathlon	Triathlon	197*	60 (54-65)	22	21	0	0	0	1	0	1.5 (0.0-3.2)	7.2 (3.6-10.8)	8.7 (4.6-12.9)	10.8 (5.8-15.7)	14.9 (8.3-21.5)	n.a.
HLS Uni	HLS Uni	171*	58 (52-65)	37	36	0	0	0	1	0	2.3 (0.1-4.6)	8.8 (4.5-13)	16.5 (10.9-22.0)	19.4 (13.5-25.4)	20.6 (14.5-26.7)	n.a.
Allegretto	Allegretto	108*	57 (51-65)	22	19	0	0	3	0	0	6.5 (1.8-11.1)	12 (5.9-18.2)	18 (10.7-25.4)	20.4 (12.6-28.3)	n.a.	n.a.

Please note: n.a. if <50 cases were at risk; UKA: unicondylar knee arthroplasty; CI: confidence interval; IQR: interquartile range.

Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure of the prosthesis may have influenced the cumulative revision percentages.

UKA by fixation

FIGURE Cumulative revision percentage of unicondylar knee arthroplasties for osteoarthritis by fixation of revision in the Netherlands in 2007-2022 (n=45,561)

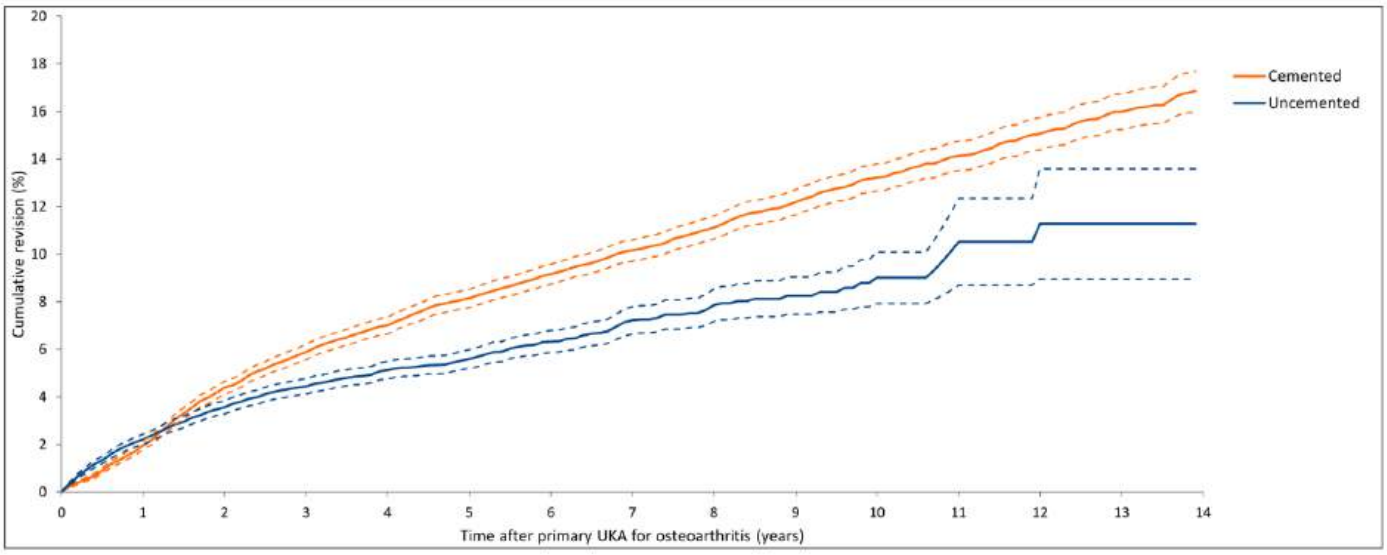


TABLE Cumulative revision percentages

Cumulative revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
Fixation							
Cemented	24,231	1.7 (1.5-1.9)	5.8 (5.4-6.1)	8.1 (7.7-8.5)	10.1 (9.6-10.6)	13.2 (12.6-13.7)	16.8 (16.0-17.7)
Uncemented	21,330	2.1 (1.9-2.3)	4.4 (4.1-4.7)	5.5 (5.1-5.9)	7.1 (6.6-7.7)	8.8 (7.8-9.8)	11.3 (9.0-13.6)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
UKA: unicondylar knee arthroplasty; CI: confidence interval.

UKA by pre-PROM

FIGURE Cumulative revision percentage of unicondylar knee arthroplasties by valid pre-operative PROM of patients who underwent a UKA for osteoarthritis in the Netherlands in 2014-2022 (n=37,166)

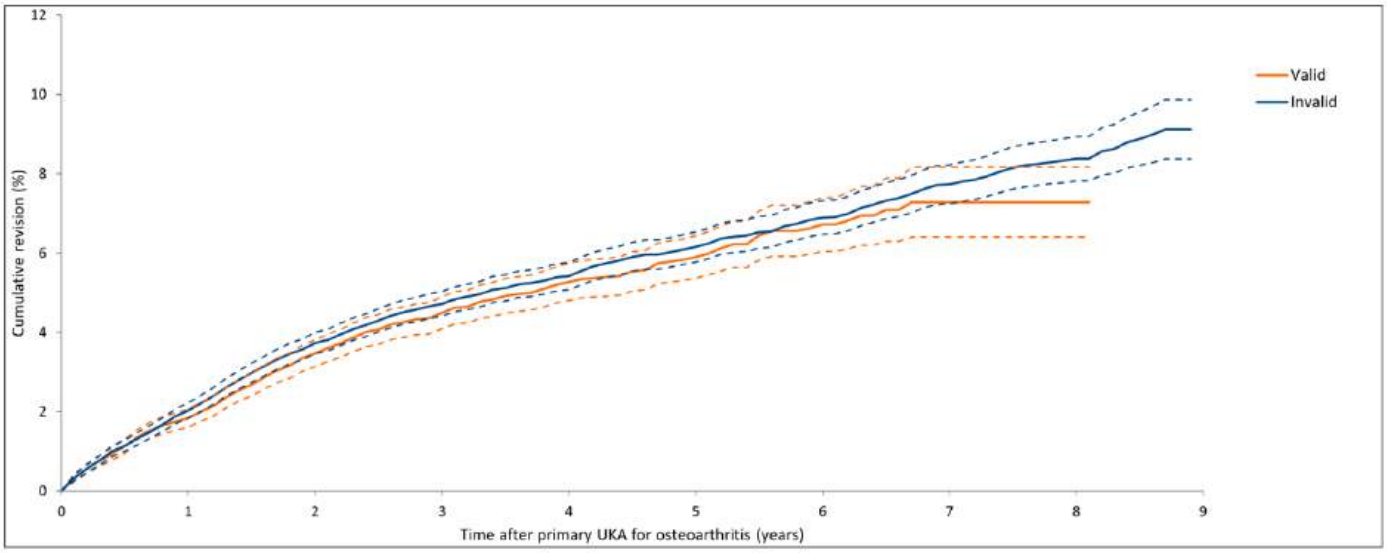


TABLE Cumulative revision percentages

Cumulative revision percentages - Kaplan Meier (95% CI)

	Number (n)	1yr	3yr	5yr	7yr	9yr
Pre-PROM						
Valid	15,186	1.8 (1.5-2.0)	4.4 (4.0-4.8)	5.8 (5.3-6.4)	7.3 (6.4-8.2)	n.a.
Invalid	21,980	1.9 (1.7-2.1)	4.7 (4.4-5.0)	6.1 (5.7-6.5)	7.7 (7.2-8.2)	9.1 (8.4-9.9)

Valid: pre-operative PROM reported; Invalid: non-responders to pre-operative PROM; PROM: patient reported outcome measure.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
n.a. if <50 cases were at risk; UKA: unicondylar knee arthroplasty; CI: confidence interval.

PROMs

Response

Response TKA

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a TKA for osteoarthritis per pre-operative PROMs registering hospital (n=94) in the Netherlands in 2014-2022

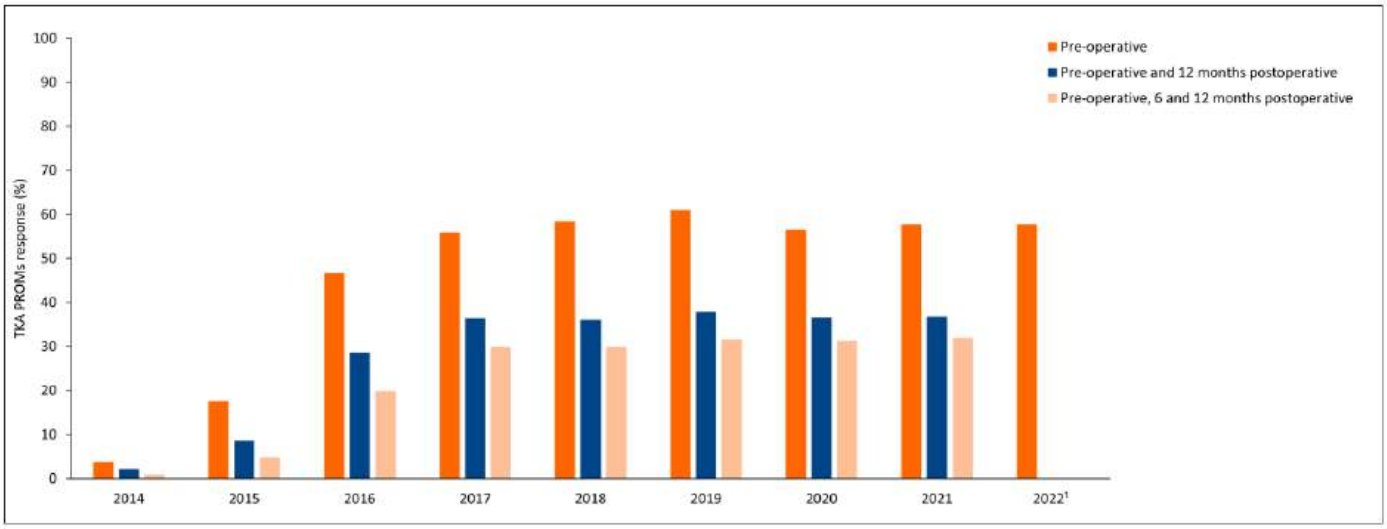


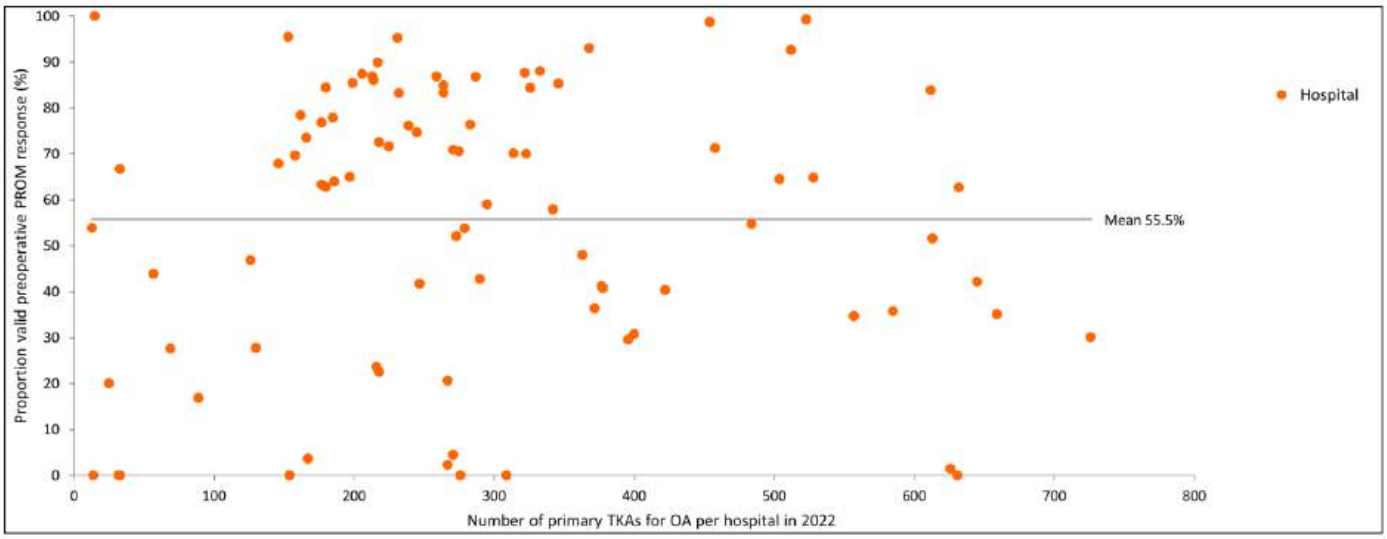
TABLE PROMs response percentages

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022[1]
TKA for osteoarthritis (n)	22,197	22,322	22,918	23,635	24,052	24,051	18,116	19,939	24,841
TKA PROMs response (%)									
Pre-operative	3.7	17.6	46.7	55.9	58.4	61.0	56.5	57.7	57.7
Pre-operative and 12 months postoperative	2.2	8.6	28.6	36.4	36.0	37.9	36.6	36.8	n.a.
Pre-operative, 6 and 12 months postoperative	0.9	4.7	19.9	29.9	29.9	31.5	31.3	31.9	n.a.

[1] The 12 months postoperative PROMs response percentage is not (yet) available for 2022.
TKA: total knee arthroplasty; PROM: patient reported outcome measure.

Response pre-PROM per hospital

FIGURE Scatterplot of pre-operative response percentage of patients who underwent a primary TKA for osteoarthritis per hospital (n=88) in the Netherlands in 2022

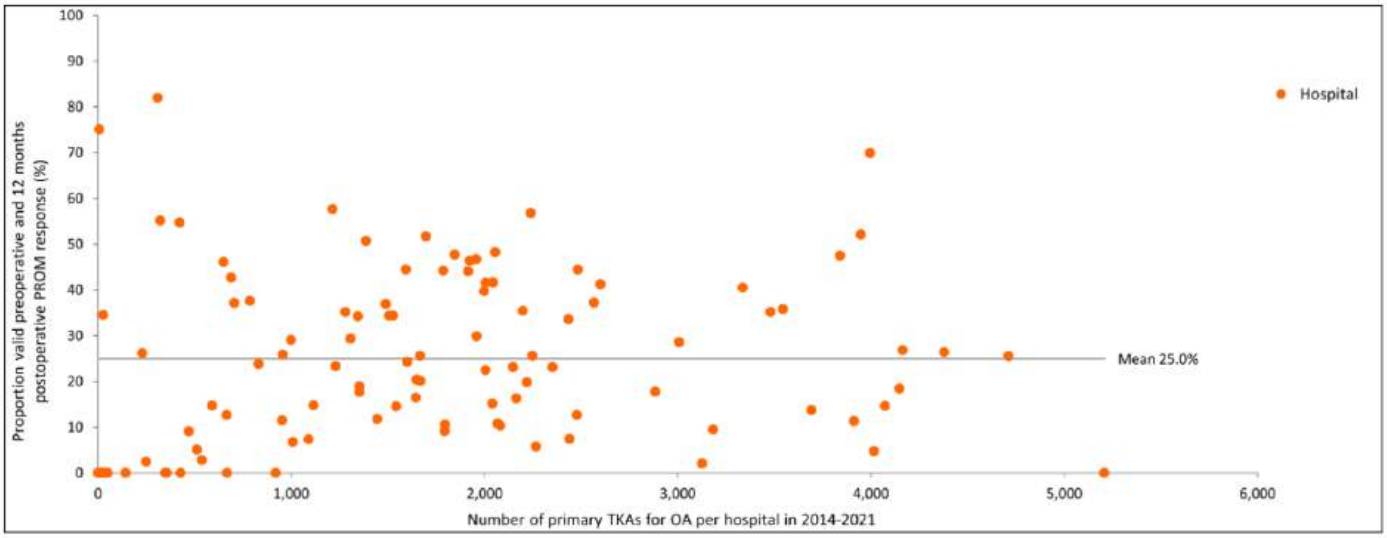


Please note: TKA: total knee arthroplasty; OA: osteoarthritis; PROM: patient reported outcome measure.

The mean pre-operative response rate is 55.8% in the Netherlands in 2022. 49 out of 88 (55.7%) hospitals scored above the national mean.

Response PROM trajectory per hospital

FIGURE Scatterplot of PROM trajectory (pre-operative and 12 months postoperative) response percentage of patients who underwent a primary THA for osteoarthritis per hospital (n=100) in the Netherlands in 2014-2021



Please note: TKA: total knee arthroplasty; OA: osteoarthritis: PROM: patient reported outcome measure.

The mean PROM trajectory response rate was 30.0% in the Netherlands between 2014-2021. 43 out of 100 (43.0%) hospitals scored above the national mean.

Response UKA

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a UKA per pre-operative PROMs registering hospital (n=90) in the Netherlands in 2014-2022

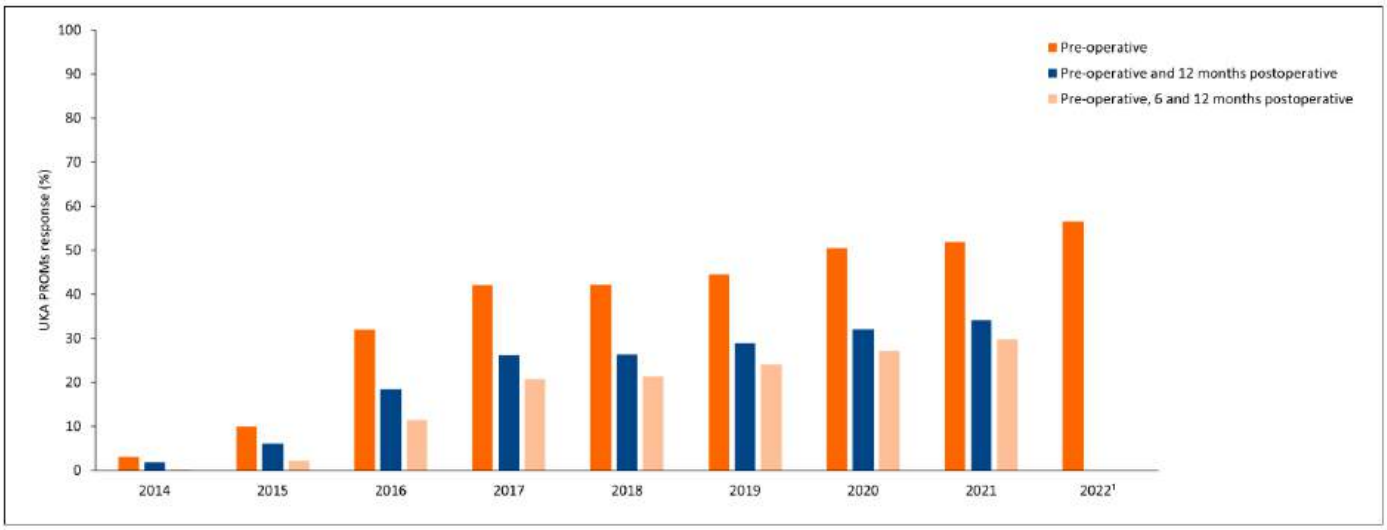


TABLE PROMs response percentages

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022¹
UKA (n)	2,227	2,552	2,812	3,533	3,916	4,732	4,582	5,500	6,730
UKA PROMs response (%)									
Pre-operative	3.1	10.0	31.9	42.1	42.2	44.5	50.5	51.8	56.5
Pre-operative and 12 months postoperative	1.8	6.0	18.4	26.1	26.3	28.9	32.0	34.1	n.a.
Pre-operative, 6 and 12 months postoperative	0.3	2.2	11.5	20.7	21.4	24.0	27.1	29.7	n.a.

¹ The 12 months postoperative PROMs response percentage is not (yet) available for 2022.
UKA: unicondylar knee arthroplasty; PROM: patient reported outcome measure.

Mean scores (pre-operative, 6 months and 12 months)

NRS (rest)

FIGURE Mean pre-operative, 6 months and 12 months postoperative NRS (rest) scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2022

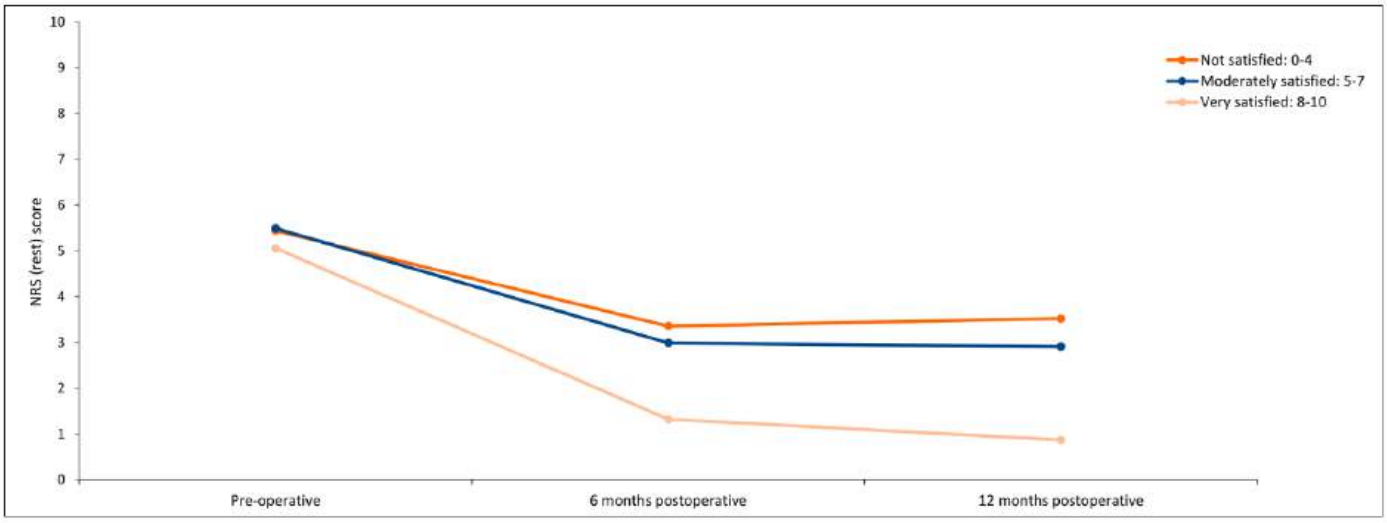


TABLE Mean NRS (rest) scores

NRS (rest) score	Pre-operative		6 months postoperative		12 months postoperative	
NRS satisfaction	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,485	5.44 (5.34-5.54)	2,480	3.36 (3.25-3.46)	2,517	3.52 (3.41-3.63)
Moderately satisfied: 5-7	7,580	5.49 (5.44-5.54)	7,675	2.99 (2.94-3.04)	7,743	2.91 (2.85-2.96)
Very satisfied: 8-10	24,709	5.05 (5.02-5.09)	24,999	1.32 (1.29-1.34)	25,284	0.87 (0.85-0.89)
Total	37,846	5.19 (5.16-5.21)	38,313	1.84 (1.82-1.86)	38,350	1.51 (1.49-1.53)

The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

The NRS (rest) score measures pain during rest. The score has a range of 0.0 to 10.0, with 0.0 representing no pain and 10.0 representing the most possible pain.

NRS (activity)

FIGURE Mean pre-operative, 6 months and 12 months postoperative NRS (activity) scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2022

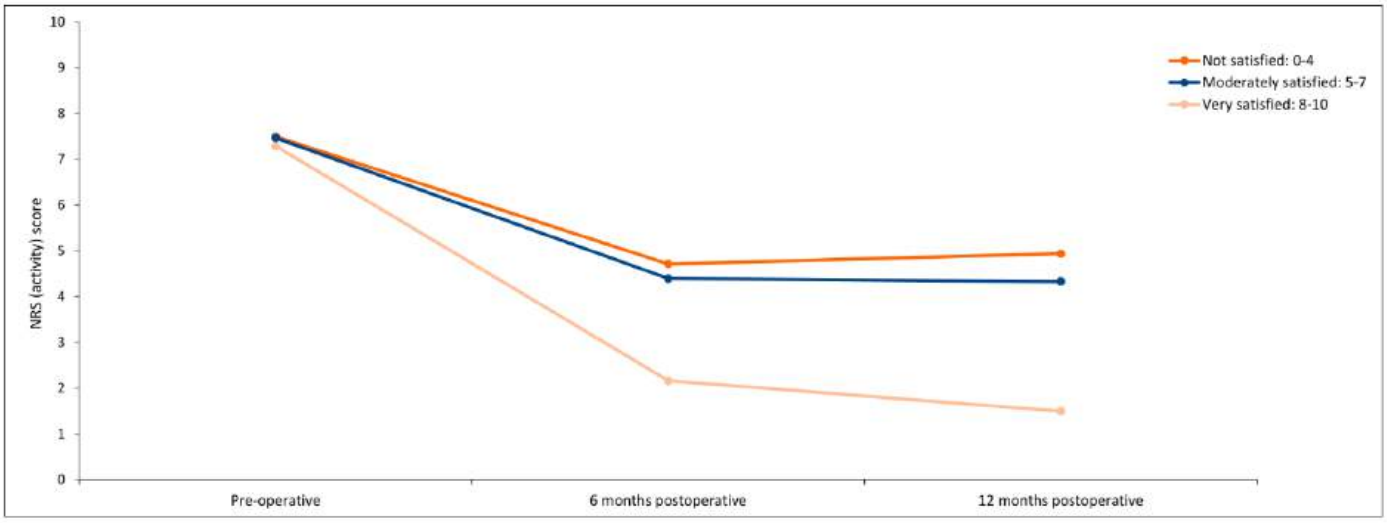


TABLE Mean NRS (activity) scores

NRS (activity) score	Pre-operative		6 months postoperative		12 months postoperative	
NRS satisfaction	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,483	7.49 (7.42-7.57)	2,477	4.71 (4.60-4.82)	2,520	4.94 (4.81-5.06)
Moderately satisfied: 5-7	7,576	7.46 (7.42-7.50)	7,679	4.39 (4.34-4.44)	7,745	4.33 (4.28-4.38)
Very satisfied: 8-10	24,700	7.28 (7.26-7.31)	25,004	2.16 (2.13-2.18)	25,305	1.90 (1.47-1.52)
Total	37,828	7.32 (7.30-7.34)	38,323	2.83 (2.80-2.85)	38,371	2.35 (2.33-2.38)

The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

The NRS (activity) score measures pain during activity. The score has a range of 0.0 to 10.0, with 0.0 representing no pain and 10.0 representing the most possible pain.

EQ5D index score

FIGURE Mean pre-operative, 6 months and 12 months postoperative EQ-5D index scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2022

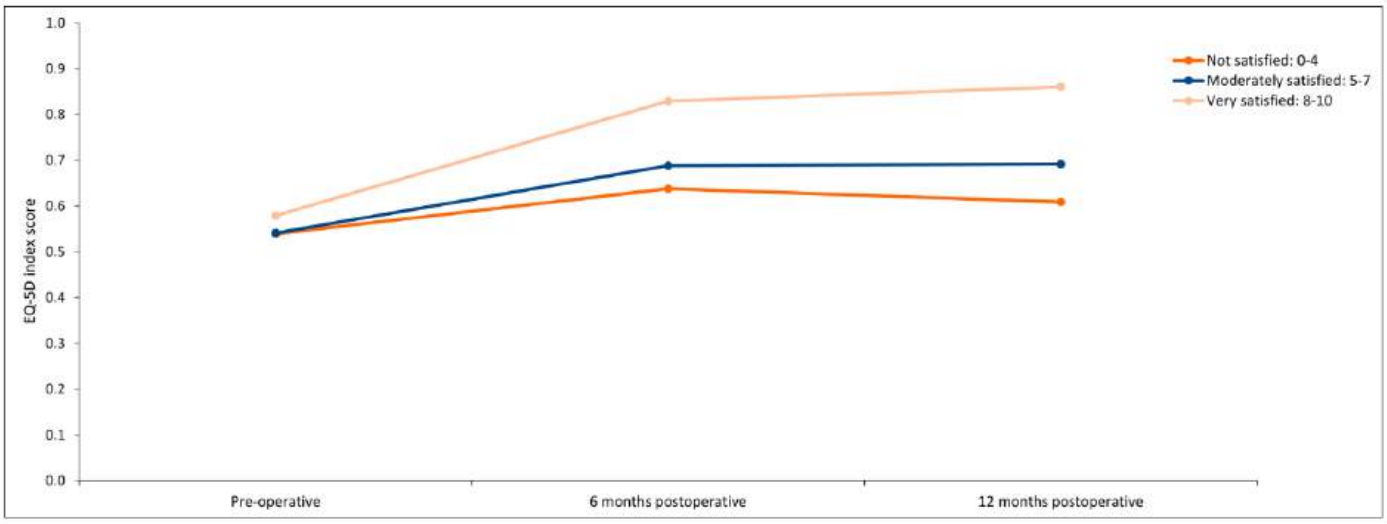


TABLE Mean EQ-5D index scores

EQ-5D Index score	Pre-operative		6 months postoperative		12 months postoperative	
NRS satisfaction	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,509	0.54 (0.53-0.55)	2,463	0.64 (0.63-0.65)	2,485	0.61 (0.60-0.62)
Moderately satisfied: 5-7	7,705	0.54 (0.54-0.55)	7,664	0.69 (0.68-0.69)	7,706	0.69 (0.69-0.70)
Very satisfied: 8-10	25,286	0.58 (0.58-0.58)	25,111	0.83 (0.83-0.83)	25,228	0.86 (0.86-0.86)
Total	39,015	0.57 (0.57-0.57)	38,793	0.78 (0.78-0.79)	38,493	0.81 (0.80-0.81)

The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

The EQ-5D index score measures quality of life. The score has a range of -0.329 to 1.0, with 1.0 representing the best possible quality of life.

EQ5D thermometer

FIGURE Mean pre-operative, 6 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2022

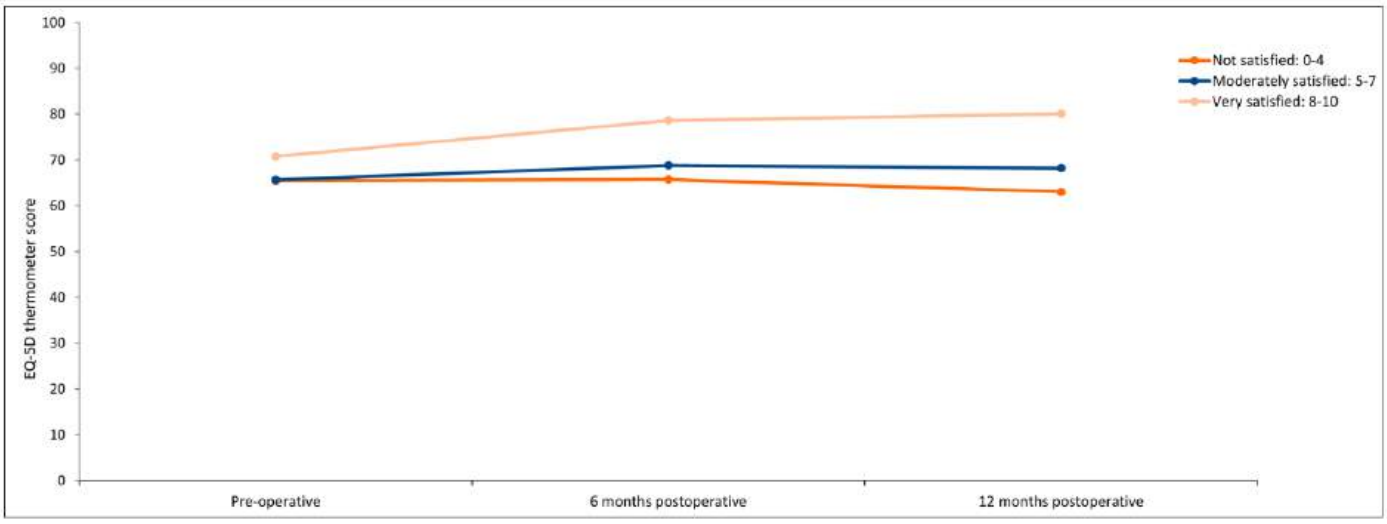


TABLE Mean EQ-5D thermometer scores

EQ-5D thermometer score	Pre-operative		6 months postoperative		12 months postoperative	
NRS satisfaction	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,517	65.5 (64.7-66.3)	2,484	65.7 (64.9-66.6)	2,491	63.1 (62.2-63.9)
Moderately satisfied: 5-7	7,716	65.7 (65.2-66.1)	7,710	68.8 (68.4-69.2)	7,742	68.2 (67.8-68.6)
Very satisfied: 8-10	25,296	70.8 (70.5-71.0)	25,272	78.6 (78.4-78.9)	25,324	80.0 (79.8-80.3)
Total	39,102	69.0 (68.8-69.2)	39,031	75.5 (75.3-75.6)	38,698	76.0 (75.8-76.2)

The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

The EQ-5D thermometer score measures the health situation. The score has a range of 0.0 to 100.0, with 0.0 representing the worst possible health situation and 100.0 the best possible health situation.

KOOS-PS score

FIGURE Mean pre-operative, 6 months and 12 months postoperative KOOS-PS scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2022

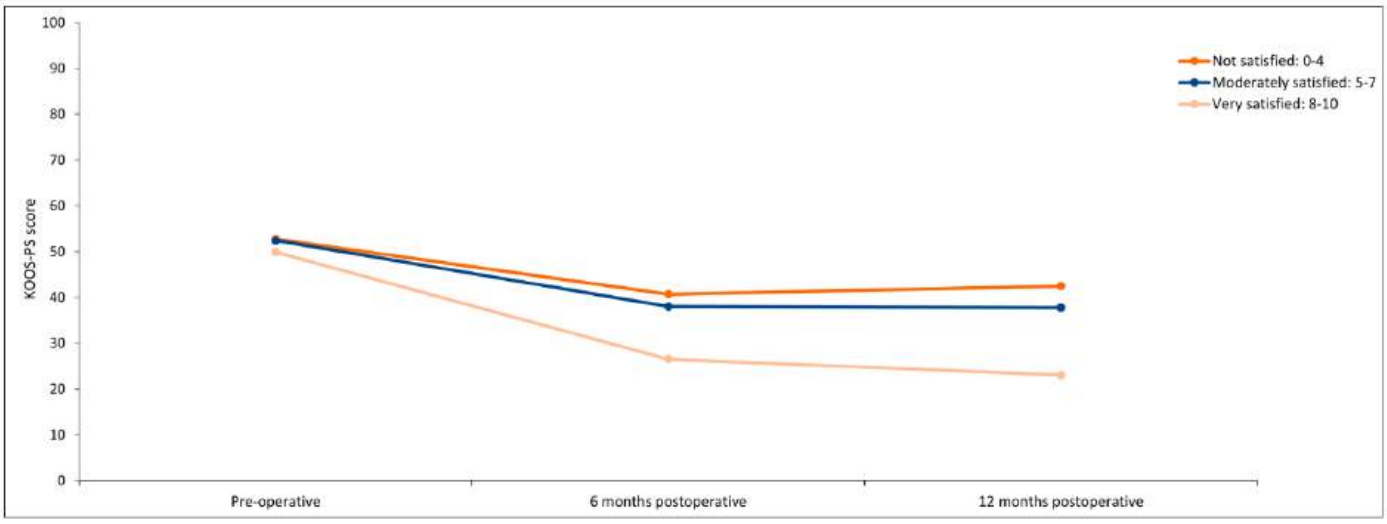


TABLE Mean KOOS-PS scores

KOOS-PS score	Pre-operative		6 months postoperative		12 months postoperative	
NRS satisfaction	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,469	52.7 (52.1-53.3)	2,413	40.7 (40.1-41.4)	2,440	42.5 (41.7-43.2)
Moderately satisfied: 5-7	7,597	52.4 (52.1-52.7)	7,403	38.0 (37.8-38.3)	7,477	37.7 (37.5-38.0)
Very satisfied: 8-10	24,936	49.9 (49.7-50.0)	24,435	26.5 (26.4-26.7)	24,584	23.0 (22.9-23.2)
Total	38,451	50.6 (50.5-50.8)	37,735	30.2 (30.0-30.3)	37,548	27.7 (27.6-27.9)

The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

The KOOS-PS score measures the physical functioning of patients with osteoarthritis to the knee. The score has a range of 0.0 to 100.0, with 0.0 representing no effort and 100.0 the most possible effort.

Oxford Knee score

FIGURE Mean pre-operative, 6 months and 12 months postoperative Oxford Knee scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2022

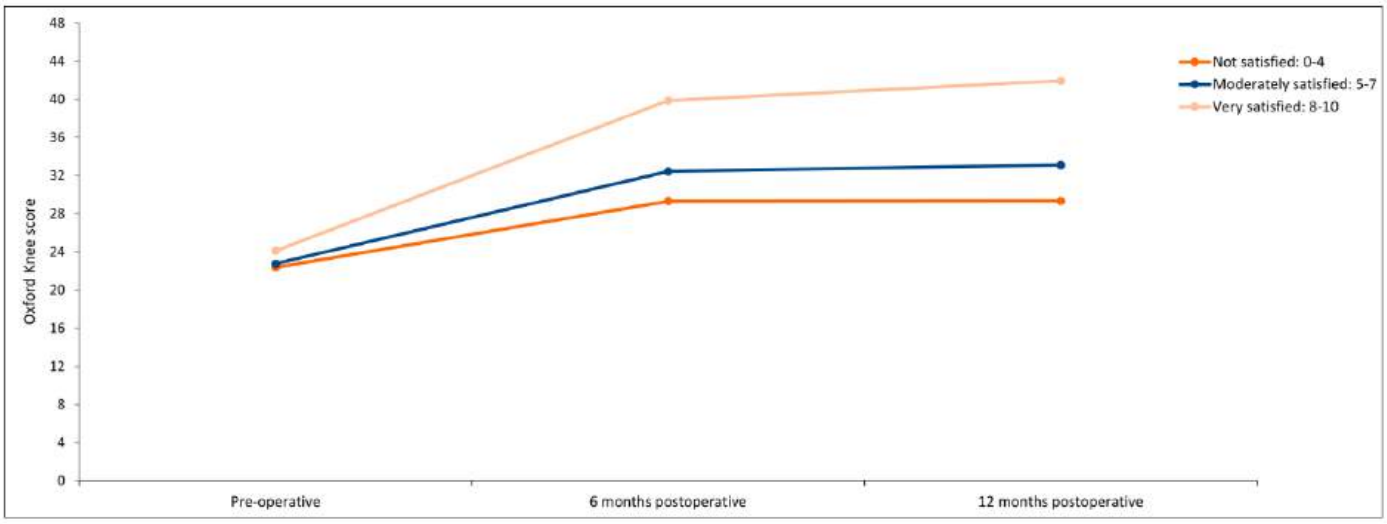


TABLE Mean Oxford Knee scores

Oxford Knee score	Pre-operative		6 months postoperative		12 months postoperative	
NRS satisfaction	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,408	22.4 (22.1-22.7)	2,378	29.3 (28.9-29.7)	2,394	29.3 (28.9-29.8)
Moderately satisfied: 5-7	7,347	22.8 (22.6-22.9)	7,323	32.4 (32.3-32.6)	7,378	33.1 (33.0-33.3)
Very satisfied: 8-10	24,016	24.1 (24.0-24.2)	23,974	39.9 (39.8-40.0)	24,104	41.9 (41.9-42.0)
Total	36,895	23.7 (23.6-23.8)	36,728	37.5 (37.4-37.6)	36,348	39.1 (39.1-39.2)

The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

The Oxford Knee score measures the physical functioning and pain of patients with osteoarthritis to the knee. The score has a range of 0.0 to 48.0, with 0.0 representing no functional ability and 48.0 the most functional ability.

NRS (satisfaction)

FIGURE Mean 6 months and 12 months postoperative NRS (satisfaction) scores of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2022

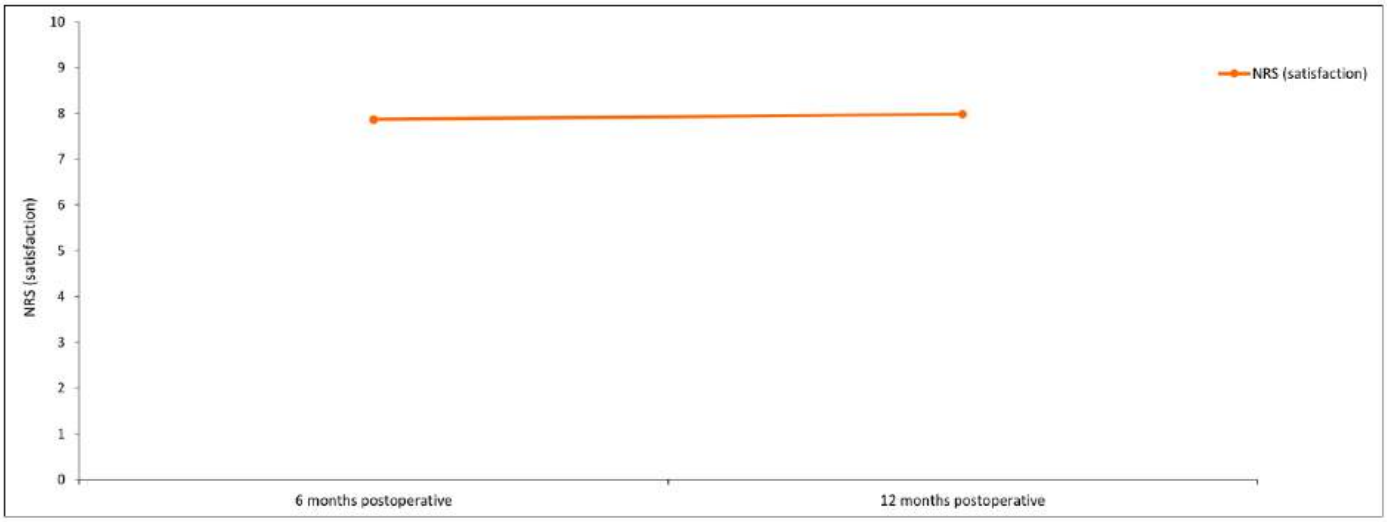


TABLE Mean NRS (satisfaction) scores

	6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)
NRS satisfaction	35,796	7.87 (7.84-7.89)	35,936	7.98 (7.95-8.01)

TKA: total knee arthroplasty; CI: confidence interval.

The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.

Anchor questions

FIGURE Mean 6 months and 12 months postoperative change in daily functioning and pain of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2022

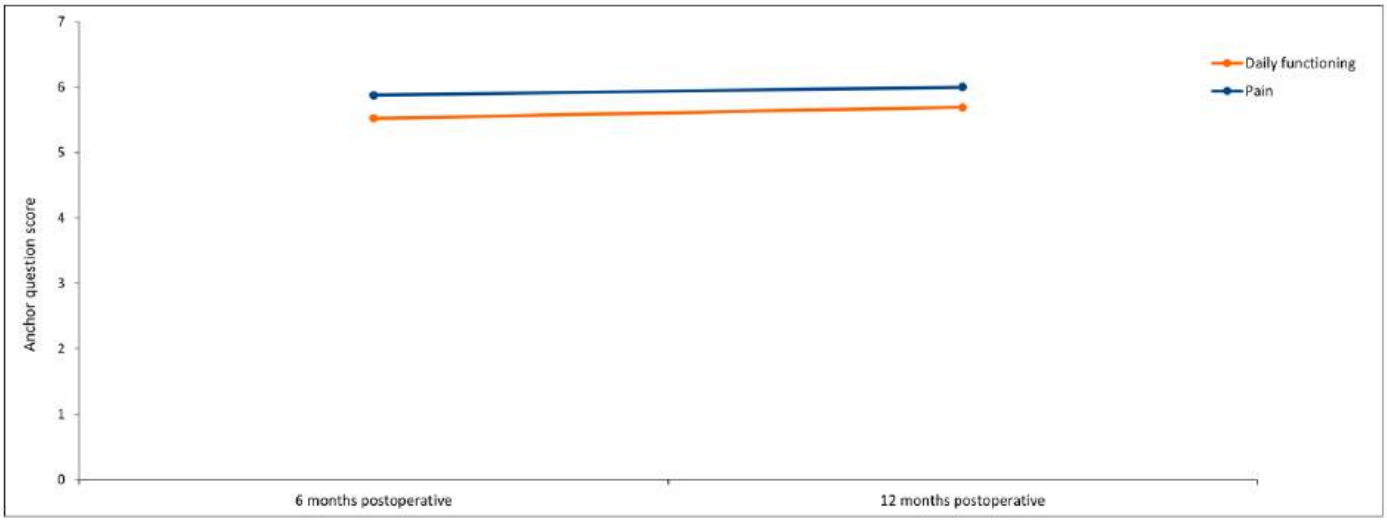


TABLE Mean anchor questions

	6 months postoperative		12 months postoperative	
Anchor question score	n	Mean (95% CI)	n	Mean (95% CI)
Daily functioning	37,712	5.52 (5.51-5.53)	37,742	5.69 (5.67-5.70)
Pain	35,759	5.87 (5.86-5.88)	35,781	6.00 (5.99-6.01)

TKA: total knee arthroplasty; CI: confidence interval.

The anchor questions daily functioning and pain measure change in daily functioning and change in pain degree after joint replacement. The score has a range of 1.0 to 7.0, with 1.0 representing very deteriorated and 7.0 representing very improved.

Ankle arthroplasty

Numbers

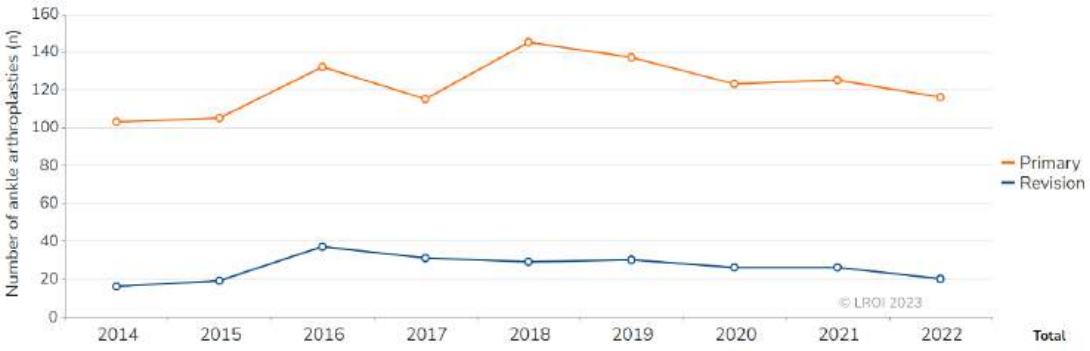
Registered procedures

TABLE Number of registered ankle arthroplasties per year of surgery (2014-2022) in the LROI in April 2023

Year of surgery	Type of ankle arthroplasty: Total arthroplasty (n)	Other (n)	Unknown/ missing(n)	Revision arthroplasty (n)	Total (n)
2014	102	0	1	16	119
2015	105	0	0	19	124
2016	125	6	1	37	169
2017	111	3	1	31	146
2018	143	1	1	29	174
2019	134	2	1	30	167
2020	122	0	1	26	149
2021	125	0	0	26	151
2022	115	1	0	20	136
Total	1,082	13	6	234	1,335

Type of procedures

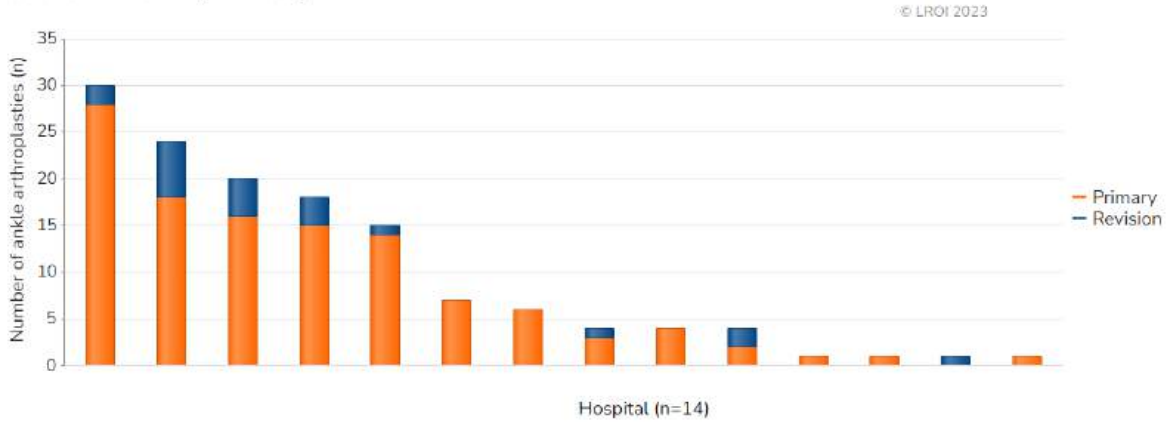
FIGURE Number of primary ankle arthroplasties and ankle revision arthroplasties registered in the LROI in the Netherlands in 2014-2022



Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Type of procedure (n)										
Primary	103	105	132	115	145	137	123	125	116	**1,101**
Revision	16	19	37	31	29	30	26	26	20	**234**
Total:	**119**	**124**	**169**	**146**	**174**	**167**	**149**	**151**	**136**	1,335

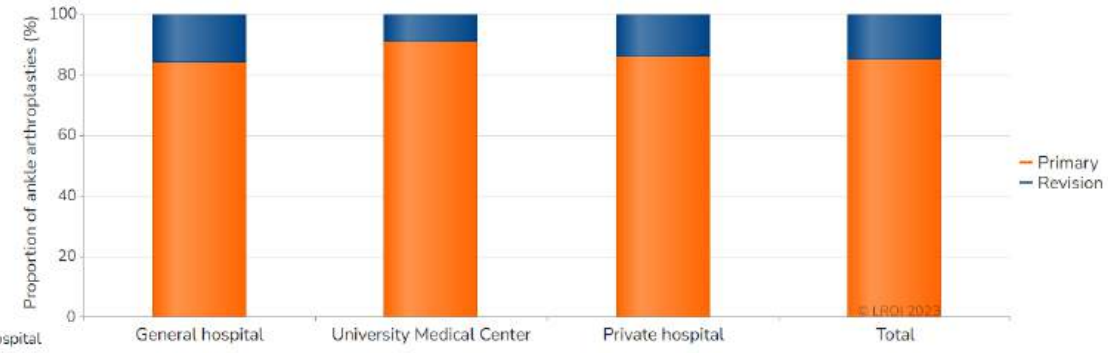
Type of procedure per hospital

FIGURE Number of primary ankle arthroplasties and ankle revision arthroplasties per hospital in the Netherlands in 2022 (n=136)



Type of hospital

FIGURE Primary ankle arthroplasties and ankle revision arthroplasties (proportion [%] per category) by type of hospital in the Netherlands in 2022



Type of procedure (%)				
Primary	84.27	90.91	86.11	**85.29**
Revision	15.73	9.09	13.89	**14.71**
Total (n):	**89**	**11**	**36**	**136**

Please note: in 2022, 8 general hospitals, 2 UMCs and 4 private hospitals performed ankle arthroplasties.
General: general hospital; UMC: university medical centre; Private: private hospital.

Primary ankle arthroplasty

Demographics

Patient characteristics by diagnosis

TABLE Patient characteristics of all patients with a registered primary ankle arthroplasty by diagnosis in the Netherlands in 2022

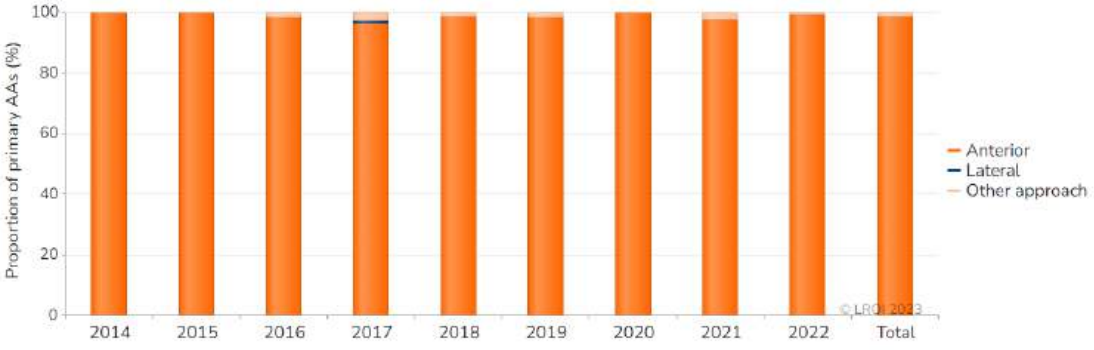
	Osteoarthritis (n=102)	No osteoarthritis[1] (n=14)	Total (n=116)
Mean age (years) (SD)	69.3 (7.5)	66.1 (6.6)	68.9 (7.5)
Age (years) (%)			
<50	1	0	1
50-59	9	14	9
60-69	38	57	41
70-79	43	29	41
≥80	9	0	8
Gender (%)			
Men	60	43	58
Women	40	57	42
ASA score (%)			
I	19	14	18
II	59	72	60
III-IV	22	14	22
Type of hospital (%)			
General	62	86	65
UMC	10	0	8
Private	28	14	27
Charnley-score (%)			
A One ankle joint affected	69	57	67
B1 Both ankle joints affected	14	0	12
B2 Contralateral ankle joint with a total ankle prosthesis	4	0	4
C Multiple joints affected or chronic disease that affects quality of life	14	43	17
Mean Body Mass Index (kg/m²) (SD)	27.6 (4.0)	27.4 (4.2)	27.5 (4.0)
Body Mass Index (kg/m²) (%)			
Underweight (≤18,5)	0	0	0
Normal weight (>18,5-25)	28	50	30
Overweight (>25-30)	50	21	46
Obesity (>30-40)	22	29	24
Morbid obesity (>40)	0	0	0
Smoking (%)			
No	94	100	95
Yes	6	0	5

[1] Another diagnosis than osteoarthritis registered as primary diagnosis, specifically post-traumatic (n=8), rheumatoid arthritis (n=5) or osteonecrosis (n=1).
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

Surgery and prosthesis

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary ankle arthroplasty in the Netherlands in 2014-2022

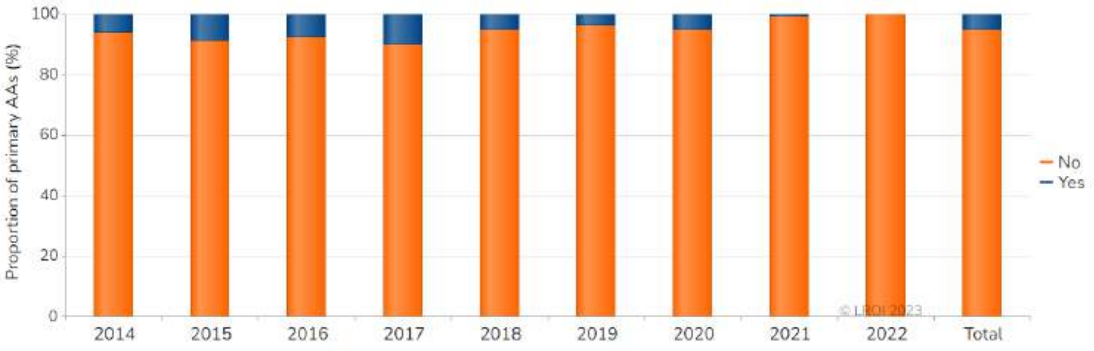


Surgical approach (%)										
Anterior	100.00	100.00	98.46	96.43	98.60	98.51	100.00	97.60	99.14	**98.71**
Lateral	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.00	**0.09**
Other approach	0.00	0.00	1.54	2.68	1.40	1.49	0.00	2.40	0.86	**1.20**
Total (n):	**101**	**101**	**130**	**112**	**143**	**134**	**120**	**125**	**116**	**1,082**

AA: ankle arthroplasty.

Medial malleolus osteotomy

FIGURE Trend (proportion [%] per year) in medial malleolus osteotomy in primary ankle arthroplasties in the Netherlands in 2014-2022

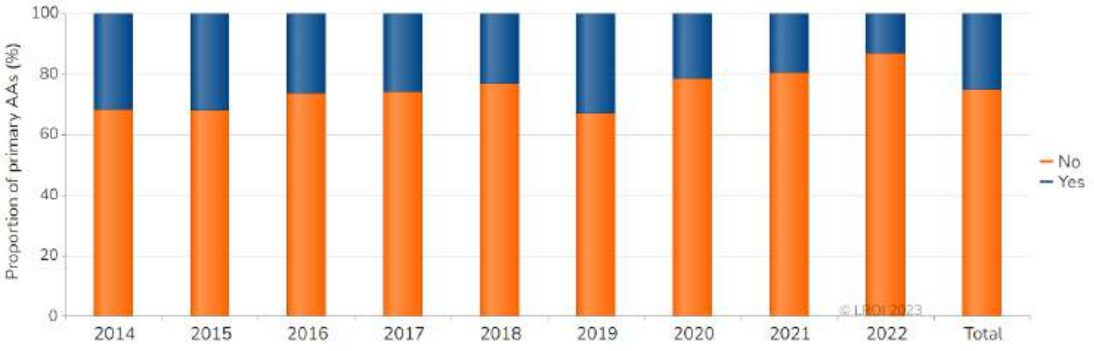


Medial malleolus osteotomy (%)										
No	94.12	91.26	92.31	90.18	95.07	96.32	95.04	99.19	100.00	**94.92**
Yes	5.88	8.74	7.69	9.82	4.93	3.68	4.96	0.81	0.00	**5.08**
Total (n):	**102**	**103**	**130**	**112**	**142**	**136**	**121**	**124**	**112**	**1,082**

AA: ankle arthroplasty.

Extension heel cord

FIGURE Trend (proportion [%] per year) in heel cord extension in primary ankle arthroplasties in the Netherlands in 2014-2022



Extension heel cord (%)										
No	68.32	67.96	73.64	74.11	76.76	66.91	78.51	80.49	86.84	**74.93**
Yes	31.68	32.04	26.36	25.89	23.24	33.09	21.49	19.51	13.16	**25.07**
Total (n):	**101**	**103**	**129**	**112**	**142**	**136**	**121**	**123**	**114**	**1,081**

AA: ankle arthroplasty.

Most frequently registered ankle prostheses

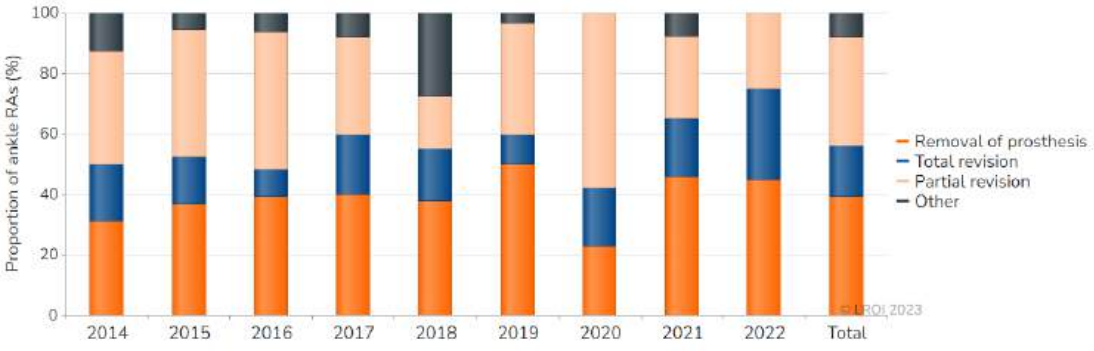
TABLE The most frequently registered primary ankle arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Total ankle arthroplasties	**133**	**124**	**114**	**115**	**110**
Name; Proportion (%)					
Salto	28.6	32.3	33.3	36.5	54.5
Infinity	51.1	44.4	59.6	51.3	39.1
Cadence	5.3	6.5	3.5	2.6	4.5
AAA OSG	12.0	8.1	1.8	3.5	1.8

Ankle revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision arthroplasty of ankle revision arthroplasties in the Netherlands in 2014-2022



Type of revision (%)										
Removal of prosthesis	31.25	36.84	39.39	40.00	37.93	50.00	23.08	46.15	45.00	**39.29**
Total revision	18.75	15.79	9.09	20.00	17.24	10.00	19.23	19.23	30.00	**16.96**
Partial revision	37.50	42.11	45.45	32.00	17.24	36.67	57.69	26.92	25.00	**35.71**
Other	12.50	5.26	6.06	8.00	27.59	3.33	0.00	7.69	0.00	**8.04**
Total (n):	**16**	**19**	**33**	**25**	**29**	**30**	**26**	**26**	**20**	224

Please note: In 10 (4.3%) ankle revision arthroplasties, the type of revision was not registered.
RA: revision arthroplasty.

Reasons for revision

TABLE Trend (proportion [%] per year) reasons for revision in patients who underwent an ankle revision arthroplasty in the Netherlands in 2016-2022

Year	2016	2017	2018	2019	2020	2021	2022	Total
Ankle revision arthroplasty (n)	37	31	29	30	26	26	20	199
Reasons for revision; Proportion[1] (%)								
Cyst formation	21.6	41.9	41.4	53.3	23.1	53.9	30.0	37.7
Inlay wear	35.1	45.2	31.0	40.0	30.8	30.8	25.0	34.7
Loosening of talus component	29.7	38.7	37.9	40.0	11.5	30.8	30.0	31.7
Loosening of tibia component	18.9	22.6	34.5	26.7	19.2	23.1	35.0	25.1
Malalignment	8.1	29.0	24.1	26.7	11.5	15.4	25.0	19.6
Instability	8.1	25.8	20.7	26.7	19.2	7.7	5.0	16.6
Infection	13.5	3.2	24.1	10.0	11.5	15.4	5.0	12.1
Arthrofibrosis	5.4	9.7	3.5	6.7	23.1	26.9	5.0	11.1
Dislocation	5.4	9.7	6.9	10.0	7.7	3.9	0.0	6.5
Peri-prosthetic fracture	0.0	3.2	3.5	3.3	7.7	0.0	5.0	3.0
Other	5.4	0.0	10.3	10.0	15.4	3.9	15.0	8.0

[1] One patient may have more than one reason for revision. As such, the total proportion is over 100%.

Survival

Revision by patient characteristics

By gender

FIGURE Cumulative revision percentages of primary ankle arthroplasties by gender in the Netherlands in 2014-2022 (n=1,098)

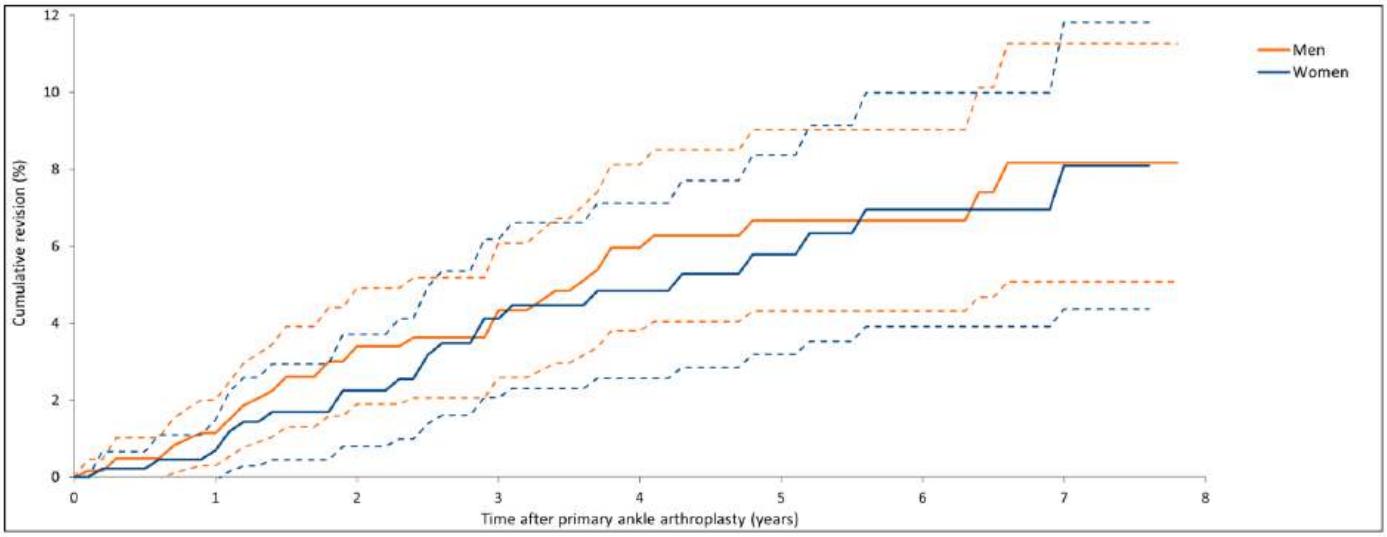


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
Gender					
Men	639	1.2 (0.3-2.0)	3.6 (2.1-5.2)	6.7 (4.3-9.0)	8.2 (5.1-11.3)
Women	459	0.5 (0.0-1.1)	4.1 (2.1-6.2)	5.8 (3.2-8.4)	7.0 (3.9-10.0)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: The number of registered ankle revision arthroplasties is not complete.
CI: confidence interval.

By age category

FIGURE Cumulative revision percentages of primary ankle arthroplasties by age category in the Netherlands in 2014-2023 (n=1,100)

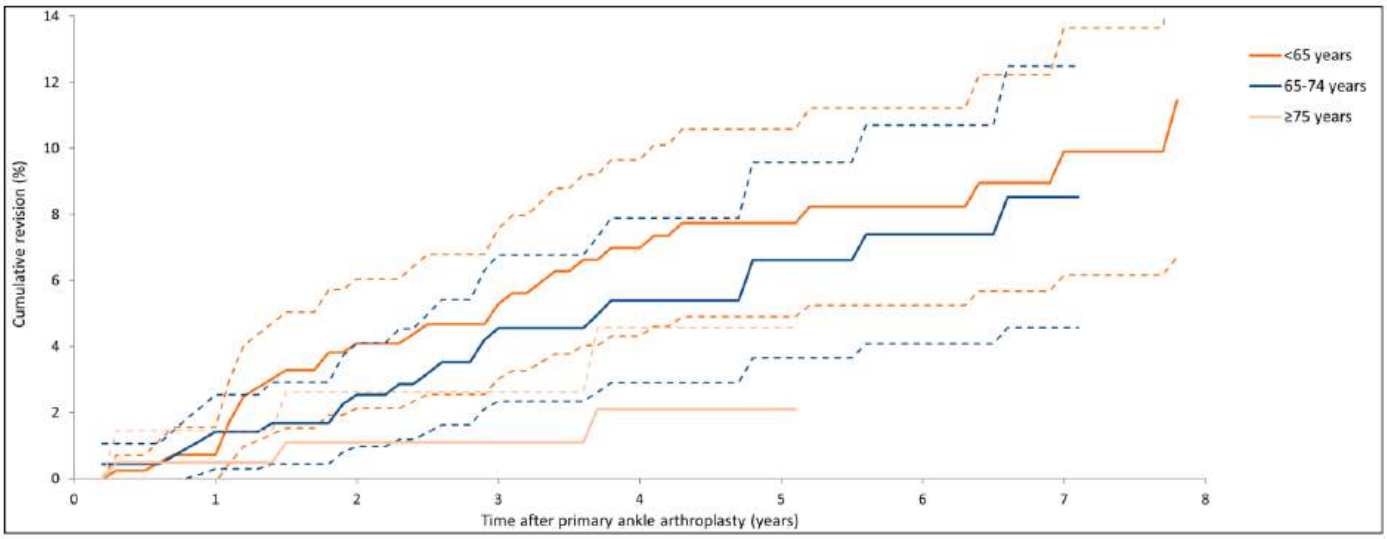


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
Age category					
<65	430	0.7 (0.0-1.6)	4.7 (2.6-6.8)	7.7 (4.9-10.6)	9.0 (5.7-12.2)
65-75	462	1.2 (0.1-2.2)	4.2 (2.1-6.3)	6.6 (3.7-9.6)	8.5 (4.6-12.5)
>75	208	0.5 (0.0-1.5)	1.1 (0.0-2.6)	2.1 (0.0-4.6)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: The number of registered ankle revision arthroplasties is not complete.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

By BMI

FIGURE Cumulative revision percentages of primary ankle arthroplasties by BMI in the Netherlands in 2014-2024 (n=1,090)

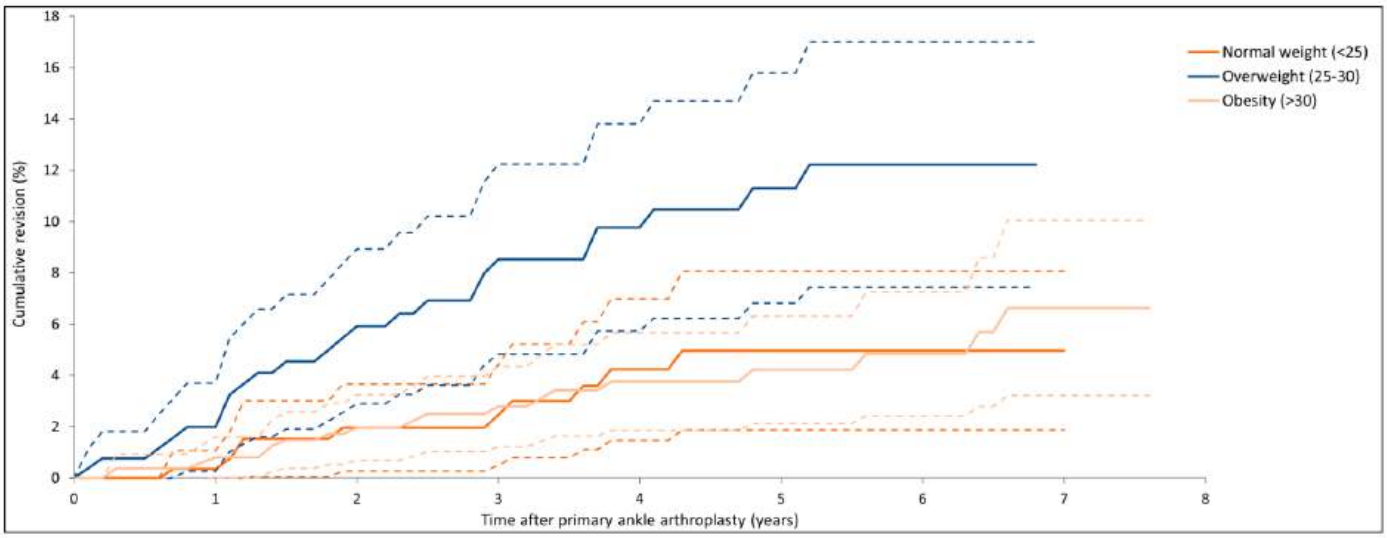


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
BMI category					
Normal weight (<25)	297	0.4 (0.0-1.1)	2.0 (0.3-3.7)	5.0 (1.9-8.1)	5.0 (1.9-8.1)
Overweight (25-30)	527	0.6 (0.0-1.3)	2.5 (1.1-4.0)	4.2 (2.1-6.3)	6.6 (3.2-10.1)
Obesity (>30)	266	2.0 (0.3-3.7)	8.0 (4.4-11.6)	11.3 (6.8-15.8)	12.2 (7.4-17.0)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: The number of registered ankle revision arthroplasties is not complete.
CI: confidence interval.

Revision by procedure characteristics

Overall

FIGURE Cumulative revision percentage of primary ankle arthroplasties in the Netherlands in 2014-2022 (n=1,100)

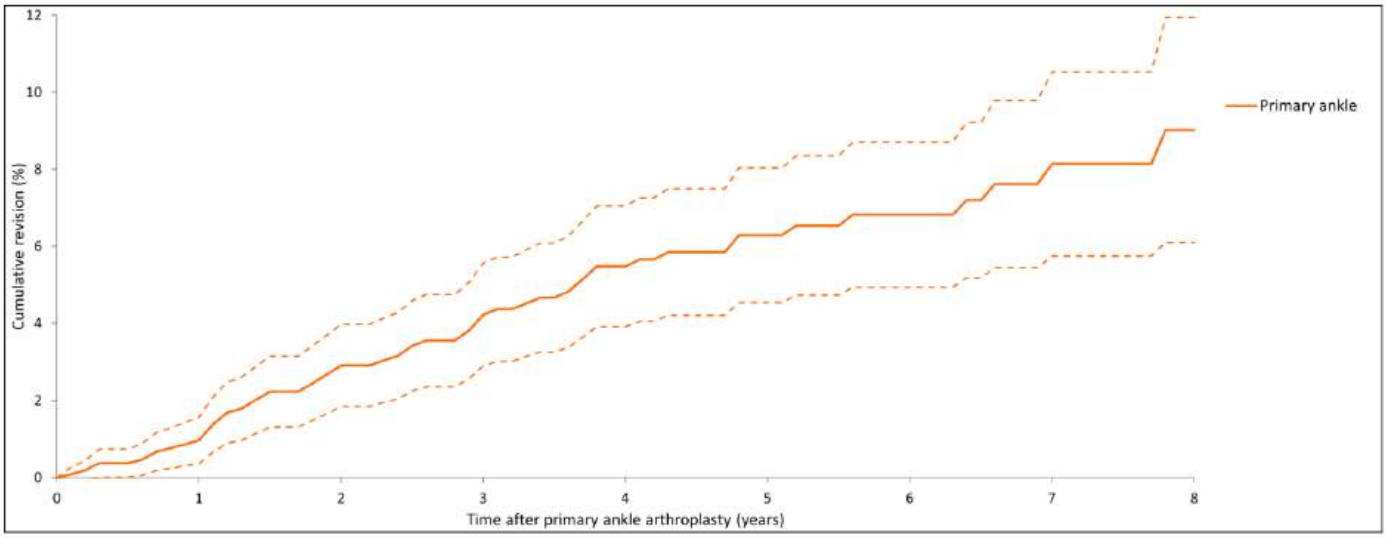


TABLE Cumulative revision percentages of primary ankle arthroplasties

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Primary ankle arthroplasty	1.100	0.86 (0.30-1.43)	3.82 (2.57-5.07)	6.29 (4.54-8.04)	7.62 (5.44-9.80)	9.02 (6.10-11.94)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: The number of registered ankle revision arthroplasties is not complete.
CI: confidence interval.

In 2014-2022, 52 (4.7%) primary ankle arthroplasties were implanted in patients who died within eight years after the primary procedure.

By previous surgery

FIGURE Cumulative revision percentages of primary ankle arthroplasties by previous surgery in the Netherlands in 2014-2022 (n=1,073)

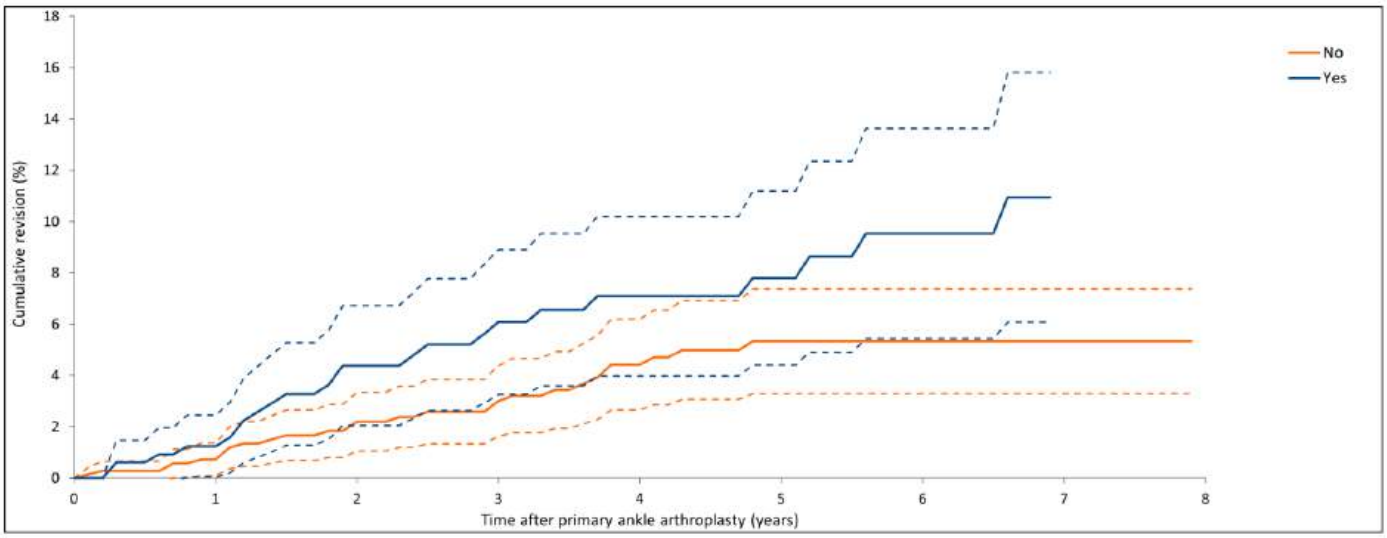


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
Previous surgery					
No	733	0.7 (0.1-1.4)	2.6 (1.3-3.8)	5.3 (3.3-7.4)	5.3 (3.3-7.4)
Yes	340	1.2 (0.0-2.5)	5.6 (2.9-8.3)	7.8 (4.4-11.2)	10.9 (6.1-15.8)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: The number of registered ankle revision arthroplasties is not complete.
CI: confidence interval.

Shoulder arthroplasty

Numbers

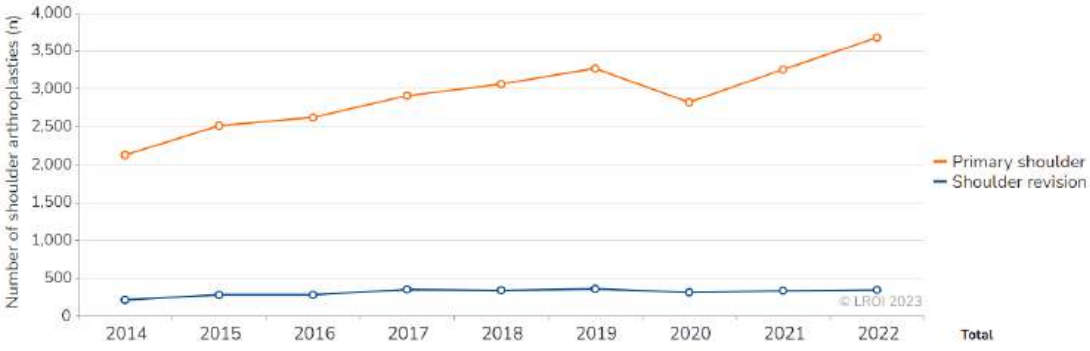
Registered procedures

TABLE Number of registered shoulder arthroplasties per year of surgery (2014-2022) in the LROI in April 2023

Year of surgery	Type of shoulder arthroplasty: Reversed arthroplasty (n)	Total anatomical arthroplasty (n)	Hemi-arthroplasty (n)	Unknown/ missing (n)	Revision arthroplasty (n)	Total (n)
2014	1,246	398	462	14	208	2,328
2015	1,578	502	423	7	272	2,782
2016	1,748	519	338	14	274	2,893
2017	1,988	560	343	14	346	3,251
2018	2,140	629	285	6	334	3,394
2019	2,430	600	233	3	353	3,619
2020	2,159	477	178	4	309	3,127
2021	2,451	586	178	38	328	3,581
2022	2,866	601	205	1	339	4,012
Total	18,606	4,872	2,645	101	2,763	28,987

Procedures

FIGURE Number of primary shoulder arthroplasties and shoulder revision arthroplasties registered in the LROI in the Netherlands 2014-2022

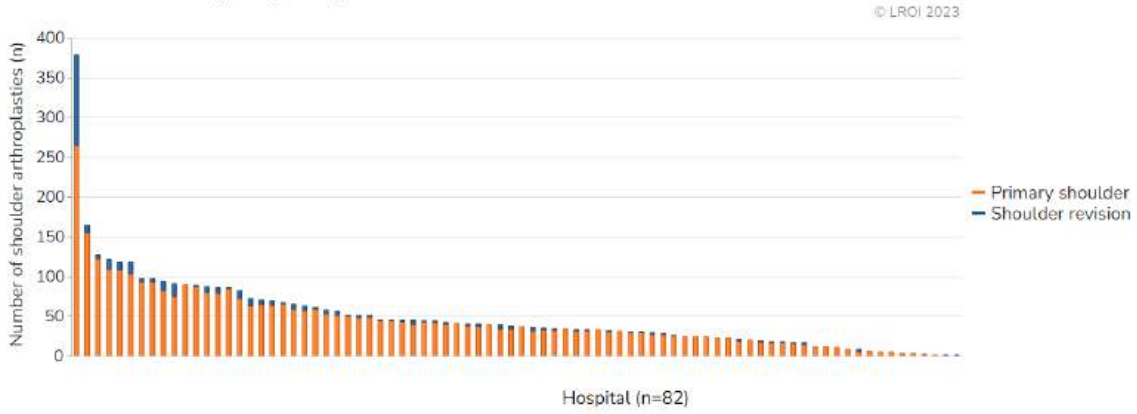


Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Type of procedure (n)										
Primary shoulder	2,120	2,510	2,619	2,905	3,060	3,266	2,818	3,253	3,673	**26,224**
Shoulder revision	208	272	274	346	334	353	309	328	339	**2,763**
Total:	**2,328**	**2,782**	**2,893**	**3,251**	**3,394**	**3,619**	**3,127**	**3,581**	**4,012**	**28,987**

Out of 3,673 primary shoulder arthroplasties that were performed in 2022, 1% (n=47) was performed bilaterally.

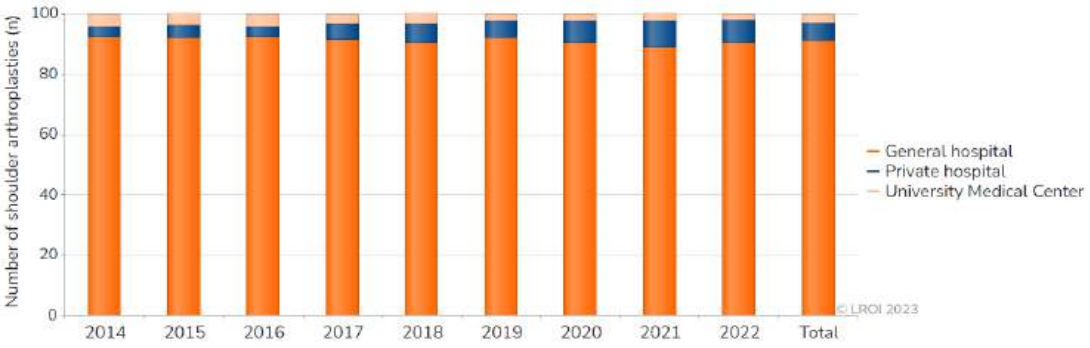
Type of procedure per hospital

FIGURE Number of primary shoulder arthroplasties and shoulder revision arthroplasties per hospital in the Netherlands 2022 (n=3,673)



Type of hospital

FIGURE Trend (proportion [%] per year) in type of hospital performing primary and revision shoulder arthroplasties in the Netherlands in 2014-2022



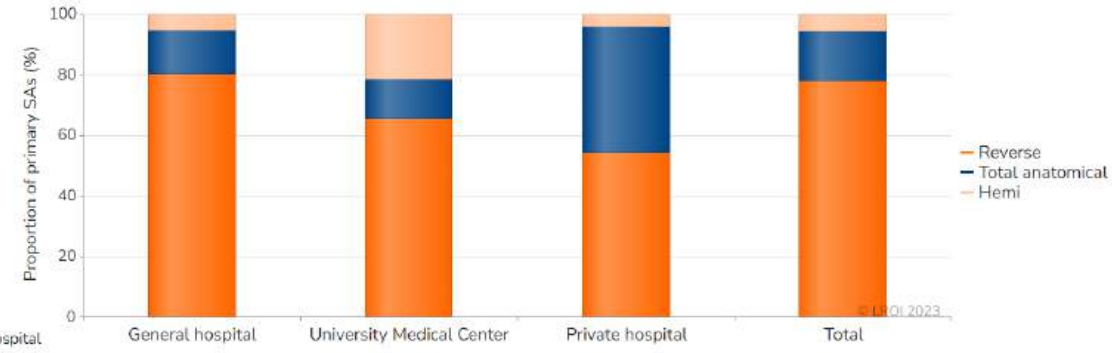
Type of hospital (%)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
General hospital	92.35	92.06	92.46	91.45	90.37	92.15	90.44	89.00	90.40	**91.09**
Private hospital	3.48	4.28	3.46	5.14	6.45	5.78	7.39	8.80	7.60	**6.02**
University Medical Center	4.17	3.67	4.08	3.41	3.18	2.07	2.17	2.21	1.99	**2.89**
Total (n):	**2,328**	**2,782**	**2,893**	**3,251**	**3,394**	**3,619**	**3,127**	**3,581**	**4,012**	28,987

Please note: In 2022, 64 general hospitals, 6 UMCs and 12 private hospitals performed shoulder arthroplasties.
General: general hospital; UMC: university medical centre; Private: private hospital.

Type of primary shoulder prosthesis by type of hospital

FIGURE Type of primary shoulder arthroplasty (proportion [%] per category) by type of hospital in the Netherlands in 2022



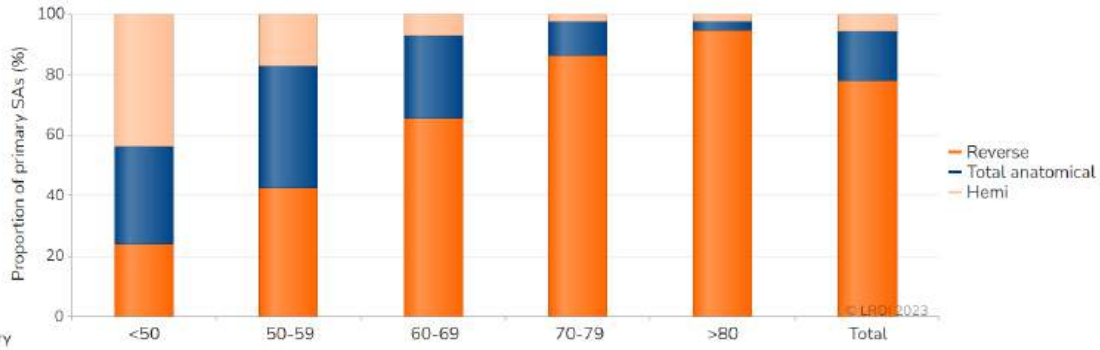
Type of primary shoulder arthroplasty (%)

	General hospital	University Medical Center	Private hospital	Total
Reverse	80.41	65.71	54.42	**78.05**
Total anatomical	14.21	12.86	41.50	**16.37**
Hemi	5.38	21.43	4.08	**5.58**
Total (n):	**3,308**	**70**	**294**	**3,672**

Please note: In 2 (0.1%) primary shoulder arthroplasties, the type of primary shoulder arthroplasty was not registered in 2022.
SA: shoulder arthroplasty; Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.
General: general hospital; UMC: university medical centre; Private: private hospital.

Type of primary shoulder prosthesis by age category

FIGURE Type of primary shoulder arthroplasty (proportion [%] per category) by age category in patients with a primary shoulder arthroplasty in the Netherlands in 2022



Type of primary shoulder arthroplasty (%)						
Reverse	23.94	42.66	65.54	86.36	94.82	**78.05**
Total anatomical	32.39	40.21	27.39	11.10	2.74	**16.37**
Hemi	43.66	17.13	7.07	2.53	2.44	**5.58**
Total (n):	**71**	**286**	**920**	**1,738**	**657**	**3,672**

SA: shoulder arthroplasty; Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

Primary shoulder arthroplasty

Demographics

Patient characteristics by type of shoulder prosthesis

TABLE Patient characteristics of all patients with a registered primary shoulder arthroplasty by type of primary shoulder arthroplasty in the Netherlands in 2022

	Reverse	Total anatomical	Hemi	Total[1]
N (%)	**2,866 (78)**	**601 (16)**	**205 (6)**	**3,673**
Mean age (years) (SD)	73.6 (7.9)	65.6 (8.2)	62.5 (12.5)	71.7 (9.0)
Age (years) (%)				
<50	1	4	15	2
50-59	4	19	24	8
60-69	21	42	32	25
70-79	52	32	21	47
≥80	22	3	8	18
Gender (%)				
Men	26	36	38	28
Women	74	64	62	72
ASA score (%)				
I	5	13	12	6
II	54	63	58	56
III-IV	41	24	30	38
Type of hospital (%)				
General	93	78	87	90
UMC	2	2	7	2
Private	5	20	6	8
Specialism (%)				
Orthopaedic surgeon	99	100	97	99
Trauma surgeon	1	0	3	1
Diagnosis (%)				
Osteoarthritis	34	91	51	44
Fracture	22	0	22	18
Cuff arthropathy	22	0	1	17
Post-traumatic	9	3	9	8
Cuff rupture	7	0	0	6
Rheumatoid arthritis	2	2	3	2
Osteonecrosis	1	3	9	2
Chronic (sub)dislocation	1	0	0	1
Inflammatory arthritis	0	0	1	0
Tumour	0	0	1	0
Other	2	1	3	2
Walch score (%)				
A1	47	31	48	43
A2	29	38	28	31
B1	9	19	8	11
B2	9	9	7	9
B3	4	2	4	4
C	2	1	5	2
Mean Body Mass Index (kg/m²) (SD)	28.2 (5.2)	28.6 (5.1)	28.6 (5.7)	28.3 (5.2)
Body Mass Index (kg/m²) (%)				
Underweight (≤18,5)	1	1	1	1
Normal weight (>18,5-25)	29	25	28	28
Overweight (>25-30)	39	43	36	39
Obesity (>30-40)	28	28	31	29
Morbid obesity (>40)	3	3	4	3
Smoking (%)				
No	91	90	87	91
Yes	9	10	13	9

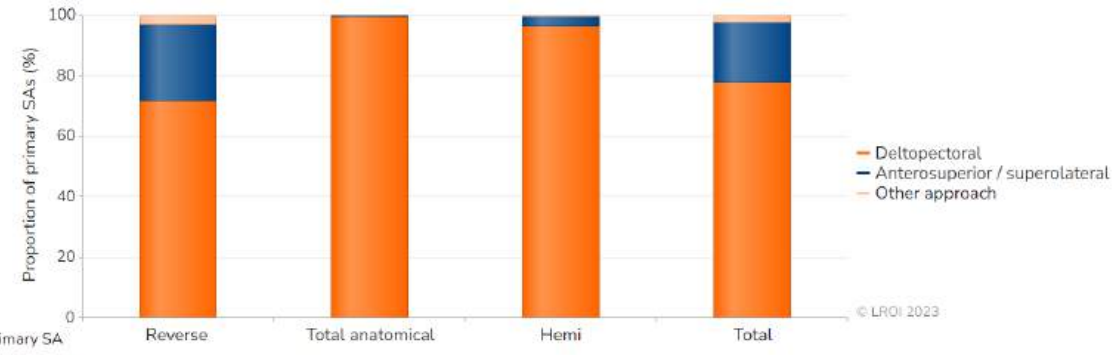
[1] Also contains 1 (0.03%) primary shoulder arthroplasty of which the type of prosthesis had not been registered.
Reverse: reverse total shoulder arthroplasty; Total anatomical: anatomic total shoulder arthroplasty; Hemi: shoulder hemiarthroplasty; General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

The number of registered shoulder hemiarthroplaties in the LROI is not complete, since these procedures are also performed by trauma surgeons.

Surgical techniques

Surgical approach by type of shoulder prosthesis

FIGURE Surgical approach (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2022

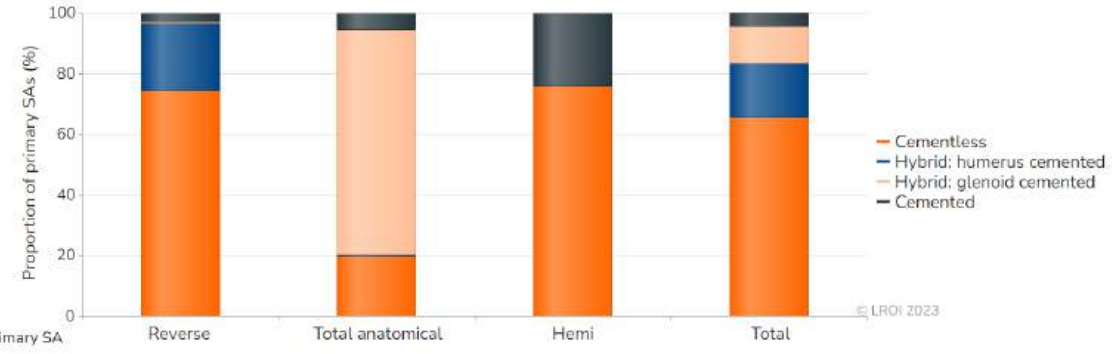


Surgical approach (%)				
Deltopectoral	71.71	99.66	96.46	**77.57**
Anterosuperior / superolateral	25.28	0.34	3.03	**20.04**
Other approach	3.01	0.00	0.51	**2.38**
Total (n):	**2,828**	**581**	**198**	**3,607**

SA: shoulder arthroplasty. Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

Fixation by type of shoulder prosthesis

FIGURE Type of fixation (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2022



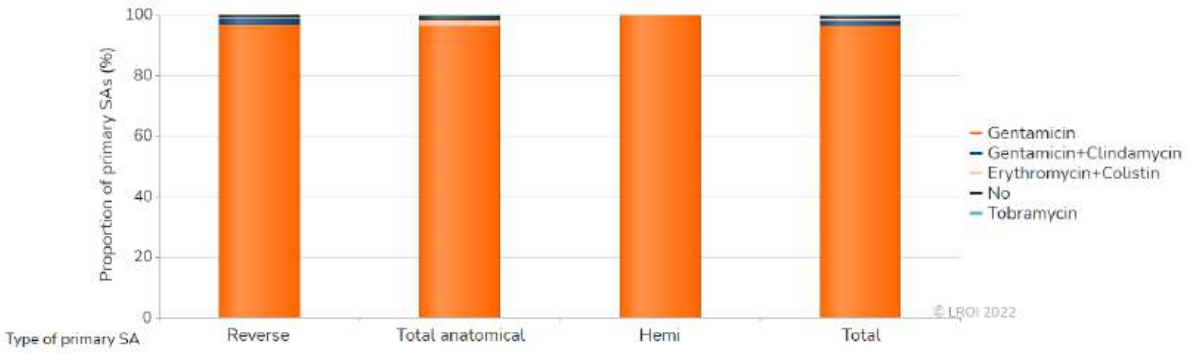
Fixation (%)				
Cementless	74.49	19.86	75.88	**65.75**
Hybrid: humerus cemented	22.31	0.69	0.00	**17.77**
Hybrid: glenoid cemented	0.60	74.27	0.00	**12.45**
Cemented	2.60	5.18	24.12	**4.04**
Total (n):	**2,842**	**579**	**170**	**3,591**

SA: shoulder arthroplasty. Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

Bone cement

Antibiotics by type of shoulder prosthesis

FIGURE Use of antibiotics in bone cement (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2021



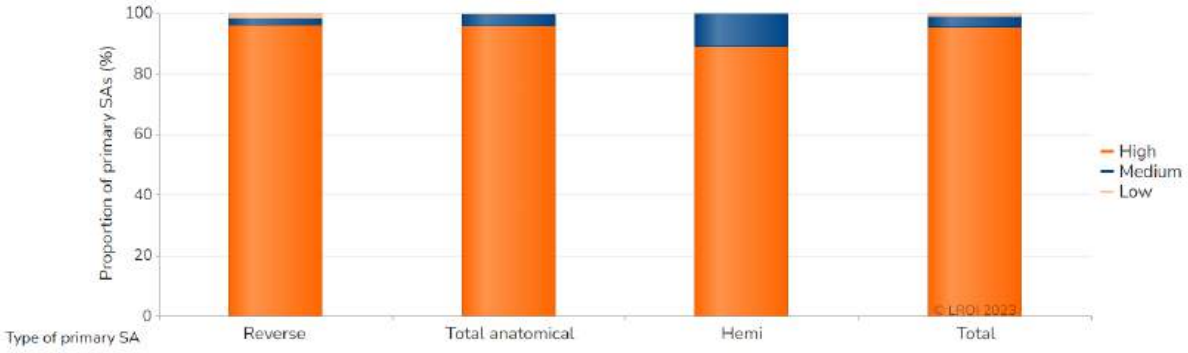
Bone cement antibiotics (%)

	Reverse	Total anatomical	Hemi	Total
Gentamicin	96.84	96.33	100.00	**96.83**
Gentamicin+Clindamycin	2.28	0.00	0.00	**1.25**
Erythromycin+Colistin	0.18	2.20	0.00	**0.96**
No	0.70	1.22	0.00	**0.86**
Tobramycin	0.00	0.24	0.00	**0.10**
Total (n):	**570**	**409**	**63**	**1,042**

SA: shoulder arthroplasty. Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

Viscosity by type of shoulder prosthesis

FIGURE Bone cement viscosity (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2022



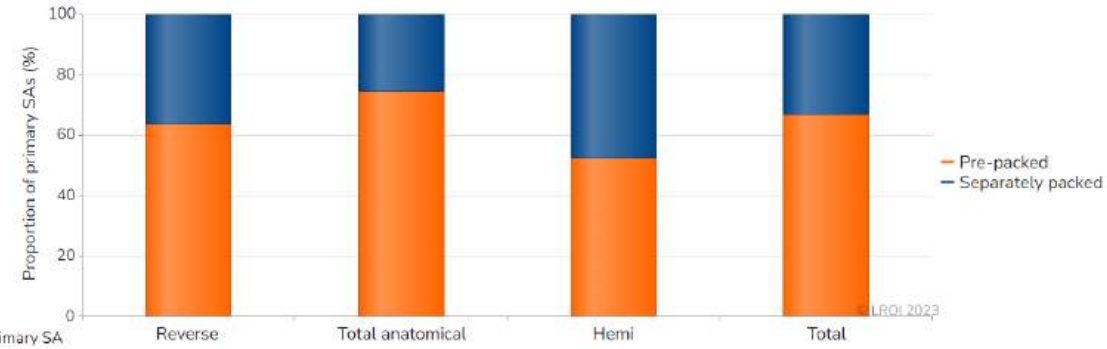
Bone cement viscosity (%)

	Reverse	Total anatomical	Hemi	Total
High	96.04	95.73	89.23	**95.54**
Medium	2.44	4.03	10.77	**3.50**
Low	1.52	0.24	0.00	**0.96**
Total (n):	**657**	**422**	**65**	**1,144**

SA: shoulder arthroplasty. Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

Vacuum mixing system by type of shoulder prosthesis

FIGURE Bone cement pre-packed in a vacuum mixing system (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2022



Type of primary SA	Reverse	Total anatomical	Hemi	Total
Vacuum mixing system (%)				
Pre-packed	63.47	74.41	52.31	**66.87**
Separately packed	36.53	25.59	47.69	**33.13**
Total (n):	**657**	**422**	**65**	**1,144**

Separately packed: separately packed bone cement components; Pre-packed: Bone cement pre-packed in a vacuum mixing system.
SA: shoulder arthroplasty; Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

Most frequently registered components

Reverse total shoulder arthroplasty

TABLE The most frequently registered humeral stems, humeral liners, glenospheres, metaphyses and glenoid baseplates in primary reverse total shoulder arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Humeral stem (n)	**1,967**	**2,246**	**1,928**	**2,336**	**2,645**
Name; Proportion (%)					
Delta X-tend	34.6	33.9	30.9	27.5	30.4
Aequalis Ascend Flex	13.4	13.4	14.1	16.1	13.7
Comprehensive Mini	9.3	8.4	8.9	7.7	10.0
Aequalis Reversed Fracture	6.0	5.1	7.2	7.1	6.7
Global Unite	1.1	4.5	3.4	4.3	5.6

Year	2018	2019	2020	2021	2022
Humeral liner (n)	**1,823**	**2,085**	**1,899**	**2,272**	**2,517**
Name; Proportion (%)					
Delta X-tend	33.6	35.9	34.3	31.9	37.3
Aequalis Ascend Flex	14.9	14.9	15.4	20.2	15.9
Comprehensive	11.4	11.9	13.3	12.1	15.0
Aequalis Reversed Fracture	5.9	5.3	6.5	6.6	6.3
Equinoxe	7.1	6.4	5.0	5.1	5.6

Year	2018	2019	2020	2021	2022
Glenosphere (n)	**1,940**	**2,216**	**1,840**	**2,245**	**2,644**
Name; Proportion (%)					
Delta X-tend	35.0	36.8	28.8	27.7	35.4
Aequalis Reversed II	27.0	24.5	26.9	26.2	20.8
Comprehensive	11.2	11.6	13.5	12.4	14.7
Perform Reversed	4.2	5.9	5.1	9.6	7.1
Equinoxe	6.8	6.0	5.4	5.2	5.3

Year	2018	2019	2020	2021	2022
Metaphysis (n)	**1,510**	**1,829**	**1,498**	**1,821**	**2,067**
Name; Proportion (%)					
Delta X-tend	34.2	37.5	29.1	27.7	34.2
Aequalis Ascend Flex	17.8	17.2	19.0	23.8	18.0
Comprehensive	14.0	13.1	16.2	14.1	17.7
Aequalis Reversed	12.7	12.1	9.1	7.4	6.7
Equinoxe	8.5	7.2	6.8	6.4	6.7

Year	2018	2019	2020	2021	2022
Glenoid baseplate	**1,946**	**2,197**	**1,933**	**2,259**	**2,581**
Name; Proportion (%)					
Delta X-tend	35.9	38.9	33.6	29.7	36.6
Aequalis Reversed II	26.7	24.8	25.6	26.1	21.7
Comprehensive	11.8	11.7	12.7	12.4	15.1
Perform Reversed	4.2	5.7	4.7	9.4	7.3
Equinoxe	6.7	5.4	3.9	4.9	5.2

Total anatomical shoulder arthroplasty

TABLE The most frequently registered humeral stems, humeral heads and glenoid components in primary total anatomical shoulder arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Humeral stem (n)	**526**	**518**	**380**	**514**	**535**
Name; Proportion (%)					
Aequalis Ascend Flex	26.6	26.3	33.9	37.0	34.8
Global Icon	4.2	6.2	7.1	6.6	11.8
Comprehensive Nano	8.6	7.7	7.4	10.5	11.4
SMR Stemless	5.7	6.9	7.6	5.1	9.9
Affinis Short	5.5	10.6	8.7	7.8	8.8

Year	2018	2019	2020	2021	2022
Humeral liner (n)	**530**	**529**	**393**	**530**	**546**
Name; Proportion (%)					
Aequalis Ascend Flex	27.4	27.4	35.4	37.0	35.2
Comprehensive	12.3	9.6	10.4	14.5	13.7
Global Icon	1.3	5.7	6.6	6.6	12.1
Global Unite/Global AP	18.3	17.2	16.0	12.6	11.0
SMR head	8.9	9.8	8.4	7.5	9.5

Year	2018	2019	2020	2021	2022
Glenosphere (n)	**580**	**551**	**389**	**540**	**544**
Name; Proportion (%)					
Aequalis Perform Keeled	15.3	18.7	27.8	27.8	27.4
Global APG+	28.1	26.9	23.7	18.0	24.4
Comprehensive	12.6	9.8	11.3	15.0	14.5
Aequalis Perform Pegged	10.0	9.8	9.5	10.6	10.1
SMR TT hybrid glenoid	0.0	0.2	2.6	5.0	6.1

Shoulder hemiarthroplasty

TABLE The most frequently registered humeral stems and humeral heads in primary shoulder hemiarthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Humeral stem (n)	**211**	**166**	**141**	**157**	**164**
Name; Proportion (%)					
Aequalis Ascend Flex	18.0	21.1	27.0	23.6	22.6
Global Unite	7.6	5.4	3.5	6.4	7.9
Sidus Baseplate	6.6	2.4	4.3	7.0	7.3
Affinis Short	3.8	10.8	2.8	2.5	7.3
Comprehensive Fracture	6.6	3.6	7.8	11.5	6.7

Year	2018	2019	2020	2021	2022
Humeral head (n)	**251**	**198**	**158**	**160**	**172**
Name; Proportion (%)					
Aequalis Pyrocarbon Humeral Head	8.0	15.7	22.8	15.6	12.8
Aequalis Ascend Flex	8.8	4.0	5.1	10.0	12.8
Comprehensive	18.3	21.2	10.1	18.1	11.0
SMR head	3.2	5.1	9.5	11.3	10.5
Copeland	8.4	7.1	9.5	6.9	8.1

Most frequently registered types of bone cement

Reverse total shoulder arthroplasty

TABLE The most frequently registered types of bone cement by type of mixing system used during primary reverse total shoulder arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**247**	**294**	**306**	**385**	**417**
Cement name; Proportion (%)					
Palacos R+G	45.7	47.3	57.5	59.0	47.0
Refobacin Bone Cement R	49.0	44.2	32.0	34.3	46.5
Refobacin Plus Bone Cement	5.3	8.5	10.5	6.8	6.5

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**255**	**239**	**218**	**183**	**240**
Cement name; Proportion (%)					
Palacos R+G	66.3	68.6	59.2	80.9	69.6
Copal G+C	3.9	1.7	3.2	2.7	12.9
Palacos MV+G	4.7	3.8	7.8	4.4	5.8
Palacos LV+G	9.4	5.9	2.8	4.9	4.2
Refobacin Bone Cement R	0.4	9.6	14.7	3.3	3.3

Total anatomical shoulder arthroplasty

TABLE The most frequently registered types of bone cement by type of mixing system used during primary total anatomical shoulder arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**140**	**238**	**181**	**284**	**313**
Cement name; Proportion (%)					
Refobacin Bone Cement R	52.9	47.1	36.5	49.3	48.9
Palacos R+G	37.1	47.1	54.1	44.0	40.9
Refobacin Plus Bone Cement	10.0	5.9	9.4	6.7	10.2

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**293**	**185**	**134**	**129**	**108**
Cement name; Proportion (%)					
Palacos R+G	84.0	71.9	61.9	78.3	47.2
Copal G+C	0.0	0.0	0.0	0.0	27.8
Simplex ABC EC	6.5	19.5	12.7	7.0	12.0
Refobacin Bone Cement R	1.0	5.9	19.4	5.4	4.6
Biomet Bone Cement R	0.0	0.0	2.2	3.9	3.7

Shoulder hemiarthroplasty

TABLE The most frequently registered types of bone cement by type of mixing system used during primary shoulder hemiarthroplasties in the Netherlands in 2018-2022

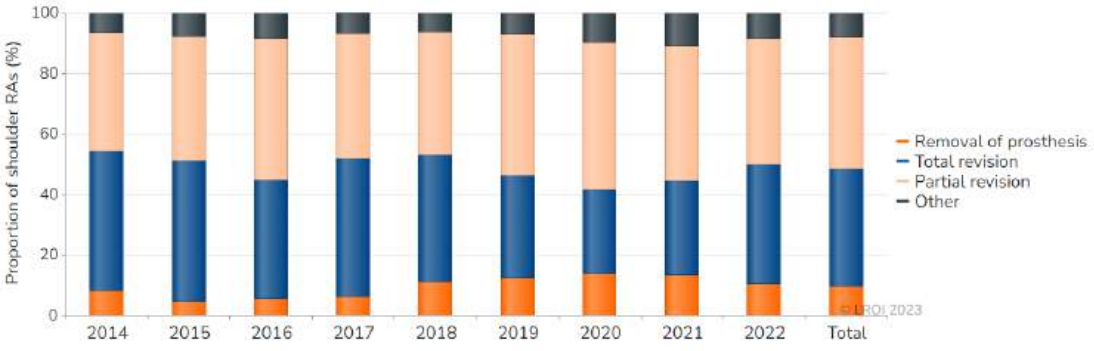
Year	2018	2019	2020	2021	2022
Bone cement pre-packed in a vacuum mixing system (n)	**41**	**46**	**30**	**52**	**34**
Cement name; Proportion (%)					
Refobacin Bone Cement R	48.8	52.2	33.3	38.5	50.0
Refobacin Plus Bone Cement	26.8	13.0	40.0	15.4	29.4
Palacos R+G	24.4	34.8	26.7	46.2	20.6

Year	2018	2019	2020	2021	2022
Separately packed bone cement components (n)	**48**	**34**	**29**	**12**	**30**
Cement name; Proportion (%)					
Palacos R+G	66.7	47.1	65.5	83.3	56.7
Simplex ABC EC	4.2	8.8	6.9	0.0	16.7
Refobacin Bone Cement R	10.4	5.9	6.9	0.0	10.0

Shoulder revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in shoulder revision arthroplasties in the Netherlands in 2014-2022



Type of shoulder revision (%)										
Removal of prosthesis	8.33	4.62	5.70	6.33	11.21	12.36	13.77	13.46	10.71	**9.87**
Total revision	46.08	46.54	39.16	45.78	42.06	33.91	27.87	31.19	39.29	**38.65**
Partial revision	39.22	41.15	46.77	41.27	40.50	46.55	48.85	44.65	41.37	**43.51**
Other	6.37	7.69	8.37	6.63	6.23	7.18	9.51	10.70	8.63	**7.97**
Total (n):	**204**	**260**	**263**	**332**	**321**	**348**	**305**	**327**	**336**	**2,696**

RA: revision arthroplasty

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a shoulder revision arthroplasty in the Netherlands in 2014-2022

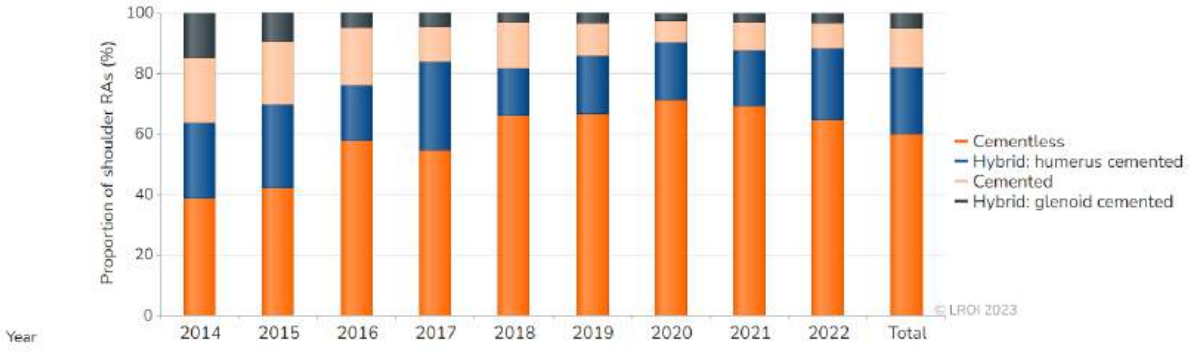
Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Shoulder revision (n)	208	272	274	346	334	353	309	328	339	2,763
Reasons for revision; Proportion[1] (%)										
Infection	19.2	16.5	22.3	21.4	24.9	28.1	28.8	32.3	30.4	25.3
Instability	12.5	15.4	23.4	26.3	22.2	22.7	24.0	19.8	20.4	21.1
Progression of osteoarthritis	24.0	24.6	16.8	16.8	15.0	12.2	10.4	11.3	11.2	15.2
Loosening of glenoid component	12.5	13.2	10.6	13.0	11.1	11.3	10.4	14.3	18.6	12.9
Cuff rupture	13.9	15.1	11.0	14.5	12.0	11.3	10.0	11.0	10.9	12.1
Cuff arthropathy	12.5	13.2	13.5	11.9	9.6	11.6	9.7	7.6	4.4	10.2
Malalignment	12.0	12.9	8.4	8.3	6.0	6.2	9.4	5.8	9.7	8.5
Loosening of humeral component	7.8	7.7	11.0	4.6	7.2	5.4	8.7	7.9	8.9	7.6
Peri-prosthetic fracture	2.3	5.6	5.1	4.6	6.6	6.2	5.8	8.8	8.0	6.2
Revision after shoulder removal[2]									3.0	
Other	10.6	11.8	12.0	9.3	12.6	11.9	17.5	12.8	11.2	12.2

[1] One patient may have more than one reason for revision. As such, the total proportion is over 100%.
[2] Please note: Removal after shoulder revision was not registered before 2022.

Surgical techniques

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in shoulder revision arthroplasties in the Netherlands in 2014-2022

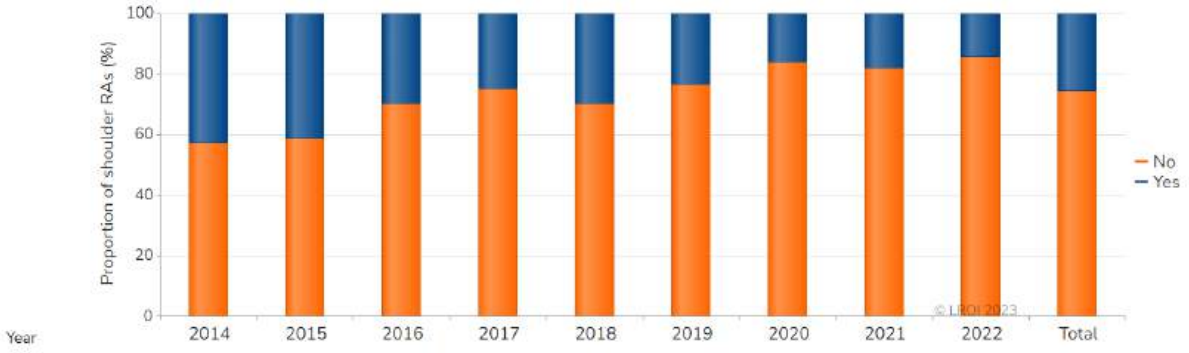


Fixation (%)	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Cementless	38.98	42.28	57.96	54.55	66.28	66.89	71.32	69.31	64.63	**60.14**
Hybrid: humerus cemented	24.86	27.64	18.37	29.55	15.33	19.21	18.99	18.41	23.81	**21.79**
Cemented	21.47	20.73	18.78	11.36	15.33	10.60	7.36	9.39	8.16	**13.13**
Hybrid: glenoid cemented	14.69	9.35	4.90	4.55	3.07	3.31	2.33	2.89	3.40	**4.94**
Total (n):	**177**	**246**	**245**	**308**	**261**	**302**	**258**	**277**	**294**	**2,368**

RA: revision arthroplasty.

Conversion to TSA

FIGURE Trend (proportion [%] per year) in conversion of a shoulder hemiprosthesis to a total (anatomical or reverse) shoulder arthroplasty in the Netherlands in 2014-2022

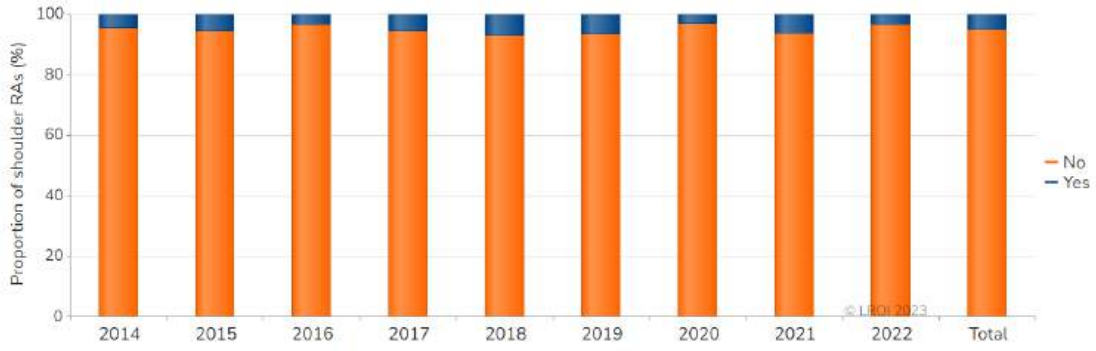


Conversion to TSA (%)	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
No	57.14	58.68	70.24	75.23	70.13	76.67	83.89	81.99	85.71	**74.66**
Yes	42.86	41.32	29.76	24.77	29.87	23.33	16.11	18.01	14.29	**25.34**
Total (n):	**182**	**242**	**252**	**323**	**298**	**330**	**298**	**311**	**329**	**2,565**

RA: revision arthroplasty; TSA: total shoulder arthroplasty.

Conversion to hemi

FIGURE Trend (proportion [%] per year) in conversion of a total (anatomical or reverse) shoulder arthroplasty to a shoulder hemiprosthesis in the Netherlands in 2014-2022

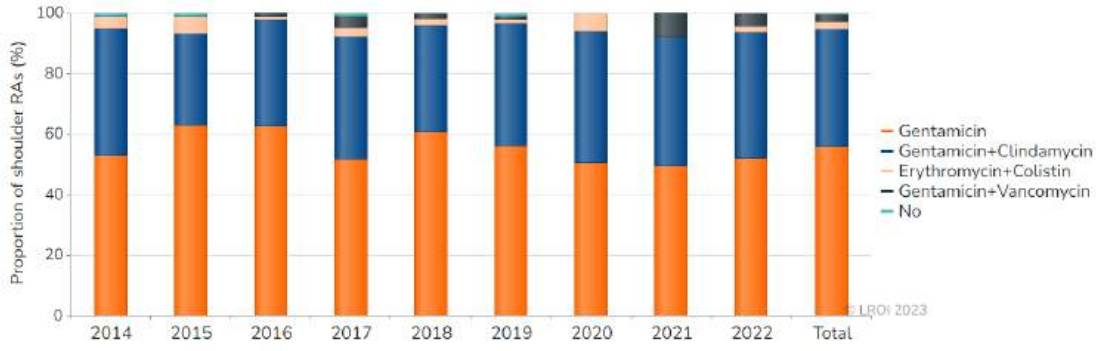


Conversion to hemi (%)	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
No	95.40	94.44	96.76	94.29	92.81	93.58	96.94	93.85	96.64	**94.92**
Yes	4.60	5.56	3.24	5.71	7.19	6.42	3.06	6.15	3.36	**5.08**
Total (n):	**174**	**234**	**247**	**315**	**292**	**327**	**294**	**309**	**327**	**2,519**

RA: revision arthroplasty

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in shoulder revision arthroplasties in the Netherlands in 2014-2022



Bone cement antibiotics (%)	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gentamicin	52.94	62.93	62.63	51.92	60.58	56.18	50.75	49.43	52.08	**55.90**
Gentamicin+Clindamycin	42.16	30.17	35.35	40.38	35.58	40.45	43.28	42.53	41.67	**38.66**
Erythromycin+Colistin	3.92	6.03	1.01	2.88	1.92	1.12	5.97	0.00	2.08	**2.78**
Gentamicin+Vancomycin	0.00	0.00	1.01	3.85	1.92	1.12	0.00	8.05	4.17	**2.20**
No	0.98	0.86	0.00	0.96	0.00	1.12	0.00	0.00	0.00	**0.46**
Total (n):	**102**	**116**	**99**	**104**	**104**	**89**	**67**	**87**	**96**	**864**

RA: revision arthroplasty

Most frequently registered

Components

TABLE The most frequently registered humeral stems, humeral heads, humeral liners, glenoid baseplates, glenospheres and metaphyses in shoulder revision arthroplasties in the Netherlands in 2022

Year	2018	2019	2020	2021	2022
Humeral stem (n)	**151**	**139**	**105**	**128**	**145**
Name; Proportion (%)					
Delta X-tend	43.7	36.7	41.9	36.7	42.1
Aequalis Ascend Flex	3.3	7.9	8.6	7.0	13.8
Aequalis Ascend Flex Cemented	2.0	4.3	0.0	3.9	9.0
Global Unite	4.0	6.5	1.0	7.8	7.6
Aequalis Flex Revive	0.0	0.0	4.8	10.2	5.5

Year	2018	2019	2020	2021	2022
Humeral head (n)	**48**	**32**	**26**	**32**	**31**
Name; Proportion (%)					
Aequalis Ascend Flex	10.4	18.8	26.9	28.1	41.9
Global AP	25.0	21.9	15.4	15.6	19.4
Comprehensive	2.1	6.3	3.8	0.0	6.5
Global Unite/Global AP	6.3	12.5	7.7	6.3	6.5
SMR CTA head	0.0	6.3	0.0	3.1	6.5

Year	2018	2019	2020	2021	2022
Humeral liner (n)	**181**	**219**	**189**	**198**	**221**
Name; Proportion (%)					
Delta X-tend	47.5	37.9	37.6	51.5	53.4
Aequalis Ascend Flex	7.7	14.6	12.7	16.7	20.4
Comprehensive	11.0	9.1	11.1	9.1	8.6
Aequalis Reversed II	8.8	9.1	5.8	5.1	4.1
Equinoxe	5.0	5.9	6.3	3.0	3.6

Year	2018	2019	2020	2021	2022
Glenoid baseplate (n)	**146**	**128**	**93**	**117**	**125**
Name; Proportion (%)					
Delta X-tend	50.7	47.7	43.0	45.3	52.0
Aequalis Reversed II	11.6	21.1	15.1	13.7	18.4
Perform Reversed	4.1	4.7	3.2	9.4	9.6
Comprehensive	9.6	9.4	15.1	12.0	8.8
Affinis Inverse	2.1	3.9	6.5	4.3	2.4

Year	2018	2019	2020	2021	2022
Glenosphere (n)	**191**	**218**	**141**	**165**	**175**
Name; Proportion (%)					
Delta X-tend	46.6	37.2	27.0	38.8	44.0
Aequalis Reversed II	15.2	18.3	17.0	13.3	18.9
Perform Reversed	2.6	9.2	6.4	10.3	13.1
Comprehensive	11.0	7.8	11.3	9.7	7.4
SMR reversed head	3.7	4.1	11.3	3.6	2.9

Year	2018	2019	2020	2021	2022
Metaphysis (n)	**112**	**128**	**100**	**121**	**130**
Name; Proportion (%)					
Aequalis Ascend Flex	13.4	20.3	16.0	26.4	30.8
Delta X-tend	25.0	21.9	17.0	24.0	26.9
Comprehensive	17.9	17.2	19.0	16.5	14.6
Aequalis Reversed II	10.7	13.3	7.0	4.1	3.8
Anatomical inverse Humeral Cups	8.9	10.2	10.0	5.0	3.8

Types of bone cement

TABLE The most frequently registered types of bone cement used during shoulder revision arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement (n)	**101**	**84**	**60**	**76**	**90**
Cement name; Proportion (%)					
Copal G+C	28.7	34.5	38.3	43.4	40.0
Palacos R+G	40.6	35.7	28.3	32.9	27.8
Refobacin Bone Cement R	14.9	14.3	11.7	15.8	14.4
Refobacin Plus Bone Cement	3.0	3.6	1.7	0.0	5.6
Copal G+V	2.0	1.2	0.0	2.6	3.3

Survival overall

Revision within 1 and 3 years

By type of shoulder arthroplasty

TABLE Cumulative 1-year and 3-year revision percentage of primary shoulder arthroplasties by type of shoulder arthroplasty in the Netherlands in 2017-2021 (n=15,178)

		Kaplan Meier (95% CI)	
Type of primary shoulder arthroplasty	Number (n)	1yr	3yr
Reverse	11,131	2.5 (2.2-2.7)	4.0 (3.6-4.4)
Total anatomical	2,839	1.2 (0.8-1.6)	3.9 (3.2-4.7)
Hemi	1,208	2.2 (1.3-3.0)	6.6 (5.1-8.1)

Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.
CI: confidence interval

In 2017-2021, 359 (2.3%) primary shoulder arthroplasties were implanted in patients who died within one year and 789 (5.2%) primary shoulder arthroplasties were implanted in patients who died within three years after the primary procedure.

By type of revision within 1 year

TABLE Cumulative 1-year revision percentage of primary total (reverse and anatomical) shoulder arthroplasties by type of revision in the Netherlands in 2017-2021

	Cumulative 1-year revision percentage - Kaplan Meier (95% CI)	
	Reverse (n=11,131)	Anatomical (n=2,839)
Any type of revision[1]	2.5 (2.2-2.7)	1.2 (0.8-1.6)
Major revision[2]	1.1 (0.9-1.3)	1.0 (0.6-1.3)
Only humeral stem	0.2 (0.1-0.3)	0.2 (0.0-0.4)
Only glenoid baseplate (reverse) or glenoid (anatomical)	0.4 (0.3-0.5)	0.4 (0.1-0.6)
Humeral stem and glenoid baseplate (reverse) or glenoid (anatomical)	0.4 (0.3-0.5)	0.3 (0.1-0.5)
Minor revision[3]	1.4 (1.1-1.6)	0.2 (0.0-0.3)
DAIR	0.4 (0.3-0.5)	0.0 (0.0-0.0)
No DAIR	1.0 (0.8-1.2)	0.2 (0.0-0.3)

[1] Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
[2] Revision of at least the humeral stem or glenoid baseplate (reverse)/ glenoid (anatomical) component.
[3] Only liner and/or metaphysis exchange (including DAIR procedures).
Reverse: reverse total shoulder arthroplasty; Anatomical: total anatomical shoulder arthroplasty; CI: confidence interval.

In 2017-2021, 216 (1.9%) primary reverse total shoulder arthroplasties and 20 (0.7%) primary total anatomical shoulder arthroplasties were implanted in patients who died within one year after the primary procedure.

Time after primary reverse TSA

TABLE Time after primary reverse total shoulder arthroplasty until short-term revision in the Netherlands in 2017-2021 (n=11,131)

Time after primary reverse TSA	Percentage revisions (%)
Day 0-29	0.6
Day 30-182	1.4
Day 183-364	0.6
Day 365-730 (second year)	0.8
Day 731-1095 (third year)	0.3

TSA: total shoulder arthroplasty

Time after primary anatomical TSA

TABLE Time after primary anatomical total shoulder arthroplasty until short-term revision in the Netherlands in 2017-2021 (n=2,839)

Time after primary anatomical TSA	Percentage revisions (%)
Day 0-29	0.1
Day 30-182	0.5
Day 183-364	0.7
Day 365-730 (second year)	1.7
Day 731-1095 (third year)	0.5

TSA: total shoulder arthroplasty

Time after primary hemi

TABLE Time after primary shoulder hemiarthroplasty until short-term revision in the Netherlands in 2017-2021 (n=1,208)

Time after primary hemi	Percentage revisions (%)
Day 0-29	0.4
Day 30-182	0.6
Day 183-364	1.6
Day 365-730 (second year)	2.6
Day 731-1095 (third year)	1.0

Reasons for revision by type of shoulder

TABLE Reasons for revision within one year in patients that underwent a shoulder revision arthroplasty by type of shoulder arthroplasty in the Netherlands in 2017-2021

	Type of shoulder arthroplasty		
	Reverse (n=287)	Total anatomical (n=39)	Hemi (n=31)
Reason for revision	Proportion[1] (%)	Proportion[1] (%)	Proportion[1] (%)
Instability	45.6	30.8	25.8
Infection	29.6	0.0	9.7
Cuff rupture	n.a.	38.5	32.3
Malalignment	4.5	12.8	16.1
Cuff arthroplasty	n.a.	7.7	25.8
Loosening of glenoid component	10.5	10.3	0.0
Loosening of humeral component	2.8	2.6	6.5
Peri-prosthetic fracture	8.0	7.7	0.0
Progression of osteoarthritis	1.7	2.6	16.1
Other	10.8	15.4	22.6

Please note: After a reverse total shoulder arthroplasty, the rotater cuff is no longer present.
Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.
[1]One patient may have more than one reason of revision.

Revision within 7 years

Overall

FIGURE Cumulative revision percentage of primary shoulder arthroplasties in the Netherlands in 2014-2022 (n=26,112)

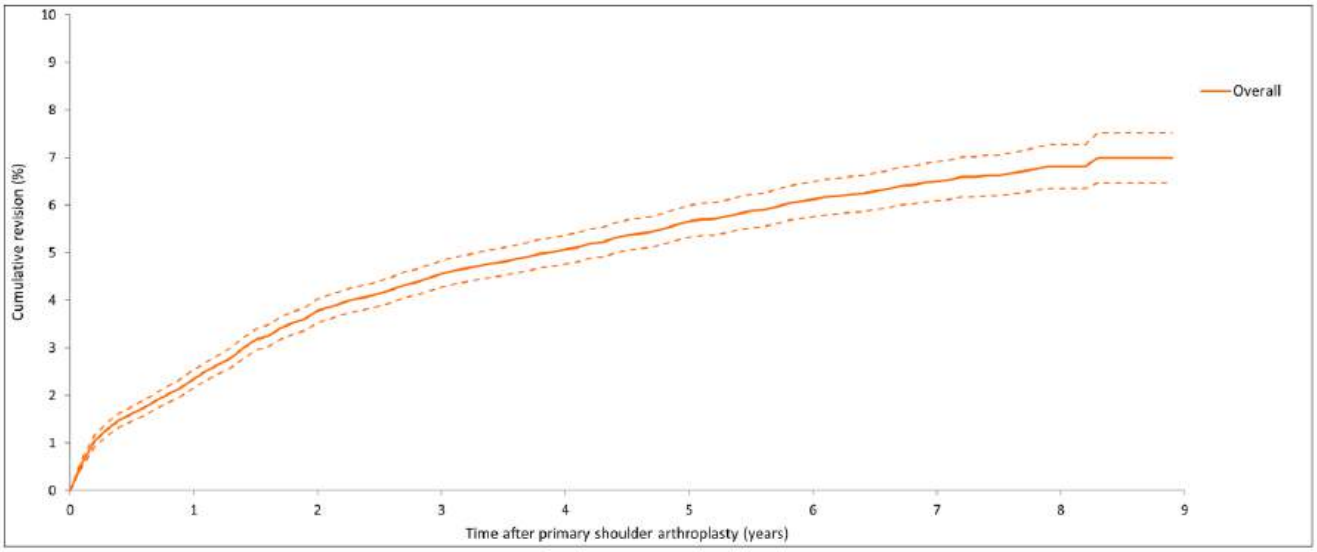


TABLE Cumulative revision percentages

	Number (n)	Number at risk (n)	Competing Risk (95% CI)	Kaplan Meier[1] (95% CI)
Primary shoulder arthroplasty	26,112			
1-year revision (%)		21,746	2.3 (2.1-2.5)	2.2 (2.0-2.4)
3-year revision (%)		14,823	4.4 (4.1-4.7)	4.5 (4.2-4.7)
5-year revision (%)		8,394	5.4 (5.1-5.7)	5.6 (5.3-5.9)
7-year revision (%)		3,446	6.1 (5.7-6.5)	6.5 (6.1-6.9)

[1] The cumulative revision percentage using the Kaplan Meier method is shown in the figure.
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

In 2014-2022, 2,674 (10.2%) primary shoulder arthroplasties were implanted in patients who died within seven years after the primary procedure.

By type of shoulder arthroplasty

FIGURE Cumulative revision percentage of primary shoulder arthroplasties by type of shoulder arthroplasty in the Netherlands in 2014-2022 (n=26,016)

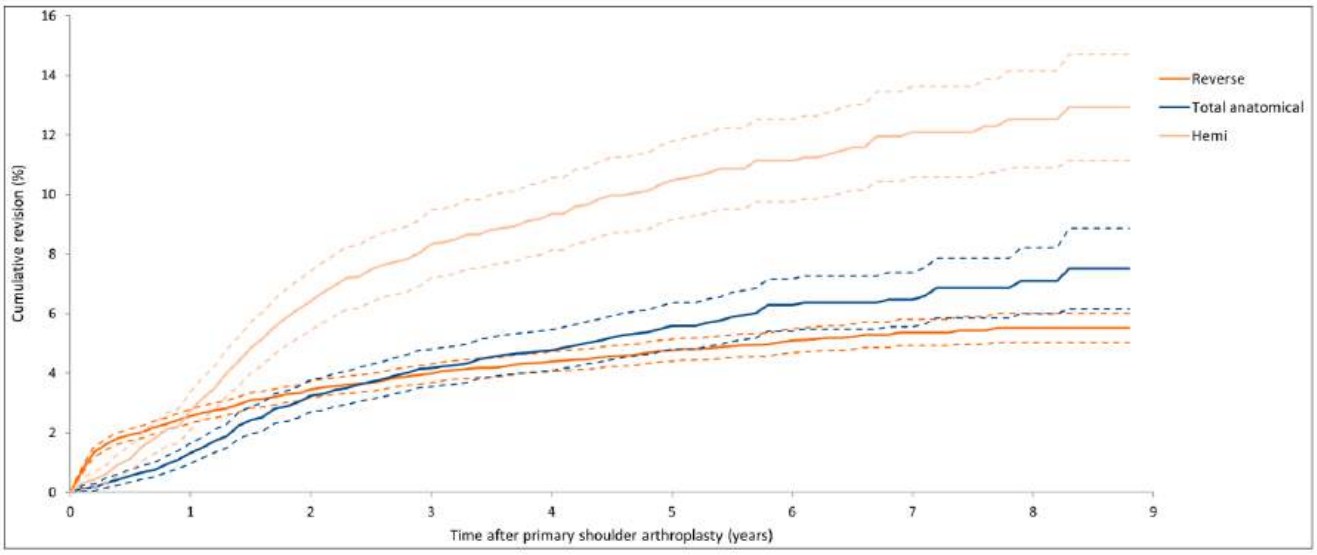


TABLE Cumulative revision percentages

Type of primary shoulder arthroplasty	Number (n)	Cumulative revision percentages - Kaplan Meier (95% CI) 1yr	3yr	5yr	7yr
Reverse	18,534	2.4 (2.2-2.7)	3.9 (3.6-4.2)	4.7 (4.4-5.1)	5.4 (4.9-5.8)
Total anatomical	4,855	1.1 (0.8-1.4)	4.1 (3.5-4.8)	5.5 (4.7-6.2)	6.5 (5.6-7.4)
Hemi	2,627	2.2 (1.7-2.8)	8.0 (6.9-9.1)	10.3 (9.0-11.6)	12.0 (10.5-13.4)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty. CI: confidence interval

By procedure year

FIGURE Cumulative revision percentage of total (anatomical or reverse) shoulder arthroplasties by procedure year of primary shoulder arthroplasty in the Netherlands in 2015-2022 (n=15,271)

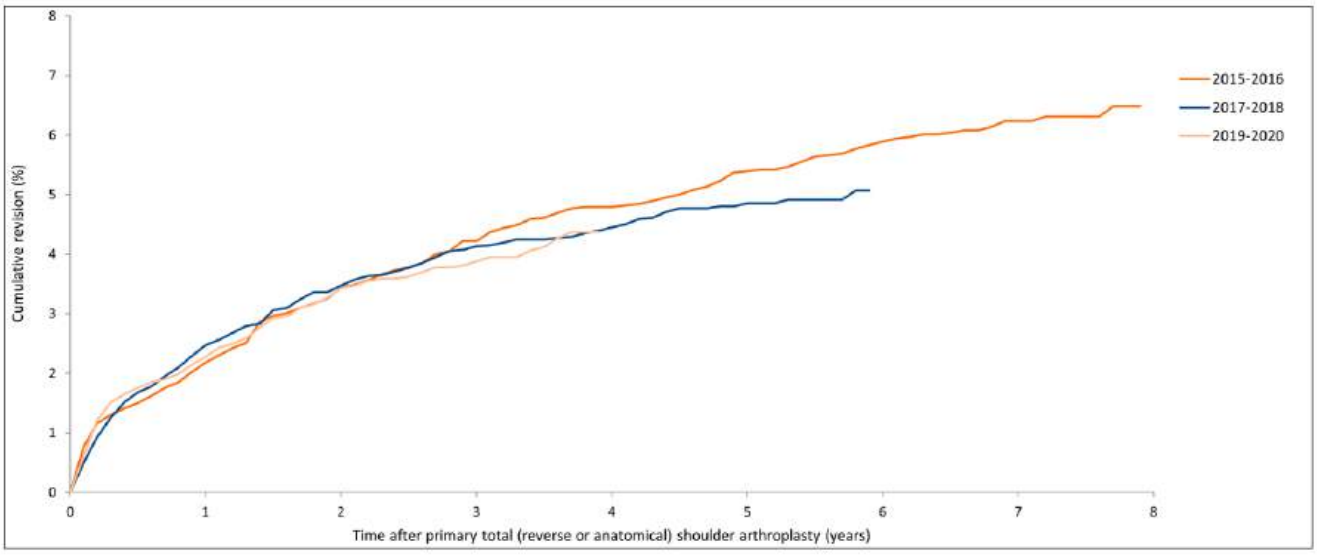


TABLE Cumulative revision percentages

Cumulative revision percentages - Kaplan Meier (95% CI)

Procedure year primary shoulder	Number (n)	1yr	3yr	5yr	7yr
2015-2016	4,330	2.02 (1.60-2.44)	4.22 (3.61-4.83)	5.37 (4.69-6.05)	6.23 (5.48-6.98)
2017-2018	5,302	2.29 (1.89-2.69)	4.07 (3.53-4.61)	4.80 (4.21-5.39)	n.a.
2019-2020	5,639	2.14 (1.76-2.52)	3.81 (3.30-4.32)	n.a.	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk.
CI: confidence interval

Survival reverse total shoulder arthroplasty

Revision by patient characteristics

Reverse TSA by gender

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by gender in the Netherlands in 2014-2022 (n=18,520)

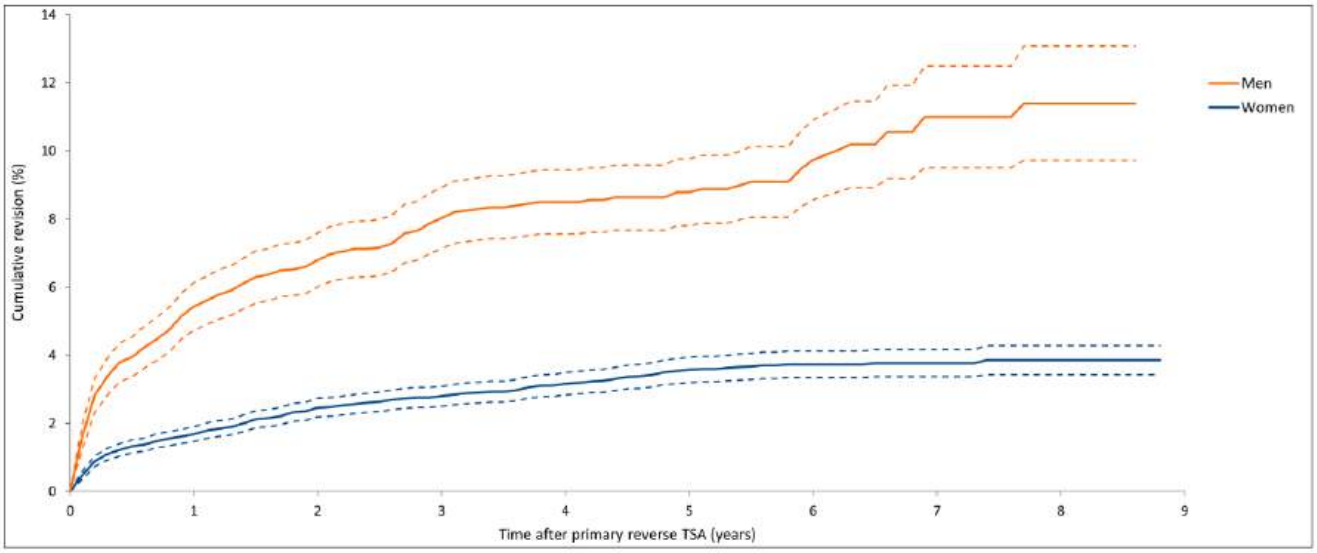


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Gender						
Men	4,352	5.2 (4.5-5.8)	7.9 (7.0-8.7)	8.8 (7.8-9.8)	11.0 (9.5-12.5)	11.4 (9.7-13.1)
Women	14,168	1.6 (1.4-1.8)	2.8 (2.5-3.1)	3.5 (3.2-3.9)	3.8 (3.4-4.2)	3.9 (3.4-4.3)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

Reverse TSA by age category

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by age category in the Netherlands in 2014-2022 (n=18,519)

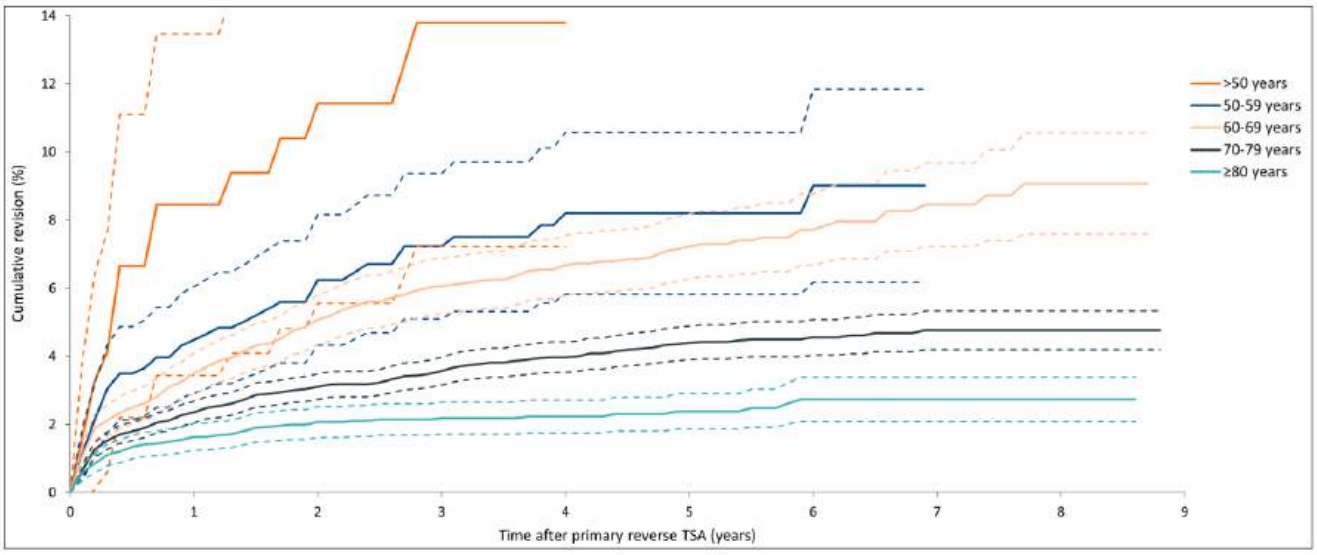


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Age (years)						
<50	124	8.5 (3.4-13.5)	13.8 (7.2-20.4)	n.a.	n.a.	n.a.
50-59	711	4.3 (2.8-5.8)	7.2 (5.1-9.4)	8.2 (5.8-10.6)	9 (6.2-11.9)	9.0 (6.2-11.9)
60-69	3,992	3.3 (2.7-3.8)	6.0 (5.2-6.8)	7.1 (6.2-8.1)	8.5 (7.2-9.7)	9.1 (7.6-10.6)
70-79	9,407	2.3 (2.0-2.6)	3.5 (3.1-3.9)	4.4 (3.9-4.8)	4.8 (4.2-5.3)	4.8 (4.2-5.3)
≥80	4,285	1.5 (1.2-1.9)	2.1 (1.7-2.6)	2.4 (1.9-2.9)	2.7 (2.1-3.4)	2.7 (2.1-3.4)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by diagnosis

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by diagnosis in the Netherlands in 2014-2022 (n=18,459)

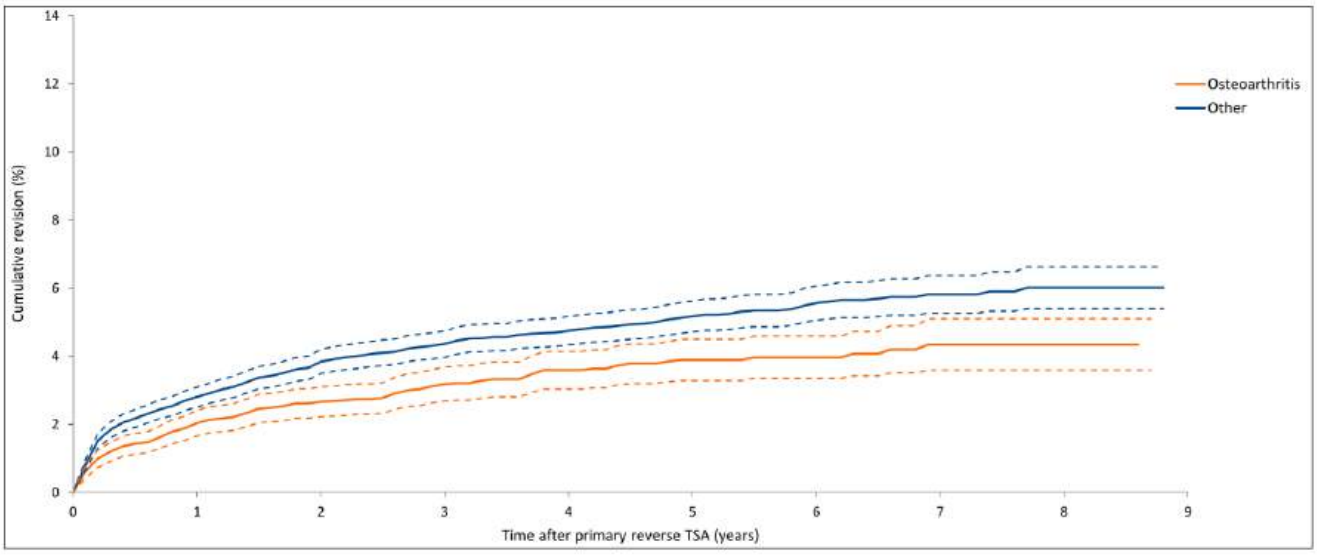


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Diagnosis						
Osteoarthritis	5,857	1.9 (1.5-2.2)	3.1 (2.6-3.6)	3.9 (3.3-4.5)	4.3 (3.6-5.1)	4.3 (3.6-5.1)
Other	12,602	2.7 (2.4-3.0)	4.3 (3.9-4.7)	5.1 (4.7-5.6)	5.8 (5.3-6.4)	6.0 (5.4-6.6)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

Reverse TSA by ASA score

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by ASA score in the Netherlands in 2014-2022 (n=18,359)

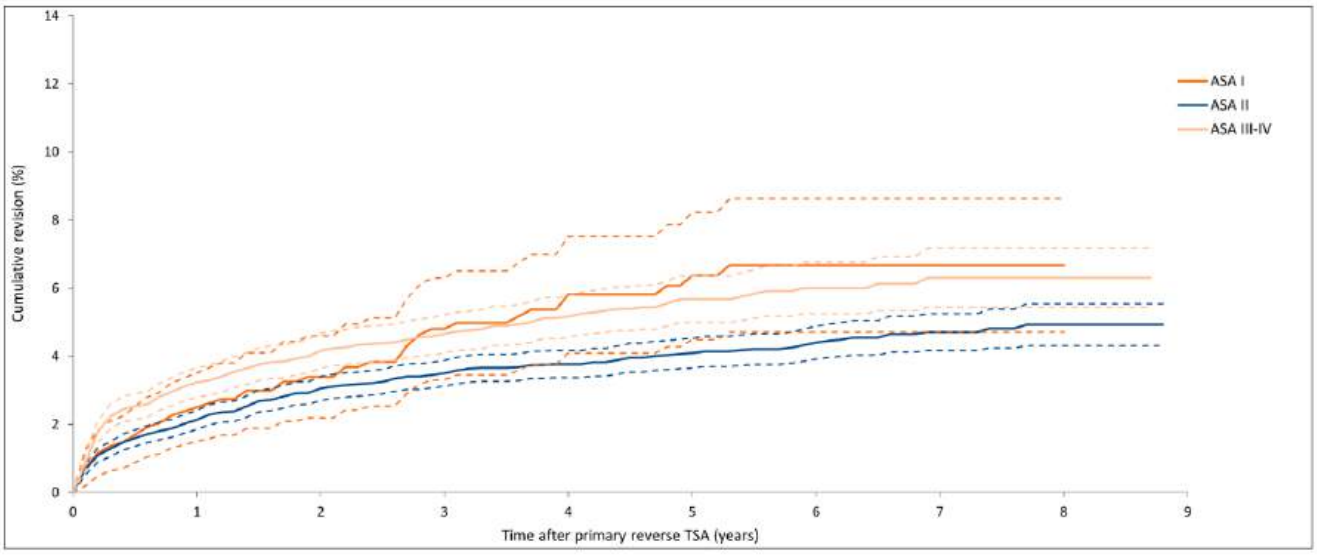


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
ASA score						
I	970	2.4 (1.4-3.4)	4.8 (3.3-6.3)	6.1 (4.3-7.9)	6.7 (4.7-8.6)	6.7 (4.7-8.6)
II	10,586	2.0 (1.7-2.3)	3.5 (3.1-3.8)	4.1 (3.6-4.5)	4.7 (4.2-5.3)	4.9 (4.3-5.5)
III-IV	6,803	3.1 (2.7-3.5)	4.6 (4.0-5.1)	5.7 (5.0-6.4)	6.3 (5.4-7.2)	6.3 (5.4-7.2)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

Reverse TSA by BMI category

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by BMI category in the Netherlands in 2014-2022 (n=18,222)

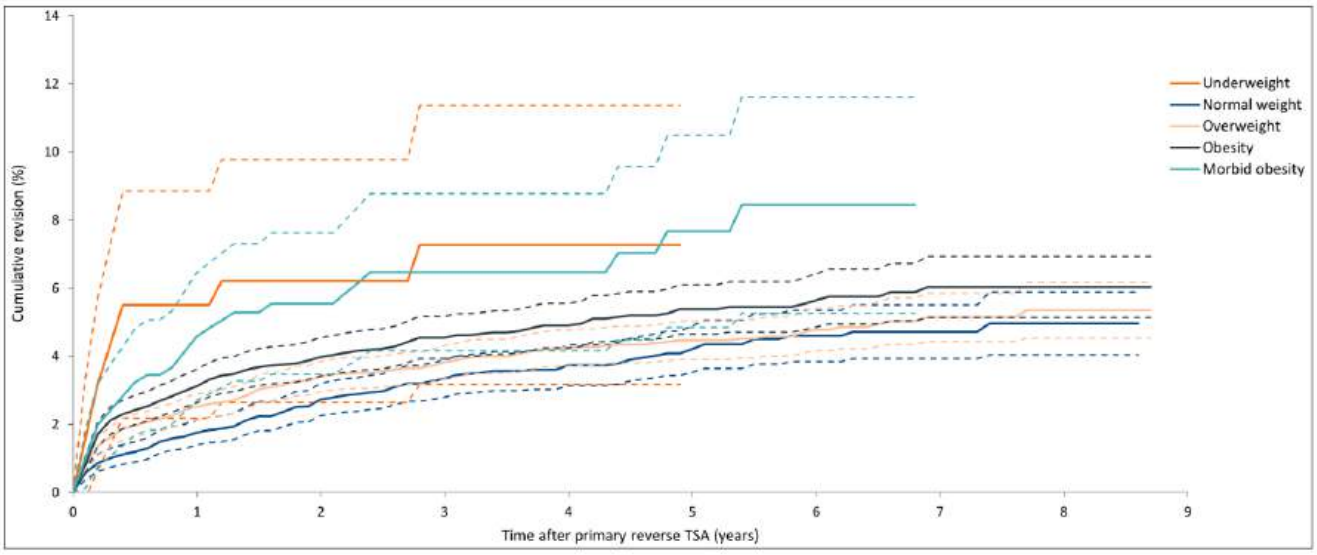


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Body Mass Index (kg/m²)						
Underweight (≤18.5)	193	5.5 (2.2-8.8)	7.3 (3.2-11.4)	7.3 (3.2-11.4)	n.a.	n.a.
Normal weight (>18.5-25)	5,282	1.6 (1.3-2.0)	3.3 (2.7-3.8)	4.1 (3.4-4.7)	4.7 (3.9-5.5)	5.0 (4.0-5.9)
Overweight (>25-30)	7,122	2.4 (2.1-2.8)	3.7 (3.2-4.2)	4.5 (3.9-5.0)	5.1 (4.4-5.9)	5.4 (4.5-6.2)
Obesity (>30-40)	5,112	3.0 (2.5-3.5)	4.6 (3.9-5.2)	5.4 (4.7-6.1)	6.0 (5.1-6.9)	6.0 (5.1-6.9)
Morbid obesity (>40)	513	4.1 (2.4-5.9)	6.5 (4.2-8.8)	7.7 (4.8-10.5)	n.a.	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by Walch score

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by walch score in the Netherlands in 2014-2022 (n=15,027)

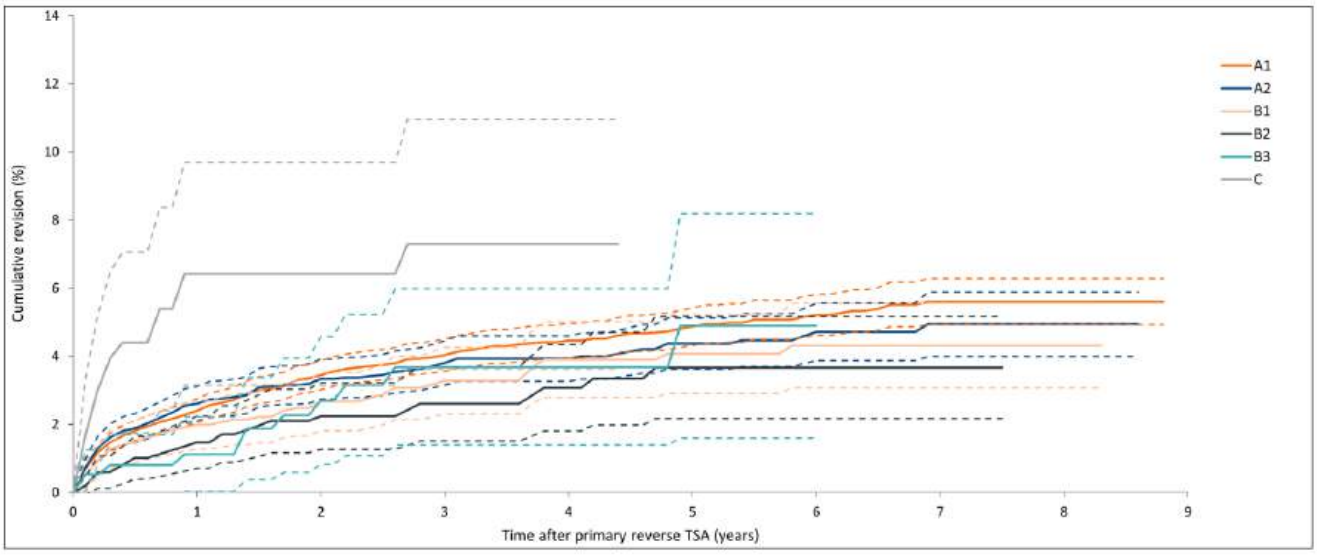


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Walch-score						
A1	7,826	2.3 (1.9-2.6)	4.0 (3.5-4.4)	4.8 (4.3-5.3)	5.6 (4.9-6.3)	5.6 (4.9-6.3)
A2	3,996	2.5 (2.0-3.0)	3.7 (3.1-4.3)	4.4 (3.6-5.1)	4.9 (4.0-5.9)	4.9 (4.0-5.9)
B1	1,534	1.9 (1.2-2.6)	3.2 (2.2-4.1)	4.1 (2.9-5.2)	4.3 (3.1-5.6)	4.3 (3.1-5.6)
B2	1,045	1.4 (0.6-2.1)	2.6 (1.5-3.7)	3.7 (2.2-5.2)	3.7 (2.2-5.2)	n.a.
B3	387	1.1 (0.0-2.2)	3.7 (1.4-6.0)	4.9 (1.6-8.2)	n.a.	n.a.
C	239	6.4 (3.1-9.7)	7.3 (3.6-11.0)	n.a.	n.a.	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by smoking

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by smoking in the Netherlands in 2014-2022 (n=18,196)

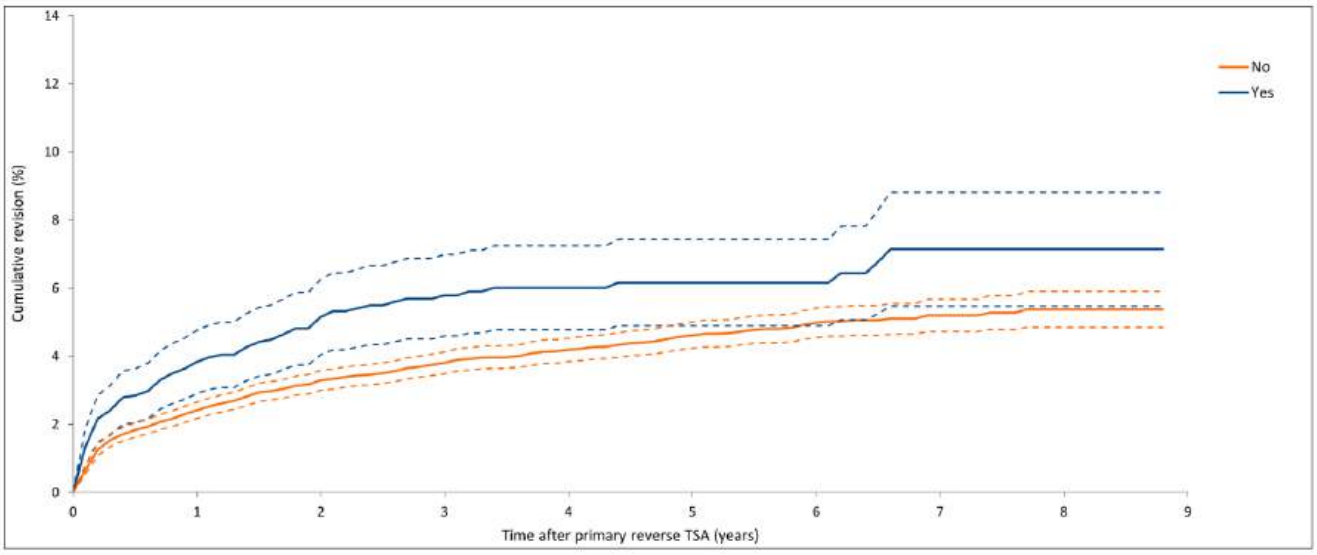


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Smoking						
No	16,464	2.3 (2.1-2.5)	3.8 (3.4-4.1)	4.6 (4.2-5)	5.2 (4.7-5.7)	5.4 (4.8-5.9)
Yes	1,732	3.6 (2.7-4.5)	5.7 (4.5-6.9)	6.2 (4.9-7.4)	7.1 (5.5-8.8)	7.1 (5.5-8.8)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

Revision by procedure characteristics

Reverse TSA by procedure year

FIGURE Cumulative revision percentage of primary reverse total shoulder arthroplasties by procedure year of primary arthroplasty in the Netherlands in 2014-2022 (n=15,679)

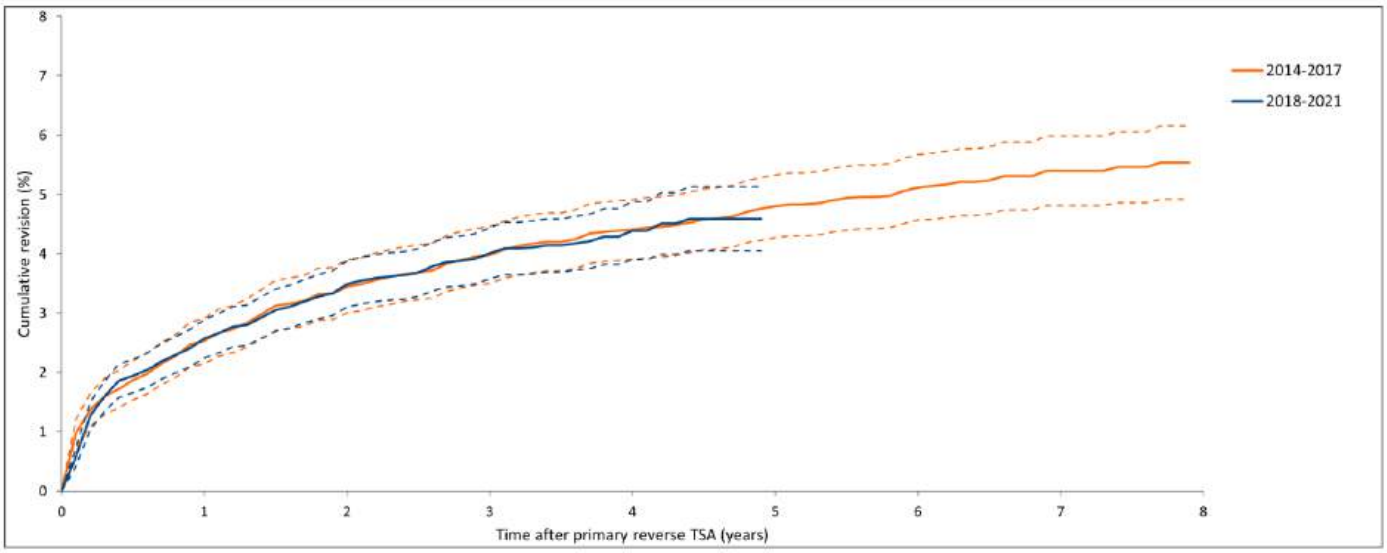


TABLE Cumulative revision percentages

Cumulative revision percentages - Kaplan Meier (95% CI)

Procedure year primary reverse TSA	Number (n)	1yr	3yr	5yr	7yr
2014-2017	6,532	2.53 (2.15-2.91)	3.95 (3.47-4.43)	4.76 (4.23-5.29)	5.40 (4.81-5.99)
2018-2021	9,147	2.57 (2.24-2.90)	3.92 (3.50-4.34)	4.59 (4.05-5.13)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk.
TSA: total shoulder arthroplasty; CI: confidence interval

Survival total anatomical shoulder arthroplasty

Revision by patient characteristics

Anatomical TSA by gender

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by gender in the Netherlands in 2014-2022 (n=4,853)

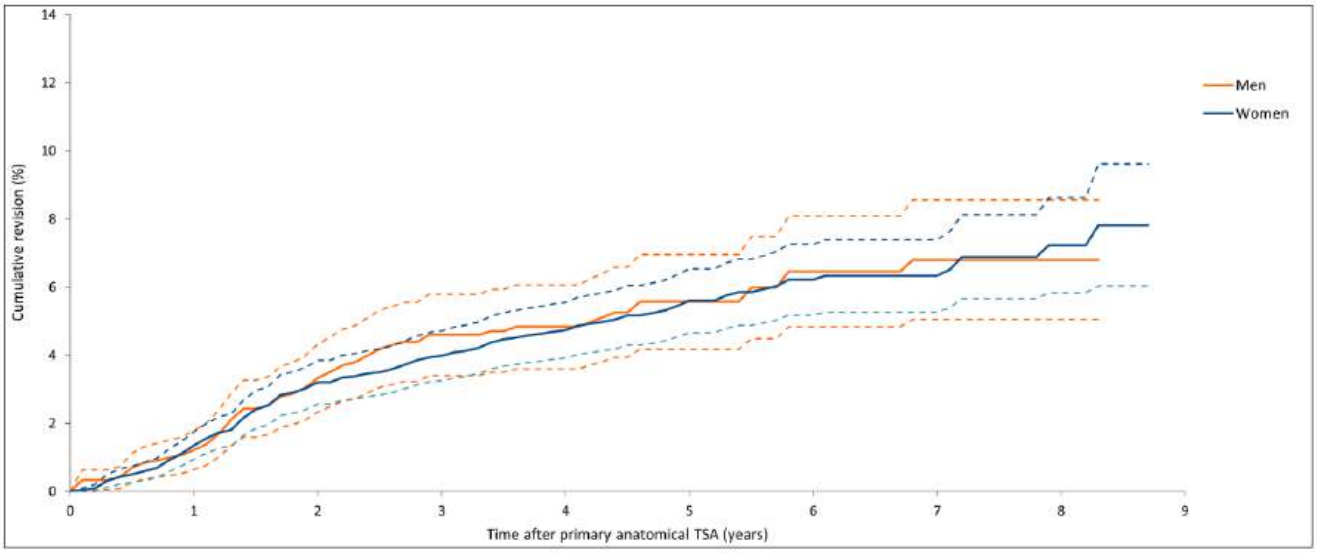


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Gender						
Men	1,506	1.1 (0.5-1.6)	4.6 (3.4-5.8)	5.6 (4.2-7.0)	6.8 (5.0-8.6)	6.8 (5.0-8.6)
Women	3,347	1.1 (0.7-1.5)	3.9 (3.2-4.7)	5.5 (4.5-6.4)	6.3 (5.3-7.4)	7.2 (5.8-8.6)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

Anatomical TSA by age category

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by age category in the Netherlands in 2014-2022 (n=4,853)

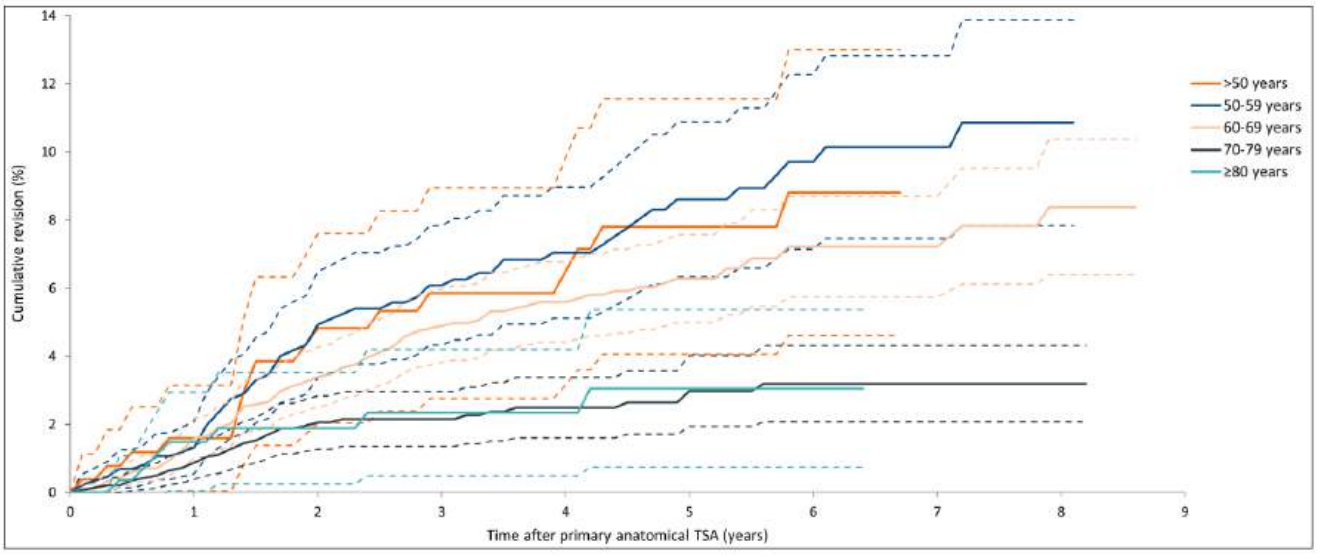


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Age (years)						
<50	262	1.6 (0.0-3.1)	5.9 (2.8-8.9)	7.8 (4.1-11.6)	n.a.	n.a.
50-59	896	1.2 (0.5-1.9)	6.1 (4.3-7.8)	8.6 (6.3-10.9)	10.1 (7.5-12.8)	10.9 (7.8-13.9)
60-69	1.928	1.2 (0.7-1.7)	4.8 (3.7-5.9)	6.3 (5.0-7.6)	7.2 (5.7-8.7)	8.4 (6.4-10.4)
70-79	1.487	0.7 (0.3-1.2)	2.2 (1.3-3.0)	2.6 (1.7-3.6)	3.2 (2.1-4.3)	3.2 (2.1-4.3)
≥80	280	1.5 (0.0-2.9)	2.3 (0.5-4.2)	3.1 (0.7-5.4)	3.1 (0.7-5.4)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by diagnosis

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by diagnosis in the Netherlands in 2014-2022 (n=4,830)

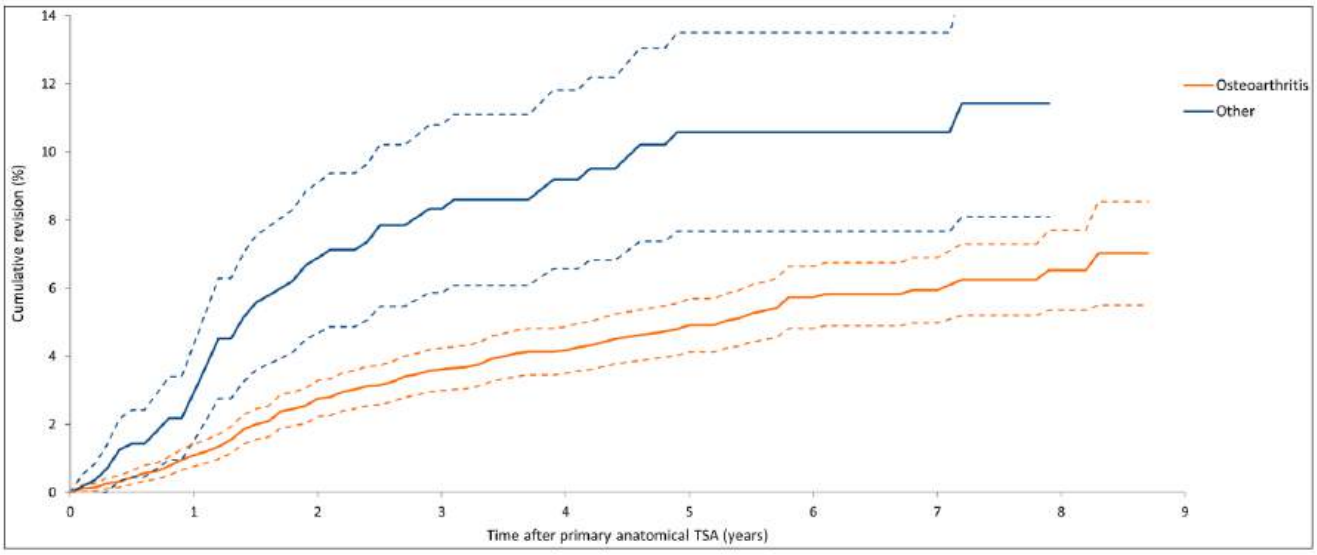


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Diagnosis						
Osteoarthritis	4,254	1.0 (0.7-1.3)	3.6 (2.9-4.2)	4.8 (4.0-5.6)	5.9 (5.0-6.9)	6.5 (5.3-7.7)
Other	576	2.2 (1.0-3.4)	8.3 (5.9-10.8)	10.6 (7.7-13.5)	10.6 (7.7-13.5)	11.4 (8.1-14.8)

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

Anatomical TSA by ASA score

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by ASA score in the Netherlands in 2014-2022 (n=4,813)

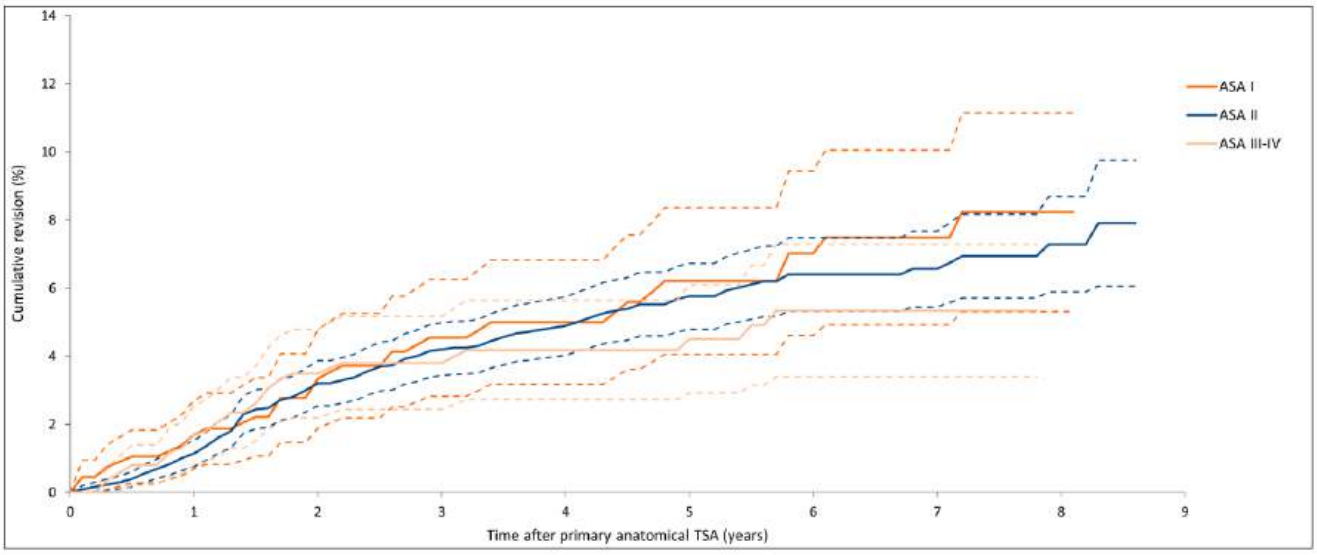


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
ASA score						
I	682	1.4 (0.5-2.3)	4.5 (2.8-6.3)	6.2 (4.1-8.4)	7.5 (4.9-10.1)	8.2 (5.3-11.2)
II	3,201	1.0 (0.6-1.4)	4.2 (3.4-4.9)	5.7 (4.7-6.6)	6.6 (5.4-7.7)	7.3 (5.9-8.7)
III-IV	930	1.3 (0.5-2.1)	3.8 (2.4-5.2)	4.2 (2.7-5.6)	5.3 (3.4-7.3)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by BMI category

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by BMI category in the Netherlands in 2014-2022 (n=4,765)

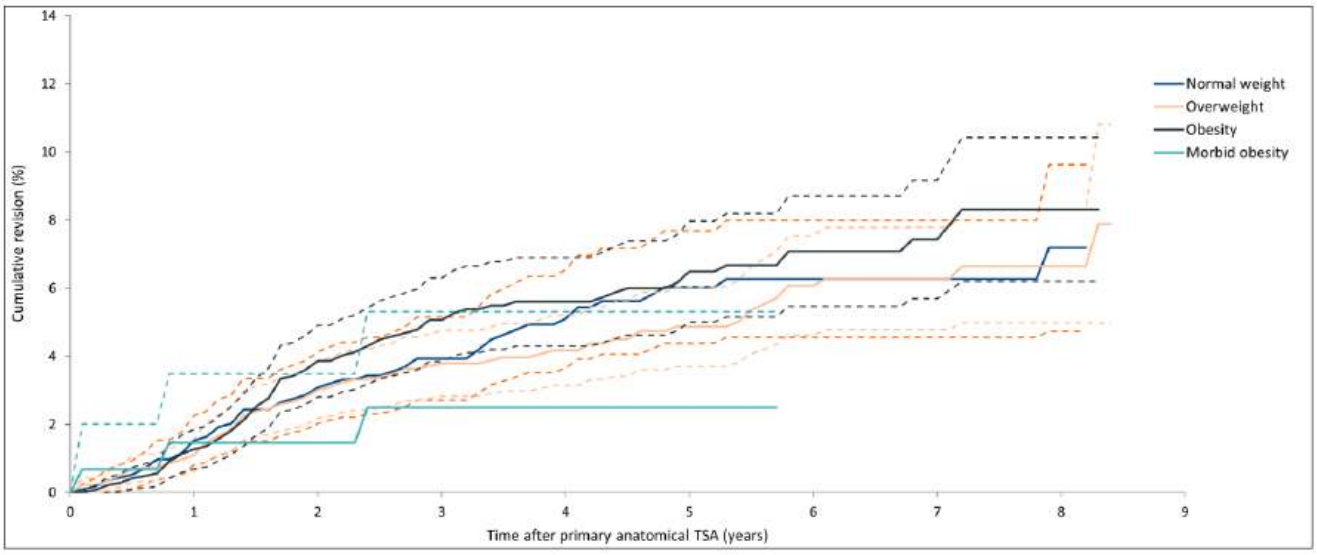


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Body Mass Index (kg/m²)						
Underweight (≤18.5)	29	n.a.	n.a.	n.a.	n.a.	n.a.
Normal weight (>18.5-25)	1,201	1.2 (0.5-1.8)	3.9 (2.7-5.1)	6.0 (4.4-7.7)	6.3 (4.6-8.0)	7.2 (4.7-9.6)
Overweight (>25-30)	1,863	1.0 (0.5-1.4)	3.7 (2.8-4.7)	4.9 (3.7-6.0)	6.3 (4.8-7.8)	6.6 (5.0-8.3)
Obesity (>30-40)	1,523	1.1 (0.6-1.7)	5.1 (3.8-6.3)	6.2 (4.7-7.6)	7.4 (5.7-9.2)	8.3 (6.2-10.4)
Morbid obesity (>40)	149	1.5 (0.0-3.5)	2.5 (0.0-5.3)	2.5 (0.0-5.3)	n.a.	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by Walch score

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by walch score in the Netherlands in 2014-2022 (n=4,594)

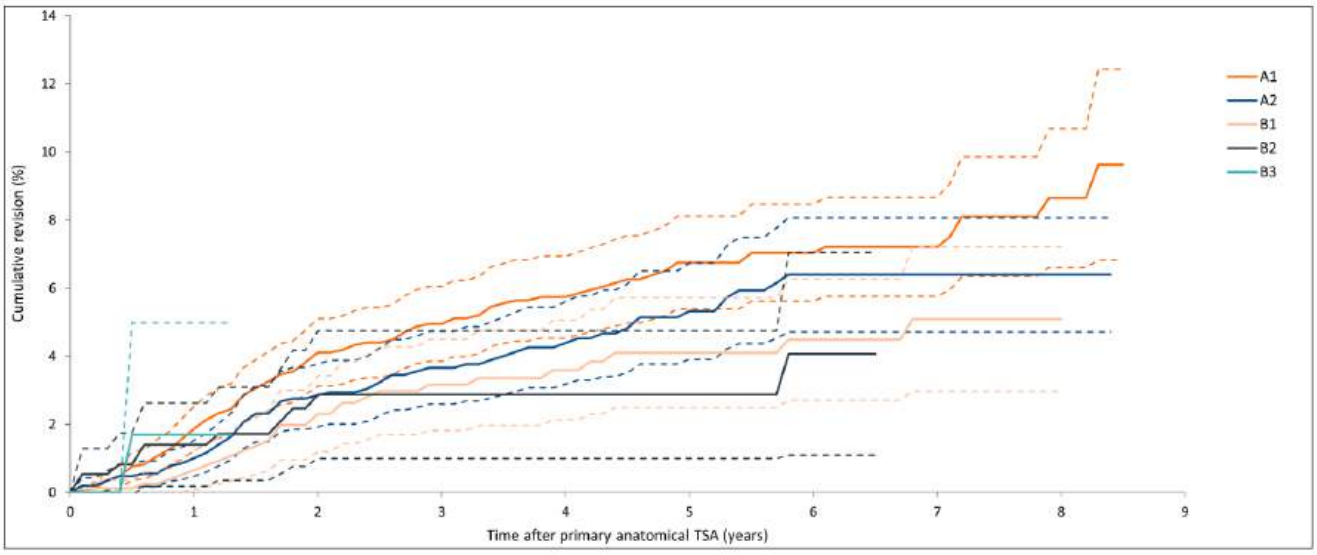


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Walch-score						
A1	1,769	1.6 (1.0-2.2)	5.0 (3.9-6.0)	6.8 (5.4-8.1)	7.2 (5.8-8.7)	8.6 (6.6-10.7)
A2	1,514	0.8 (0.4-1.3)	3.7 (2.6-4.7)	5.1 (3.8-6.5)	6.4 (4.7-8.1)	6.4 (4.7-8.1)
B1	839	0.5 (0.0-1.0)	3.2 (1.8-4.5)	4.1 (2.5-5.7)	5.1 (3.0-7.2)	5.1 (3.0-7.2)
B2	376	1.4 (0.2-2.6)	2.9 (1.0-4.7)	2.9 (1.0-4.7)	n.a.	n.a.
B3	65	1.7 (0.0-5.0)	n.a.	n.a.	n.a.	n.a.
C	31	n.a.	n.a.	n.a.	n.a.	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by smoking

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by smoking in the Netherlands in 2014-2022 (n=4,802)

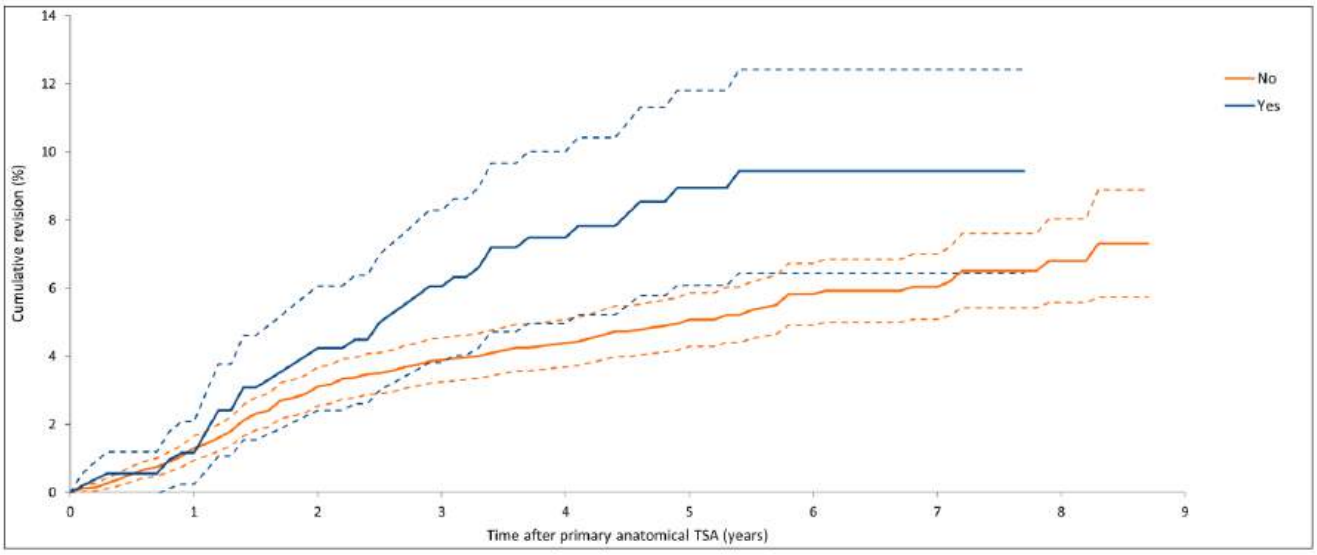


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Smoking						
No	4,252	1.1 (0.7-1.4)	3.9 (3.2-4.5)	5.0 (4.2-5.7)	6.0 (5.1-7.0)	6.8 (5.6-8.0)
Yes	550	1.2 (0.2-2.1)	6.1 (3.8-8.3)	9.0 (6.1-11.8)	9.4 (6.4-12.4)	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Revision by procedure characteristics

Anatomical TSA by procedure year

FIGURE Cumulative revision percentage of primary total anatomical shoulder arthroplasties by procedure year of primary arthroplasty in the Netherlands in 2014-2022 (n=4,255)

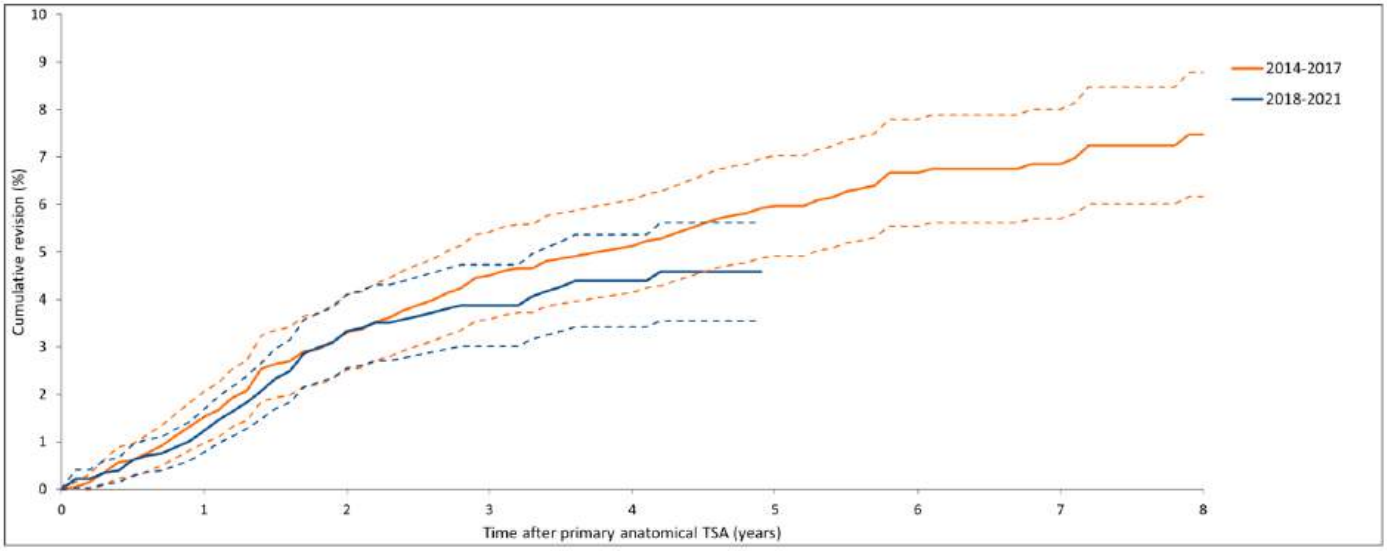


TABLE Cumulative revision percentages

Cumulative revision percentages - Kaplan Meier (95% CI)

Procedure year primary anatomical TSA	Number (n)	1yr	3yr	5yr	7yr
2014-2017	1,975	1.52 (0.98-2.06)	4.45 (3.54-5.36)	5.92 (4.87-6.97)	6.85 (5.70-8.00)
2018-2021	2,280	1.23 (0.78-1.68)	3.87 (3.01-4.73)	n.a.	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk.
CI: confidence interval

Survival hemi

Revision by procedure characteristics

Hemi by procedure year

FIGURE Cumulative revision percentage of primary hemi shoulder arthroplasties by procedure year of primary arthroplasty in the Netherlands in 2014-2022 (n=2,423)PROMs

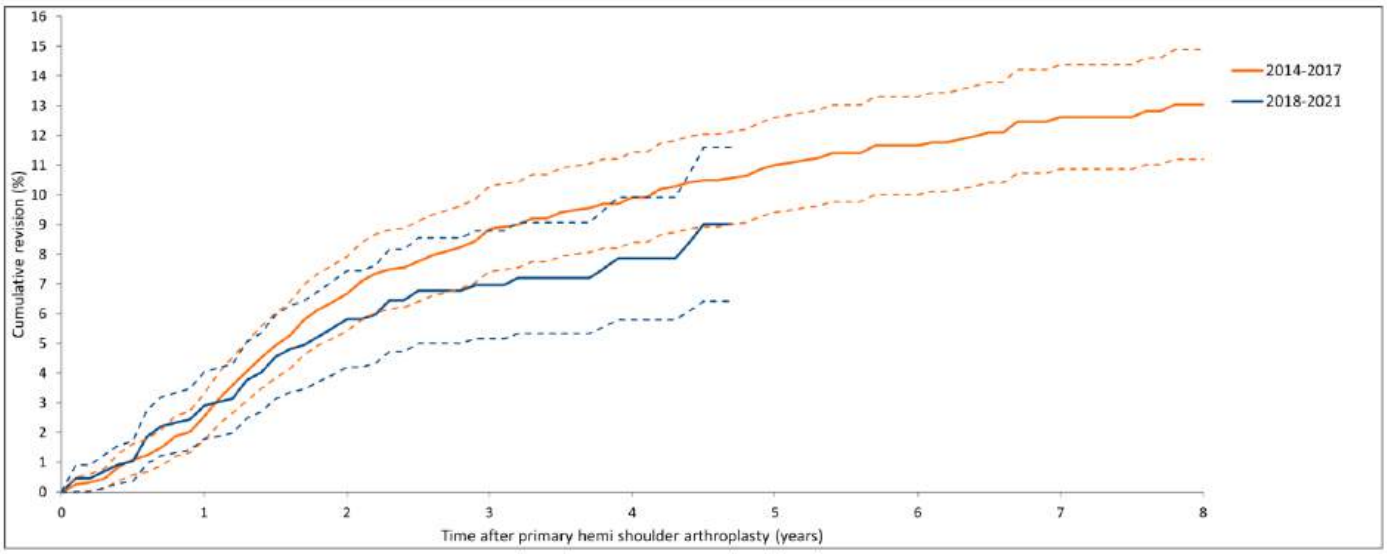


TABLE Cumulative revision percentages

Cumulative revision percentages - Kaplan Meier (95% CI)

Procedure year primary hemi arthroplasty	Number (n)	1yr	3yr	5yr	7yr
2014-2017	1,555	2.54 (1.75-3.33)	8.45 (7.04-9.86)	10.86 (9.27-12.45)	12.47 (10.73-14.21)
2018-2021	868	2.91 (1.78-4.04)	6.97 (5.16-8.78)	n.a.	n.a.

Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: n.a. if <50 cases were at risk.
CI: confidence interval

Response

Response

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty per pre-operative PROMs registering hospital (n=67) in the Netherlands in 2014-2022

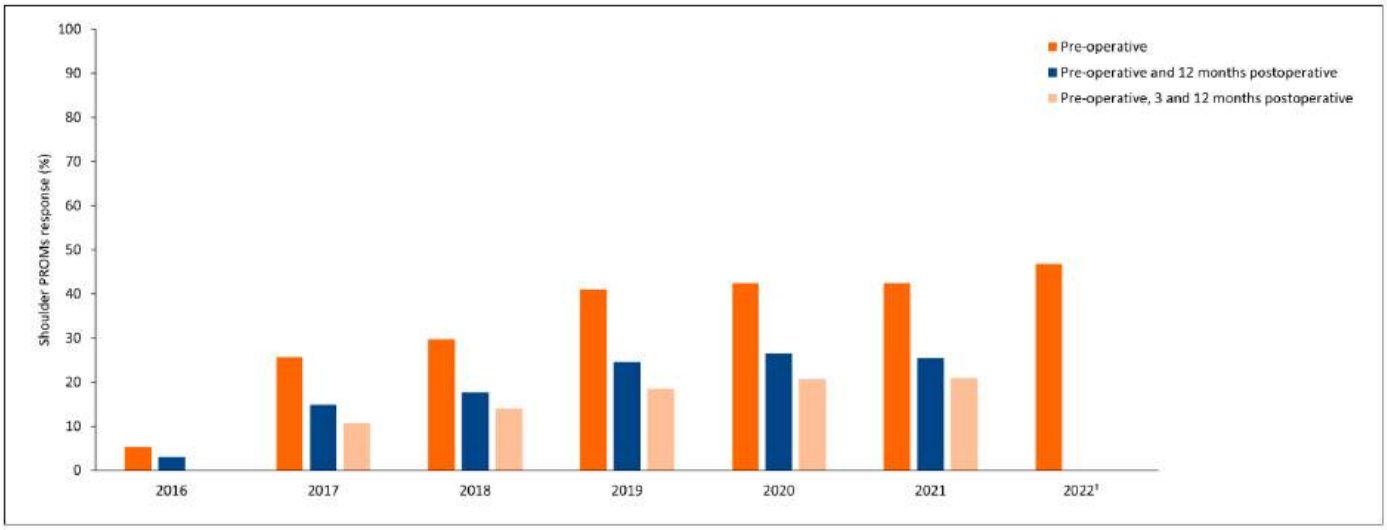


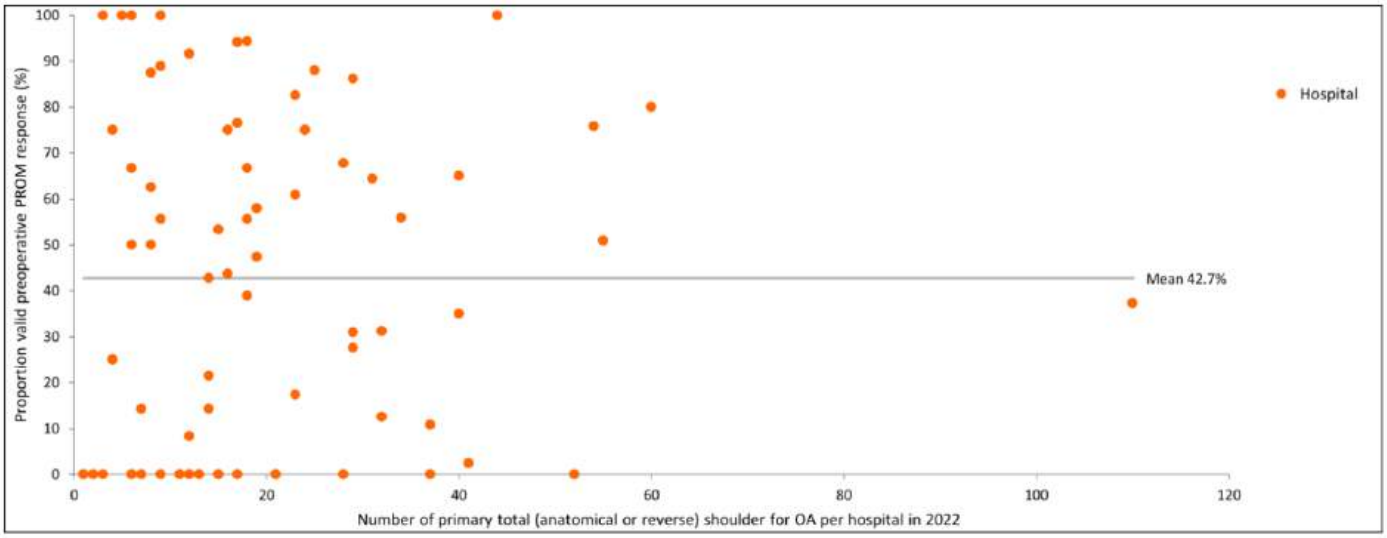
TABLE PROMs response percentages

Year	2016	2017	2018	2019	2020	2021	2022¹
Total (anatomical or reverse) shoulder arthroplasty (n)	1,813	2,030	2,275	2,488	2,137	2,496	2,804
PROMs response (%)							
Pre-operative	5.3	25.7	29.7	41.0	42.5	42.5	46.8
Pre-operative and 12 months postoperative	3.0	14.9	17.7	24.6	26.5	25.5	n.a.
Pre-operative, 3 and 12 months postoperative	1.9	10.7	14.0	18.5	20.6	20.9	n.a.

¹ The 12 months postoperative PROMs response percentage is not (yet) available for 2022.
PROM: patient reported outcome measure.

Response pre-PROM per hospital

FIGURE Scatterplot of pre-operative response percentage of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis per hospital (n=77) in the Netherlands in 2022



Please note: PROM: patient reported outcome measure; OA: osteoarthritis

The mean pre-operative response rate is 42.7% in the Netherlands in 2022.
40 out of 77 (51.9%) hospitals scored above the national mean.

Mean scores (pre-operative, 3 months and 12 months)

NRS (rest)

FIGURE Mean pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2021

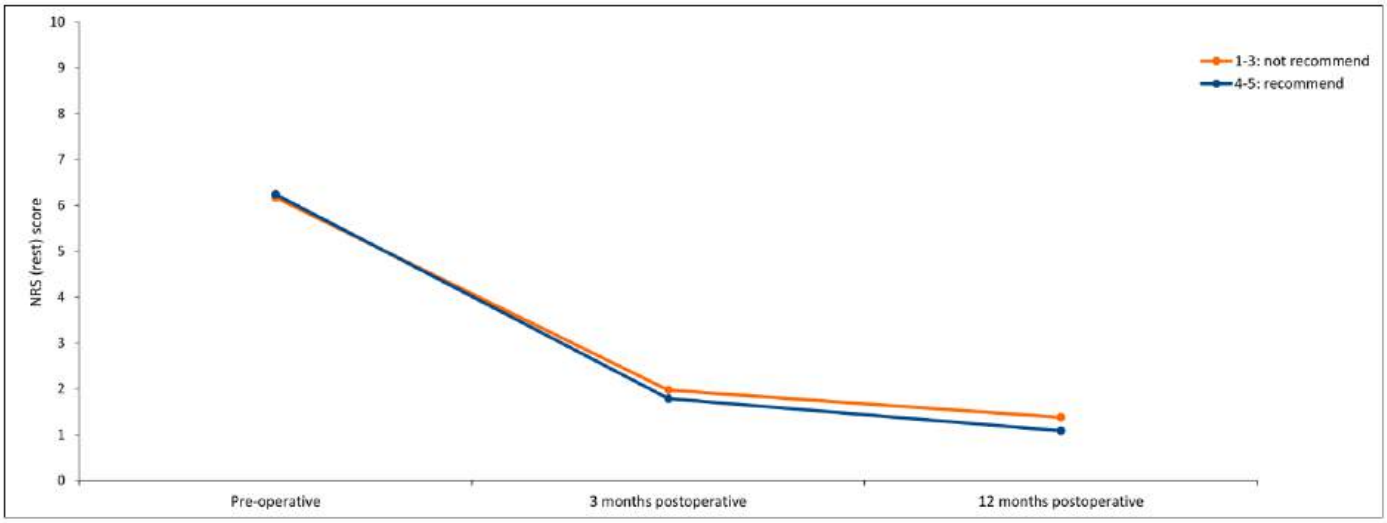


TABLE Mean NRS (rest) scores

NRS (rest) score	Pre-operative		3 months postoperative		12 months postoperative	
Recommendation score	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	727	6.17 (6.01-6.33)	726	1.97 (1.80-2.14)	735	1.38 (1.22-1.54)
4-5: recommend	260	6.24 (5.95-6.53)	260	1.78 (1.52-2.05)	261	1.08 (0.86-1.31)
Total	1045	6.17 (6.03-6.30)	1046	1.93 (1.80-2.07)	1050	1.31 (1.18-1.44)

The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.
CI: confidence interval.

The NRS (rest) score measures pain during rest. The score has a range of 0.0 to 10.0, with 0.0 representing no pain and 10.0 representing the most possible pain.

NRS (activity)

FIGURE Mean pre-operative, 3 months and 12 months postoperative NRS (activity) scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2021

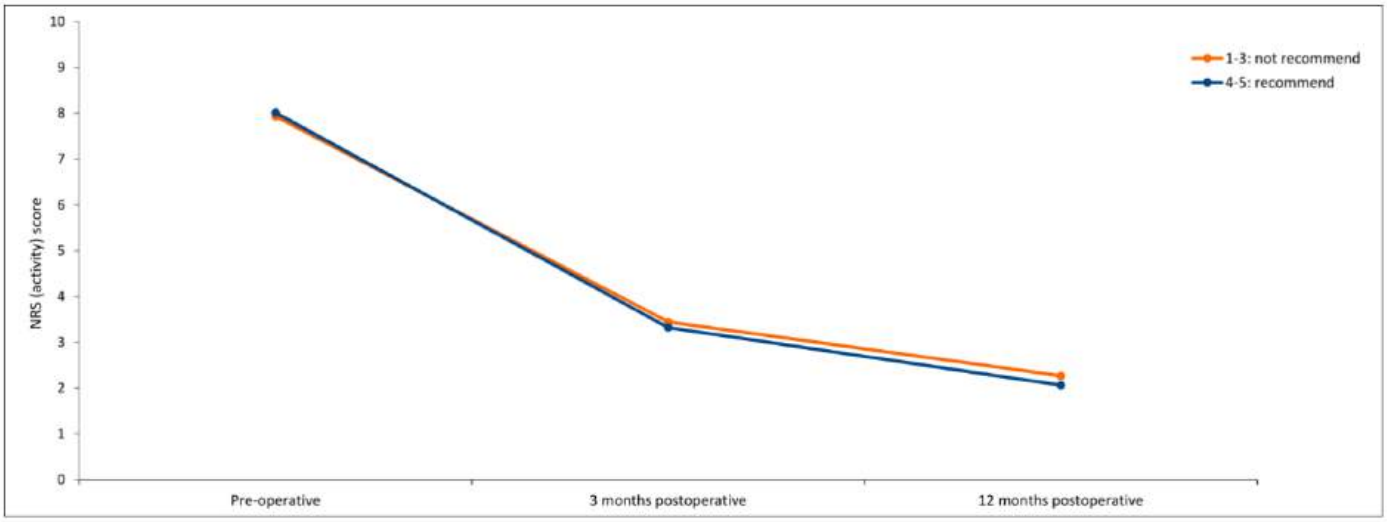


TABLE Mean NRS (activity) scores

NRS (activity) score	Pre-operative		3 months postoperative		12 months postoperative	
Recommendation score	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	727	7.93 (7.80-8.05)	726	3.44 (3.26-3.63)	735	2.27 (2.09-2.45)
4-5: recommend	261	8.01 (7.80-8.22)	259	3.32 (3.02-3.62)	259	2.06 (1.76-2.36)
Total	1046	7.92 (7.81-8.02)	1044	3.41 (3.26-3.57)	1048	2.21 (2.06-2.37)

The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.
CI: confidence interval.

The NRS (activity) score measures pain during activity. The score has a range of 0.0 to 10.0, with 0.0 representing no pain and 10.0 representing the most possible pain.

EQ5D index score

FIGURE Mean pre-operative, 3 months and 12 months postoperative EQ-5D index scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2021

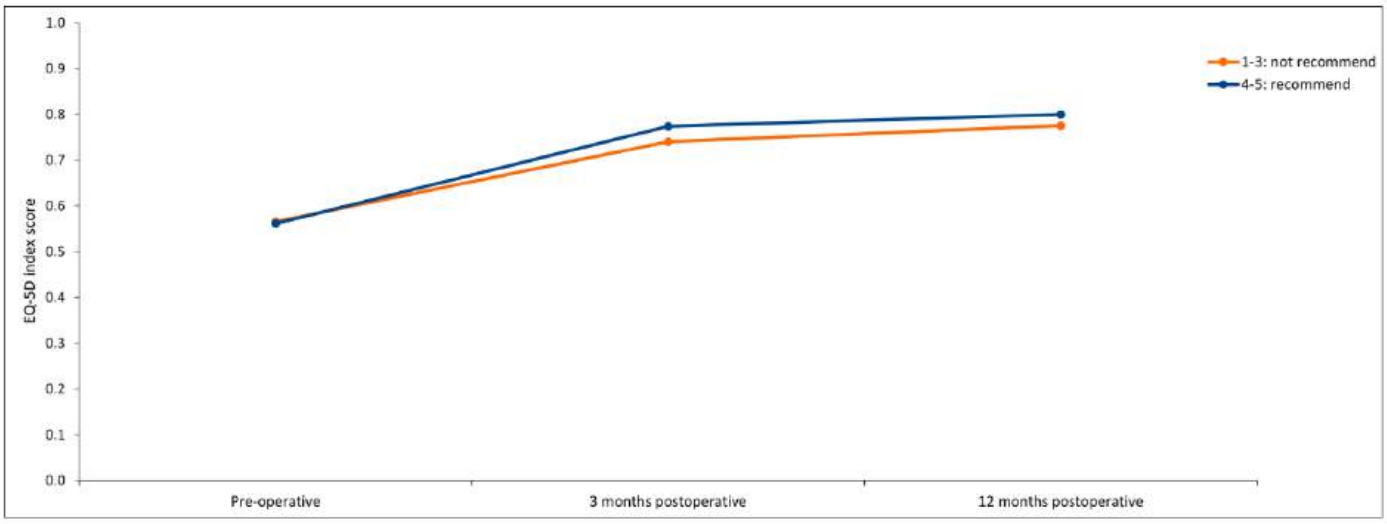


TABLE Mean EQ-5D Index scores

EQ-5D Index score	Pre-operative		3 months postoperative		12 months postoperative	
Recommendation score	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	722	0.57 (0.55-0.58)	704	0.74 (0.73-0.75)	700	0.78 (0.76-0.79)
4-5: recommend	242	0.56 (0.54-0.59)	240	0.77 (0.75-0.79)	257	0.80 (0.78-0.82)
Total	1035	0.56 (0.55-0.58)	1016	0.75 (0.74-0.76)	1020	0.78 (0.77-0.79)

The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.
CI: confidence interval.

The EQ-5D index score measures quality of life.
The score has a range of -0.329 to 1.0, with 1.0 representing the best possible quality of life.

EQ5D thermometer

FIGURE Mean pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2021

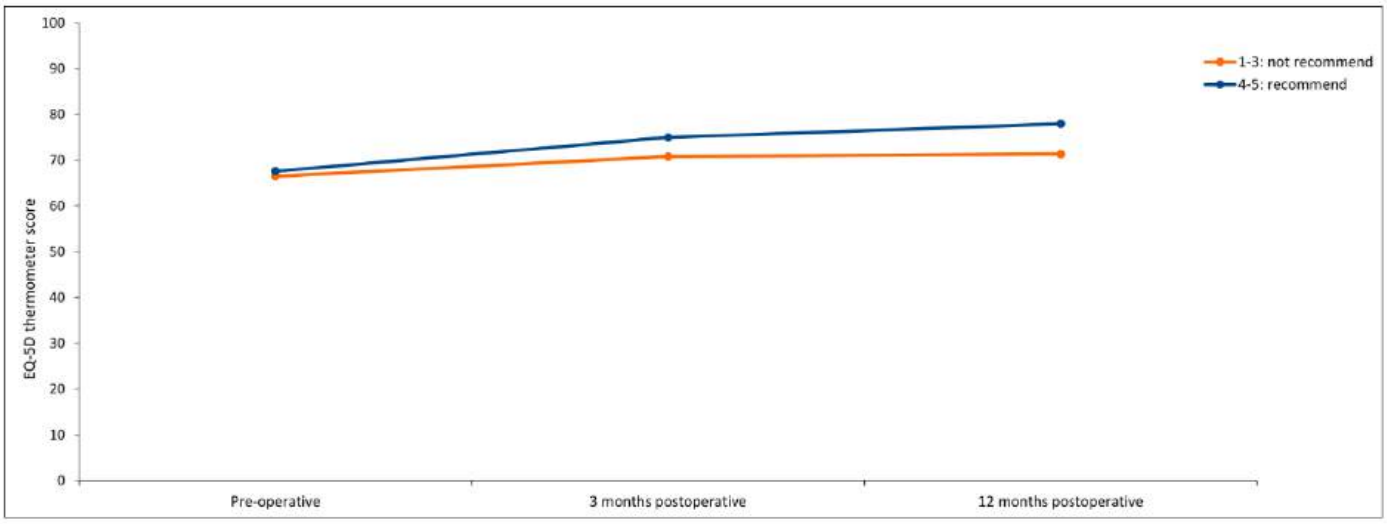


TABLE Mean EQ-5D thermometer scores

EQ-5D thermometer	Pre-operative		3 months postoperative		12 months postoperative[1]	
Recommendation score	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	725	66.5 (65.1-67.9)	712	70.8 (69.2-72.3)	710	71.3 (69.7-72.9)
4-5: recommend	243	67.6 (65.2-70.0)	247	75.0 (72.6-77.3)	258	78.0 (76.1-79.8)
Total	1041	66.5 (65.3-67.7)	1031	72.2 (70.9-73.4)	1027	73.1 (71.9-74.4)

The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.
CI: confidence interval.

The EQ-5D thermometer score measures the health situation.
The score has a range of 0.0 to 100.0, with 0.0 representing the worst possible health situation and 100.0 the best possible health situation.

Oxford Shoulder score

FIGURE Mean pre-operative, 3 months and 12 months postoperative Oxford Shoulder scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2021

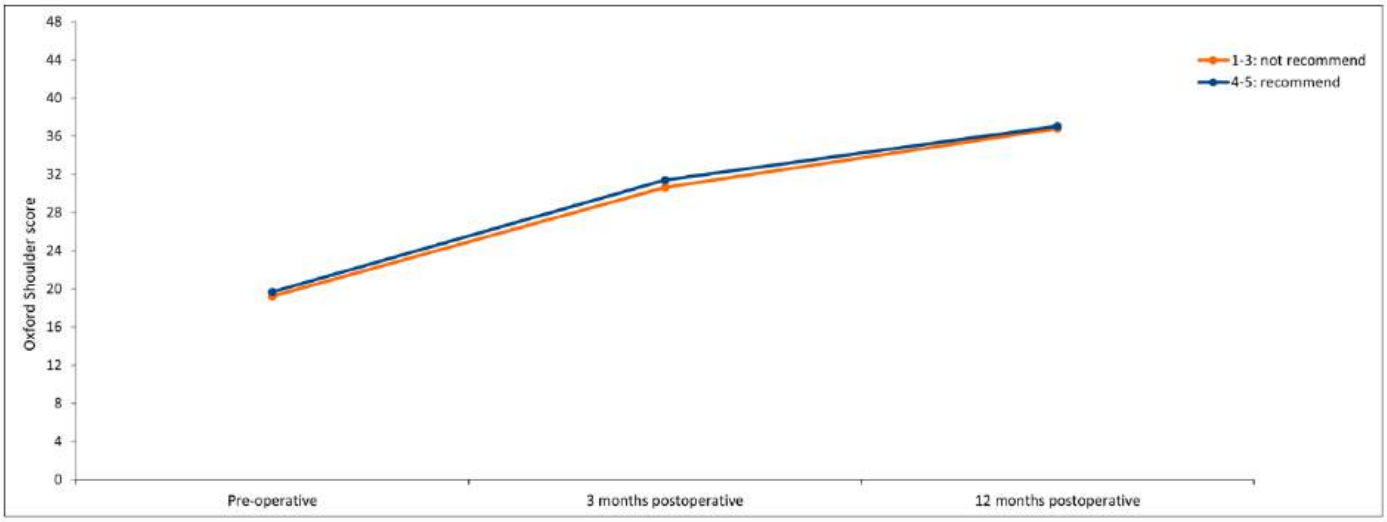


TABLE Mean Oxford Shoulder Scores (OSS)

	Pre-operative		3 months postoperative		12 months postoperative	
Recommendation score	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	719	19.2 (18.7-19.8)	711	30.6 (29.8-31.4)	722	36.8 (36.0-37.6)
4-5: recommend	255	19.7 (18.7-20.6)	255	31.4 (30.2-32.6)	254	37.0 (35.7-38.4)
Total	1036	19.4 (18.9-19.9)	1031	30.8 (30.2-31.4)	1026	36.9 (36.3-37.6)

The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.
CI: confidence interval.

The Oxford Shoulder score measures the physical functioning and pain of patients with osteoarthritis to the shoulder. The score has a range of 0.0 to 48.0, with 0.0 representing no functional ability and 48.0 the most functional ability.

Recommendation

FIGURE Mean 3 months and 12 months postoperative recommendation scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis in the Netherlands in 2016-2021

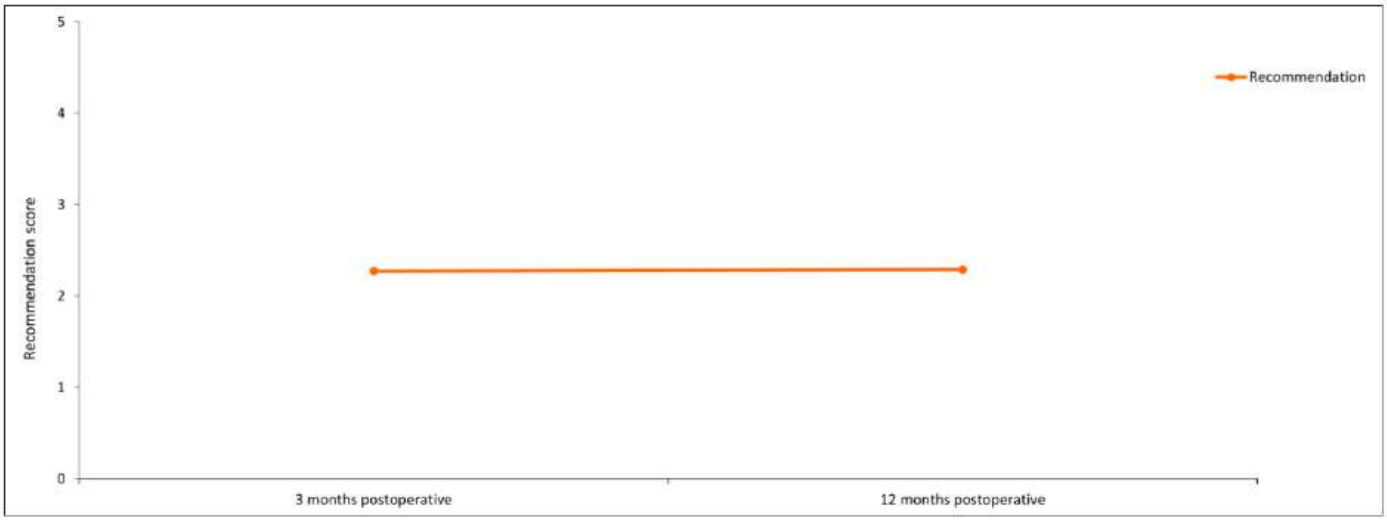


TABLE Mean recommendation

	3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)
Recommendation score	998	2.27 (2.18-2.36)	996	2.29 (2.19-2.38)

CI: confidence interval.

The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.

Anchor questions

FIGURE Mean 3 months and 12 months postoperative change in daily functioning and pain of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis in the Netherlands in 2016-2021

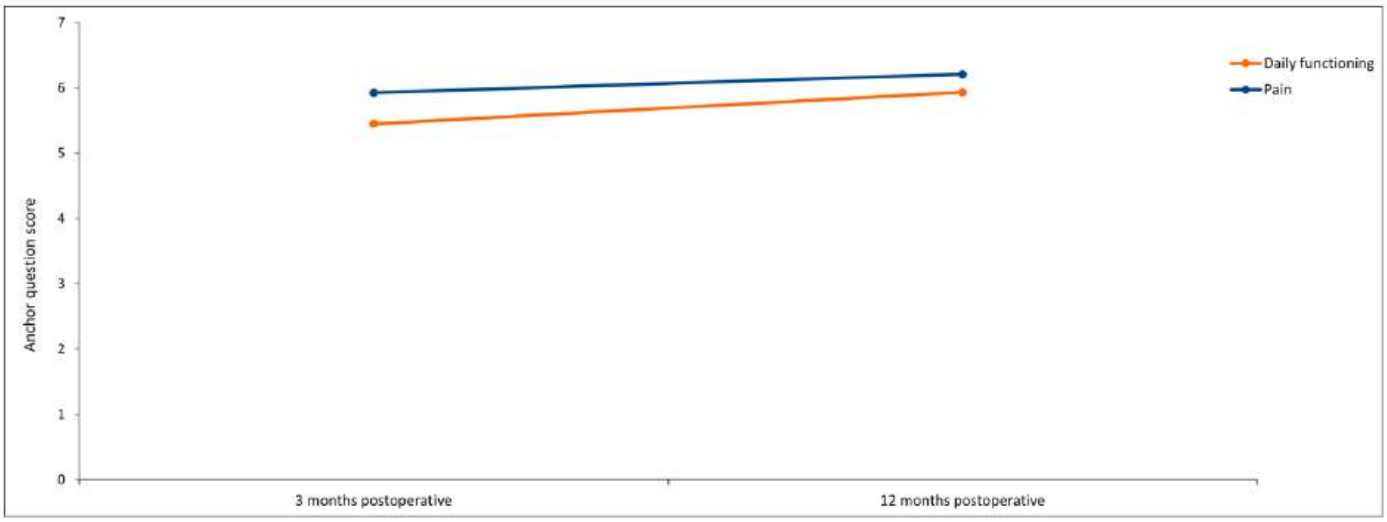


TABLE Mean anchor questions: Daily functioning and Pain

	3 months postoperative		12 months postoperative	
Anchor question score	n	Mean (95% CI)	n	Mean (95% CI)
Daily functioning	1011	5.45 (5.36-5.54)	1010	5.93 (5.85-6.01)
Pain	997	5.92 (5.85-6.00)	1005	6.21 (6.14-6.27)

CI: confidence interval.

The anchor questions measure change in daily functioning and change in pain after joint replacement.
The score has a range of 1.0 to 7.0, with 1.0 representing very deteriorated and 7.0 representing very improved.

Elbow arthroplasty

Numbers

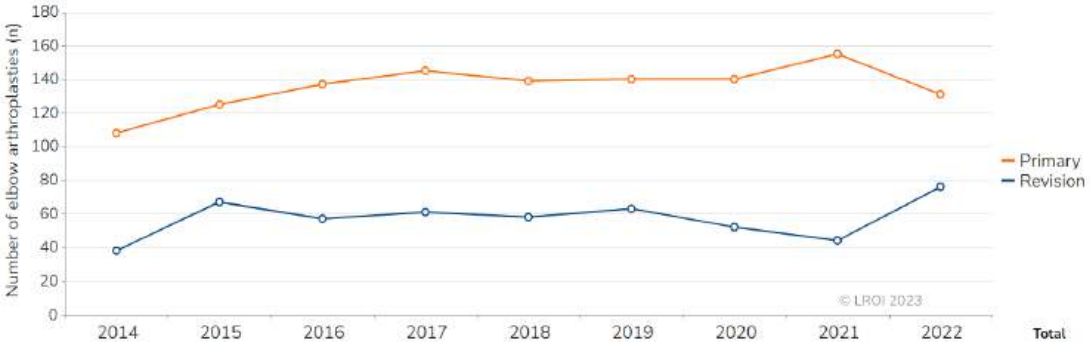
Registered procedures

TABLE Number of registered elbow arthroplasties per year of surgery (2014-2022) in the LROI in April 2023

	Type of elbow arthroplasty							
Year of surgery	Total arthroplasty (n)	Distal hemihumeral arthroplasty (n)	Radial head arthroplasty (n)	Radiocapitellar arthroplasty (n)	Other (n)	Unknown/ missing (n)	Revision arthroplasty (n)	Total (n)
2014	72	5	23	0	0	8	38	146
2015	78	4	41	1	0	1	67	192
2016	67	2	45	13	2	8	57	194
2017	67	1	41	13	0	23	61	206
2018	73	5	54	2	2	3	58	197
2019	79	2	57	0	0	2	63	203
2020	78	3	55	0	3	1	52	192
2021	74	7	74	0	0	0	44	199
2022	71	2	56	1	0	1	76	207
Total	659	31	446	30	7	47	516	1,736

Type of procedures

FIGURE Number of primary elbow arthroplasties and elbow revision arthroplasties registered in the LROI in the Netherlands in 2014-2022

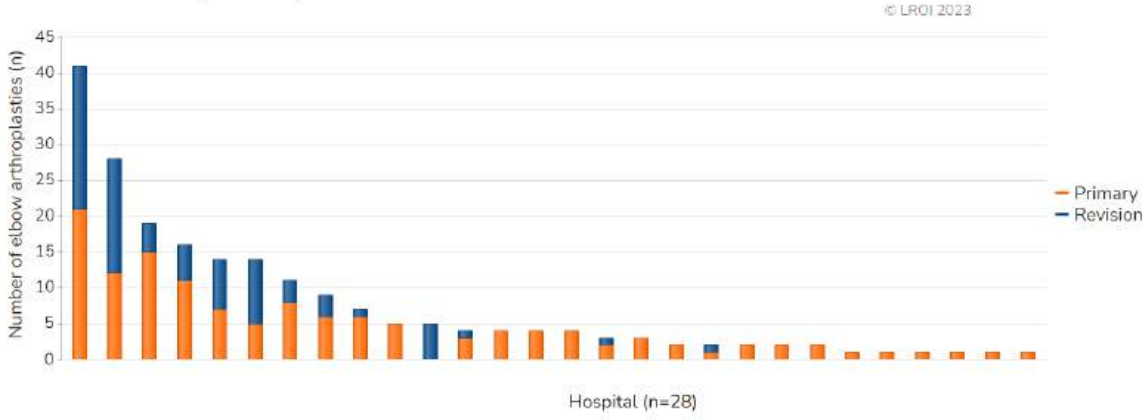


Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Type of procedure (n)										
Primary	108	125	137	145	139	140	140	155	131	1,220
Revision	38	67	57	61	58	63	52	44	76	516
Total:	146	192	194	206	197	203	192	199	207	1,736

Out of 131 primary elbow arthroplasties that were performed in 2022, 0% (n=0) was performed bilaterally.

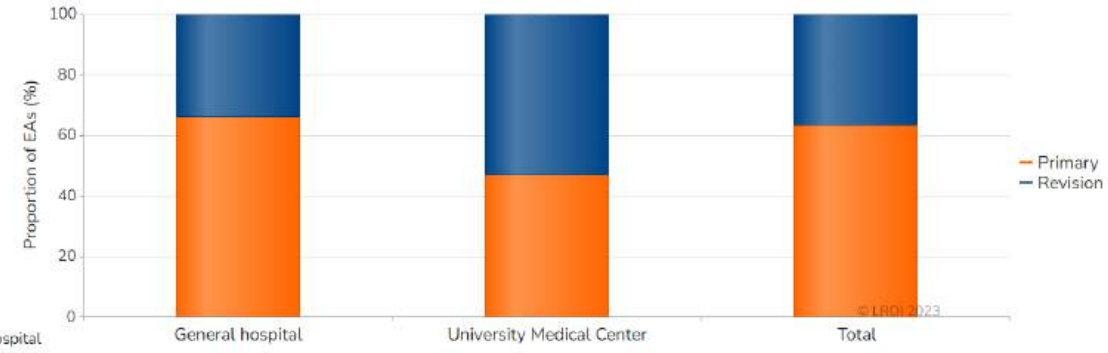
Type of procedure per hospital

FIGURE Number of primary elbow arthroplasties and elbow revision arthroplasties per hospital in the Netherlands in 2022 (n=207)



Type of hospital

FIGURE Primary elbow arthroplasties and elbow revision arthroplasties (proportion [%] per category) by type of hospital in the Netherlands in 2022



Type of hospital	General hospital	University Medical Center	Total
Type of procedure (%)			
Primary	66.29	46.88	**63.29**
Revision	33.71	53.12	**36.71**
Total (n):	**175**	**32**	**207**

Please note: in 2022, 24 general hospitals, 4 UMCs and 0 private hospitals performed elbow arthroplasties.
EA: elbow arthroplasty; General: general hospital; UMC: university medical centre.

Primary elbow arthroplasty

Demographics

Patient characteristics by type of elbow prosthesis

TABLE Patient characteristics of all patients with a registered primary elbow arthroplasty by type of elbow arthroplasty in the Netherlands in 2022

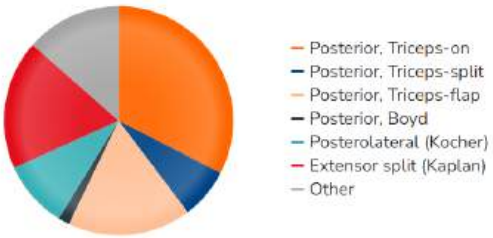
	Total arthroplasty[1] (n=73)	Radial head arthroplasty[2] (n=57)	Total[3] (n=131)
Mean age (years) (SD)	68.1 (9.2)	59.5 (14.7)	64.3 (12.6)
Age (years) (%)			
<50	3	21	11
50-59	14	23	18
60-69	34	33	33
70-79	41	16	30
≥80	8	7	8
Gender (%)			
Men	25	35	30
Women	75	65	70
ASA score (%)			
I	10	22	15
II	59	64	61
III-IV	31	14	24
Type of hospital (%)			
General	85	95	89
UMC	15	5	11
Private	0	0	0
Diagnosis (%)			
Acute fracture	11	82	42
Late post-traumatic	34	11	23
Osteoarthritis	26	2	16
Rheumatoid arthritis	18	0	10
Inflammatory arthritis	3	0	2
Osteonecrosis	0	2	1
Hemophilic arthropathy	1	0	1
Tumour	0	0	0
Other	7	3	5
Mean Body Mass Index (kg/m²) (SD)	28.1 (5.6)	27.9 (5.2)	28.1 (5.4)
Body Mass Index (kg/m²) (%)			
Underweight (≤18.5)	0	2	1
Normal weight (>18.5-25)	30	27	28
Overweight (>25-30)	44	41	43
Obesity (>30-40)	22	27	24
Morbid obesity (>40)	4	3	4
Smoking (%)			
No	92	87	89
Yes	8	13	11

[1] Including distal hemihumeral prostheses (n=2).
[2] Including radiocapitellar arthroplasty(n=1).
[3]Also contains 1 primary elbow arthroplasty of which the type of prosthesis has not been registered.
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

Surgical techniques

Surgical approach

FIGURE Surgical approach for performing a primary elbow arthroplasty in the Netherlands in 2022 (n=126)

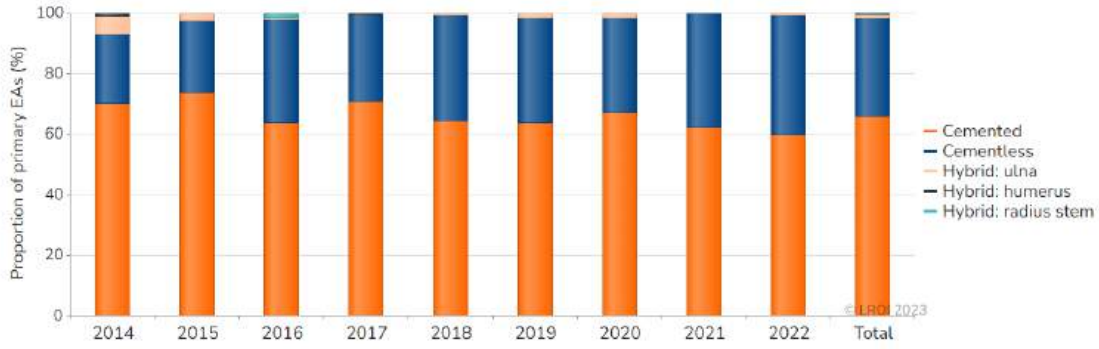


Surgical approach	Number (n)	Proportion (%)
Posterior, Triceps-on	41	32.54%
Posterior, Triceps-split	9	7.14%
Posterior, Triceps-flap	22	17.46%
Posterior, Boyd	2	1.59%
Posterolateral (Kocher)	12	9.52%
Extensor split (Kaplan)	23	18.25%
Other	17	13.49%

Please note: In 2022 the registration has been changed. Therefore, no trend can be shown for the surgical approach.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary elbow arthroplasties in the Netherlands in 2014-2022



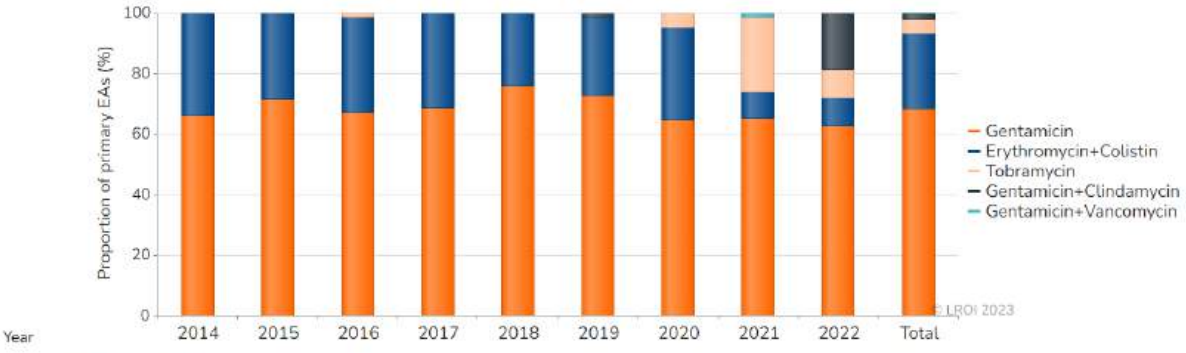
Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Fixation (%)										
Cemented	70.30	73.77	63.91	70.92	64.44	63.77	66.91	62.09	59.84	**66.02**
Cementless	22.77	23.77	33.83	28.37	34.81	34.78	31.65	37.91	39.37	**32.30**
Hybrid: ulna	5.94	2.46	0.75	0.00	0.74	1.45	1.44	0.00	0.79	**1.35**
Hybrid: humerus	0.99	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00	**0.17**
Hybrid: radius stem	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	**0.17**
Total (n):	**101**	**122**	**133**	**141**	**135**	**138**	**139**	**153**	**127**	**1,189**

EA: elbow arthroplasty.

Bone cement

Antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in primary elbow arthroplasties in the Netherlands in 2014-2022



Bone cement antibiotics (%)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gentamicin	66.20	71.59	67.06	68.75	75.95	72.84	64.63	65.43	62.67	**68.42**
Erythromycin+Colistin	33.80	28.41	31.76	31.25	24.05	25.93	30.49	8.64	9.33	**24.93**
Tobramycin	0.00	0.00	1.18	0.00	0.00	0.00	4.88	24.69	9.33	**4.43**
Gentamicin+Clindamycin	0.00	0.00	0.00	0.00	0.00	1.23	0.00	0.00	18.67	**2.08**
Gentamicin+Vancomycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23	0.00	**0.14**
Total (n):	**71**	**88**	**85**	**80**	**79**	**81**	**82**	**81**	**75**	**722**

EA: elbow arthroplasty

Viscosity

FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary elbow arthroplasties in the Netherlands in 2014-2022

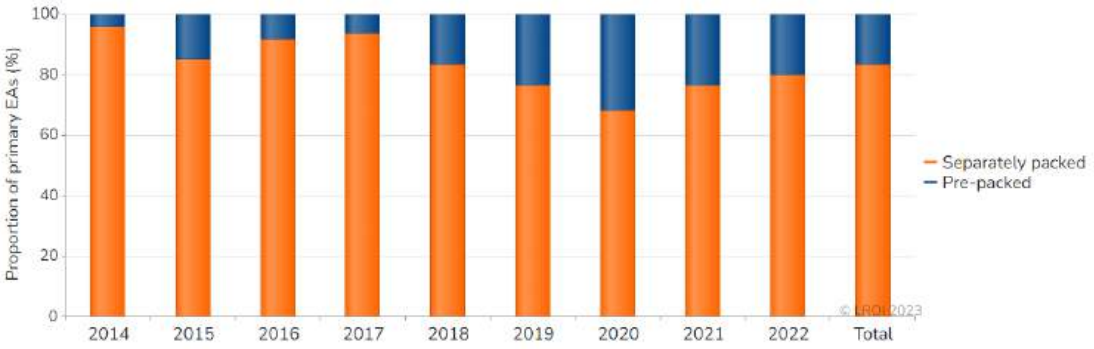
Bone cement viscosity (%)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
High	52.11	55.68	54.12	56.25	59.49	59.26	47.56	51.85	68.00	**55.96**
Medium	38.03	39.77	40.00	36.25	34.18	33.33	46.34	34.57	20.00	**36.01**
Low	9.86	4.55	5.88	7.50	6.33	7.41	6.10	13.58	12.00	**8.03**
Total (n):	**71**	**88**	**85**	**80**	**79**	**81**	**82**	**81**	**75**	**722**

EA: elbow arthroplasty

Vacuum mixing system

FIGURE Trend (proportion [%] per year) in use of bone cement pre-packed in a vacuum mixing system in primary elbow arthroplasties in the Netherlands in 2014-2022



Vacuum mixing system (%)										
Separately packed	95.77	85.23	91.76	93.75	83.54	76.54	68.29	76.54	80.00	**83.38**
Pre-packed	4.23	14.77	8.24	6.25	16.46	23.46	31.71	23.46	20.00	**16.62**
Total (n):	**71**	**88**	**85**	**80**	**79**	**81**	**82**	**81**	**75**	**722**

EA: elbow arthroplasty; Separately packed: separately packed bone cement components; Pre-packed: Bone cement pre-packed in a vacuum mixing system.

Most frequently registered

Elbow prostheses

TABLE The most frequently registered total elbow arthroplasties and radial head arthroplasties in primary elbow arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Total elbow arthroplasties[1] (n)	**70**	**65**	**58**	**70**	**65**
Name; Proportion (%)					
Latitude EV	44.3	41.5	51.7	60.0	46.2
Coonrad/Morrey	37.1	38.5	20.7	17.1	23.1
Latitude	2.9	10.8	15.5	12.9	12.3
NES	7.1	1.5	3.4	7.1	9.2
Discovery	7.1	7.7	8.6	2.9	6.2

Year	2018	2019	2020	2021	2022
Radial head arthroplasties (n)	**46**	**46**	**45**	**60**	**45**
Name; Proportion (%)					
RHS	56.5	56.5	80.0	65.0	42.2
Anatomic Radial Head	10.9	6.5	4.4	5.0	35.6
Explor	28.3	32.6	8.9	18.3	8.9
ICARA	2.2	2.2	2.2	6.7	8.9

[1] Including distal hemihumeral prostheses.

Types of bone cement

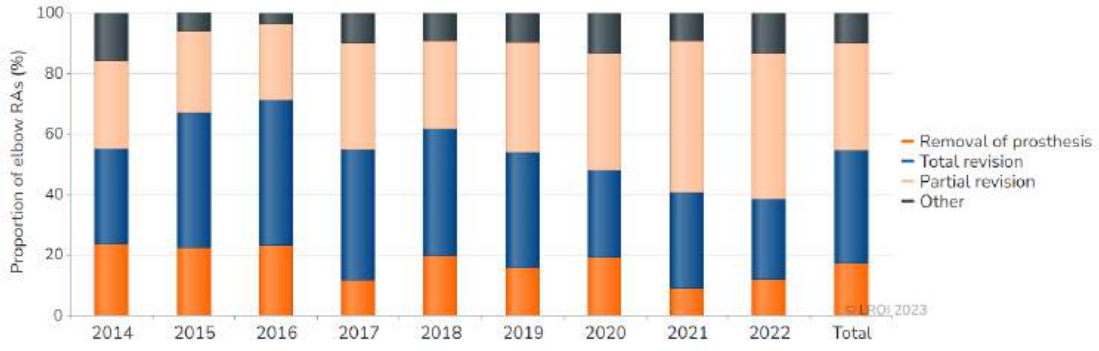
TABLE The registered types of bone cement used during primary elbow arthroplasties in the Netherlands in 2018-2022

Year	2018	2019	2020	2021	2022
Bone cement used (n)	**82**	**79**	**81**	**81**	**75**
Name; Proportion (%)					
PALACOS R+G	24.4	34.2	35.8	28.4	36.0
COPAL G+C	0.0	0.0	0.0	0.0	18.7
PALACOS LV+G	6.1	6.3	7.4	13.6	12.0
Simplex ABC EC	30.5	24.1	25.9	8.6	9.3
Simplex ABC TOBRA	4.9	0.0	0.0	24.7	9.3

Elbow revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in elbow revision arthroplasties in the Netherlands in 2014-2022



Type of elbow revision (%)	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Removal of prosthesis	23.68	22.39	23.21	11.67	20.00	15.87	19.23	9.09	12.00	**17.25**
Total revision	31.58	44.78	48.21	43.33	41.82	38.10	28.85	31.82	26.67	**37.45**
Partial revision	28.95	26.87	25.00	35.00	29.09	36.51	38.46	50.00	48.00	**35.49**
Other	15.79	5.97	3.57	10.00	9.09	9.52	13.46	9.09	13.33	**9.80**
Total (n):	**38**	**67**	**56**	**60**	**55**	**63**	**52**	**44**	**75**	**510**

RA: revision arthroplasty

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent an elbow revision arthroplasty in the Netherlands in 2016-2022

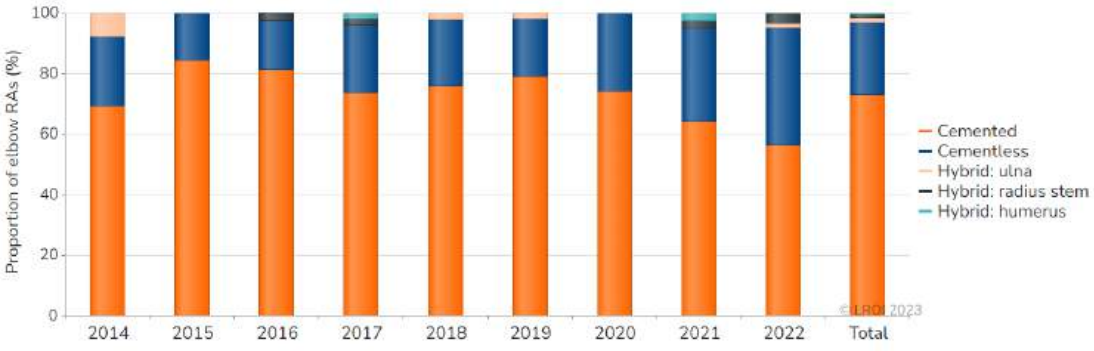
Year	2016	2017	2018	2019	2020	2021	2022	Total
Elbow revision arthroplasty (n)	57	61	58	63	52	44	76	411
Reasons for revision; Proportion[1] (%)								
Polyethylene wear	28.1	27.9	27.6	22.2	15.4	15.9	19.7	22.6
Metallosis	22.8	23.0	22.4	23.8	13.5	20.5	14.5	20.0
Instability	21.1	41.0	15.5	20.6	5.8	22.7	11.8	19.7
Loosening of ulnar component	15.8	18.0	17.2	17.5	23.1	13.6	21.1	18.3
Loosening of humeral component	15.8	14.8	15.5	12.7	30.8	20.5	14.5	17.3
Infection	14.0	3.3	15.5	15.9	23.1	18.2	23.7	16.3
Loosening of radial head component	21.1	18.0	20.7	15.9	15.4	13.6	6.6	15.6
Peri-prosthetic fracture	3.5	18.0	19.0	19.1	17.3	15.9	7.9	14.1
Malalignment[2]							7.9	
Revision after elbow removal[2]							2.6	
Other	12.3	24.6	10.3	14.3	13.5	15.9	15.8	15.3

[1] One patient may have more than one reason for revision. As such, the total proportion is over 100%.
[2] Please note: Malalignment and Removal after elbow revision were not registered before 2022.

Surgical techniques

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in elbow revision arthroplasties in the Netherlands in 2014-2022

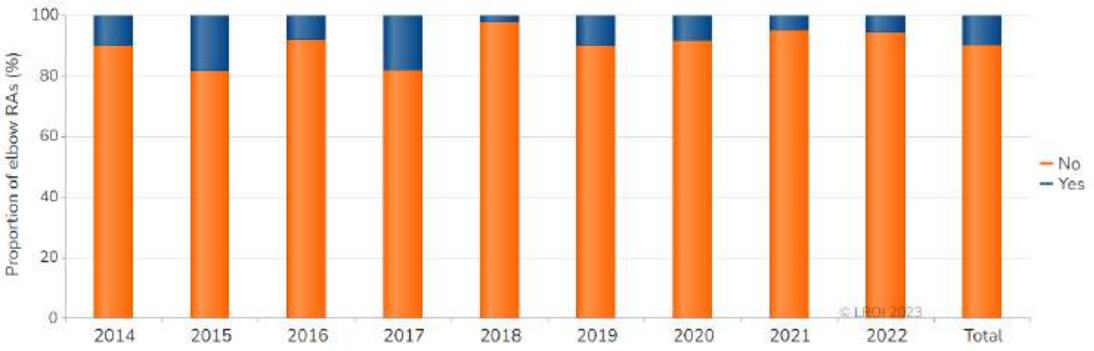


Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Fixation (%)										
Cemented	69.23	84.62	81.40	73.58	76.09	79.25	74.36	64.10	56.45	**73.12**
Cementless	23.08	15.38	16.28	22.64	21.74	18.87	25.64	30.77	38.71	**23.97**
Hybrid: ulna	7.69	0.00	0.00	0.00	2.17	1.89	0.00	0.00	1.61	**1.21**
Hybrid: radius stem	0.00	0.00	2.33	1.89	0.00	0.00	0.00	2.56	3.23	**1.21**
Hybrid: humerus	0.00	0.00	0.00	1.89	0.00	0.00	0.00	2.56	0.00	**0.48**
Total (n):	**26**	**52**	**43**	**53**	**46**	**53**	**39**	**39**	**62**	**413**

RA: revision arthroplasty

Conversion to TEA

FIGURE Trend (proportion [%] per year) in conversion of a radial head arthroplasty to a total elbow arthroplasy in the Netherlands in 2014-2022

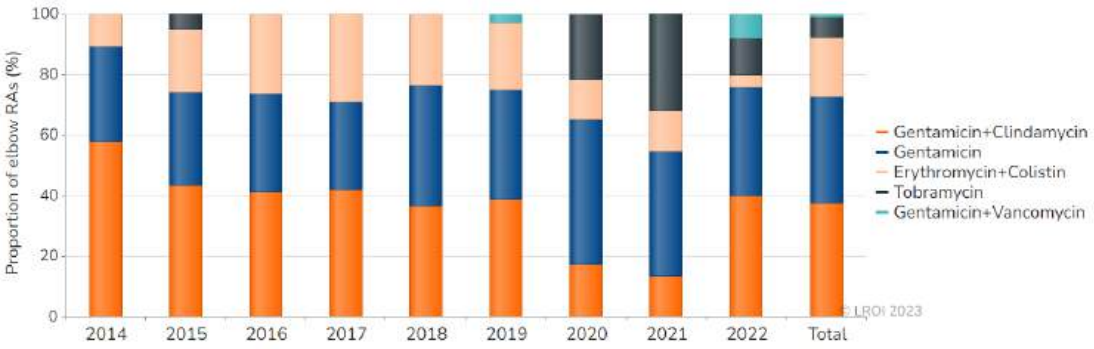


Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Conversion to total elbow arthroplasties (%)										
No	90.00	81.82	92.00	82.14	97.96	90.00	91.67	95.24	94.44	**90.48**
Yes	10.00	18.18	8.00	17.86	2.04	10.00	8.33	4.76	5.56	**9.52**
Total (n):	**30**	**55**	**50**	**56**	**49**	**60**	**48**	**42**	**72**	**462**

RA: revision arthroplasty

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in elbow revision arthroplasties in the Netherlands in 2014-2022



Bone cement antibiotics (%)	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gentamicin+Clindamycin	57.89	43.59	41.18	42.11	36.67	38.89	17.39	13.64	40.00	**37.59**
Gentamicin	31.58	30.77	32.35	28.95	40.00	36.11	47.83	40.91	36.00	**35.34**
Erythromycin+Colistin	10.53	20.51	26.47	28.95	23.33	22.22	13.04	13.64	4.00	**19.55**
Tobramycin	0.00	5.13	0.00	0.00	0.00	0.00	21.74	31.82	12.00	**6.39**
Gentamicin+Vancomycin	0.00	0.00	0.00	0.00	0.00	2.78	0.00	0.00	8.00	**1.13**
Total (n):	**19**	**39**	**34**	**38**	**30**	**36**	**23**	**22**	**25**	**266**

RA: revision arthroplasty

Most frequently registered components

TABLE The most frequently registered humerus, ulna, radial head and radial stem components in elbow revision arthroplasties in the Netherlands in 2022

Humerus (n=24)	Number (n)	Proportion (%)
Latitude EV	8	34
Coonrad/Morrey	6	25
NES	6	25
Lateral Resurfacing Elbow	2	8
Latitude	1	4
Mutars	1	4

Ulna (n=31)	Number (n)	Proportion (%)
Latitude EV	20	65
Coonrad/Morrey	5	16
NES	3	10
Mutars	1	3
Unknown	2	6

Radial head (n=8)	Number (n)	Proportion (%)
ICARA	2	25
Lateral Resurfacing Elbow	2	25
RHS	2	25
Unknown	2	25

Radial stem (n=7)	Number (n)	Proportion (%)
RHS	4	57
ICARA	2	29
Unknown	1	14

Most frequently registered types of bone cement

TABLE The most frequently registered types of bone cement used during elbow revision arthroplasties in the Netherlands in 2022 (n=25)

Name	Number (n)	Proportion (%)
COPAL G+C	8	32
Refobacin Bone Cement R	5	20
Palacos R+G	3	12
Simplex ABC TOBRA	3	12
COPAL G+V	2	8
Refobacin Revision	2	8
Palacos LV+G	1	4
Simplex ABC EC	1	4

Survival Overall

Overall

FIGURE Cumulative revision percentage of primary elbow arthroplasties in the Netherlands in 2014-2022 (n=1,211)

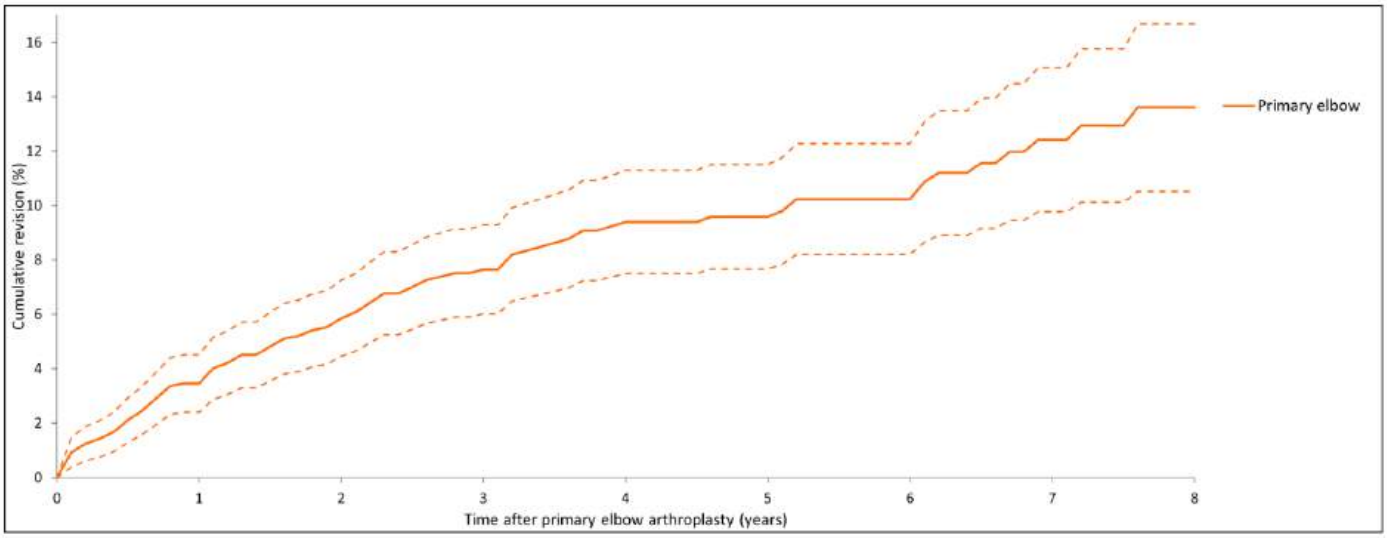


TABLE Cumulative revision percentages of primary elbow arthroplasties

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
Primary elbow arthroplasty	1,211	3.46 (2.41-4.51)	7.52 (5.90-9.14)	9.59 (7.67-11.51)	12.42 (9.77-15.07)	13.60 (10.52-16.68)

CI: confidence interval

In 2014-2022, 95 (7.8%) primary elbow arthroplasties were implanted in patients who died within eight years after the primary procedure.

By type of elbow arthroplasty

FIGURE Cumulative revision percentage of primary elbow arthroplasties by type of elbow arthroplasty in the Netherlands in 2014-2022 (n=1,098)

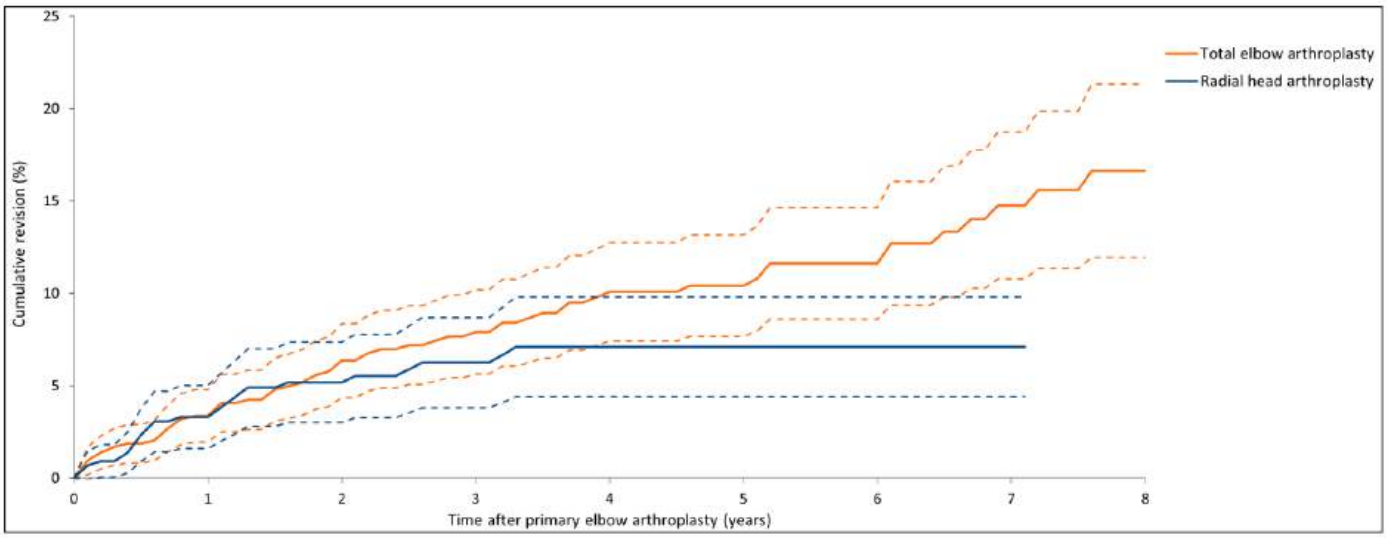


TABLE Cumulative revision percentages of primary elbow arthroplasties

		Cumulative revision percentages - Kaplan Meier (95% CI)				
	Number (n)	1yr	3yr	5yr	7yr	8yr
By type of primary elbow arthroplasty						
Total elbow arthroplasty	655	3.36 (1.94-4.78)	7.67 (5.44-9.90)	10.41 (7.67-13.15)	14.75 (10.77-18.73)	16.63 (11.95-21.31)
Radial head arthroplasty	443	3.31 (1.60-5.02)	6.25 (3.80-8.70)	7.10 (4.40-9.80)	7.10 (4.40-9.80)	n.a.

CI: confidence interval; n.a. if <50 cases were at risk

Survival TEA

Revision by patient characteristics

TEA by gender

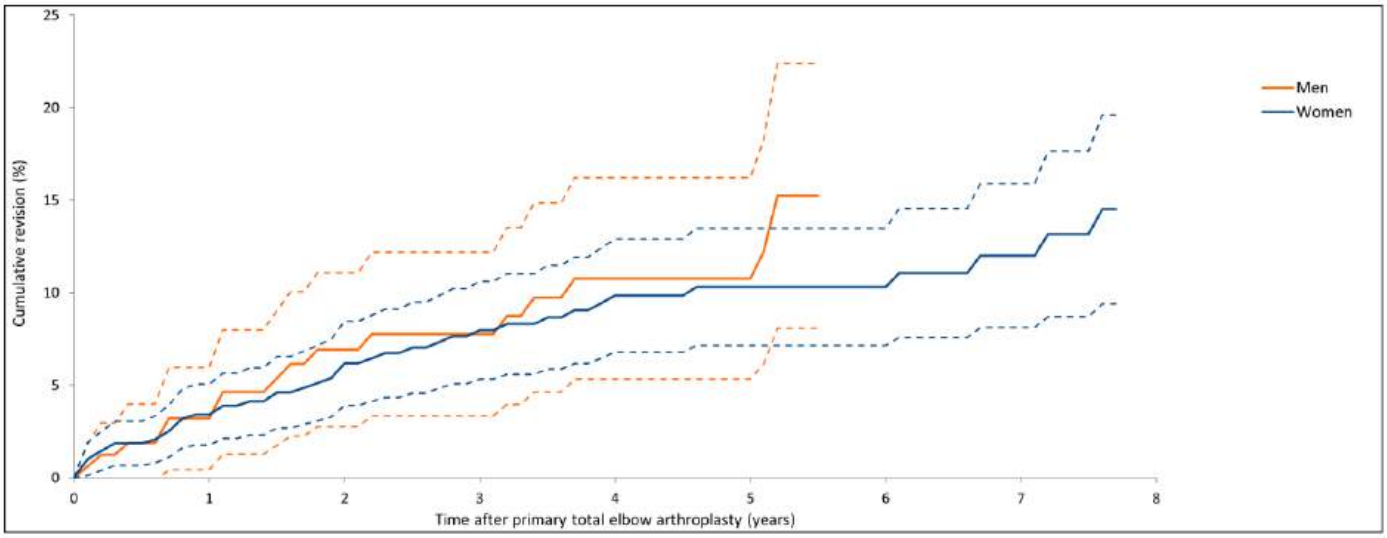


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)			
	Number (n)	1yr	3yr	5yr	7yr
Gender					
Men	162	3.2 (0.4-6.0)	7.8 (3.3-12.2)	10.8 (5.3-16.2)	n.a.
Women	493	3.4 (1.8-5.1)	7.7 (5.1-10.2)	10.3 (7.1-13.5)	12.0 (8.1-15.9)

CI: confidence interval; n.a. if <50 cases were at risk

TEA by age category

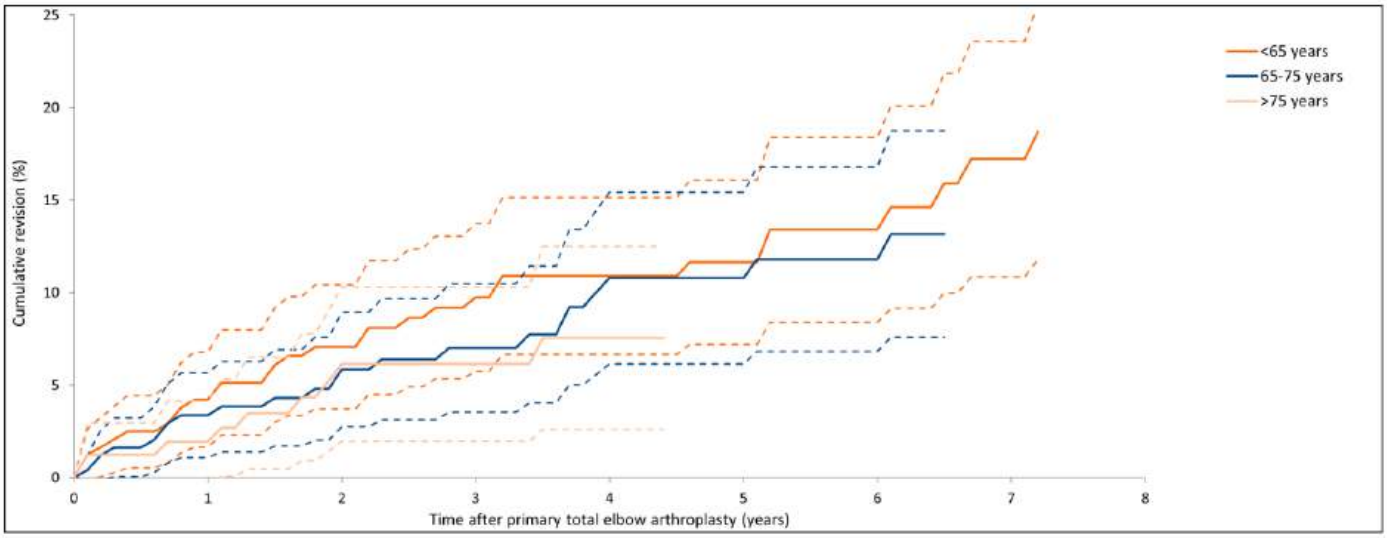


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)		
	Number (n)	1yr	3yr	5yr
Age category				
>65 years	242	4.2 (1.7-6.8)	9.2 (5.3-13.1)	11.6 (7.2-16.1)
65-75 years	249	3.4 (1.1-5.7)	7.0 (3.5-10.5)	10.8 (6.1-15.4)
>75 years	164	2.0 (0.0-4.2)	6.1 (2.0-10.3)	7.5 (2.6-12.5)

CI: confidence interval

TEA by BMI

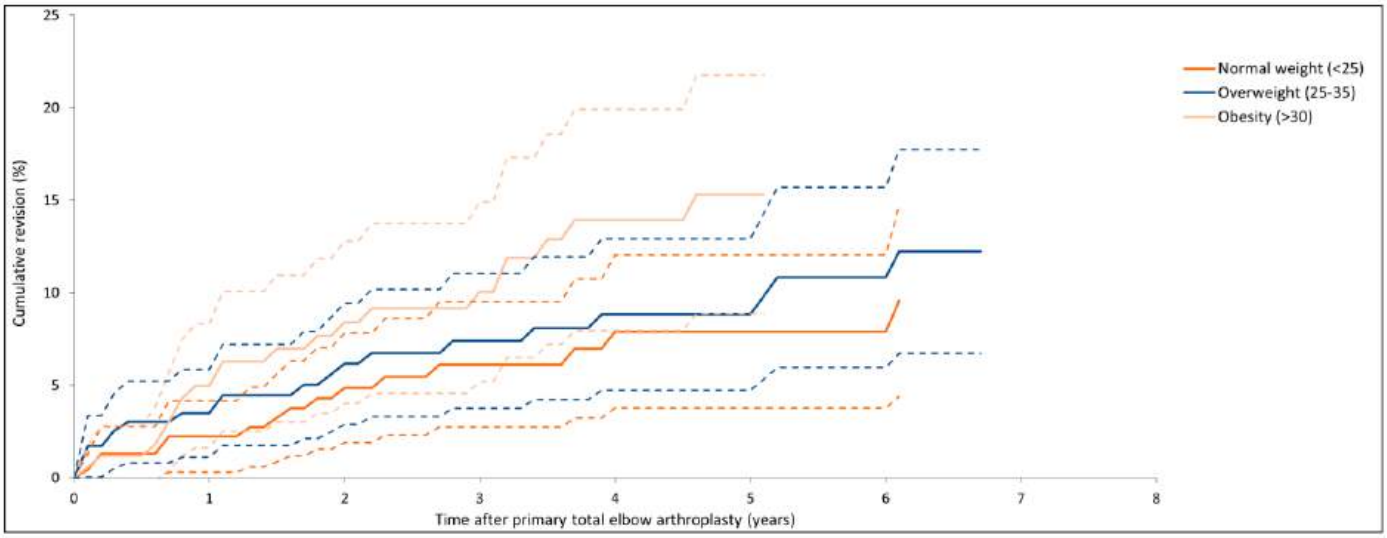


TABLE Cumulative revision percentages

		Cumulative revision percentages - Kaplan Meier (95% CI)		
	Number (n)	1yr	3yr	5yr
BMI category				
Normal weight (<25)	236	2.2 (0.3-4.2)	6.1 (2.7-9.5)	7.9 (3.8-12.0)
Overweight (25-30)	236	3.5 (1.1-5.9)	7.4 (3.7-11.0)	8.8 (4.7-12.9)
Obesity (>30)	171	5.0 (1.6-8.3)	9.2 (4.6-13.7)	15.3 (8.9-21.8)

CI: confidence interval

Wrist arthroplasty

Numbers

Registered procedures

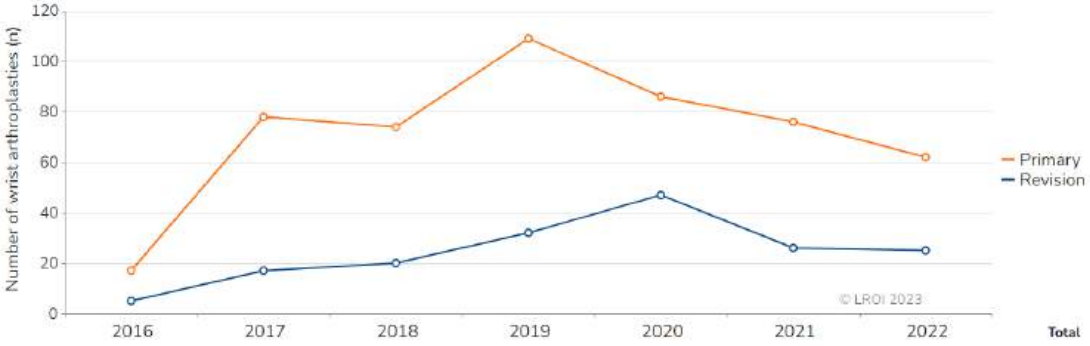
TABLE Number of registered wrist arthroplasties per year of surgery (2017-2022) in the LROI in April 2023

Year of surgery	Type of wrist arthroplasty: Total wrist arthroplasty (n)	Ulnar head arthroplasty (n)	DRU arthroplasty (n)	Hemi arthroplasty (n)	Other (n)	Revision arthroplasty (n)	Total[1] (n)
2017	35	13	10	1	14	17	95
2018	37	7	18	2	6	20	94
2019	43	7	30	5	20	32	141
2020	34	9	16	12	10	47	133
2021	27	4	16	16	8	26	102
2022	22	2	14	19	3	25	87
Total	198	42	104	55	61	167	652

[1] In 3.8% (n=25) primary wrist arthroplasties the type of primary wrist prosthesis has not been registered.

Type of procedure

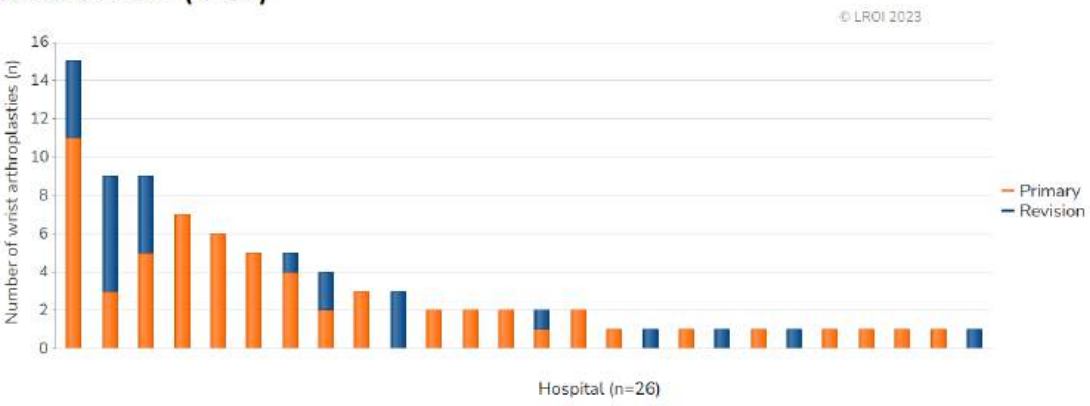
FIGURE Number of primary wrist arthroplasties and wrist revision arthroplasties registered in the LROI in the Netherlands in 2017-2022



Year	2016	2017	2018	2019	2020	2021	2022	Total
Type of procedure (n)								
Primary	17	78	74	109	86	76	62	**502**
Revision	5	17	20	32	47	26	25	**172**
Total:	**22**	**95**	**94**	**141**	**133**	**102**	**87**	**674**

Type of procedure per hospital

FIGURE Number of primary wrist arthroplasties and wrist revision arthroplasties per hospital in the Netherlands in 2022 (n=87)



Please note: in 2022, 18 general hospitals, 5 university medical centres and 3 private hospitals performed wrist arthroplasties.

Primary wrist arthroplasty

Demographics

Patient characteristics

TABLE Patient characteristics of all patients with a registered primary wrist arthroplasty in the Netherlands in 2022

	Plastic surgeon (n=32)	Orthopaedic surgeon (n=24)	Trauma surgeon (n=5)	Total (n=62)
Mean age (years) (SD)	62.1 (9.9)	67.3 (9.7)	64.0 (11.4)	64.6 (10.3)
Age (years) (%)				
<50	13	4	20	10
50-59	28	17	20	23
60-69	31	38	20	32
70-79	25	33	40	29
≥80	3	8	0	6
Gender (%)				
Men	50	46	0	44
Women	50	54	100	56
ASA score (%)				
I	31	4	20	19
II	59	42	20	48
III-IV	10	54	60	33
Type of hospital (%)				
General	72	92	80	81
UMC	6	8	20	8
Private	22	0	0	11
Diagnosis (%)				
Osteoarthritis	72	67	75	70
Post-traumatic	16	21	25	18
Rheumatoid arthritis	6	8	0	6
Osteonecrosis	3	0	0	2
Inflammatory arthritis	0	4	0	2
Other	3	0	0	2
Mean Body Mass Index (kg/m²) (SD)	28.3 (4.2)	27.1 (4.2)	35.2 (8.6)	28.3 (4.9)
Body Mass Index (kg/m²) (%)				
Underweight (≤18.5)	0	0	0	0
Normal weight (>18.5-25)	18	42	0	27
Overweight (>25-30)	52	37	25	44
Obesity (>30-40)	30	21	50	27
Morbid obesity (>40)	0	0	25	2
Smoking (%)				
No	93	83	80	88
Yes	7	17	20	12

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

Surgery and prosthesis

Most frequently registered components

TABLE The most frequently registered carpal, radial stem and ulnar head components in primary wrist arthroplasties in the Netherlands in 2022

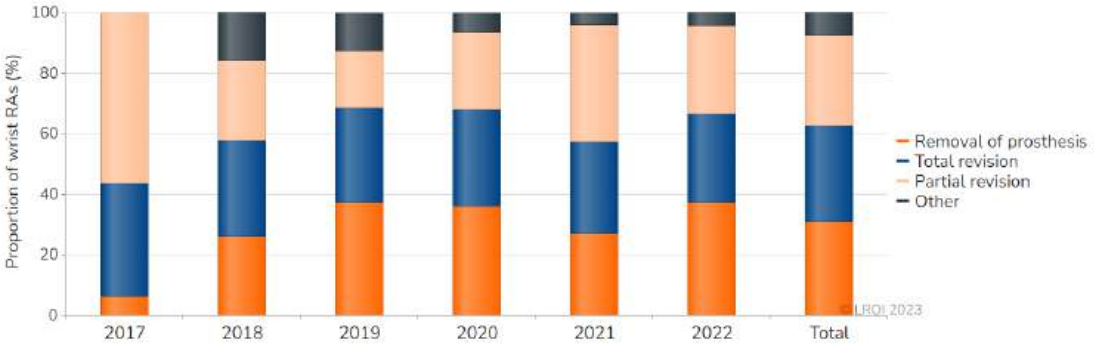
Carpal (n=41)		Radial stem (n=20)	
Name	**Number (n)**	**Name**	**Number (n)**
RCPI	17	Freedom	8
Freedom	16	Distal radioulnar joint	7
Remotion	5	Remotion	3
Motec	3	Motec	2

Ulnar head (n=2)	
Name	**Number (n)**
UHP prothese	2

Wrist revision arthroplasty

Type of revision

FIGURE Type of revision arthroplasty of wrist revision arthroplasties in the Netherlands in 2017-2022



Type of wrist revision (%)							
Removal of prosthesis	6.25	26.32	37.50	36.17	26.92	37.50	**31.10**
Total revision	37.50	31.58	31.25	31.91	30.77	29.17	**31.71**
Partial revision	56.25	26.32	18.75	25.53	38.46	29.17	**29.88**
Other	0.00	15.79	12.50	6.38	3.85	4.17	**7.32**
Total (n):	**16**	**19**	**32**	**47**	**26**	**24**	164

RA: revision arthroplasty

Reasons for revision

TABLE Reasons for revision in patients who underwent a wrist revision arthroplasty in the Netherlands in 2022 (n=24)

Reasons for revision	Number[1] (n)
Loosening of carpal component	11
Bone resorption of carpal component	8
Instability	7
Dislocation	4
Loosening of radial component	3
Bone resorption of radial component	3
Infection	2
Revision after removal	2
Peri-prosthetic fracture	1
Implant fracture	1
Loosening of ulnar component	1
Other	5

[1] One patient may have more than one reason for revision or re-surgery.

Most frequently registered components

TABLE The most frequently registered carpal, radial stem and ulnar head components in wrist revision arthroplasties in the Netherlands in 2022

Carpal (n=8)		Radial stem (n=3)	
Name	Number (n)	Name	Number (n)
Freedom	6	Freedom	1
Motec	1	Distal radioulnar joint	1
Remotion	1	Motec	1

Survival

Overall

FIGURE Cumulative revision percentage of primary wrist arthroplasties in the Netherlands in 2017-2022 (n=485)

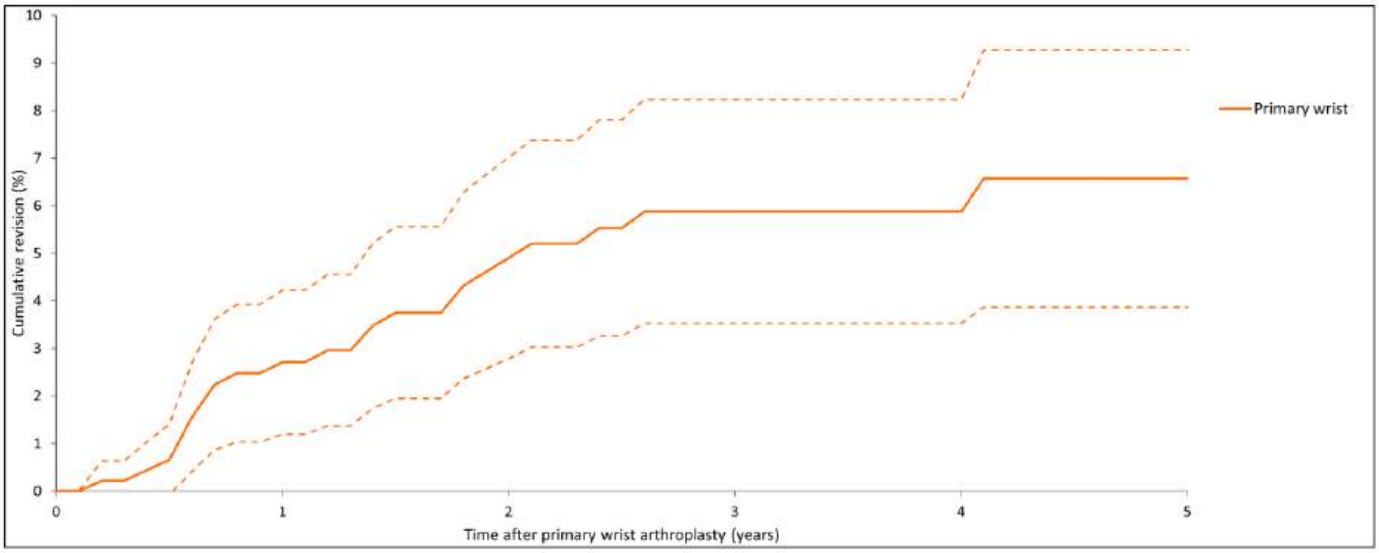


TABLE Cumulative revision percentages of primary wrist arthroplasties

	Number (n)	Number at risk (n)	Kaplan Meier (95% CI)
Primary wrist arthroplasty	485		
1-year revision (%)		409	2.48 (1.03-3.93)
2-year revision (%)		325	4.61 (2.57-6.65)
3-year revision (%)		244	5.88 (3.53-8.23)
4-year revision (%)		143	5.88 (3.53-8.23)
5-year revision (%)		73.5	6.57 (3.87-9.27)

CI: confidence interval.
Please note: The number of registered primary wrist and revision arthroplasties is not complete.

In 2017-2022, 15 (3.1%) primary wrist arthroplasties were implanted in patients who died within five years after the primary procedure.

Finger arthroplasty

Numbers

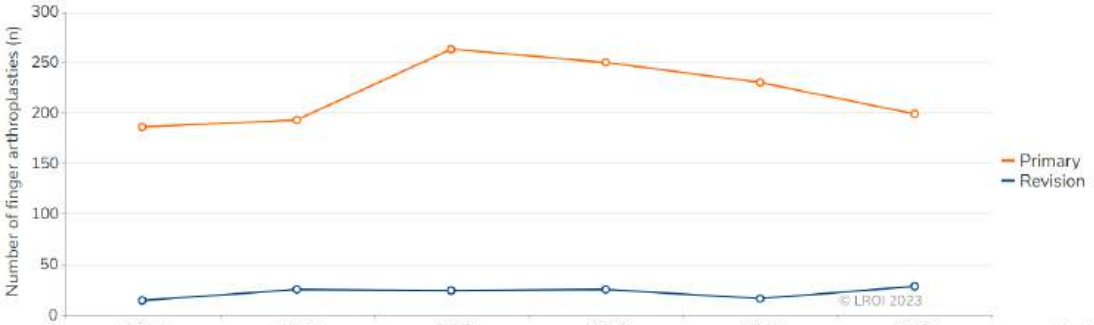
Registered procedures

TABLE Number of registered finger arthroplasties per year of surgery (2017-2022) in the LROI in April 2023

Year of surgery	Type of finger arthroplasty: Total arthroplasty (n)	Type of finger arthroplasty: Revision arthroplasty (n)	Total (n)
2017	186	14	200
2018	193	25	218
2019	263	24	287
2020	250	25	275
2021	230	16	246
2022	199	28	227
Total	1,321	132	1,453

Type of procedure

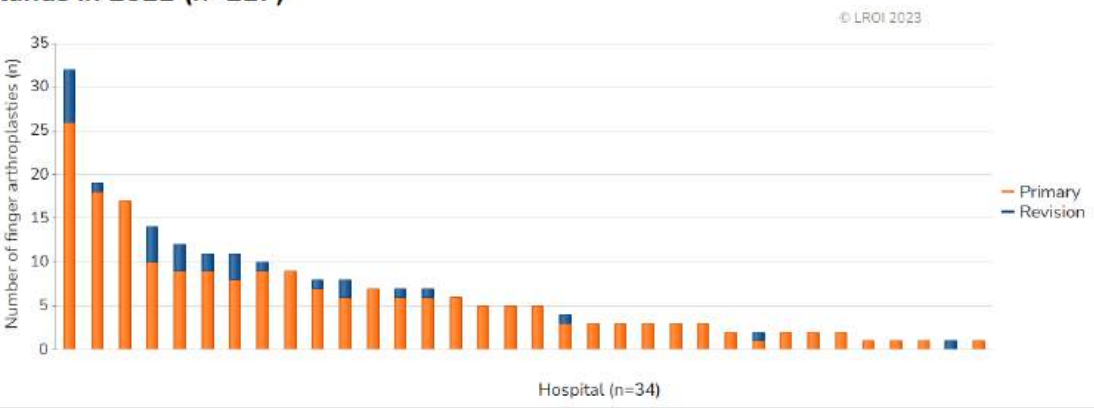
FIGURE Number of primary finger arthroplasties and finger revision arthroplasties registered in the LROI in the Netherlands in 2017-2022



Year	2017	2018	2019	2020	2021	2022	Total
Type of procedure (n)							
Primary	186	193	263	250	230	199	**1,321**
Revision	14	25	24	25	16	28	**132**
Total:	**200**	**218**	**287**	**275**	**246**	**227**	**1,453**

Type of procedure per hospital

FIGURE Number of primary finger arthroplasties and finger revision arthroplasties per hospital in the Netherlands in 2022 (n=227)



Please note: in 2022, 27 general hospitals, 2 university medical centres and 5 private hospitals performed finger arthroplasties.

Type of primary finger prosthesis

TABLE Type of primary finger prosthesis in primary finger arthroplasties in the Netherlands in 2022 (n=199)

	Type of finger					
Finger joint	Thumb (n)	Index (n)	Middle (n)	Ring (n)	Small (n)	Total (n)
CMC	17	n.a.	n.a.	n.a.	n.a.	17
MCP	0	29	30	15	16	90
PIP	n.a.	19	30	29	8	86
DIP	0	2	1	0	1	4
Total (n)	17	50	61	44	25	197

Please note: In 2 (1.0%) primary finger arthroplasties, the type of finger was not registered.

Primary finger arthroplasty

Demographics

Patient characteristics by specialism

TABLE Patient characteristics of all patients with a registered primary finger arthroplasty in the Netherlands in 2022

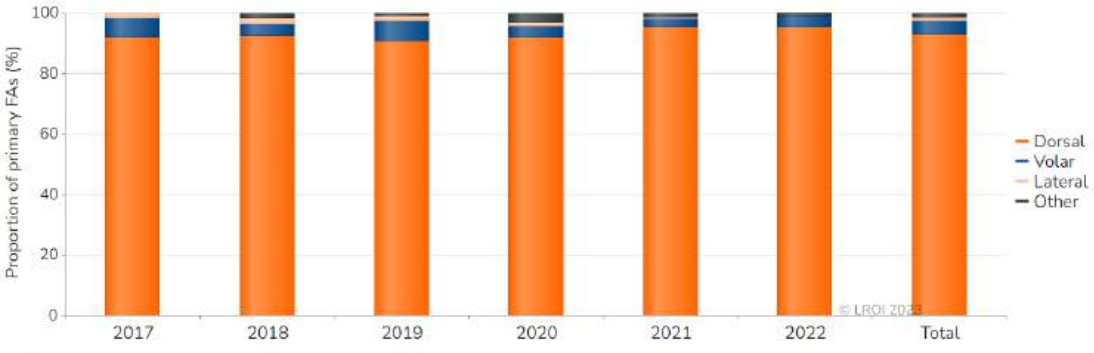
	Plastic surgeon (n=102)	Orthopaedic surgeon (n=89)	Total (n=199)[1]
Mean age (years) (SD)	65.8 (9.7)	65.1 (10.9)	65.4 (10.1)
Age (years) (%)			
<50	9	6	7
50-59	14	21	18
60-69	35	36	37
70-79	37	30	33
≥80	5	7	5
Gender (%)			
Men	27	9	19
Women	73	91	81
ASA score (%)			
I	24	11	18
II	57	52	55
III-IV	19	37	27
Type of hospital (%)			
General	53	98	75
UMC	19	2	11
Private	28	0	14
Diagnosis (%)			
Osteoarthritis	80	46	64
Rheumatoid arthritis	17	52	33
Post-traumatic	1	1	1
Inflammatory arthritis	0	1	1
Osteonecrosis	0	0	0
Other	2	0	1
Mean Body Mass Index (kg/m²) (SD)	26.8 (4.9)	26.1 (6.4)	26.4 (5.7)
Body Mass Index (kg/m²) (%)			
Underweight (≤18.5)	1	4	3
Normal weight (>18.5-25)	40	52	45
Overweight (>25-30)	30	33	31
Obesity (>30-40)	28	8	19
Morbid obesity (>40)	1	3	2
Smoking (%)			
No	87	90	88
Yes	13	10	12

Please note: in 2022, 1 (0.5%) patient had a primary finger arthroplasty performed by a trauma surgeon. For 7 (3.5%) patients with a primary finger arthroplasties the specialism was not registered.
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

Surgery and prosthesis

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary finger arthroplasty in the Netherlands in 2017-2022

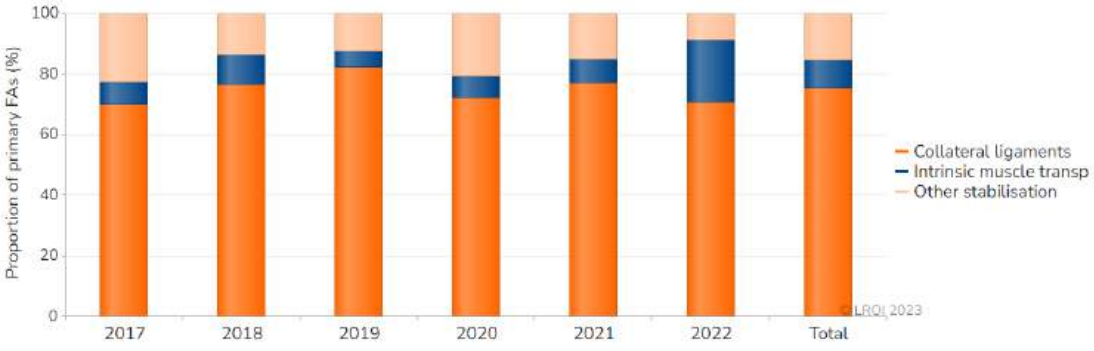


Surgical approach (%)	2017	2018	2019	2020	2021	2022	Total
Dorsal	92.05	92.67	90.83	91.95	95.56	95.65	**93.05**
Volar	6.25	3.66	6.67	3.81	2.67	3.26	**4.39**
Lateral	1.70	2.09	1.67	1.27	0.44	0.00	**1.20**
Other	0.00	1.57	0.83	2.97	1.33	1.09	**1.36**
Total (n):	**176**	**191**	**240**	**236**	**225**	**184**	**1,252**

FA: finger arthroplasty.

Soft tissue stabilisation

FIGURE Trend (proportion [%] per year) in type of stabilisation in primary finger arthroplasty in the Netherlands in 2017-2022



Soft tissue stabilisation (%)	2017	2018	2019	2020	2021	2022	Total
Collateral ligaments	70.00	76.61	82.16	72.19	77.11	70.87	**75.37**
Intrinsic muscle transp	7.50	9.68	5.41	7.28	7.83	20.47	**9.28**
Other stabilisation	22.50	13.71	12.43	20.53	15.06	8.66	**15.35**
Total (n):	**120**	**124**	**185**	**151**	**166**	**127**	**873**

FA: finger arthroplasty.

Most frequently registered components

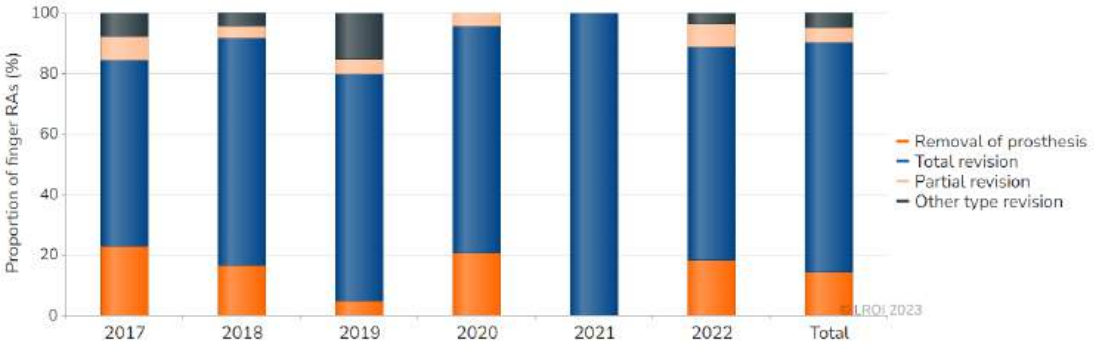
TABLE The most frequently registered proximal and distal components in primary finger arthroplasties in the Netherlands in 2022

Proximal (n=172)		Distal (n=8)	
Name	Proportion (%)	Name	Proportion (%)
MCP Implant Stryker	22.1	Tactys	62.5
Silicone PIP Integra	20.3	PIP Implant Integra	12.5
Silicone MCP Integra	14.5	Cap Flex PIP prothese	12.5
Silicone PIP Stryker	13.4	MAIA	12.5
Swanson	13.4		
KeriFlex MCP	3.5		

Finger revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision arthroplasty of finger revision arthroplasties in the Netherlands in 2017-2022



Type of finger revision (%)	2017	2018	2019	2020	2021	2022	Total
Removal of prosthesis	23.08	16.67	5.00	20.83	0.00	18.52	**14.52**
Total revision	61.54	75.00	75.00	75.00	100.00	70.37	**75.81**
Partial revision	7.69	4.17	5.00	4.17	0.00	7.41	**4.84**
Other type revision	7.69	4.17	15.00	0.00	0.00	3.70	**4.84**
Total (n):	**13**	**24**	**20**	**24**	**16**	**27**	**124**

RA: revision arthroplasty

Reasons for revision

TABLE Reasons for revision in patients who underwent a finger revision arthroplasty in the Netherlands in 2022 (n=24)

Reasons for revision	Number[1] (n)
Implant fracture	15
Instability	11
Dislocation	10
Malalignment	6
Bone resorption of proximal component	5
Bone resorption of distal component	5
Loosening of proximal component	1
Other	0

[1] One patient may have more than one reason for revision.

Survival

Overall

FIGURE Cumulative revision percentage of primary finger arthroplasties in the Netherlands in 2017-2022 (n=1,318)

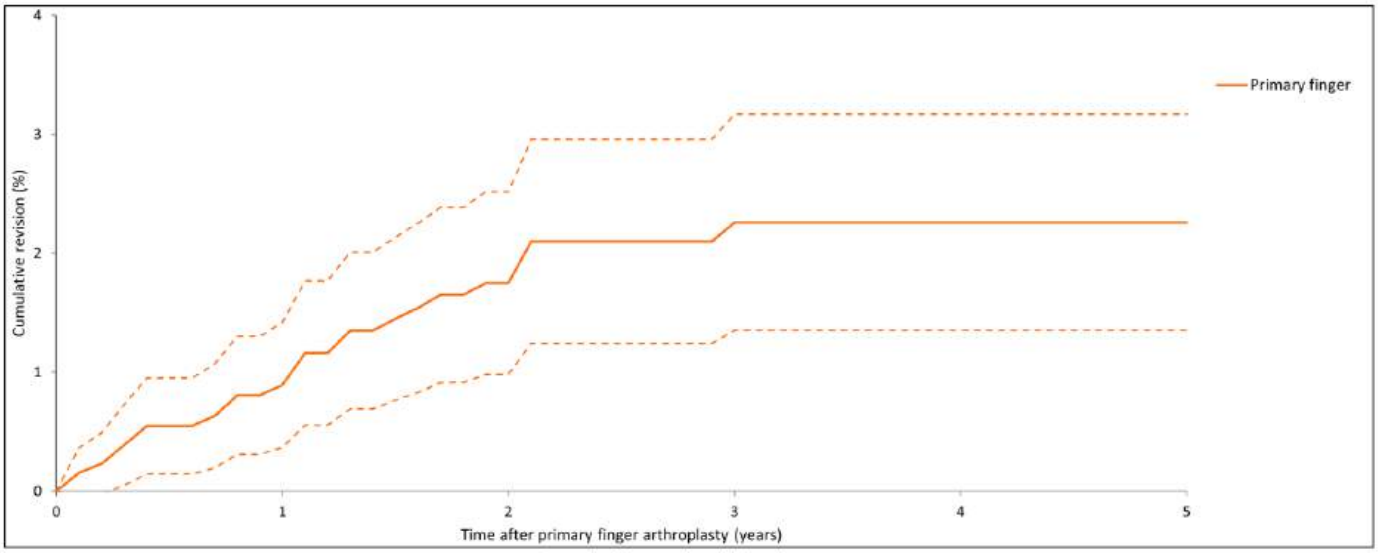


TABLE Cumulative revision percentages of primary finger arthroplasties

	Number (n)	Number at risk (n)	Kaplan Meier (95% CI)
Primary finger arthroplasty	1,318		
1-year revision (%)		1,116	0.80 (0.31-1.30)
2-year revision (%)		878	1.75 (0.98-2.52)
3-year revision (%)		630	2.10 (1.24-2.96)
4-year revision (%)		378	2.26 (1.35-3.17)
5-year revision (%)		182	2.26 (1.35-3.17)

CI: confidence interval.
Please note: The number of registered primary finger and revision arthroplasties is not complete.

In 2017-2022, 26 (2.0%) primary finger arthroplasties were implanted in patients who died within five years after the primary procedure.

Data quality

Completeness

Coverage and completeness

TABLE Completeness of registering hospitals and completeness of registered arthroplasties in the LROI based on the hospital information system in 2022

	Number of hospitals in LROI[1] (n)	Completeness of registering hospitals[2] (%)	Median [range] number of registrations	Completeness of registrations[3] (%)
Hip arthroplasties		100		
Primary total hip arthroplasties	80		324 [1-1,023]	99
Primary hip hemiarthroplasties	78		68 [1-285]	92
Hip revision arthroplasties	81		36 [1-281]	97
Knee arthroplasties		100		
Primary knee arthroplasties	66		331 [22-990]	99
Knee revision arthroplasties	84		29 [2-418]	98
Ankle arthroplasties		100		
Primary ankle arthroplasties	9		2 [1-28]	96
Ankle revision arthroplasties	8		2 [1-6]	95
Shoulder arthroplasties		100		
Primary shoulder arthroplasties	65		37 [1-265]	97
Shoulder revision arthroplasties	59		2 [1-114]	95
Elbow arthroplasties		100		
Primary elbow arthroplasties	23		3 [1-21]	85
Elbow revision arthroplasties	15		4 [1-21]	87
Wrist arthroplasties		100		
Primary wrist arthroplasties	14		2 [1-11]	59
Wrist revision arthroplasties	10		1 [1-6]	85
Finger arthroplasties		100		
Primary finger arthroplasties	23		3 [1-26]	60
Finger revision arthroplasties	7		2 [1-6]	100

[1] Number of hospitals that performed arthroplasties in accordance with their hospital information system in 2022.
[2] Proportion of total number of hospitals that performed arthroplasties in 2022. The information provided regarding the completeness of registered hospitals is based on data available of the most recent update the Dutch Orthopaedic Association (NOV) provided us.
[3] Completeness of number of registered arthroplasties in the LROI in August 2023, compared to the total number of arthroplasties performed (based on the hospital information system) in 2022. This pertains only to hospitals that submitted data for comparison.
Please note: 3 hospitals (trauma surgery) and 5 hospitals (plastic surgery) registered not in the LROI and provided no hospital information system data for comparison. .

Overall completeness per arthroplasty

FIGURE Completeness (proportion [%] per joint) of the registration of procedures in the LROI in 2022

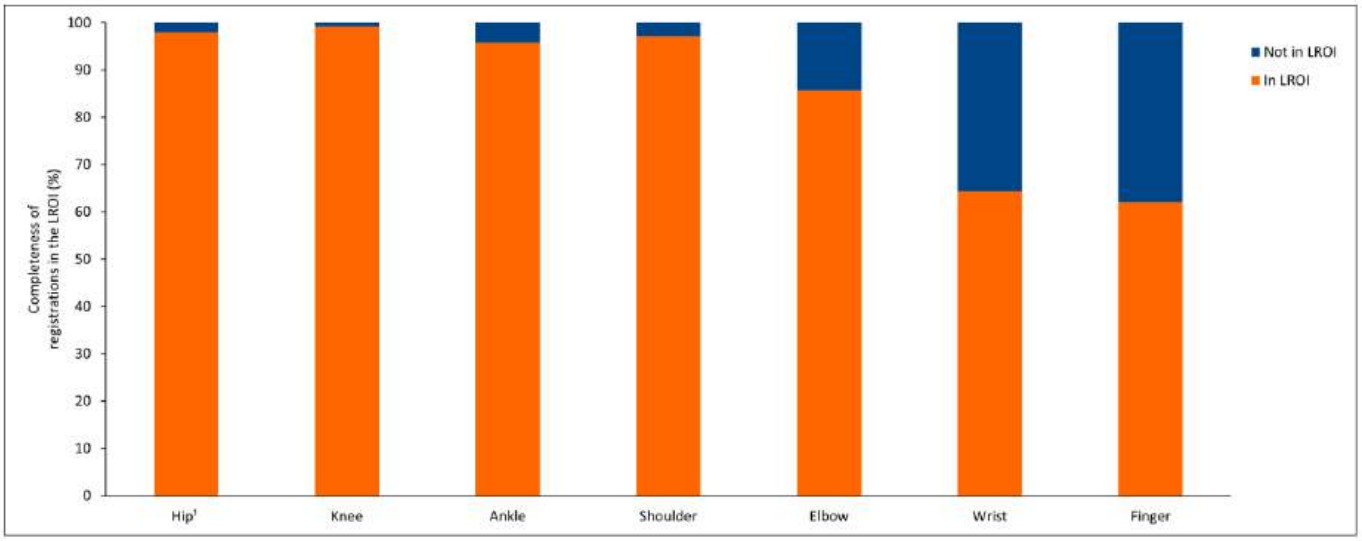


TABLE Completeness (proportion [%] per joint)

	Hip[1]	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Number of procedures in HIS (n)	47,352	37,104	142	4,143	259	129	327
Completeness of registrations in the LROI[2] (%)	97.9	99.2	95.8	97.2	85.7	64.3	62.1

[1] Includes primary total hip arthroplasties, primary hip hemiarthroplasties and hip revision arthroplasties.
[2] Completeness of number of registered arthroplasties (orthopaedic, trauma and plastic surgery) in the LROI in August 2023, compared to the total number of arthroplasties performed (based on the hospital information system) in 2022. This pertains only to hospital that submitted data for comparison.
Please note: 3 hospitals (trauma surgery) and 5 hospitals (plastic surgery) registered not in the LROI and provided no hospital information system data for comparison.

Completeness per year

TABLE Completeness (proportion [%] per joint) of the registration of procedures in the LROI in 2013-2022

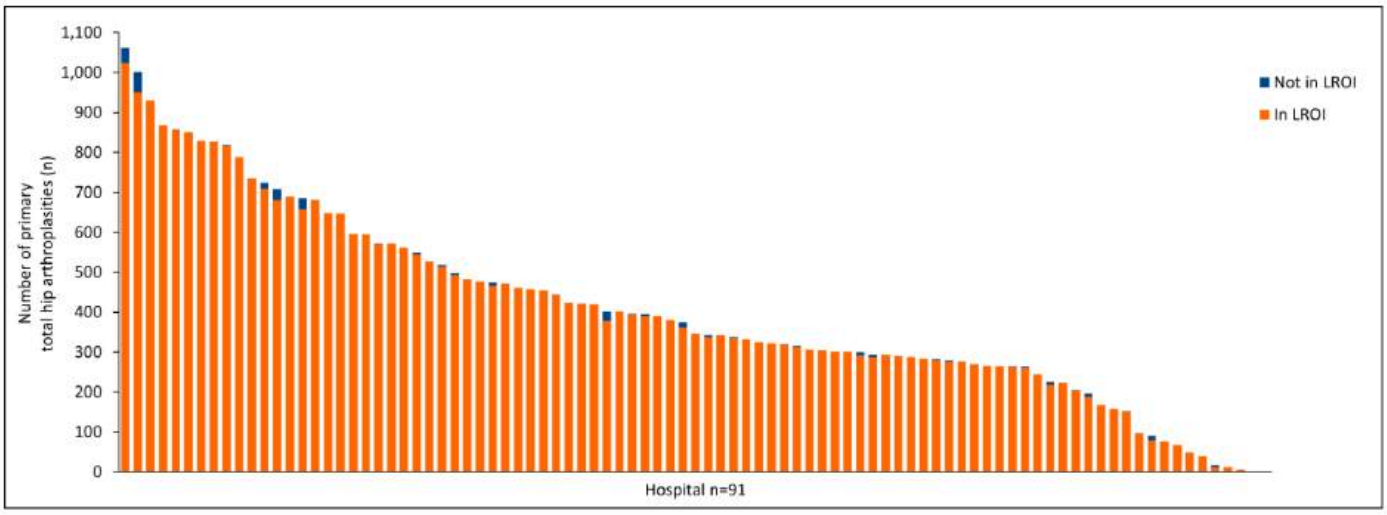
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Hip arthroplasties										
Primary total hip arthroplasties	97	96	98	99	99	99	99	99	99	99
Primary hip hemiarthroplasties [1]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	92
Primary hip hemiarthroplasties (orthopaedic surgeon)	71	84	88	95	96	96	94	97	96	n.a.
Primary hip hemiarthroplasties (trauma surgeon)	n.a.	n.a.	n.a.	50	64	65	63	68	74	n.a.
Hip revision arthroplasties	88	93	97	97	98	97	97	98	98	97
Knee arthroplasties										
Primary knee arthroplasties	95	96	98	99	100	99	99	99	97	99
Knee revision arthroplasties	90	93	98	98	98	97	97	98	97	98
Ankle arthroplasties										
Primary ankle arthroplasties	n.a.	80	91	92	100	98	98	95	95	96
Ankle revision arthroplasties	n.a.	55	67	94	87	83	55	95	96	95
Shoulder arthroplasties										
Primary shoulder arthroplasties [1]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	97
Primary shoulder arthroplasties (orthopaedic surgeon)	n.a.	78	94	94	98	91	96	96	97	n.a.
Primary shoulder arthroplasties (trauma surgeon)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	32	25	n.a.
Shoulder revision arthroplasties	n.a.	74	90	92	90	78	91	93	79	95
Elbow arthroplasties										
Primary elbow arthroplasties	n.a.	70	85	88	91	89	85	92	89	85
Elbow revision arthroplasties	n.a.	55	86	93	87	85	83	91	78	87
Wrist arthroplasties										
Primary wrist arthroplasties[1]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	59
Primary wrist arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	71	29	55	70	73	n.a.
Primary wrist arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	64	62	50	56	75	n.a.
Wrist revision arthroplasties[1]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	85
Wrist revision arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	18	83	77	100	93	n.a.
Wrist revision arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	25	50	50	86	75	n.a.
Finger arthroplasties										
Primary finger arthroplasties[1]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	60
Primary finger arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	53	63	66	65	81	n.a.
Primary finger arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	67	68	60	82	84	n.a.
Finger revision arthroplasties[1]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	100
Finger revision arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	17	100	90	41	83	n.a.
Finger revision arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	24	40	57	67	100	n.a.

[1] Completeness of number of registered hip, shoulder and elbow arthroplasties includes orthopaedic en trauma surgery. Completeness of number of registered wrist and finger arthroplasties includes orthopaedic, trauma and plastic surgery.
Completeness: Number of registered arthroplasies in the LROI compared to the total number of arthroplasties performed based on the hospital information system (HIS). This pertains only to hospitals that submitted data for comparison.
Please note: Ankle, shoulder and elbow arthroplasties were registered since 2014; wrist and finger arthroplasties were registered since 2016.

The completeness of number of registered arthroplasties in the LROI is determined every year in August. Improving data completeness and data quality by registering missing data is an ongoing process.

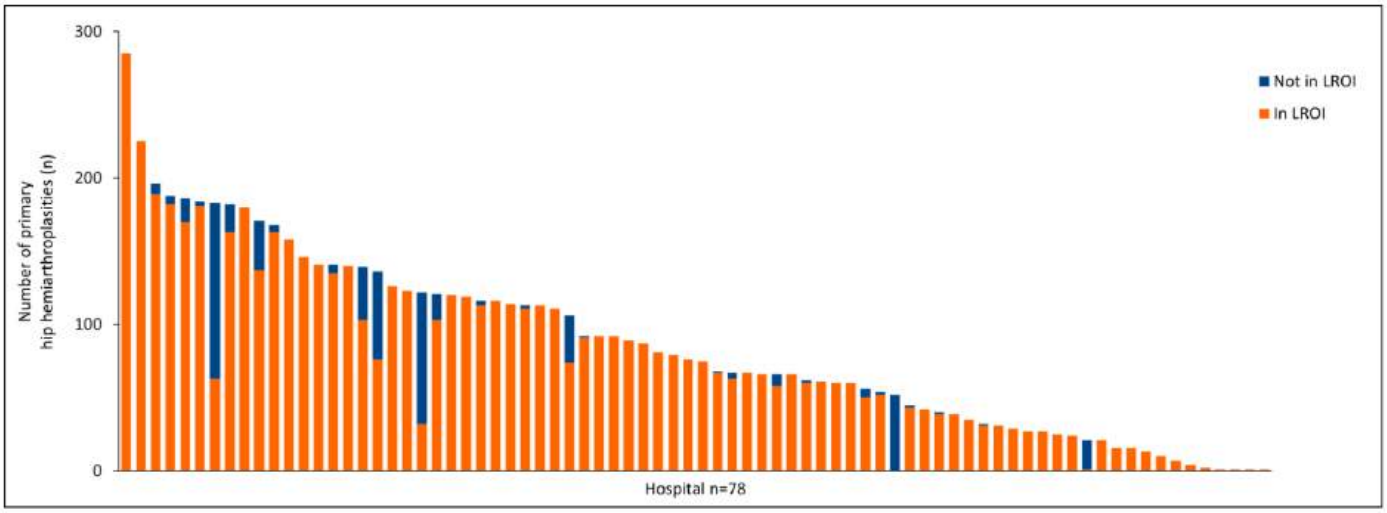
Completeness primary THA per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for primary total hip arthroplasties in 2022



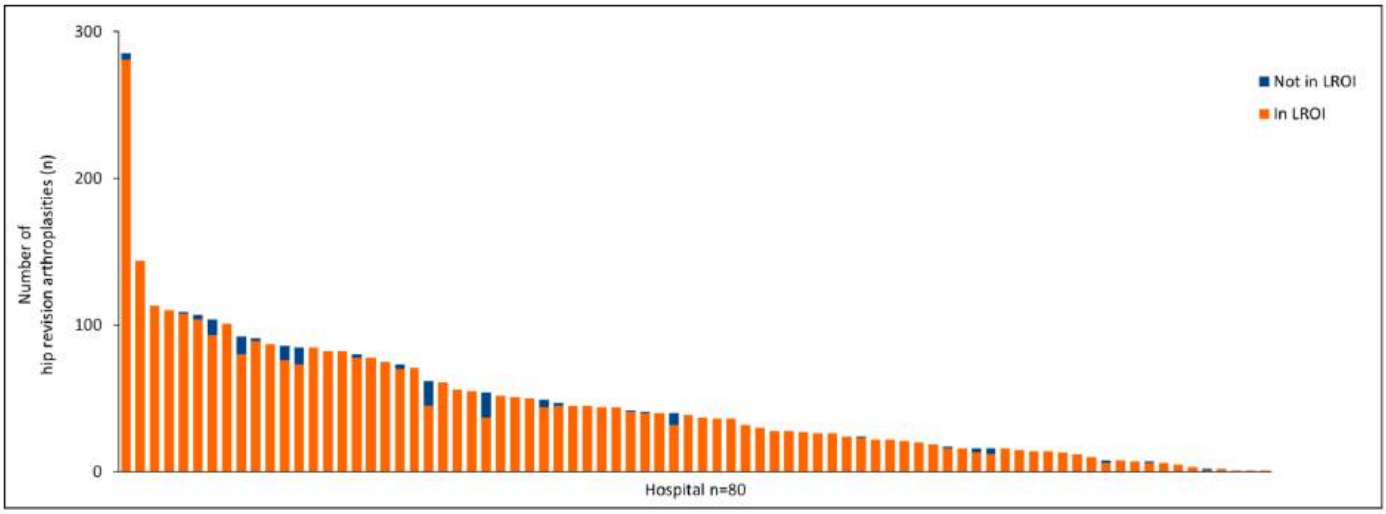
Completeness primary hip hemiarthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for primary hip hemiarthroplasties (performed by an orthopaedic surgeon) in 2022



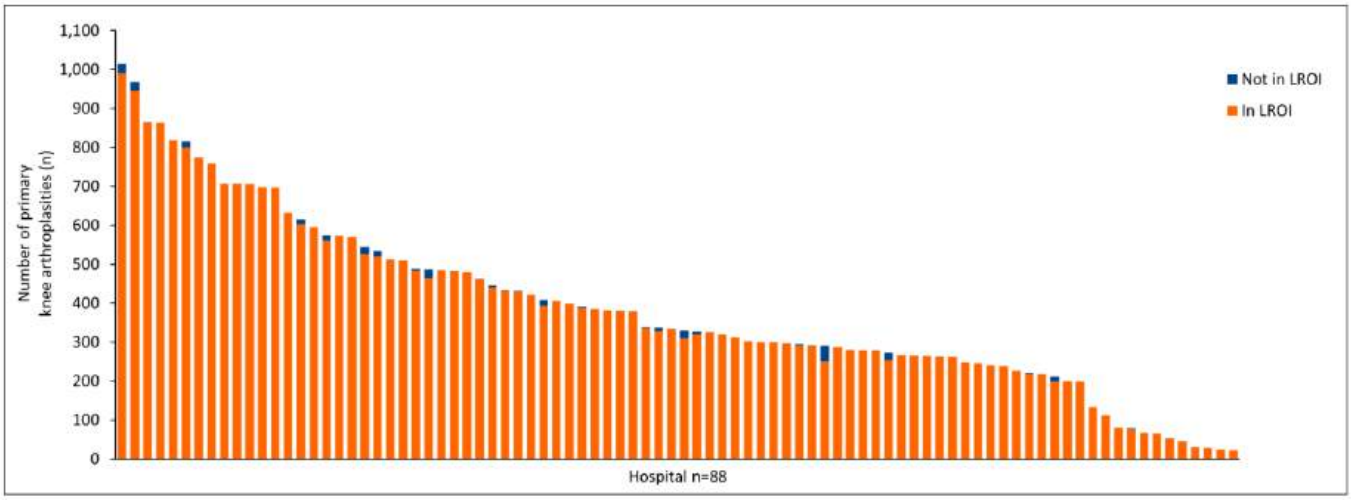
Completeness hip revision arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for hip revision arthroplasties in 2022



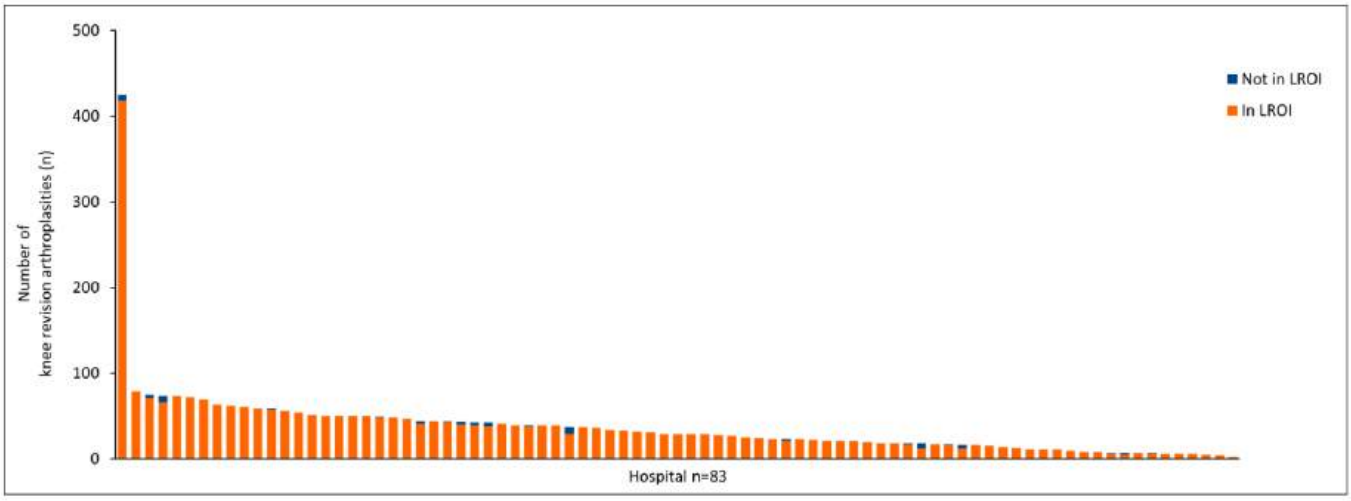
Completeness primary knee arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for primary knee arthroplasties in 2022



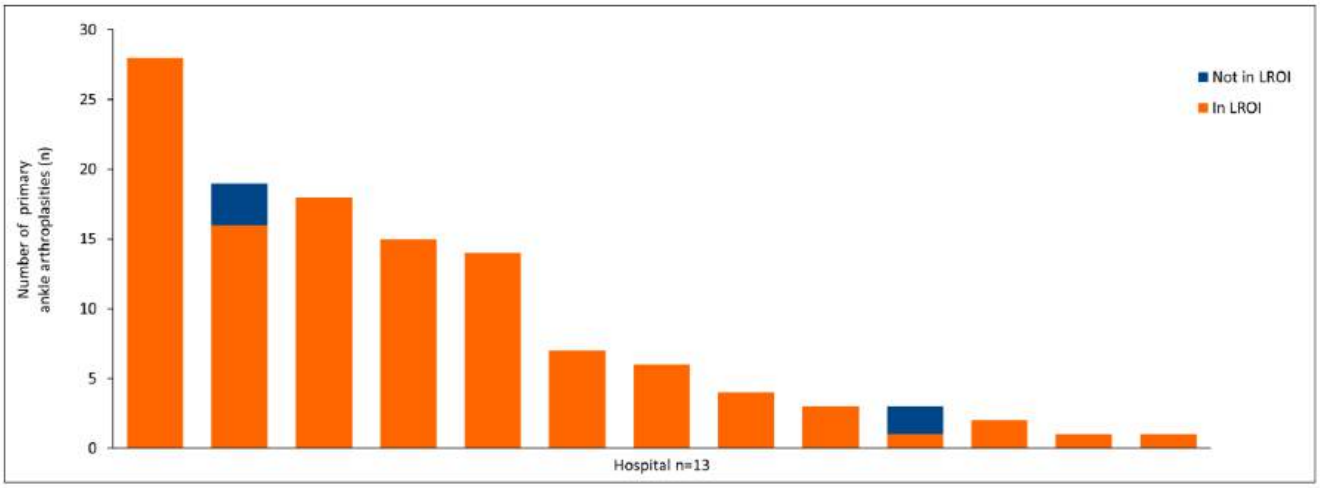
Completeness knee revision arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for knee revision arthroplasties in 2022



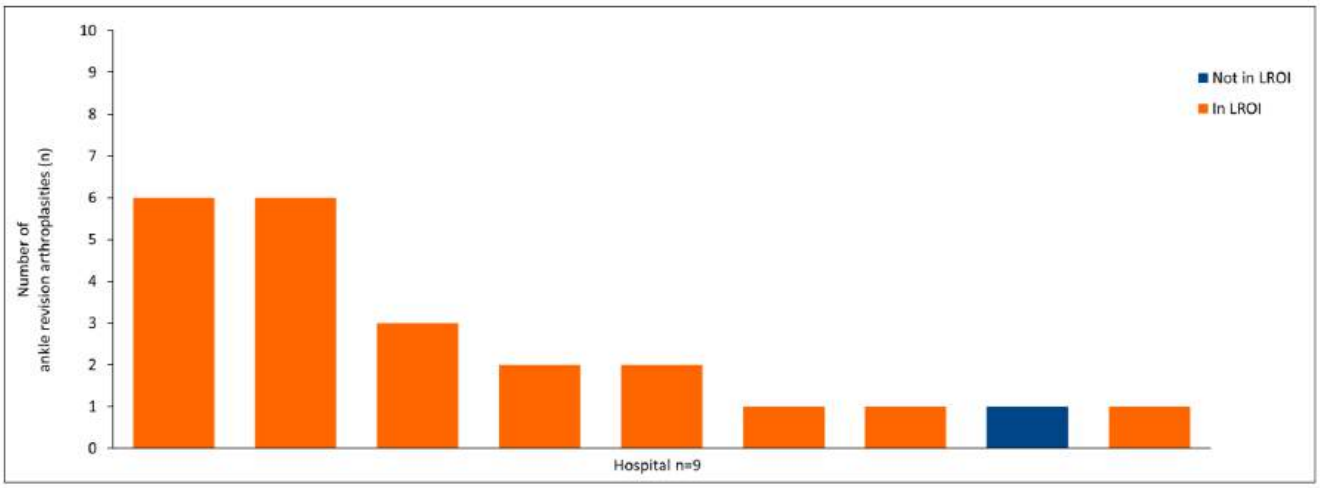
Completeness primary ankle arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for primary ankle arthroplasties in 2022



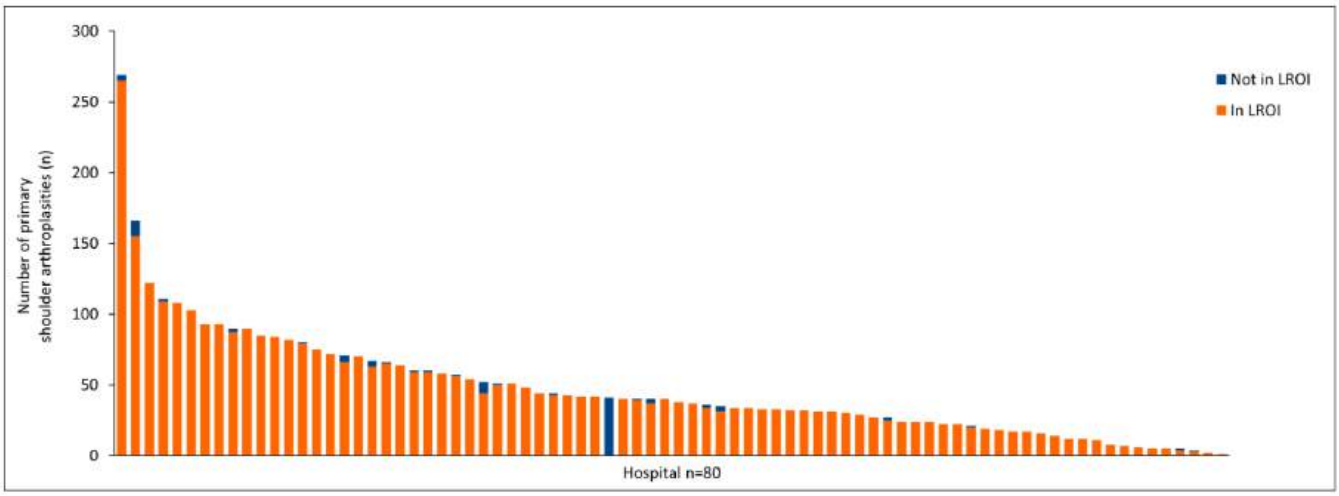
Completeness ankle revision arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for ankle revision arthroplasties in 2022



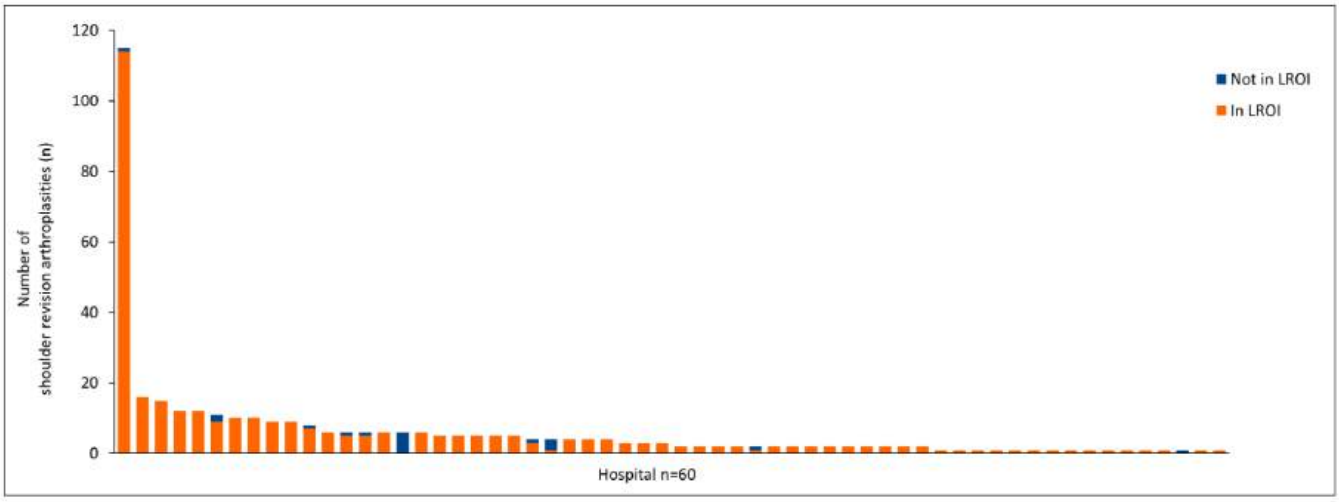
Completeness primary shoulder arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for primary shoulder arthroplasties in 2022



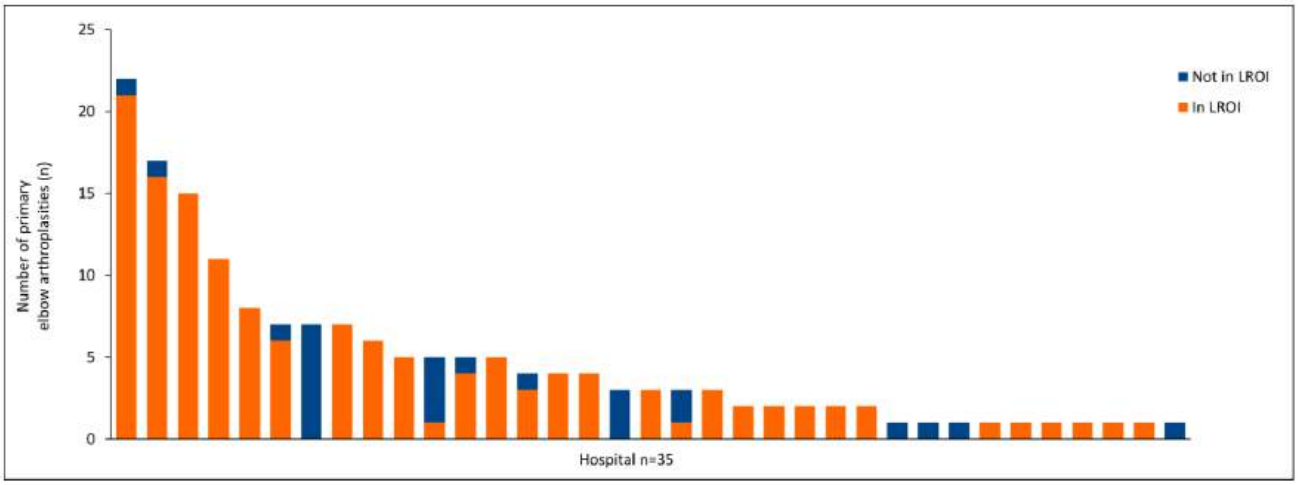
Completeness shoulder revision arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for shoulder revision arthroplasties in 2022



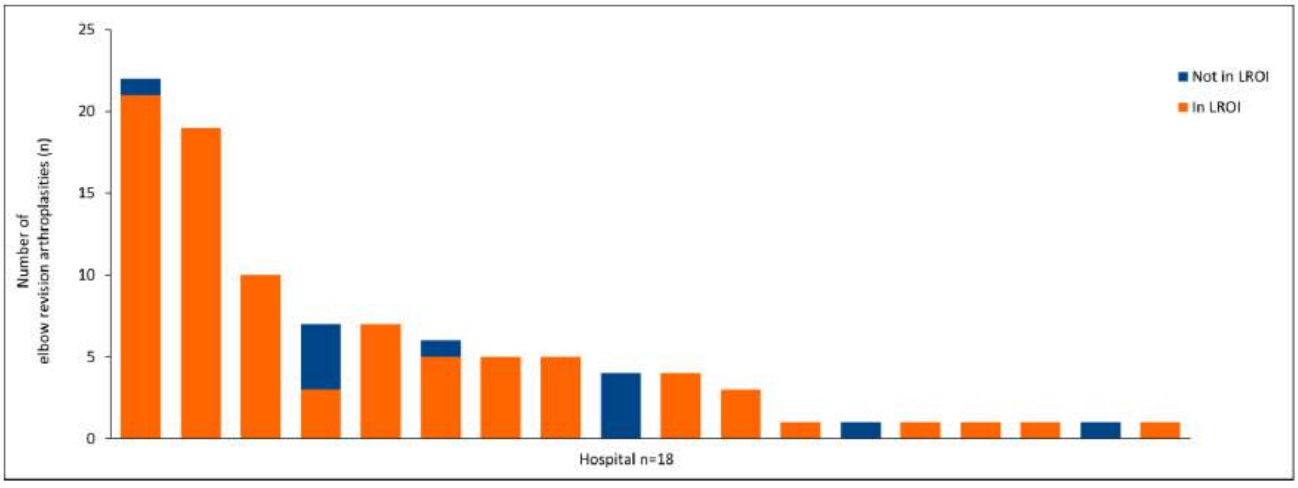
Completeness primary elbow arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for primary elbow arthroplasties in 2022



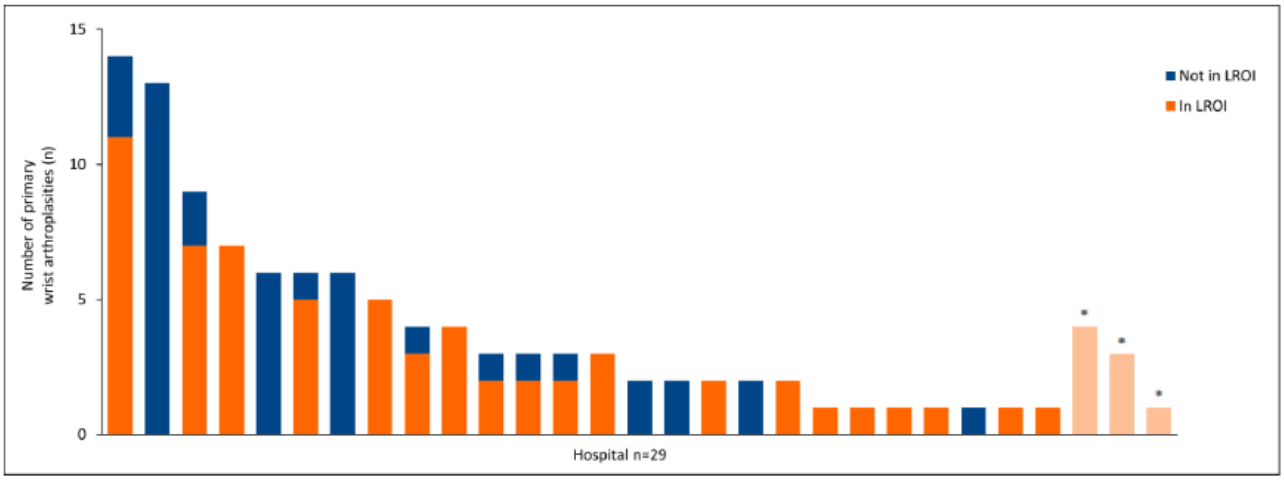
Completeness elbow revision arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for elbow revision arthroplasties in 2022



Completeness primary wrist arthroplasties per hospital

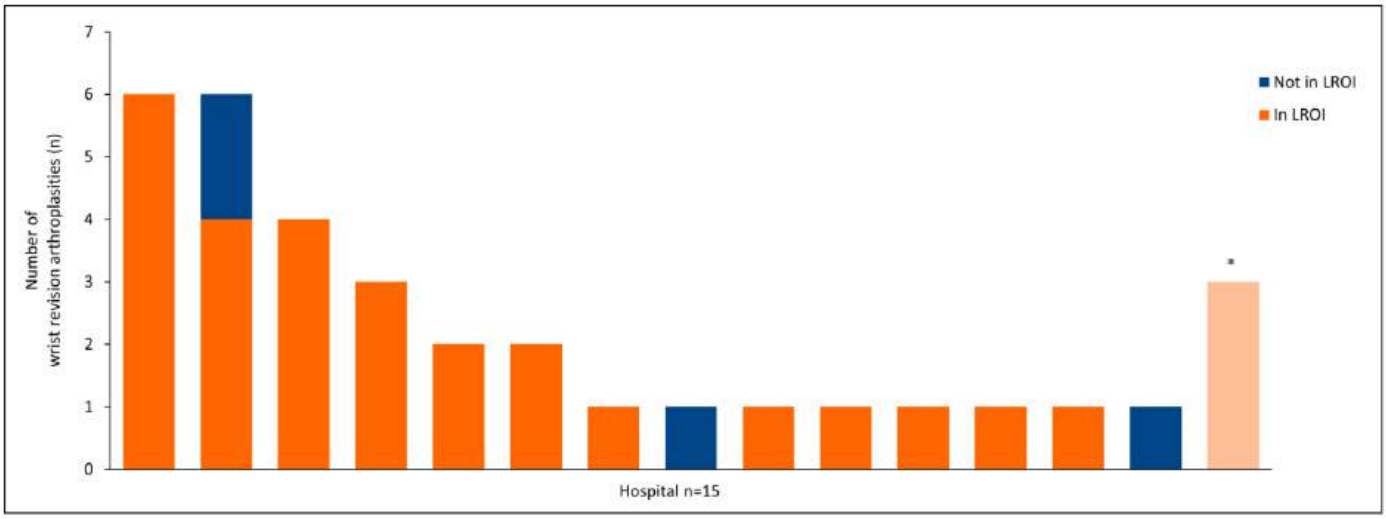
FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for primary wrist arthroplasties in 2022



* No data provided for comparison by the hospital

Completeness wrist revision arthroplasties per hospital

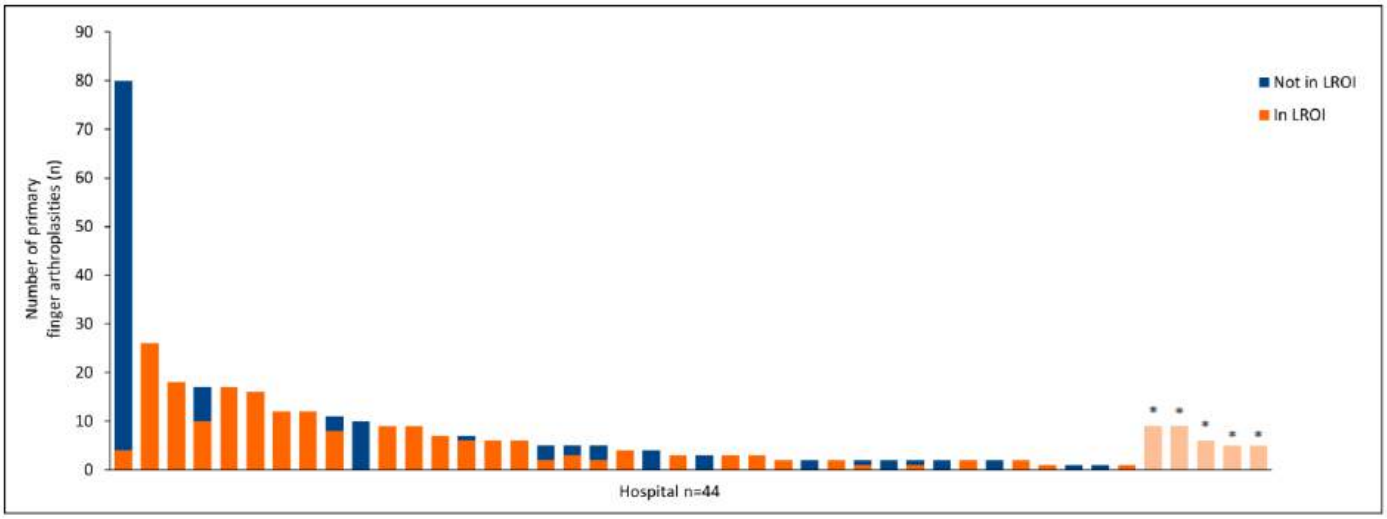
FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for wrist revision arthroplasties in 2022



* No data provided for comparison by the hospital

Completeness primary finger arthroplasties per hospital

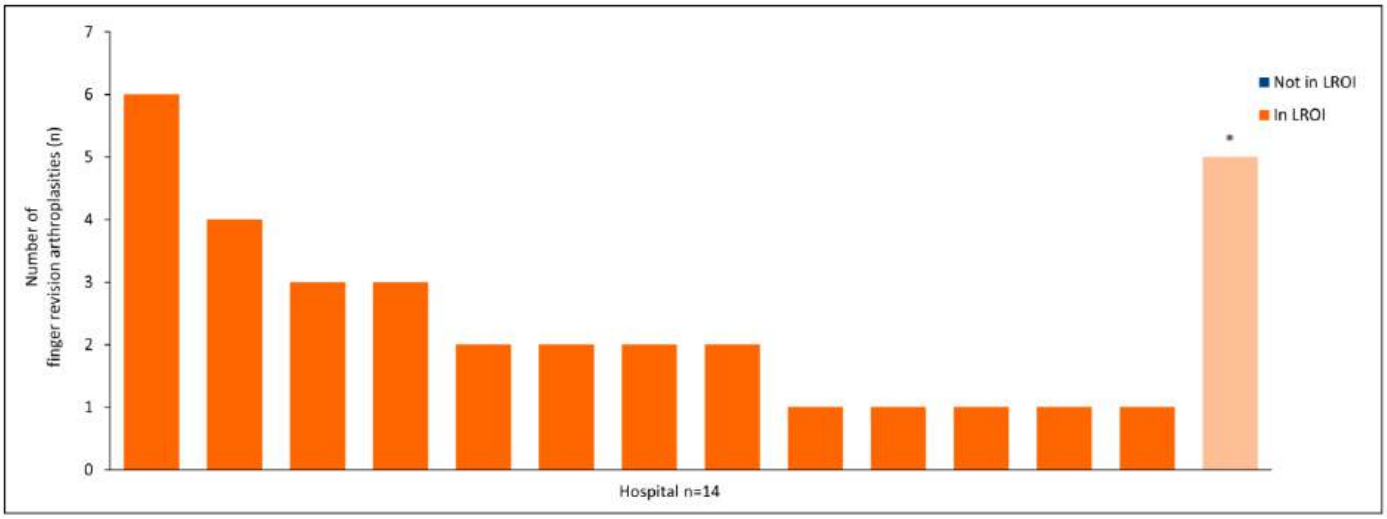
FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for primary finger arthroplasties in 2022



* No data provided for comparison by the hospital

Completeness finger revision arthroplasties per hospital

FIGURE Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital for finger revision arthroplasties in 2022



* No data provided for comparison by the hospital

Validity

Overall validity

FIGURE Validity (proportion [%] per joint) of the registration of procedures in the LROI in 2022

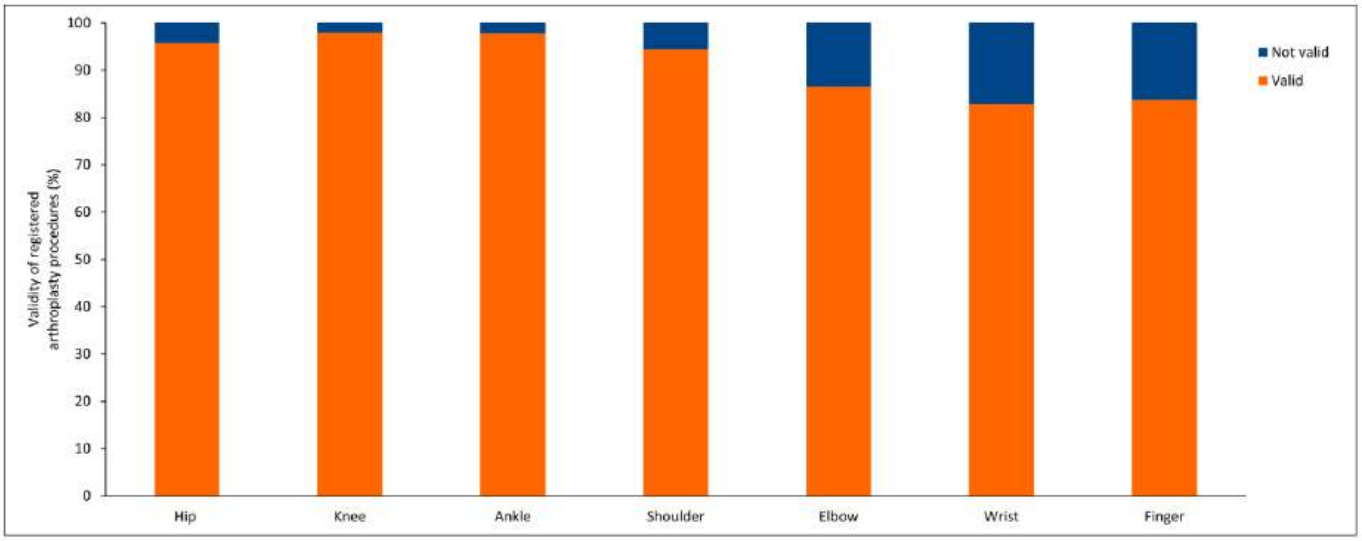


TABLE Validity (proportion [%] per joint)

	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Number of procedures (n)	46,408	36,807	136	4,012	207	87	227
Valid registered procedures (%)	95.7	97.9	97.8	94.4	86.5	82.8	83.7

Validity per variable

TABLE Overview of validity by variable for each joint of hip, knee, ankle, shoulder, wrist and finger arthroplasties registered in the LROI in the Netherlands in 2022

	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Number of arthroplasties (n)	**46,408**	**36,807**	**136**	**4,012**	**207**	**87**	**227**
Number of primary arthroplasties (n)	42,816	33,822	116	3,673	131	62	199
Number of revision arthroplasties (n)	3,592	2,985	20	339	76	25	28
General characteristics	%	%	%	%	%	%	%
Gender	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Encrypted citizen service number	99.8	99.9	99.3	99.9	99.5	100.0	100.0
HIS patient number	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Date of birth	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Type of procedure	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Operating side	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Postal code	99.8	99.9	100.0	99.9	99.5	94.3	96.0
BMI	97.8	99.5	99.3	99.0	99.0	92.0	94.7
Smoking	98.8	99.6	100.0	99.3	98.0	93.1	96.0
ASA score	99.8	99.8	100.0	99.9	100.0	94.3	97.4
Fixation	99.8	99.8	100.0	98.8	98.46	90.8	93.4
Primary arthroplasty characteristics	%	%	%	%	%	%	%
Diagnosis	99.5	99.6	100.0	99.1	100.0	96.8	96.5
Charnley/Walch score	99.4	99.5	100.0	98.6	n.a.	n.a.	n.a.
Prosthesis	99.9	99.9	100.0	99.7	99.2	96.8	99.1
Surgical approach	99.5	99.7	100.0	98.2	97.7	85.5	92.5
Revision arthroplasty characteristics	%	%	%	%	%	%	%
Type of revision	99.6	99.3	100.0	99.1	98.7	96.0	96.4
Charnley score	100.0	100.0	n.a.	n.a.	n.a.	n.a.	n.a.
Reason for revision	98.4	97.8	95	98.5	94.7	96.0	96.4

Please note: Validity by variable as determined in April 2023.
HIS: hospital information system; BMI: body mass index.

General

Methodology of survival analyses

The life span of a joint prosthesis is the time between implantation of a primary prosthesis and the time of the first revision. However, patients may die before the prosthesis needs to be revised (Figure).

Link between primary and revision arthroplasties

In order to assess a prosthesis' life span, follow-up time of all primary prostheses was examined. This was done by linking revision arthroplasties to the primary arthroplasties in the LROI by means of the encrypted Citizen Service Number (BSN). In this way, the correct revision arthroplasty can be linked anonymously to a primary arthroplasty. In about 11% of the arthroplasties, the encrypted BSN was not entered into the system, mainly in the first years of registration. Links between these primary and revision arthroplasties were established based on the LROI hospital number and the LROI patient number. As such, revision arthroplasties have been linked to primary arthroplasties of a patient when the patient underwent primary and revision arthroplasty on the same joint in the same hospital.

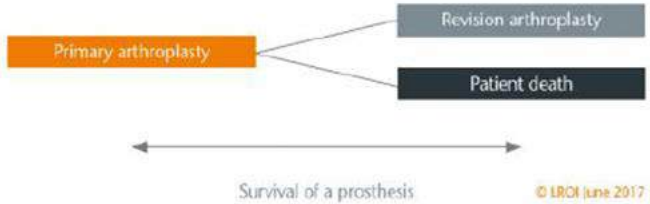
Kaplan Meier survival analysis

Survival of a prosthesis may be determined in various ways. Traditionally, the Kaplan Meier method is used. This method was developed for situations with one possible end point (such as death of the patient). However, in order to calculate survival of a prosthesis at least two end points are important: revision of the prosthesis and death of the patient. The Kaplan Meier method estimates the proportion of failed prostheses if patients would live on forever. However, a number of patients dies before the prosthesis requires revision. Consequently, fewer revisions are carried out than could be expected based on the model. That is why this method overrates the chance of revision.

Competing risk survival analysis

The competing risk method allows monitoring for several end points. When an end point occurs (such as death), other end points will no longer be available (such as prosthesis revision). The cumulative incidence (summed occurrence of an end point) will be calculated. Death of a patient is a final end point, the prosthesis will no longer be revised and this finalizes the period that a prosthesis lasts. The time at risk will be the period from primary implantation to death.

FIGURE SURVIVAL OF A PROSTHESIS.



Method comparison

In order to get a clearer picture of the difference in results between the Kaplan Meier method and competing risk method we have calculated the revision percentage within 10 years using both methods. The revision percentage was calculated for patients who underwent a total hip arthroplasty according to age group over the period 2007-2018.

This comparison shows that the revision percentage calculated by means of the Kaplan Meier method results in a higher chance of revision within 10 years. The difference is more pronounced in groups of patients with a higher chance of the competing event (death of the patient), as we can see in the groups of elderly patients (Table). This difference is still relatively minor, but will increase as follow-up extends. Consequently, this Annual Report estimates the chance of revision of a prosthesis by means of the competing risk method. However, for comparability with other arthroplasty registries Kaplan Meier revision rates are also shown.

TABLE CUMULATIVE 10-YEAR REVISION PERCENTAGE OF PRIMARY TOTAL HIP ARTHROPLASTIES BY AGE IN THE NETHERLANDS IN 2007-2018.

		Cumulative 10-year revision percentage	
	Number (n)	Competing Risk (95% CI)	Kaplan Meier (95% CI)
Age (years)			
<50	13,021	7.4 (6.8-8.2)	7.6 (6.9-8.3)
50-59	35,737	6.4 (6.0-6.9)	6.6 (6.2-7.1)
60-69	92,371	5.1 (4.8-5.3)	5.3 (5.1-5.5)
70-79	106,347	4.1 (4.0-4.3)	4.5 (4.3-4.6)
≥80	43,909	2.8 (2.6-3.0)	3.1 (2.9-3.4)

Please note: The primary outcome in a Kaplan Meier analysis is prosthesis survival, while this is the revision percentage of prostheses in the competing risk method.
In order to compare methods, survival as determined by means of the Kaplan Meier analysis is converted into the revision percentage (100% - survival% = revision%).
CI: confidence interval.

Participating hospitals

General hospitals

Admiraal de Ruyter ziekenhuis H(O) K A S E
Albert Schweitzer Ziekenhuis H(O+T) K S W(P) F(P)
Alrijne Ziekenhuis H(O) K A S W(P) F(P)
Amphia Ziekenhuis H(O) K S E W(O) F(O)
Antonius Ziekenhuis H(O) K A S
Bernhoven H(O) K S E
BovenIJ Ziekenhuis H(O+T) K S
Bravis Ziekenhuis H(O) K A S E F(O)
Canisius-Wilhelmina Ziekenhuis H(O+T) K S W(P) F(P)
Catharina Ziekenhuis H(O) K S E
Centraal Militair Hospitaal H(O) K
Deventer Ziekenhuis H(O+T) K S E W(P) F(P)
Diakonessenhuis H(O+T) K A S E W(P) F(P)
Dijklander Ziekenhuis H(O) K A S E
Elisabeth-TweeSteden Ziekenhuis H(O) K A S E W(O) F(P)
Elkerliek Ziekenhuis H(O+T) A K S E F(P)
Flevoziekenhuis H(O+T) K A S E
Franciscus Gasthuis & Vlietland H(O+T) K S E W(O+P) F(O+P)
GelreZiekenhuizen, location Apeldoorn H(O+T) K A S E W(O) F(O+P)
GelreZiekenhuizen, location Zutphen H(O) K S E
Groene Hart Ziekenhuis H(O) K S W(O) F(O)
Haaglanden Medisch Centrum H(O+T) K A S E W(P) F(P)
HagaZiekenhuis H(O+T) K A S E W(O+P) F(O+P+T)
Havenziekenhuis* H(O) K S
Het Van Weel-Bethesda Ziekenhuis H(O+T) K S
IJsselland Ziekenhuis H(O) K S
Ikazia Ziekenhuis H(O+T) K S E W(O)
Isala Klinieken H(O+T) K A S E W(P) F(P)
Jeroen Bosch Ziekenhuis H(O+T) K S E W(P) F(P)
LangeLand Ziekenhuis H(T) K S F(P+T)
Laurentius Ziekenhuis H(O) K A S E W(O) F(O)
Maasstad Ziekenhuis H(O+T) K A S E W(T) F(O)
Martini Ziekenhuis H(O+T) K A S E W(O+P) F(O+P)
Máxima Medisch Centrum H(O+T) K S E W(O) F(P)
MC Slotervaart* H(O+T) K A S E
MC Zuiderzee* H(O+T) K S
Meander Medisch Centrum H(O+T) K A S W(P) F(P)
Medisch Centrum Leeuwarden H(O+T) K S E W(P) F(P)
Medisch Spectrum Twente H(O) K S E
Noordwest Ziekenhuisgroep H(O+T) K A S E W(O) F(O+P)
OCON H(O) K S E W(O) F(O)
OLVG H(O+T) K A S E
Ommelander Ziekenhuisgroep Groningen H(O+T) K S E W(O) F(O)
Reinier de Graaf Gasthuis H(O+T) K A S E F(O)
Reinier Haga Orthopedisch Centrum H(O) K A S E W(O) F(O)
Rijnstate H(O+T) K S E W(P) F(P)
Rivas Beatrixziekenhuis H(O) K S
Rode Kruis Ziekenhuis H(O+T) K S E F(O)
Saxenburgh Medisch Centrum H(O+T) K S
Sint Maartenskliniek, location Boxmeer H(O) K S E
Sint Maartenskliniek, location Nijmegen H(O) K A S E W(O) F(O)
Sint Maartenskliniek, location Woerden* H(O) K A S E
Slingeland Ziekenhuis H(O+T) K S

Spaarne Gasthuis H(O+T) K A S W(P) F(P)
Spijkenisse Medisch Centrum H(O) K S
St. Anna Ziekenhuis H(O) K A S E
St. Antonius Ziekenhuis H(O+T) K S E F(P)
St. Jans Gasthuis H(O) K S E
Streekziekenhuis Koningin Beatrix H(O+T) K S E
Tergooi H(O+T) K S E W(O) F(O+P)
Treant Zorggroep H(O+T) K S E
VieCuri MC H(O+T) K S E F(P)
Wilhelmina Ziekenhuis H(O) K S E F(P)
Zaans Medisch Centrum H(O) K A S E
ZGT H(T)
Ziekenhuis Amstelland H(O) K A S E
Ziekenhuis Gelderse Vallei H(O+T) K S
Ziekenhuis Nij Smellinghe H(O) K S W(O+P) F(P)
Ziekenhuis Rivierenland H(O+T) K S F(P)
Ziekenhuis St. Jansdal H(O+T) K S F(P)
Ziekenhuis Tjongerschans H(O+T) K S
ZorgSaam Ziekenhuis H(O) K A S E W(O) F(O)
Zuyderland Medisch Centrum H(O) K S E W(O) F(O)

University medical centres

Amsterdam UMC H(O+T) K A S E
Erasmus MC H(O+T) K S E W(O) F(O+P)
Leids Universitair Medisch Centrum H(O) K S E W(O)
Maastricht UMC+ H(O+T) K A S E W(O+P) F(O+P)
Radboudumc H(O+T) K S E W(O) F(O)
Universitair Medisch Centrum Groningen H(O+T) K A S E W(O+P) F(O)
Universitair Medisch Centrum Utrecht H(O+T) K E W(P) F(P)

Private hospitals

Acibadem International Medical Center H(O) K A S
Annadal Kliniek H(O) K
Annatommie MC H(O) K A S
AVE Orthopedische Klinieken* H(O) K A S
Berne Kliniek W(P) F(P)
Bergman Clinics H(O) K A S W(P) F(P)
CortoClinics H(O) K
DC Klinieken, Lairesse* H(O) K S
Eisenhower Kliniek H(O) K S F(P)
FlexClinics H(O) K
Kliniek ViaSana H(O) K S
KneeClinic K
Medische Kliniek Velsen H(O) K S E
OrthoDirect H(O) K S
Orthoparc H(O) K
Orthopedie Kliniek Amsterdam* K
Orthopedie Rijnmond* H(O) K S F(O)
Park Medisch Centrum H(O) K
The Hand Clinic* W(P) F(P)
Voor de hand F(P)
Xpert Clinics H(O) K A S E W(P) F(O+P)

H: hip; K: knee; A: ankle; S: shoulder; E: elbow; W: wrist; F: finger.
O: orthopaedic surgery; T: trauma surgery; P: plastic surgery.
* These hospitals no longer perform joint replacement procedures

Definitions and abbreviations

Definitions

Acetabulum component
The part of a hip prosthesis that is implanted into the acetabulum – the socket part of a ball and socket joint

Allograft
Transplant of bone tissue from a different body

Anchor question
The anchor question (daily functioning) measures change in daily functioning after joint replacement. The anchor question (pain) measures change in pain degree after joint replacement. The score has a range of 1.0 to 7.0, with 1.0 representing very deteriorated and 7.0 representing very improved.

Arthrodesis
A procedure in which a natural joint is fused together

Arthrofibrosis
Rigidity of the joint as a consequence of connective tissue adhesion

Arthroscopy
Keyhole surgery to examine and treat joint disorders

Arthrotomy
Opening a joint during surgery

Articulation
The two surfaces that move together (articulate) in a total joint replacement

ASA score
The American Society of Anaesthesiologists (ASA) score is a scoring system for grading the overall physical condition of the patient, as follows: I – fit and healthy; II – mild disease, not incapacitating; III – incapacitating systemic disease; IV – life threatening disease

Autograft
Transplant of bone tissue originating from the patient's own body

Bilaterality
Replacing the same joint on both sides of the body by means of a prosthesis within a specific period

Body Mass Index
Index for weight compared to body length (kg/m2); ≤18.5: underweight; >18.5-25: normal weight; >25-30: overweight; >30-40: obesity; >40: morbid obesity

Bonegraft
Bone transplant

Bone resorption
Process by which osteoclasts break down bone tissue

Carpal component
Part of a wrist prosthesis that is implanted in the patient's carpal bones

Case mix
Term used to describe variation in the population, relating to factors such as diagnosis, patient age, gender and health condition

Cement
Material (polymethyl methacrylate) used to fixate joint replacements to bone

Charnley score
Clinical classification system; A: one joint affected; B1: both joints affected; B2: contralateral joint with a prosthesis; C: several joints affected or a chronic disease that affects quality of life

Competing risk survival analyse
Method to calculate survival taking into account various outcomes, in this case revision and death

Completeness
The completeness of the number of registered procedures in the LROI, based on a comparison with the hospital information system of every hospital that performs hip and/or knee arthroplasty in the Netherlands

Completeness PROM trajectory
A PROM trajectory is considered complete when preoperative, 3-months (hip, shoulder) or 6-months (knee) postoperative and 12-months postoperative PROMs are reported

Cuff arthropathy
Osteoarthritis of the shoulder joint as a consequence of the tendons around the shoulder joint being affected

Cuff rupture
Rupture of a tendon of the muscles that are around the shoulder joint

Cumulative incidence
The added up incidence over a specific period of an event (such as revision of a prosthesis or death of a patient)

Cumulative revision percentage
Added up revision percentage over a specific time period

Difference score
Difference in calculating score between pre-operative and 3, 6 or 12 months postoperative scores

Distal component
Part of a finger prosthesis that replaces the distal phalanx

Distal hemihumeral prosthesis
Elbow prosthesis in which the distal part of the humerus (upper arm bone) is replaced

Dual mobility cup
Acetabular component that consists of a dual cup and, therefore, has two independent articulation points

EQ-5D index score
The EQ-5D index score measures quality of life. The score has a range of -0.329 to 1.0, with 1.0 representing the best possible quality of life.

EQ-5D thermometer score
The EQ-5D thermometer score measures the health situation. The score has a range of 0.0 to 100.0, with 0.0 representing the worst possible health situation and 100.0 the best possible health situation.

Femur component
Part of a hip or knee prosthesis that is implanted into the femur (thigh bone)

Femoral head component
Part of a hip prosthesis that is implanted on top of the femoral component of a hip prosthesis and moves inside the acetabular component or the cup of the hip joint

Flail elbow
Situation after removal of an elbow prosthesis in which no joint is present any more between the upper and lower arm

Girdlestone situation
Revision procedure to a hip in which the hip joint or hip prosthesis is removed and no new prosthesis is implanted (often because of a bacterial infection)

Glenoid baseplate
Part of a reversed shoulder prosthesis: a metal plate that is screwed into the glenoid (shoulder cup) of the shoulder blade, on which the glenosphere is fixed

Glenoid component
The part of a shoulder prosthesis that is placed in the glenoid; the cup-shaped notch of the shoulder blade

Glenoid liner
Intermediate component (inside layer) of a total anatomical shoulder prosthesis that will be placed in a glenoid component (most often a metal one)

Glenosphere
The part of a reversed shoulder prosthesis that is placed on the glenoid baseplate which is screwed into the glenoid and is spherical in shape

HOOS-PS score
The HOOS-PS score measures the physical functioning of patients with osteoarthritis to the hip. The score has a range of 0.0 to 100.0, with 0.0 representing no effort and 100.0 the most possible effort.

Hybrid fixation
Fixation of a prosthesis in which (most often) one of both parts of a prosthesis is cemented and the other one uncemented

Humerus component
The part of a shoulder or elbow prosthesis that replaces the humerus (upper arm bone). The humeral component of a shoulder prosthesis may consist of two parts: the humeral head and the humeral stem component

Humeral liner
Intermediate component (inner layer) of a reversed shoulder prosthesis that will be placed in a metaphysical component

Inlay
Intermediate component (inner layer), made of polyethylene

Insert
Intermediate component (inner layer), made of polyethylene that is placed in the tibial component of a knee prosthesis

Kaplan Meier survival analysis
Method to calculate survival, in which only one end point is possible, in this case revision

KOOS-PS score
The KOOS-PS score measures the physical functioning of patients with osteoarthritis to the knee. The score has a range of 0.0 to 100.0, with 0.0 representing no effort and 100.0 the most possible effort.

Lateral collateral ligament
Lateral (outer) knee ligament or elbow ligament

Lateral resurfacing arthroplasty
Elbow prosthesis in which only the lateral side of the joint is replaced

Major revision (journey)
Revision of at least the acetabular or femoral component (hip) or femoral or tibial component (knee). Journey: First revision of the acetabulum or femur/tibial component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

Malalignment
Strain on a part of the body due to an abnormal position of a joint component with respect to other components

Medial malleolus osteotomy
Surgical approach of the ankle in which the medial malleolus (protruding part of the tibia on the inside of the ankle) is incised and later re-fixed to be able to have better access to the inside of the joint

Meniscectomy
Meniscus removal

Metallosis
Deposition of metal debris in soft tissues of the body

Metaphysis component
The part of a shoulder prosthesis that replaces the metaphysis (upper part) of the humerus (upper arm bone)

Minor revision
Revision of only inlay and/or femoral head component (hip) or only insert and/or patella exchange (knee)

NRS score
Numeric Rating Scale score. The NRS (rest) score measures pain during rest. The NRS (activity) score measures pain during activity. The score has a range of 0.0 to 10.0, with 0.0 representing no pain and 10.0 representing the most possible pain. The NRS (satisfaction) score measures patients' satisfaction with the outcome of joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.

ODEP rating
Orthopaedic Data Evaluation Panel. ODEP provides ratings for hip femoral stems, hip acetabular cups and total knee replacement implants. An ODEP rating consists of a number and a letter (A or B), and a star (optional). The number represents the number of years for which the product's performance had been evidenced. The letter represents the strength of evidence presented by the manufacturer (A represents strong evidence and B represents acceptable evidence). A Star (*) represents very strong evidence above A and B. Detailed information can be found at www.odep.org.uk

Olecranon
The most proximal part of the ulna

One-stage revision
A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition)

Open Reduction and Internal Fixation surgery
Type of surgery to treat a bone fracture where the broken bone is reduced or put back into place, followed by internal fixation using devices (screws, plates, rods, or pins) to hold the broken bone together

Osteoarthritis
Disorder in which the cartilage of a joint is affected

Osteochondral bone defect
Defect of the joint surface in which both cartilage and underlying bone are affected

Osteonecrosis
Cellular death of bone tissue

Osteosynthesis
Securing broken bone parts together with plates, pins and/or screws

Osteotomy
Incise the bone in order to correct the position, to shorten or lengthen the bone

Oxford Hip score
The Oxford Hip score measures the physical functioning and pain of patients with osteoarthritis to the hip. The score has a range of 0.0 to 48.0, with 0.0 representing no functional ability and 48.0 representing the most functional ability.

Oxford Knee score
The Oxford Knee score measures the physical functioning and pain of patients with osteoarthritis to the knee. The score has a range of 0.0 to 48.0, with 0.0 representing no functional ability and 48.0 representing the most functional ability.

Patella addition
Knee revision procedure in which only a patella component was added to the primary knee prosthesis

Patella component
Part of a knee prosthesis that is implanted on the inner side of the knee cap

Patellofemoral prosthesis
Two-piece knee prosthesis that provides a prosthetic (knee) articulation surface between the patella and trochlea (furrow) of the thigh bone (femur)

Primary prosthesis
The first time (primary) a prosthesis is implanted to replace the original joint

PROMs
Patient Reported Outcome Measures

Proximal component
Part of a finger prosthesis that replaces the proximal phalanx

Radial head component
Part of an elbow prosthesis that replaces the head of the radius (spoke-bone)

Radial head prosthesis
Elbow prosthesis in which only the head of the radius (spoke-bone) is replaced

Radial stem component
Part of an elbow or wrist prosthesis that is implanted in the shaft of the patient's radius (spoke-bone)

Recommendation score
The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagree and 5.0 representing totally agree.

Resurfacing hip arthroplasty
Hip prosthesis in which the cup (acetabulum) is replaced and a metal cap is implanted on top of the femoral head

Resurfacing shoulder arthroplasty
Shoulder prosthesis in which a metal cap is implanted on top of the humeral head

Reversed hybrid fixation hip prosthesis
Fixation of a hip prosthesis in which the acetabular component is cemented and the femoral component is uncemented

Reversed shoulder prosthesis
Adjusted type of total shoulder arthroplasty in which the parts are implanted in a reversed manner. A sphere (glenosphere) is implanted onto the glenoid and a stem with cup in the shaft of the shoulder head

Revision arthroplasty
Any change (insertion, replacement and/or removal) of one or more components of the prosthesis

Sauvé Kapandji procedure
Arthrodesis of a natural wrist joint and construction of a new wrist joint by splitting the ulna

Shoulder hemiarthroplasty
Shoulder hemiarthroplasty with humeral stem, stemless hemi shoulder prosthesis (without humeral stem) or resurfacing shoulder hemiarthroplasty

Synovectomy
Removal of inflamed mucosa in a joint

Talus component
Part of an ankle prosthesis that is inserted in the talus (ankle bone)

Tibia component
Part of a knee or ankle prosthesis that is inserted in the tibia (shin bone)

Total arthroplasty
Arthroplasty in which the entire joint of a patient is replaced

Ulnar component
Part of an elbow or wrist prosthesis that is inserted in the ulna

Ulnar nerve
One of the three nerves that runs along the elbow. This nerve largely runs along the ulna

Unicondylar knee arthroplasty
Replacement of half the knee (either inner or outer side) by a prosthesis

Validity
Level of accuracy and completeness of registered data

Vektis
Vektis is a care information centre. Vektis collects and analyses data on the costs and quality of health care in the Netherlands. Vektis data mainly originates from reimbursement files of health care insurers. Therefore, Vektis has national data on medication use and use of aiding devices, data on primary health care and data on Diagnosis Treatment Combinations (DBCs/DOT) in hospitals and any other types of insured care in the Netherlands. In addition, Vektis collects demographic data, based on surveys among insurers and results of quality studies. www.vektis.nl

Walch score
Clinical classification system for level and type of wear of a shoulder joint; A1: humeral head centred, minimal erosion of shoulder cup; A2: humeral head centred, substantial erosion of shoulder cup; B1: Posterior subluxation of humeral head, posterior joint cavity narrow, subchondral sclerosis and osteophytes; B2: posterior subluxation of humerus head, retroversion of shoulder cup with posterior erosion; C: retroversion of shoulder cup over 25 degrees, irrespective of erosion

Abbreviations

AA	Ankle arthroplasty
AO	Antioxidant
ASA	American Society of Anaesthesiologists
BMI	Body Mass Index
BSN	Citizen Service Number
CI	Confidence Interval
CMC	Carpometacarpal [finger joint]
D(IP)	Distal interphalangeal [finger joint]
DRU	Distal Radioulnar [prosthesis]
EA	Elbow arthroplasty
HIS	Hospital Information System
HA	Hip arthroplasty
IQR	Interquartile range
KA	Knee arthroplasty
LROI	Dutch Arthroplasty Register
MCP	Metacarpophalangeal [finger joint]
NOV	Netherlands Orthopaedic Association
NRS	Numeric Rating Scale
OA	Osteoarthritis
ODEP	Orthopaedic Data Evaluation Panel
ORIF	Open Reduction Internal Fixation
PE	Polyethylene
PIP	Proximal interphalangeal [finger joint]
PKA	Patellofemoral Knee Arthroplasty
PROM	Patient Reported Outcome Measure
RA	Revision arthroplasty
RHA	Resurfacing hip arthroplasty
RTSA	Reverse total shoulder arthroplasty
SA	Shoulder arthroplasty
SD	Standard Deviation
TEA	Total Elbow Arthroplasty
THA	Total Hip Arthroplasty
TKA	Total Knee Arthroplasty
TSA	Total Shoulder Arthroplasty
UKA	Unicondylar Knee Arthroplasty
UMC	University Medical Centre
XLPE	Cross linked polyethylene
Zo	Oxidized Zirconium