Online LROI annual report 2024

Joint arthroplasty data to 31 December 2023

Introduction

Welcome to LROI Report 2024

This online annual report 2024 of the Dutch Arthroplasty Register (LROI) contains trends and outcome information on primary and revision hip, knee, ankle, shoulder, elbow, wrist, and finger arthroplasties, as well as clubfoot treatments, in the Netherlands between 2007 and 2023. Since 2007, the LROI has been collecting data on hip and knee procedures, on ankle, shoulder and elbow procedures since 2014, on wrist and finger procedures since 2016, and on clubfoot treatments since 2022.

Survival outcomes are available for all joints

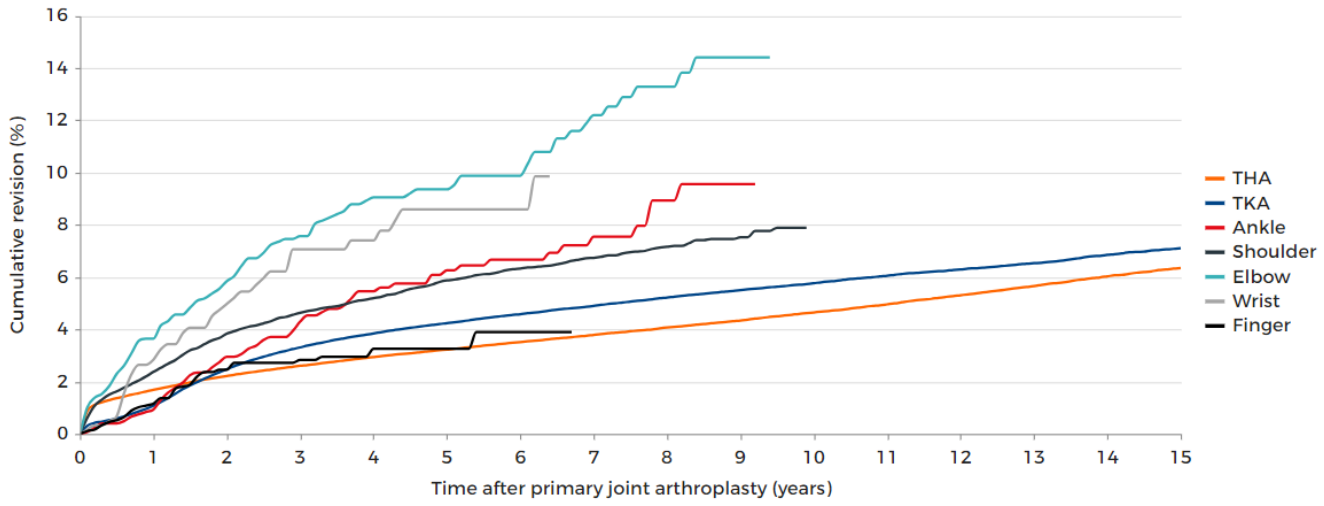
What's new?

- Survival of shoulder components
- Survival of hip hemiarthroplasties
- Survival by year of surgery by gender of primary THA and TKA
- Mortality rates for THA and hip hemiarthroplasties by age
- Practice variation in robotic assistance, navigation, and PSI for THA, TKA and UKA
- ASA distribution by hospital type for THA
- PROM response for hip and knee revision arthroplasties
- Clubfoot treatments: For the first time, this report includes an overview of the number of registered clubfoot treatments

Survival outcomes

See below for two figures that present the outcomes of revision procedures in the Netherlands between 2007 and 2023. The first figure shows the revision rates for first revisions following primary total hip arthroplasty (THA), total knee arthroplasty (TKA), and arthroplasties of the ankle, shoulder, elbow, wrist, and finger joints. The second figure illustrates the revision rates for second revisions after an initial revision for primary THA, TKA, shoulder, and elbow arthroplasties.

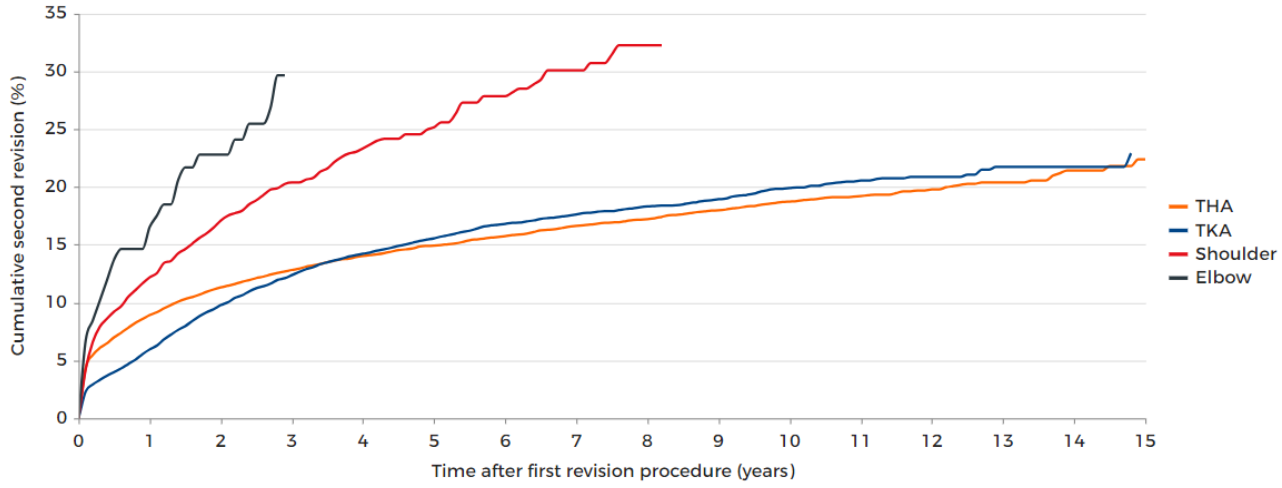
FIGURE First revision outcomes of primary THA, TKA, ankle, shoulder, elbow, wrist and finger arthroplasties in the Netherlands in 2007-2023



THA: total hip arthroplasty; TKA: total knee arthroplasty

© LROI 2024 | 001

FIGURE Second revision outcomes of primary THA, TKA, shoulder and elbow arthroplasties after first revision procedure in the Netherlands in 2007-2023



THA: total hip arthroplasty; TKA: total knee arthroplasty

Contact

Dutch Arthroplasty Register (LROI)
Bruistensingel 230 | 5232 AD ’s-Hertogenbosch | The Netherlands
+31(0) 73 700 3420 | lroi@orthopeden.org
www.lroi.nl

Colophon

Citation: LROI, 2024. *Annual report 2024.* Retrieved from https://www.lroi.nl/jaarrapportage/ (accessed [access-date]).

Analyses and editorial board
I.M.A. (Ilse) de Reus MSc, researcher, LROI head office, 's-Hertogenbosch, the Netherlands
K.A.J. (Karin) Driessen MSc, junior researcher, LROI head office, 's-Hertogenbosch, the Netherlands
N. (Nikki) van Mil, secretary, LROI head office, 's-Hertogenbosch, the Netherlands
Dr. B. (Bart) Pijls, medical director, LROI head office, 's-Hertogenbosch, the Netherlands

Scientific associations
Netherlands Orthopaedic Association (NOV)
Netherlands Society for Plastic Surgery (NVPC)
Dutch Society of Surgery (NVvH)

Data processor
SDB groep BV, the Netherlands
Site by
On-Site, Rotterdam, the Netherlands

Contents

Hip arthroplasty

Numbers

Registered procedures

TABLE Number of registered hip arthroplasties per year of surgery (2007-2023) in the LROI in April 2024

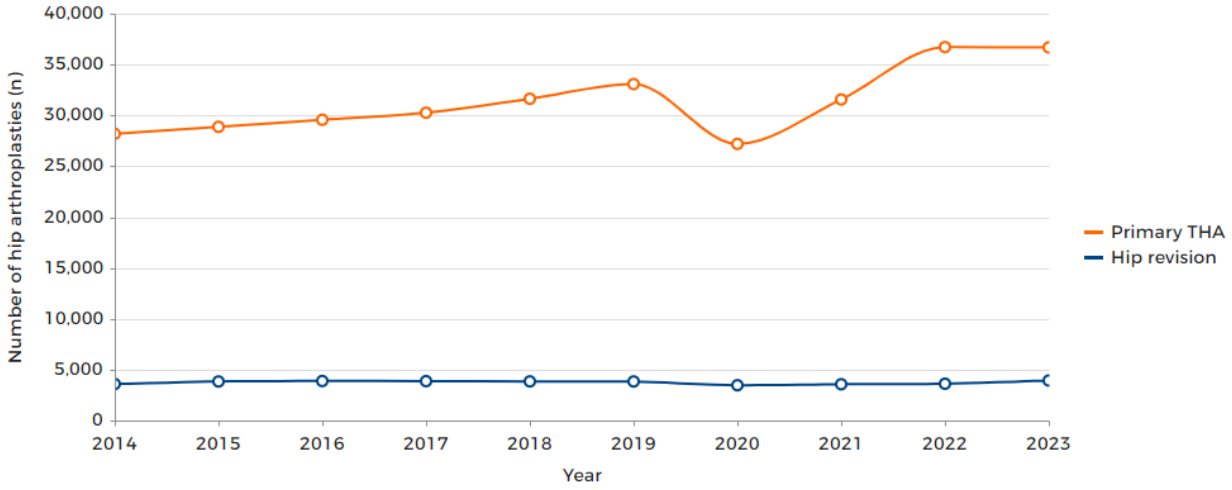
Year of surgery	Total hip arthroplasty	Hemiarthroplasty	Resurfacing arthroplasty	Unknown/ missing	Revision arthroplasty	Total
2007	8,902	1,056	452	933	1,268	**12,611**
2008	15,452	1,524	731	395	1,858	**19,960**
2009	22,106	2,145	863	299	2,679	**28,092**
2010	23,914	2,423	610	295	2,951	**30,193**
2011	24,462	2,520	228	243	3,197	**30,650**
2012	25,820	2,898	10	329	3,766	**32,823**
2013	26,261	3,069	2	261	3,517	**33,110**
2014	28,194	3,766	0	151	3,583	**35,694**
2015	28,872	4,965	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	31,634	6,385	2	26	3,843	**41,890**
2019	33,080	6,312	1	36	3,835	**43,264**
2020	27,198	6,594	0	18	3,465	**37,275**
2021	31,568	6,197	0	17	3,563	**41,345**
2022	36,718	6,526	0	27	3,615	**46,886**
2023	36,684	6,222	0	84	3,928	**46,918**
Total (n)	**460,700**	**73,998**	**2,935**	**3,338**	**56,656**	**597,627**

Please note: The LROI is nearly complete as of 2010.

© LROI 2024 | H001

Type of procedures

FIGURE Number of primary total hip arthroplasties and hip revision arthroplasties registered in the LROI in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Primary THA	28,194	28,872	29,571	30,264	31,634	33,080	27,198	31,568	36,718	36,684	**313,783**
Hip revision	3,583	3,834	3,883	3,871	3,843	3,835	3,465	3,563	3,615	3,928	**37,420**
Total (n)	**31,777**	**32,706**	**33,454**	**34,135**	**35,477**	**36,915**	**30,663**	**35,131**	**40,333**	**40,612**	**351,203**

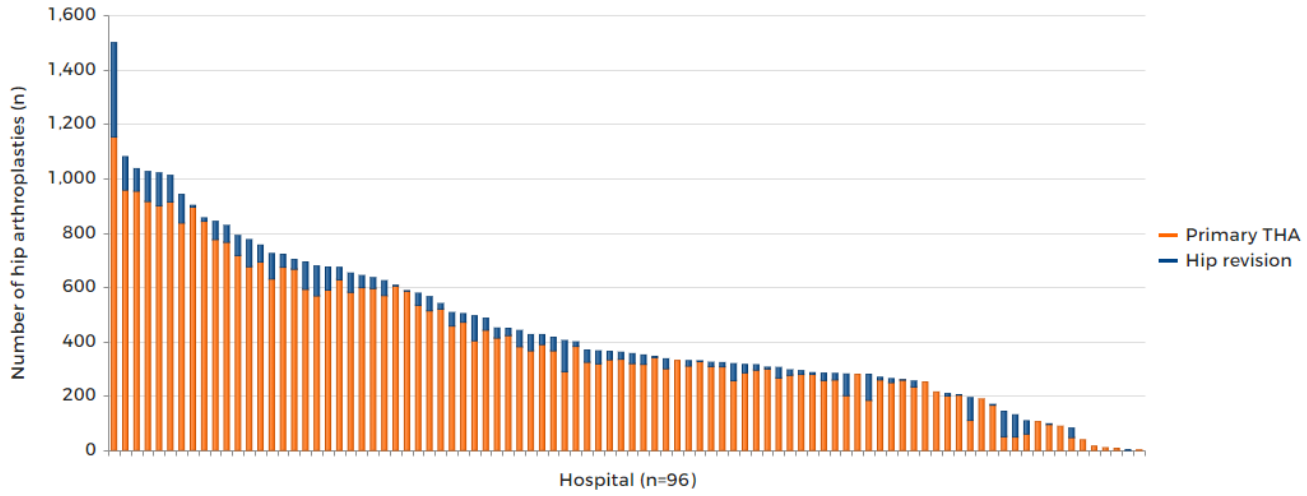
THA: total hip arthroplasty

© LROI 2024 | H002

Out of 36,684 primary total hip arthroplasties that were performed in 2023, 2.8% (n=1,015) 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 2023 (n=40,612)

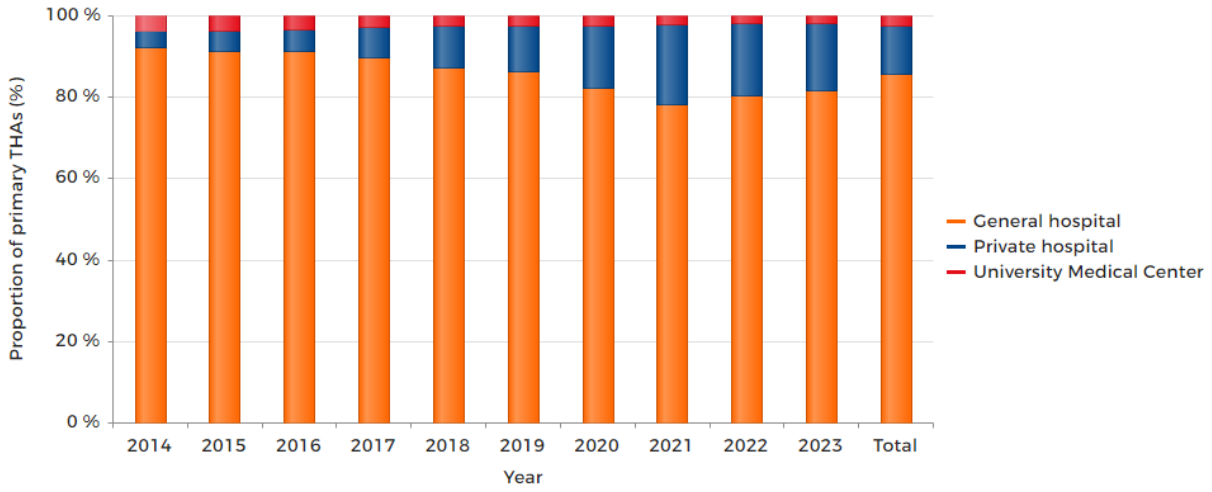


THA: total hip arthroplasty

© LROI 2024 | H003

Type of hospital – primary

FIGURE Trend (proportion [%] per year) in type of hospital performing primary total hip arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
General hospital	92.07	91.32	91.21	89.58	87.26	86.38	82.37	78.19	80.22	81.64	85.75
Private hospital	4.26	4.95	5.48	7.52	10.17	11.08	15.22	19.78	17.92	16.45	11.60
University Medical Center	3.66	3.72	3.30	2.90	2.57	2.55	2.40	2.04	1.86	1.91	2.65
Total (n)	**28,194**	**28,872**	**29,571**	**30,264**	**31,634**	**33,080**	**27,198**	**31,568**	**36,718**	**36,684**	**313,783**

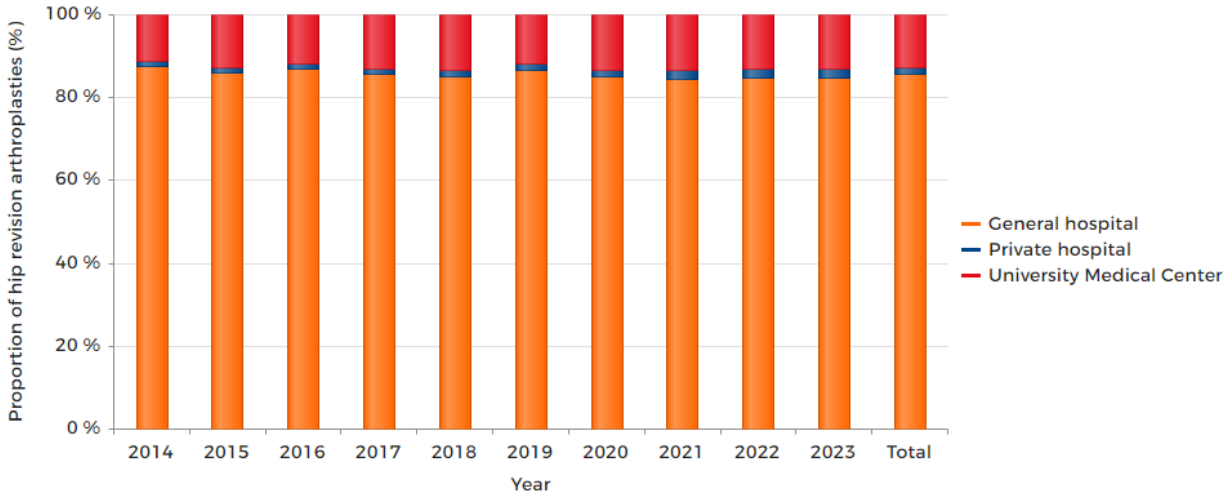
Please note: The number of general hospitals that performed primary total hip arthroplasties decreased from 69 to 63 between 2014-2023; the number of private hospitals increased from 9 to 21 and the number of University Medical Centers remained 7 between 2014-2023.

THA: total hip arthroplasty

© LROI 2024 | H004

Type of hospital – revision

FIGURE Trend (proportion [%] per year) in type of hospital performing hip revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
General hospital	87.50	86.05	86.97	85.71	84.99	86.62	84.94	84.34	84.65	84.78	85.66
Private hospital	1.20	1.17	1.11	1.11	1.48	1.49	1.59	2.33	2.41	2.16	1.60
University Medical Center	11.30	12.78	11.92	13.17	13.53	11.89	13.48	13.33	12.95	13.06	12.74
Total (n)	**3,583**	**3,834**	**3,883**	**3,871**	**3,843**	**3,835**	**3,465**	**3,563**	**3,615**	**3,928**	**37,420**

Please note: The number of general hospitals that performed hip revision arthroplasties decreased from 68 to 62 between 2014-2023; the number of private hospitals increased from 6 to 11 and the number of University Medical Centers remained 7 between 2014-2023.

Total hip arthroplasty

Demographics

Patient characteristics by diagnosis

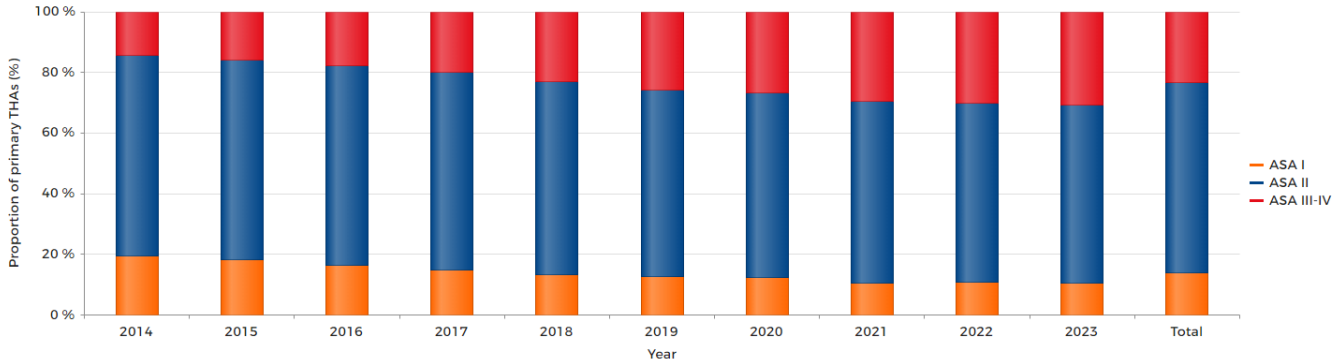
TABLE Patient characteristics of all patients with a registered primary total hip arthroplasty by diagnosis in the Netherlands in 2023

	Osteoarthritis	Fracture	Osteonecrosis	Late post-traumatic	Dysplasia	Reumatoid arthritis	Post-Perthes disease	Tumour	Other	Total
N(%)	**31,623 (86.2)**	**1,962 (5.4)**	**1,000 (2.8)**	**851 (2.4)**	**570 (1.6)**	**147 (0.4)**	**94 (0.2)**	**84 (0.2)**	**353 (1)**	**36,684**
Mean age (years) (SD)	70.1 (11.3)	69.1 (8.4)	62.5 (15.5)	67.7 (12.8)	51.8 (14.2)	65.9 (12.1)	51.3 (15.1)	64 (12.9)	63.7 (17.1)	69.3 (11.8)
Age (years) (%)										
<50	2	2	19	8	40	9	39	10	17	4
50-59	13	10	18	14	31	13	27	17	14	13
60-69	28	35	27	27	18	38	23	39	24	29
70-79	41	47	24	33	10	29	9	27	31	40
>80	16	6	12	17	1	12	2	7	14	15
Gender (%)										
Men	36	36	48	46	28	23	67	54	38	36
Women	64	64	52	54	72	77	33	46	62	64
ASA score (%)										
ASA I	13	13	10	11	30	1	28	1	11	13
ASA II	61	57	52	56	59	66	46	19	56	60
ASA III-IV	26	30	38	33	11	33	27	80	31	27
Type of hospital (%)										
General	81	96	86	89	71	86	79	73	84	82
UMC	1	4	7	5	12	4	13	27	12	2
Private	18	0	7	5	18	10	9	0	4	16
Charnley-score (%)										
A One hip joint affected	40	52	51	74	48	33	70	68	49	41
B1 Both hip joints affected	32	17	23	10	30	28	12	16	19	31
B2 Contralateral hip joint with a total hip prosthesis	25	23	21	12	18	12	16	5	16	25
C Multiple joints affected or chronic disease that affects quality of life	3	6	5	3	4	26	1	11	9	3
Mean BMI (kg/m) (SD)	27.4 (4.6)	25.1 (4.0)	26.8 (5.2)	26 (4.7)	26.6 (4.7)	27 (4.6)	28.5 (6.3)	26.5 (5.3)	26.6 (5.5)	27.2 (4.6)
Body Mass Index (kg/m) (%)										
Underweight (<=18.5)	1	3	2	4	2	0	1	4	3	1
Normal weight (>18.5-25)	33	48	39	43	38	39	28	37	37	35
Overweight (>25-30)	41	34	34	34	38	39	45	29	32	41
Obesity (>30-40)	23	10	21	16	18	20	17	27	21	22
Morbid obesity (>40)	1	0	2	1	1	1	7	0	1	1
Smoking (%)										
No	91	83	81	85	88	86	84	87	80	91
Yes	8	15	18	14	10	13	15	12	16	9

Please note: diagnosis 'Other' (353; 1.0%) includes other (195), inflammatory arthritis (35), post-infectious osteoarthritis (31), and 92 primary total hip arthroplasties where the diagnosis was not registered.
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation

ASA score per general hospital

FIGURE Trend (proportion [%] per year) in ASA score of patients with a registered primary total hip arthroplasty performed in a general hospital in the Netherlands in 2014-2023

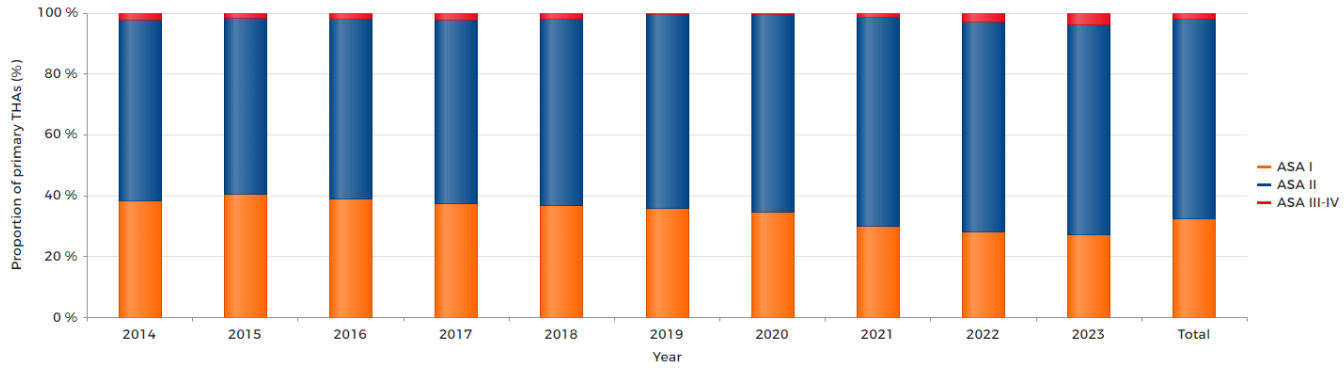


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
ASA I	19.54	18.32	16.42	14.75	13.29	12.57	12.43	10.62	10.68	10.59	13.86
ASA II	66.00	65.87	65.92	65.25	63.74	61.48	60.95	60.01	59.26	58.57	62.65
ASA III-IV	14.46	15.81	17.66	20.01	22.96	25.95	26.63	29.37	30.06	30.85	23.49
Total (n)	**25,774**	**26,296**	**26,957**	**27,103**	**27,601**	**28,572**	**22,400**	**24,679**	**29,452**	**29,937**	**268,771**

THA: total hip arthroplasty

ASA score per UMC

FIGURE Trend (proportion [%] per year) in ASA score of patients with a registered primary total hip arthroplasty performed in a private hospital in the Netherlands in 2014-2023

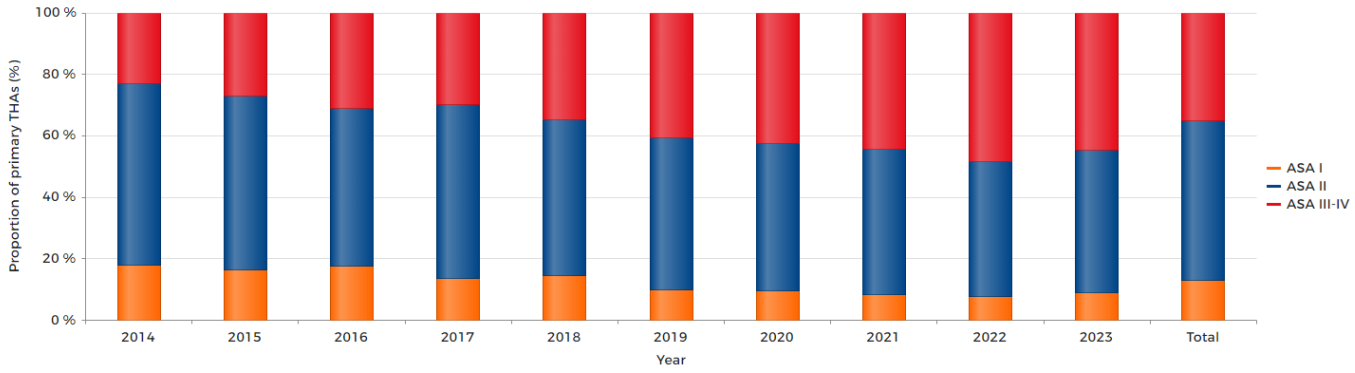


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
ASA I	38.48	40.56	38.80	37.36	36.64	35.84	34.66	29.94	28.07	27.17	32.43
ASA II	59.35	57.83	59.22	60.44	61.40	63.81	64.86	68.72	68.85	69.03	65.53
ASA III-IV	2.17	1.61	1.97	2.20	1.96	0.35	0.48	1.34	3.08	3.80	2.04
Total (n)	**1,198**	**1,430**	**1,621**	**2,275**	**3,218**	**3,664**	**4,129**	**6,215**	**6,552**	**6,022**	**36,324**

THA: total hip arthroplasty

ASA score per private hospital

FIGURE Trend (proportion [%] per year) in ASA score of patients with a registered primary total hip arthroplasty performed in a University Medical Center in the Netherlands in 2014-2023



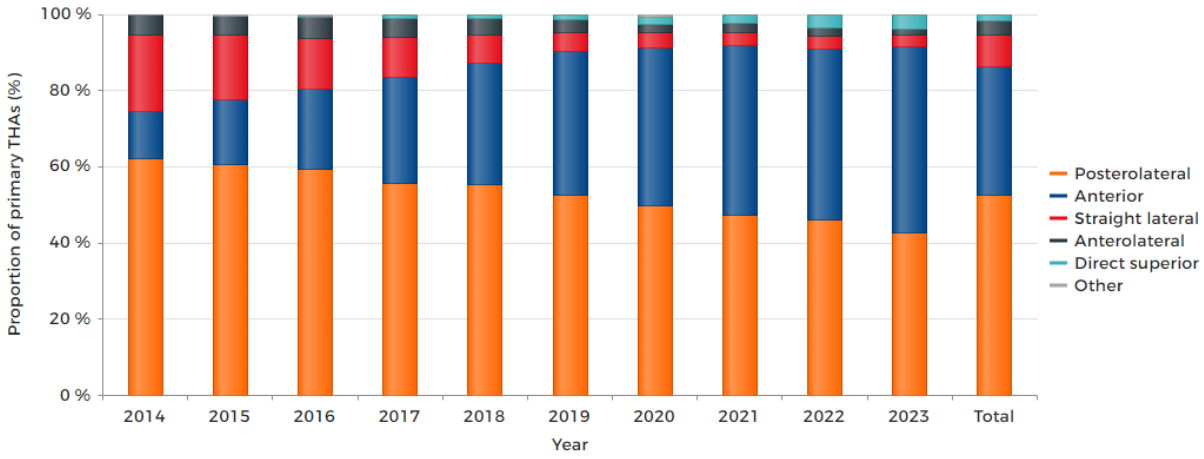
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
ASA I	17.91	16.42	17.73	13.65	14.41	9.98	9.68	8.36	7.58	9.10	13.13
ASA II	59.05	56.44	51.33	56.54	50.74	49.41	47.77	47.32	43.98	46.24	51.65
ASA III-IV	23.04	27.15	30.94	29.81	34.85	40.62	42.55	44.32	48.44	44.65	35.23
Total (n)	**1,033**	**1,072**	**976**	**879**	**812**	**842**	**651**	**634**	**673**	**692**	**8,264**

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 2014-2023

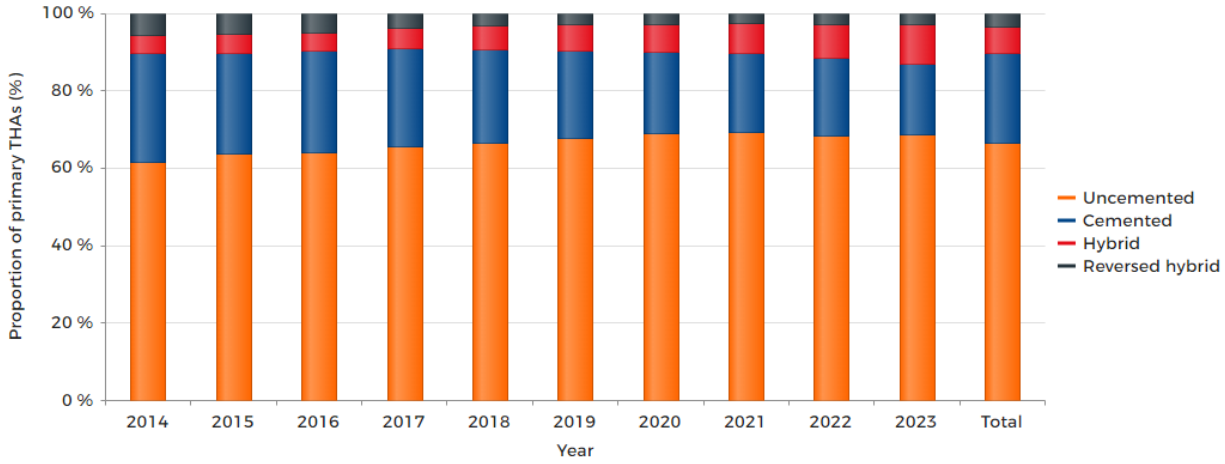


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Posterolateral	62.00	60.65	59.30	55.63	55.18	52.42	49.92	47.37	45.95	42.69	52.65
Anterior	12.39	16.80	20.92	27.76	31.91	37.70	41.30	44.34	44.99	48.71	33.50
Straight lateral	20.16	17.02	13.49	10.62	7.38	5.19	4.08	3.52	3.37	3.05	8.42
Anterolateral	5.35	5.09	5.48	4.98	4.44	3.45	2.04	2.34	2.05	1.68	3.60
Direct superior	0.00	0	0.30	0.80	0.84	1.12	1.94	2.31	3.49	3.70	1.55
Other	0.10	0.44	0.52	0.21	0.24	0.11	0.71	0.13	0.15	0.18	0.27
Total (n)	**28,031**	**28,795**	**29,555**	**30,240**	**31,614**	**33,055**	**27,162**	**31,433**	**36,563**	**36,632**	**313,080**

THA: total hip arthroplasty

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary total hip arthroplasties in the Netherlands in 2014-2023



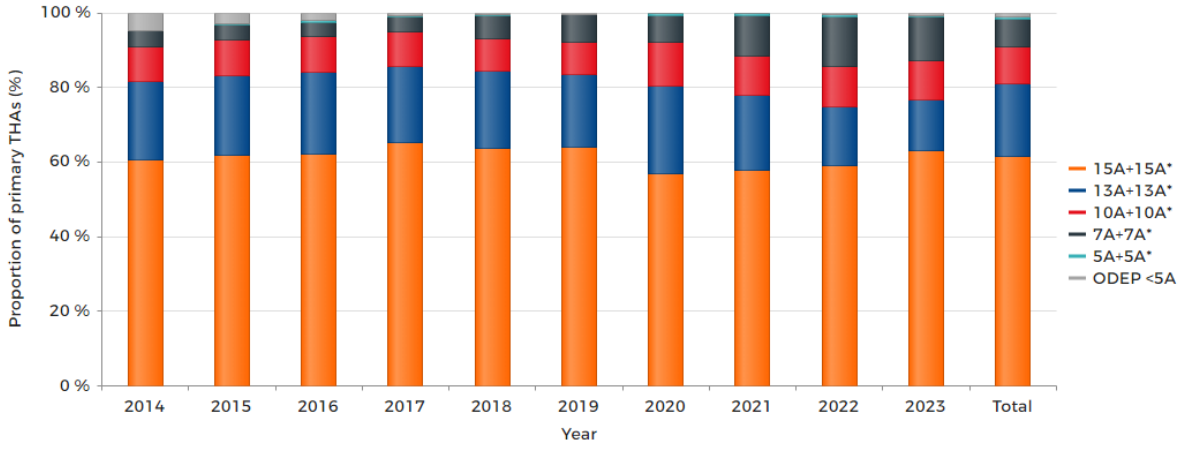
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Uncemented	61.63	63.64	64.06	65.60	66.54	67.73	68.99	69.33	68.23	68.64	66.57
Cemented	27.87	26.08	26.05	25.27	24.08	22.67	21.00	20.30	20.17	18.14	22.96
Hybrid	4.78	4.91	4.90	5.28	6.27	6.69	7.04	7.75	8.61	10.40	6.81
Reversed hybrid	5.72	5.37	4.99	3.85	3.12	2.91	2.97	2.62	2.99	2.81	3.67
Total (n)	**28,028**	**28,745**	**29,419**	**29,829**	**31,452**	**32,848**	**26,989**	**31,336**	**36,542**	**36,534**	**311,722**

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 2014-2023

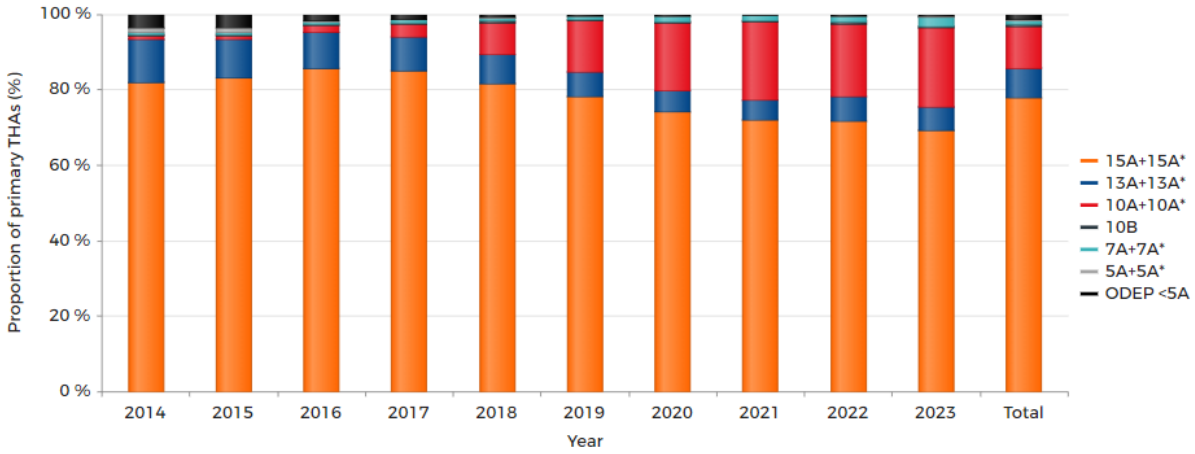


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
15A+15A*	60.48	61.96	62.21	65.21	63.82	63.96	57.02	57.69	59.18	63.21	61.53
13A+13A*	21.24	21.23	21.89	20.48	20.68	19.46	23.27	20.20	15.53	13.42	19.47
10A+10A*	9.25	9.61	9.52	9.07	8.68	8.69	11.75	10.44	10.97	10.47	9.85
7A+7A*	4.18	3.97	3.67	4.28	6.15	7.41	7.17	10.98	13.32	11.83	7.57
5A+5A*	0.15	0.27	0.62	0.24	0.24	0.18	0.57	0.44	0.61	0.38	0.37
ODEP <5A	4.70	2.95	2.08	0.70	0.43	0.32	0.21	0.25	0.39	0.69	1.21
Total (n)	**28,009**	**28,709**	**28,950**	**29,667**	**31,002**	**31,965**	**25,805**	**31,240**	**36,228**	**35,706**	**307,281**

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 2014-2023

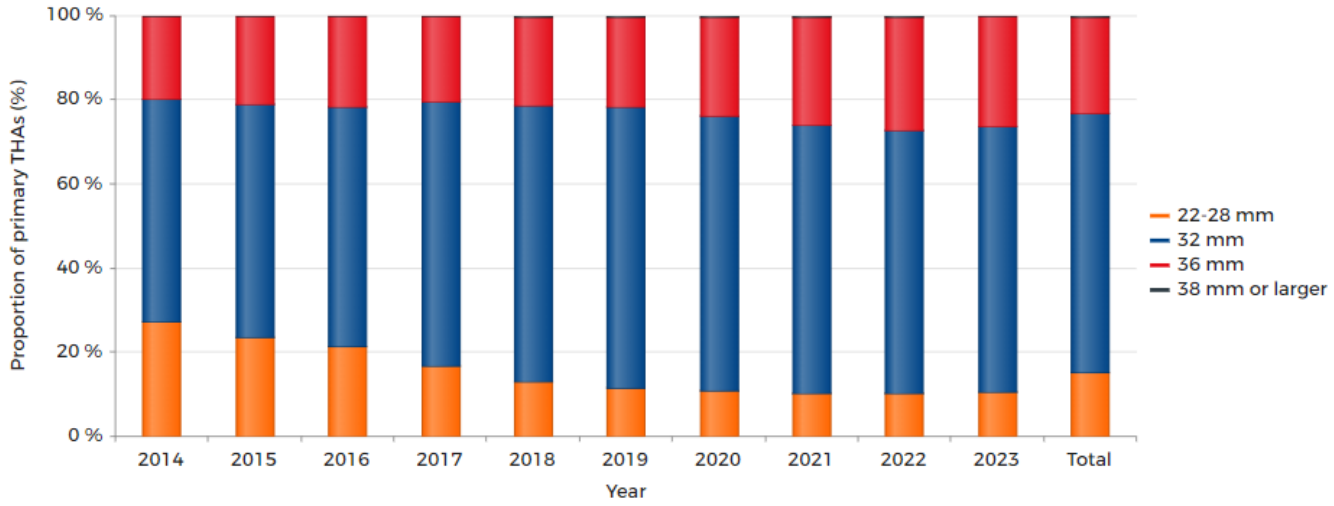


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
15A+15A*	81.94	83.28	85.62	84.92	81.59	78.31	74.24	72.14	71.70	69.34	77.98
13A+13A*	11.40	10.09	9.69	9.07	7.65	6.31	5.61	5.25	6.58	6.11	7.69
10A+10A*	1.05	1.06	1.70	3.45	8.51	13.55	17.81	20.61	19.17	20.94	11.23
10B	0.32	0.31	0.34	0.33	0.43	0.43	0.48	0.44	0.52	0.41	0.40
7A+7A*	0.38	0.62	0.50	0.82	0.75	0.96	1.48	1.28	1.57	2.39	1.11
5A+5A*	1.31	1.09	0.33	0.09	0.16	0.04	0.02	0.01	0.10	0.40	0.34
ODEP <5A	3.60	3.55	1.82	1.31	0.91	0.40	0.36	0.28	0.37	0.42	1.24
Total (n)	**27,930**	**28,588**	**28,714**	**29,530**	**30,910**	**31,760**	**25,144**	**31,017**	**36,133**	**35,522**	**305,248**

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 2014-2023



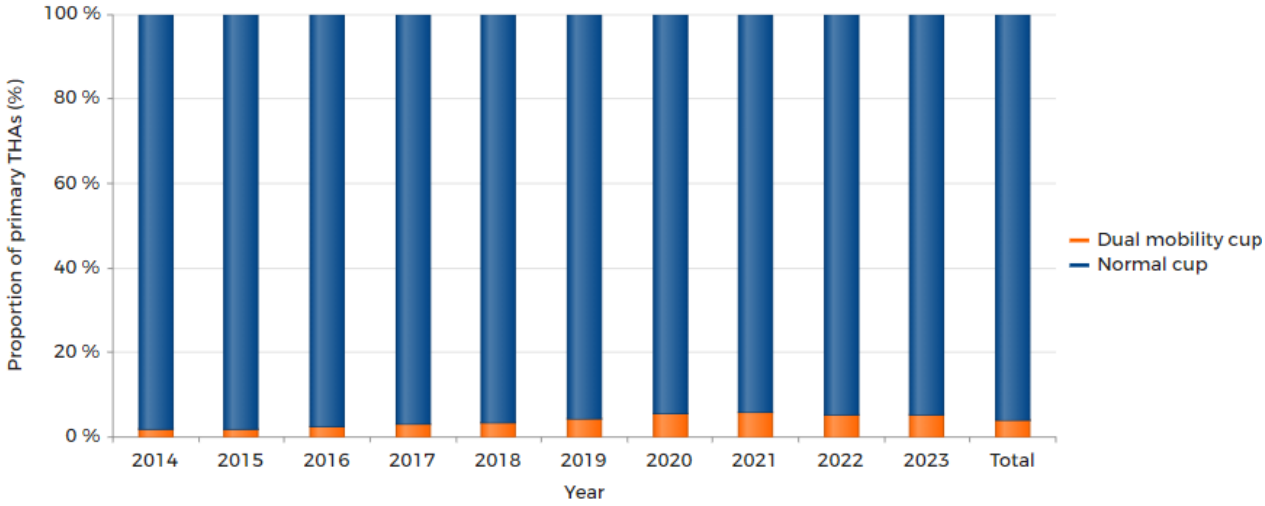
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
22-28 mm	27.19	23.38	21.22	16.54	13.03	11.49	10.71	10.19	10.33	10.36	15.14
32 mm	52.86	55.57	57.00	63.03	65.53	66.65	65.48	63.75	62.17	63.17	61.65
36 mm	19.66	20.83	21.48	20.15	21.10	21.52	23.44	25.72	27.12	26.16	22.89
38 mm or larger	0.30	0.22	0.30	0.28	0.34	0.34	0.37	0.33	0.39	0.30	0.32
Total (n)	**27,883**	**28,618**	**28,779**	**29,491**	**30,809**	**31,555**	**25,217**	**31,016**	**36,063**	**35,402**	**304,833**

THA: total hip arthroplasty

© LROI 2024 | H014

Dual mobility

FIGURE Trend (proportion [%] per year) in type of acetabular component in primary total hip arthroplasties in the Netherlands in 2014-2023



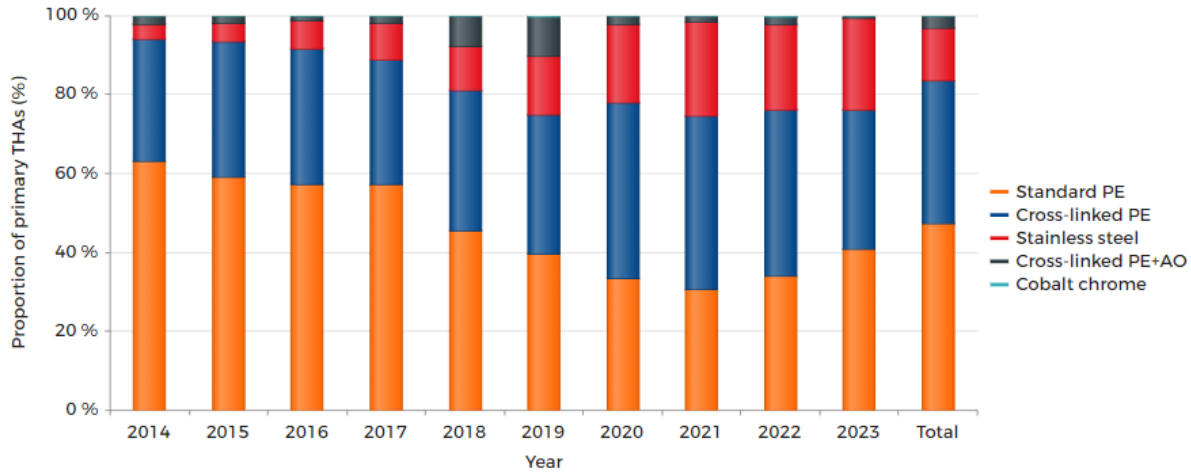
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Dual mobility cup	1.73	1.94	2.59	3.17	3.47	4.26	5.47	5.78	5.20	5.23	3.95
Normal cup	98.27	98.06	97.41	96.83	96.53	95.74	94.53	94.22	94.80	94.77	96.05
Total (n)	**28,009**	**28,709**	**28,950**	**29,668**	**31,003**	**31,977**	**25,814**	**31,251**	**36,248**	**35,718**	**307,347**

THA: total hip arthroplasty

© LROI 2024 | H015

Cemented acetabular component

FIGURE Trend (proportion [%] per year) in cemented acetabulum material in primary total hip arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Standard PE	63.09	58.96	57.32	57.27	45.38	39.50	33.33	30.74	33.94	40.71	47.17
Cross-linked PE	30.89	34.29	34.19	31.54	35.72	35.28	44.63	43.80	42.08	35.42	36.34
Stainless steel	3.65	4.68	7.01	9.14	11.09	14.94	19.74	23.82	21.80	23.15	13.17
Cross-linked PE+AO	2.14	1.91	1.25	1.82	7.59	9.97	2.11	1.44	1.84	0.51	3.08
Cobalt chrome	0.22	0.17	0.23	0.22	0.22	0.32	0.19	0.20	0.34	0.21	0.23
Total (n)	**9,358**	**8,918**	**8,874**	**8,468**	**8,265**	**8,008**	**6,252**	**6,965**	**7,982**	**7,236**	**80,326**

Please note: Titanium was used in 10 (0.01%) primary THAs in 2014-2023.

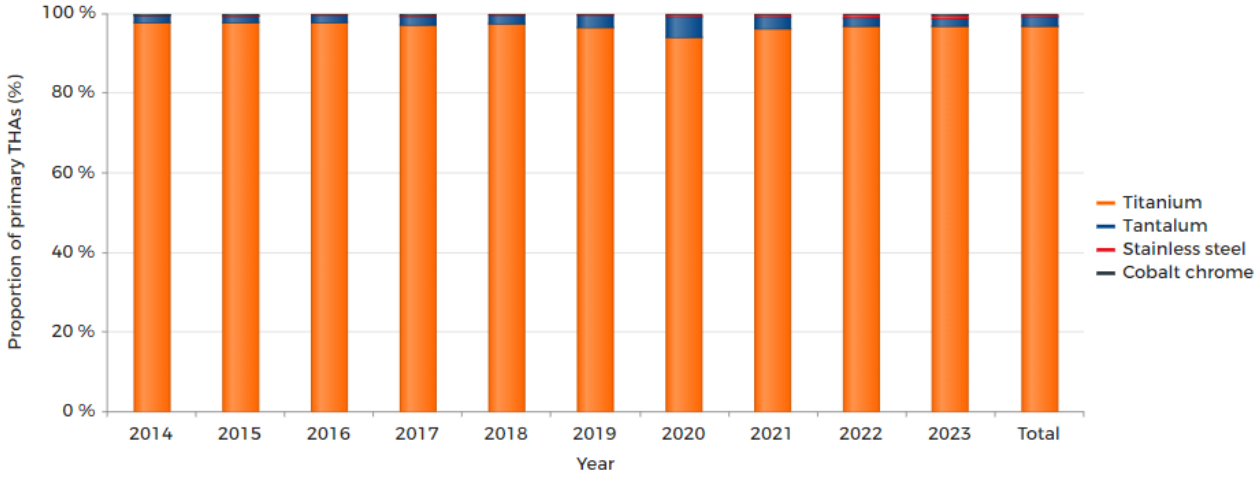
Please note: Stainless steel was used in cemented dual mobility cups.

THA: total hip arthroplasty; PE: polyethylene; AO: antioxidant

© LROI 2024 | H016

Uncemented acetabular component

FIGURE Trend (proportion [%] per year) in uncemented acetabulum material in primary total hip arthroplasties in the Netherlands in 2014-2023



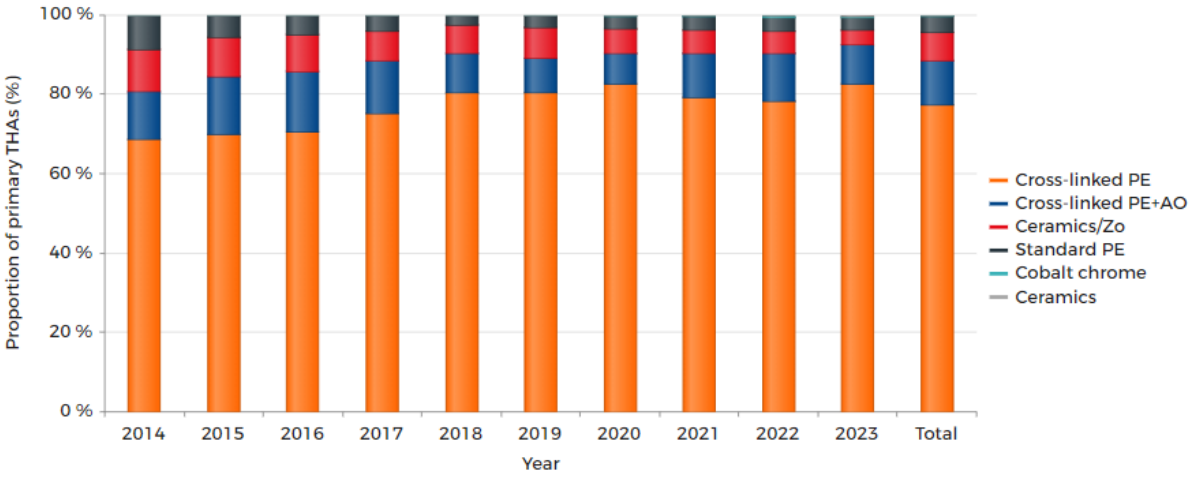
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Titanium	97.53	97.61	97.54	97.05	97.31	96.47	93.86	96.14	96.74	96.77	96.70
Tantalum	1.87	1.73	1.97	2.23	2.23	2.97	5.32	2.96	2.20	1.73	2.49
Stainless steel	0.26	0.29	0.27	0.38	0.26	0.40	0.71	0.78	0.84	0.93	0.54
Cobalt chrome	0.34	0.36	0.21	0.34	0.19	0.17	0.11	0.11	0.22	0.57	0.27
Total (n)	**18,650**	**19,790**	**20,076**	**21,200**	**22,738**	**23,963**	**19,558**	**24,279**	**28,250**	**28,479**	**226,983**

THA: total hip arthroplasty

© LROI 2024 | H017

Inlay

FIGURE Trend (proportion [%] per year) in inlay material in primary total hip arthroplasties in the Netherlands in 2014-2023

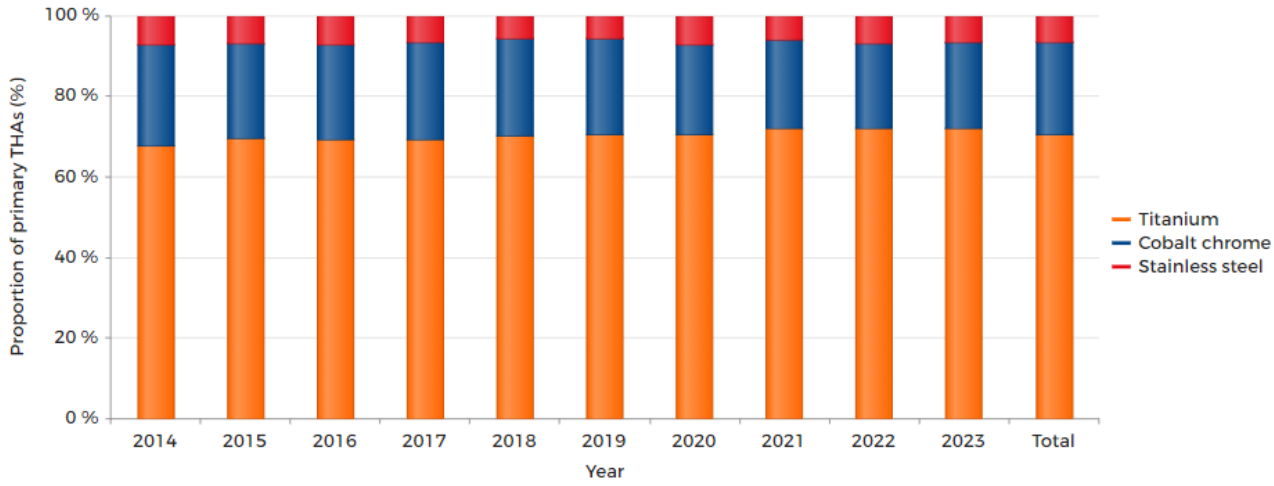


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cross-linked PE	68.64	69.95	70.52	75.23	80.27	80.32	82.60	79.27	78.06	82.60	77.28
Cross-linked PE+AO	12.14	14.38	15.07	13.21	9.87	8.57	7.67	10.86	12.23	9.81	11.26
Ceramics/Zo	10.51	9.81	9.18	7.34	7.15	7.76	6.13	6.02	5.60	3.68	7.05
Standard PE	8.50	5.60	5.14	4.08	2.62	3.14	3.27	3.45	3.25	3.06	4.03
Cobalt chrome	0.15	0.14	0.05	0.11	0.08	0.19	0.31	0.40	0.56	0.37	0.25
Ceramics	0.06	0.12	0.03	0.02	0.01	0.02	0.02	0.00	0.30	0.47	0.12
Total (n)	**17,338**	**18,511**	**19,073**	**20,545**	**22,163**	**23,419**	**18,868**	**24,156**	**27,387**	**28,031**	**219,491**

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 2014-2023

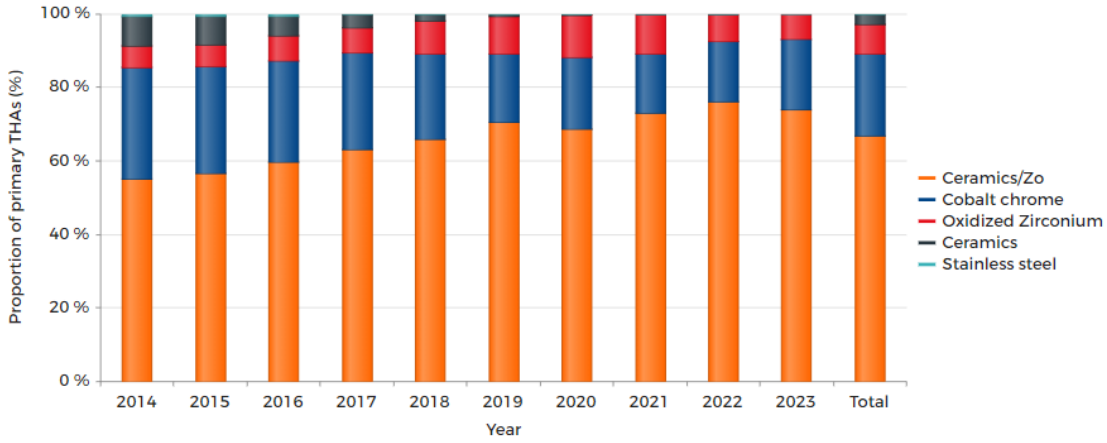


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Titanium	67.65	69.46	69.28	69.34	70.19	70.54	70.52	71.93	71.90	72.12	70.39
Cobalt chrome	25.06	23.50	23.60	23.89	23.94	23.71	22.12	22.10	21.19	21.26	22.97
Stainless steel	7.29	7.04	7.12	6.77	5.87	5.75	7.35	5.96	6.91	6.62	6.64
Total (n)	**27,930**	**28,586**	**28,714**	**29,530**	**30,908**	**31,759**	**25,144**	**31,016**	**36,132**	**35,522**	**305,241**

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 2014-2023

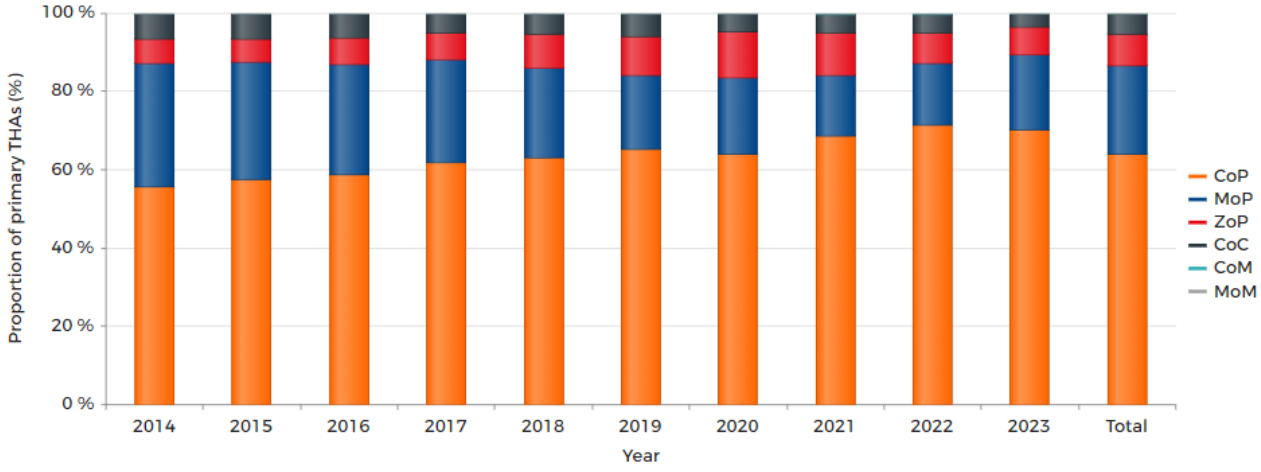


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Ceramics/Zo	54.91	56.47	59.65	63.21	65.99	70.61	68.65	72.82	75.96	73.79	66.69
Cobalt chrome	30.39	29.11	27.47	26.04	22.90	18.50	19.47	16.36	16.42	19.14	22.29
Oxidized Zirconium	6.03	6.03	6.79	6.80	8.95	10.06	11.56	10.67	7.60	7.05	8.12
Ceramics	8.01	7.69	5.39	3.69	2.07	0.72	0.23	0.09	0.01	0	2.63
Stainless steel	0.66	0.70	0.71	0.27	0.08	0.11	0.09	0.06	0.02	0.03	0.26
Total (n)	**27,876**	**28,618**	**28,779**	**29,488**	**30,811**	**31,557**	**25,216**	**31,010**	**36,063**	**35,407**	**304,825**

Please note: A titanium femoral head was used in 15 (<0.01%) primary THAs in 2014-2023. A standard PE femoral head was used in 8 (<0.01%) primary THAs in 2014-2023. A cobalt chrome/titanium femoral head was used in 1 (<0.00%) primary THAs in 2014-2023.
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 2014-2023



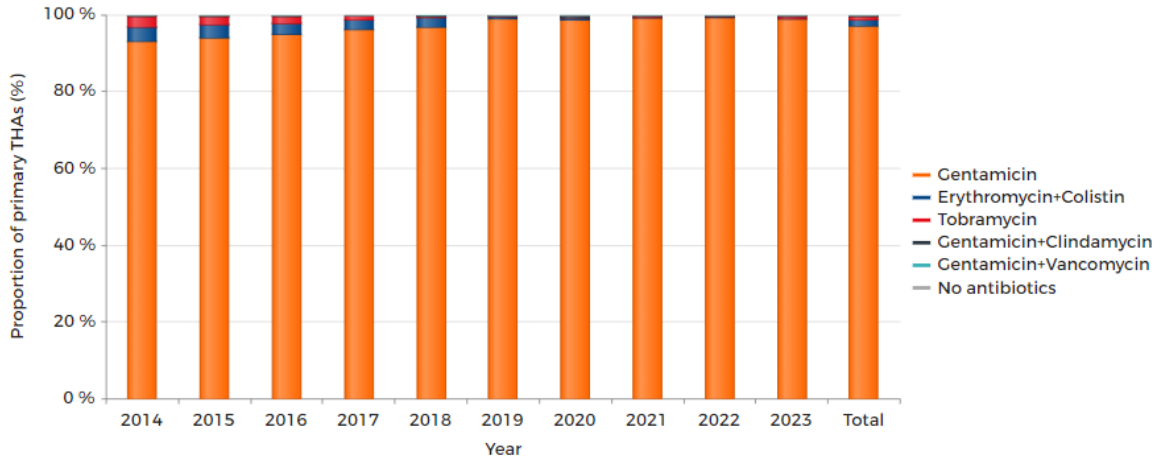
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
CoP	55.73	57.46	58.73	61.73	63.20	65.38	63.98	68.54	71.54	70.18	64.02
MoP	31.40	29.92	28.24	26.23	22.69	18.56	19.45	15.68	15.74	19.10	22.40
ZoP	6.10	6.07	6.84	6.81	8.83	10.09	11.71	10.75	7.69	7.12	8.17
CoC	6.73	6.50	6.18	5.16	5.22	5.82	4.63	4.72	4.61	3.31	5.23
CoM	0.01	0.01	0.01	0.02	0.02	0.03	0.06	0.20	0.30	0.19	0.09
MoM	0.03	0.04	0.02	0.05	0.04	0.12	0.17	0.11	0.13	0.11	0.08
Total (n)	**27,330**	**28,154**	**28,351**	**29,134**	**30,302**	**31,039**	**24,644**	**30,404**	**34,856**	**34,733**	**298,947**

Please note: MoC was used in 4 (<0.01%) primary THAs in 2014-2023.
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

Bone cement

Antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in primary total hip arthroplasties in the Netherlands in 2014-2023

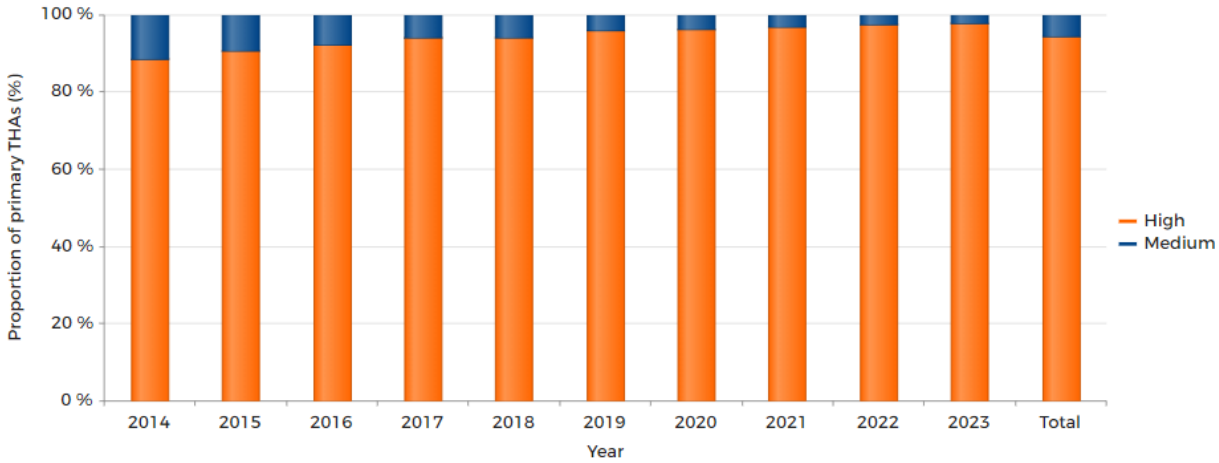


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Gentamicin	93.00	94.03	94.94	96.13	96.61	99.00	98.69	99.20	99.37	98.89	96.94
Erythromycin+Colistin	3.65	3.21	2.87	2.63	2.76	0.47	0.41	0.14	0.07	0.11	1.66
Tobramycin	2.86	2.31	1.85	0.98	0.32	0.17	0.13	0.04	0.20	0.57	0.97
Gentamicin+Clindamycin	0.28	0.36	0.29	0.22	0.26	0.25	0.50	0.44	0.31	0.28	0.31
Gentamicin+Vancomycin	0.01	0.01	0.04	0.02	0.05	0.10	0.26	0.12	0.04	0.03	0.06
No antibiotics	0.20	0.07	0.01	0.02	0	0.01	0.01	0.05	0.01	0.11	0.05
Total (n)	**10,249**	**9,869**	**9,745**	**9,900**	**9,675**	**9,696**	**7,815**	**9,113**	**10,798**	**9,925**	**96,785**

THA: total hip arthroplasty

Viscosity

FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary total hip arthroplasties in the Netherlands in 2014-2023



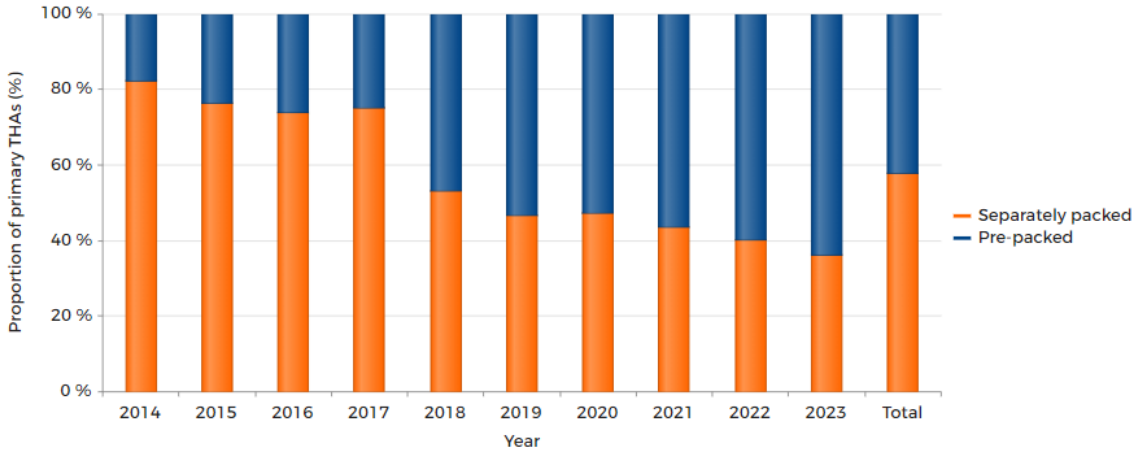
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
High	88.44	90.64	92.05	93.85	94.05	95.68	95.98	96.87	97.49	97.71	94.23
Medium	11.56	9.36	7.95	6.15	5.95	4.32	4.02	3.13	2.51	2.29	5.77
Total (n)	**10,248**	**9,869**	**9,745**	**9,899**	**9,675**	**9,696**	**7,815**	**9,111**	**10,798**	**9,925**	**96,781**

Please note: Low viscosity was used in 4 (<0.00%) primary THAs in 2014-2023.

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 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Separately packed	82.32	76.23	74.01	75.26	53.32	46.81	47.17	43.54	40.29	36.02	57.76
Pre-packed	17.68	23.77	25.99	24.74	46.68	53.19	52.83	56.46	59.71	63.98	42.24
Total (n)	**10,249**	**9,869**	**9,745**	**9,900**	**9,675**	**9,696**	**7,815**	**9,113**	**10,798**	**9,925**	**96,785**

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 cemented acetabulum components in primary total hip arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Acetabulum cemented (n)	**8,064**	**6,348**	**7,086**	**8,181**	**7,496**
Acetabulum name; Proportion (%)					
AVANTAGE Cemented	12.92	16.43	19.52	17.54	19.28
FAL Cup	11.06	7.10	6.73	11.83	18.56
MUller low profile Durasul	15.92	15.39	18.70	16.12	16.69
IP Cup	14.51	13.50	12.98	12.80	13.31
EXETER RIMFIT X3	8.42	9.20	6.63	7.33	6.91
CCB cup Low Profile	1.81	4.96	4.66	4.62	4.87
IP Cup X-Linked	2.89	2.50	3.30	3.75	4.83
Polarcup cemented	1.35	2.41	2.58	2.32	2.44
Reflection All Poly XLPE	3.76	3.32	3.18	2.36	2.01
FAL Cup X-Linked	0.43	1.98	1.81	2.19	1.76

TABLE The most frequently registered uncemented acetabulum components in primary total hip arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Acetabulum uncemented (n)	**23,623**	**19,215**	**23,866**	**27,792**	**27,981**
Acetabulum name; Proportion (%)					
Allofit	35.66	32.01	34.89	37.53	38.98
Pinnacle	19.76	19.51	20.44	19.38	19.94
R3	13.00	14.44	13.30	8.91	8.81
TRIDENT	6.87	7.74	8.87	7.30	7.61
G7 PPS	0.00	1.33	5.79	9.26	7.61
RM Pressfit Vitamys cup	3.49	4.27	3.69	3.71	3.53
TRIDENT TRITANIUM	3.53	3.51	0.64	2.55	3.32
Delta-TT	1.80	1.63	1.51	1.75	2.30
Pinnacle Gription	0.87	2.40	2.20	2.43	1.73
Continuum	2.93	5.15	2.88	2.12	1.68

Components femur

TABLE The most frequently registered cemented femur components in primary total hip arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Femur cemented (n)	**9,270**	**7,311**	**8,589**	**10,168**	**10,021**
Femur name; Proportion (%)					
Lubinus SPII	37.39	33.83	34.49	36.88	40.48
Original ME Muller	26.96	27.75	28.28	28.56	32.30
EXETER	11.66	12.54	9.49	8.98	7.84
TAPERLOC Hip Cemented CoCr	1.47	2.68	6.19	6.02	5.15
Twinsys stem Cemented	1.92	1.90	1.32	3.51	3.43
CPT	1.35	1.63	3.67	3.24	2.60
C-Stem AMT	2.39	6.72	5.77	5.65	2.06
Avenir Muller	0.00	0.00	0.01	0.84	1.96
Polarstem cemented	0.03	0.01	0.02	0.31	1.26
Spectron EF	4.00	2.83	2.70	1.86	1.15

TABLE The most frequently registered uncemented femur components in primary total hip arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Femur uncemented (n)	**22,200**	**17,589**	**22,128**	**25,690**	**25,263**
Femur name; Proportion (%)					
TAPERLOC Complete	32.32	27.12	30.55	31.48	30.27
Corail	19.90	20.29	20.11	19.38	18.87
ACCOLADE II	3.91	7.75	9.95	11.27	12.43
Polarstem	13.10	14.62	13.72	10.11	9.58
FITMORE	1.21	1.90	4.18	3.58	5.69
Avenir Muller	0.04	1.15	2.20	5.24	5.20
Corail AMT	1.68	2.43	3.28	3.58	3.77
Twinsys stem Cementless	4.70	4.17	3.47	3.41	3.28
M/L Taper	2.59	3.05	2.10	2.33	2.43
CLS Spotorno	3.34	3.20	2.21	2.20	1.94

Types of bone cement

TABLE The most frequently registered bone cement pre-packed in a vacuum mixing system used during primary total hip arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**5,120**	**4,100**	**5,096**	**6,378**	**6,283**
Cement name; Proportion (%)					
PALACOS R+G	47.34	51.24	50.90	59.63	70.28
Refobacin Bone Cement R	46.86	41.32	43.50	34.90	27.06
Refobacin Plus Bone Cement	5.80	7.41	5.55	5.46	2.66

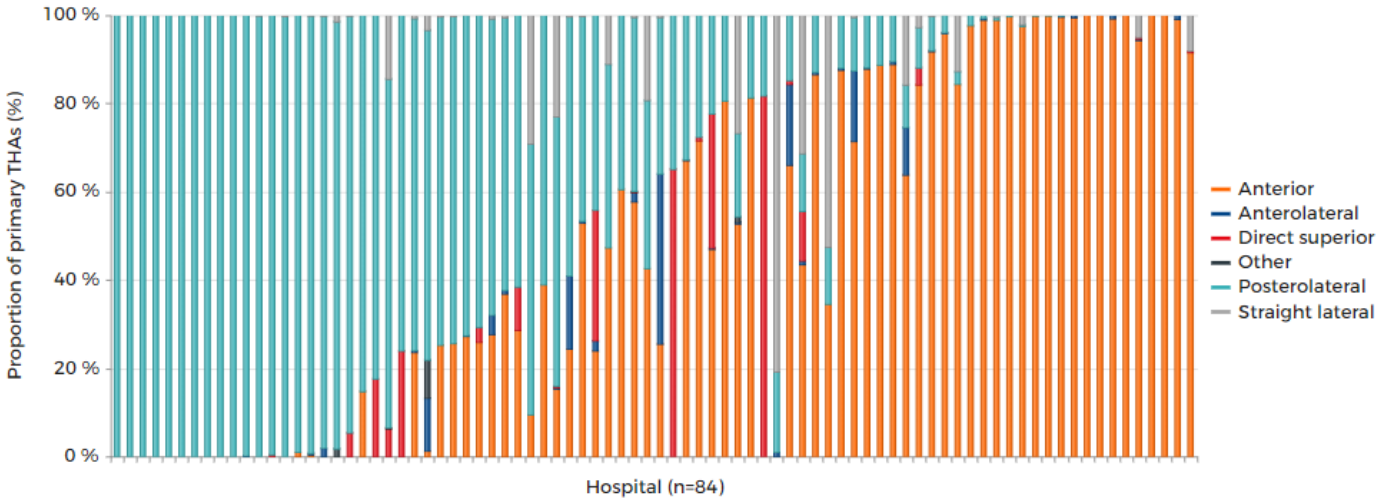
TABLE The most frequently registered separately packed bone cement used during primary total hip arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Separately packed bone cement (n)	**4,509**	**3,662**	**3,941**	**4,312**	**3,539**
Cement name; Proportion (%)					
PALACOS R+G	86.49	82.61	87.54	88.71	82.14
Refobacin Bone Cement R	3.19	7.24	3.81	4.22	10.48
PALACOS MV+G	4.97	4.21	3.65	4.31	3.84
Simplex ABC TOBRA	0.11	0.14	0.10	0.51	1.53
Subiton G	2.88	3.17	2.51	1.21	0.54
COPAL G+C	0.33	0.63	0.81	0.60	0.45
Refobacin Revision	0.20	0.44	0.20	0.14	0.31
Biomet Plus Bone Cement	0.00	0.00	0.00	0.00	0.31
Simplex ABC EC	1.02	0.85	0.33	0.19	0.31
COPAL G+V	0.18	0.52	0.28	0.09	0.06

Practice variation

Surgical approach

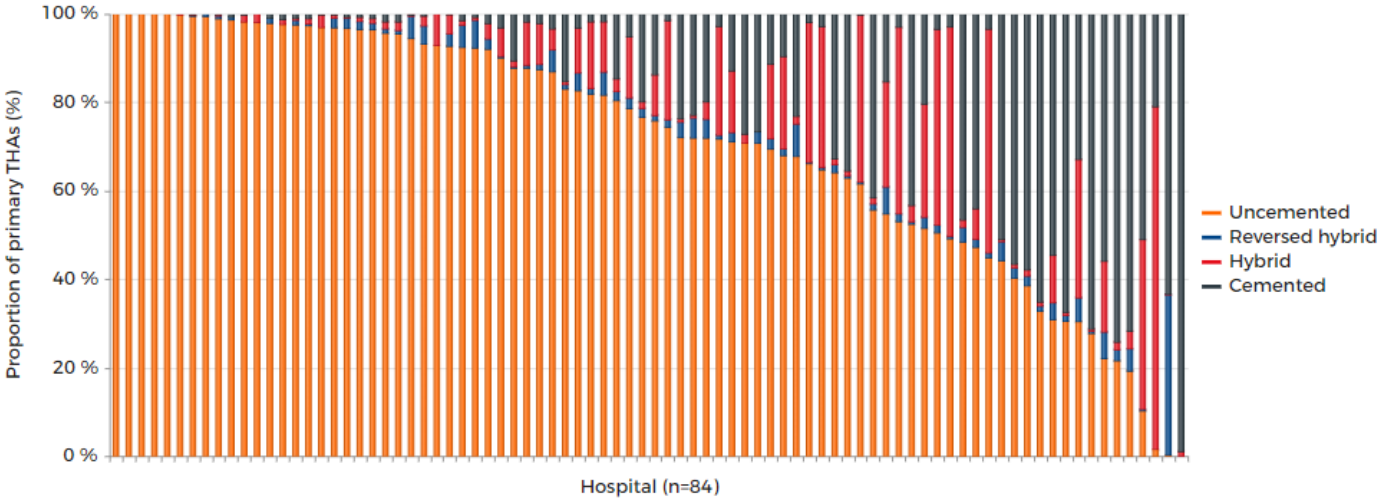
FIGURE Distribution of surgical approach used during primary total hip arthroplasties per hospital in the Netherlands in 2023 (n=36,466)



Please note: Hospitals with fewer than 50 procedures are not shown.
THA: total hip arthroplasty

Fixation

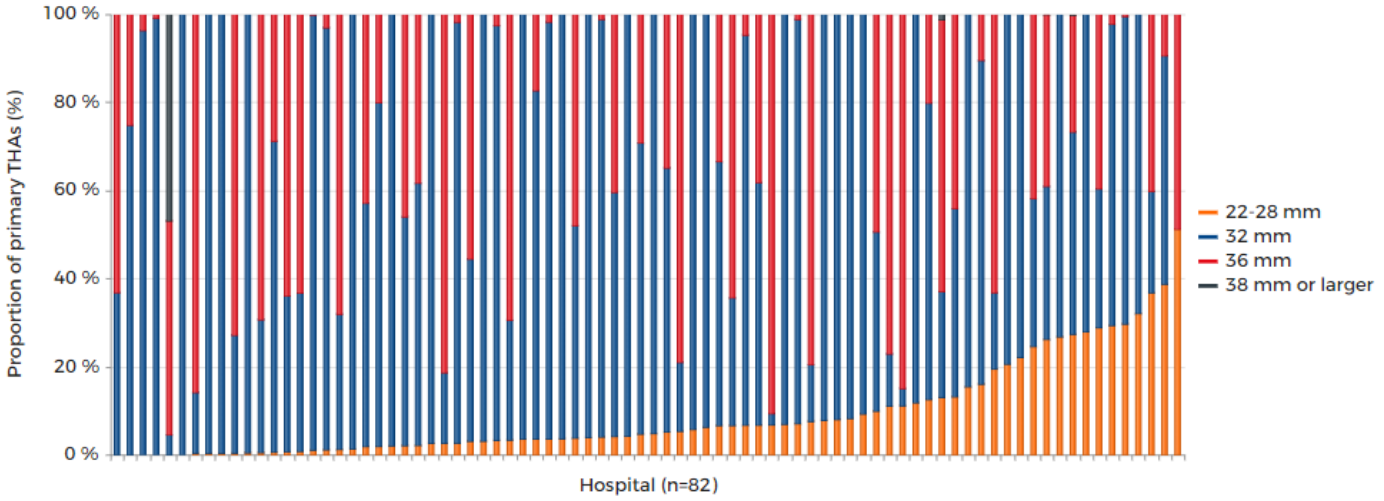
FIGURE Distribution of type of fixation used during primary total hip arthroplasties per hospital in the Netherlands in 2023 (n=36,369)



Please note: Hospitals with fewer than 50 procedures are not shown.
THA: total hip arthroplasty
© LROI 2024 | H032

Femoral head diameter

FIGURE Distribution of diameter femoral head used during primary total hip arthroplasties per hospital in the Netherlands in 2023 (n=35,240)



Please note: Hospitals with fewer than 50 procedures are not shown.
THA: total hip arthroplasty
© LROI 2024 | H033

Articulation

FIGURE Distribution of articulation used during primary total hip arthroplasties per hospital in the Netherlands in 2023 (n=34,533)

Please note: Hospitals with fewer than 50 procedures are not shown.

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

© LROI 2024 | H034

Robot assistance

FIGURE Distribution of robot assistance used during primary total hip arthroplasties per hospital in the Netherlands in 2022-2023 (n=68,022)

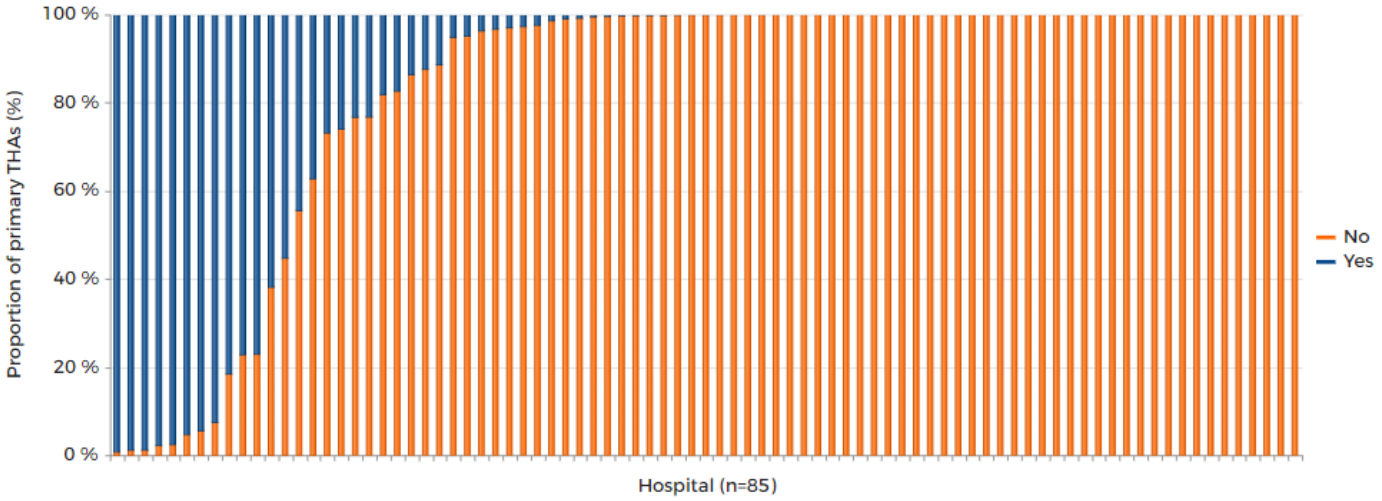
Please note: Hospitals with fewer than 50 procedures are not shown.

THA: total hip arthroplasty

© LROI 2024 | H035

Navigation

FIGURE Distribution of navigation used during primary total hip arthroplasties per hospital in the Netherlands in 2022-2023 (n=67,921)



Please note: Hospitals with fewer than 50 procedures are not shown.

THA: total hip arthroplasty

Hip hemiarthroplasty

Demographics

TABLE Patient characteristics of all patients with a primary hip hemiarthroplasty by specialism in the Netherlands in 2023

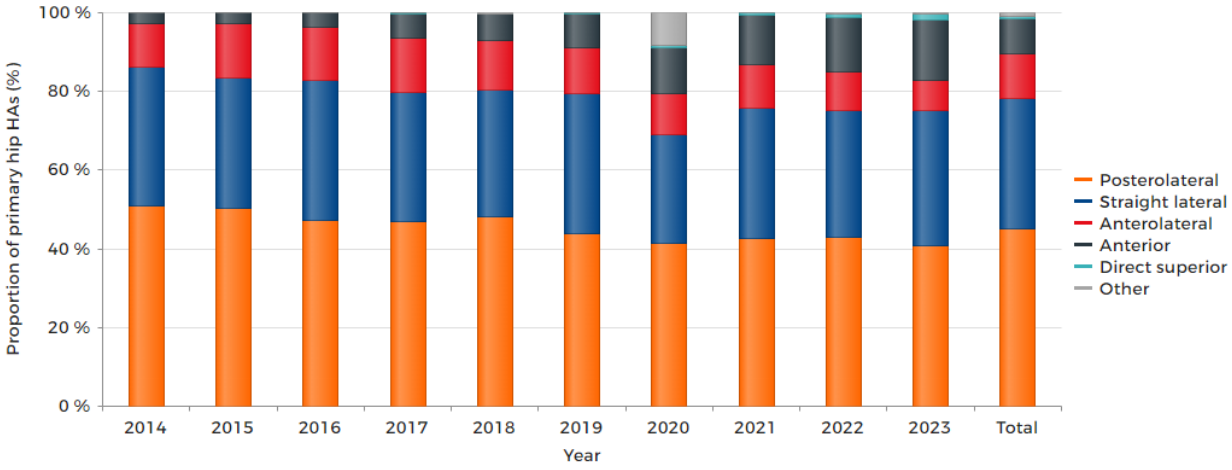
	Orthopaedic surgery	Trauma surgery	Total
N(%)	**4,178 (67.4)**	**2,030 (32.6)**	**6,222**
Mean age (years) (SD)	81.1 (9)	81.5 (7.9)	81.2 (8.7)
Age (years) (%)			
<50	1	0	1
50-59	2	1	2
60-69	6	5	6
70-79	27	31	29
>80	64	62	64
Gender (%)			
Men	36	37	37
Women	63	63	63
ASA score (%)			
ASA I	1	1	1
ASA II	27	27	27
ASA III-IV	71	70	71
Type of hospital (%)			
General	97	95	96
UMC	3	5	3
Private	0	0	0
Diagnosis (%)			
Fracture	93	84	90
Osteoarthritis	3	0	2
Post-traumatic	1	0	1
Tumour	1	0	1
Osteonecrosis	0	0	0
Dysplasia	0	0	0
Rheumatoid arthritis	0	0	0
Post-Perthes	0	0	0
Other	1	15	6
Charnley-score (%)			
A One hip joint affected	45	7	42
B1 Both hip joints affected	15	13	23
B2 Contralateral hip with a THA	27	4	25
C Multiple joints affected or chronic disease that affects quality of life	11	2	10
Mean BMI (kg/m) (SD)	24.7 (4.3)	24.5 (4.3)	24.7 (4.3)
Body Mass Index (kg/m) (%)			
Underweight (<=18.5)	5	5	5
Normal weight (>18.5-25)	50	47	54
Overweight (>25-30)	29	25	30
Obesity (>30-40)	9	8	10
Morbid obesity (>40)	0	0	0
Smoking (%)			
No	89	74	90
Yes	10	10	10

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 2014-2023

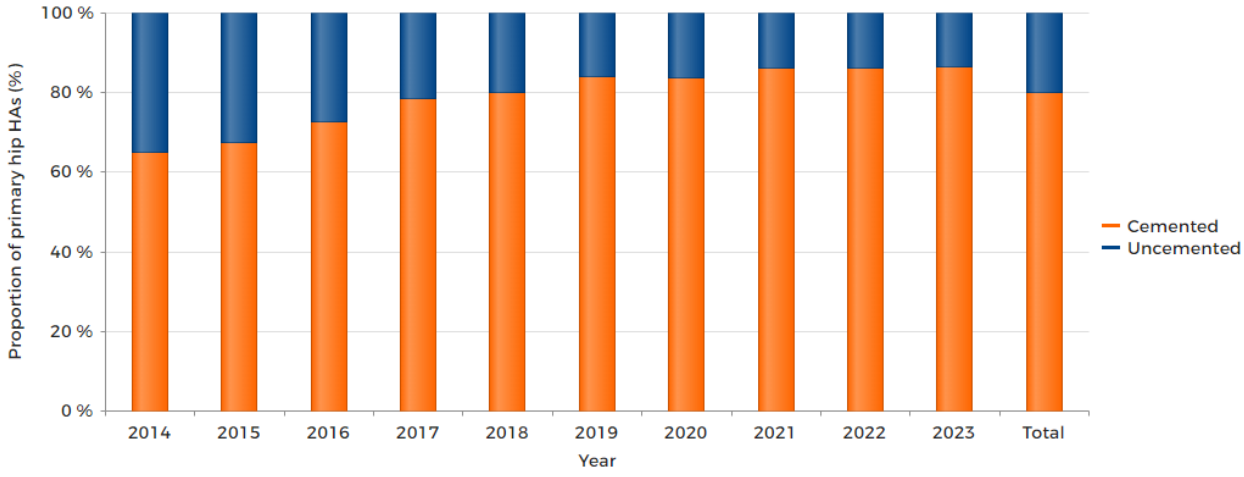


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Posterolateral	50.99	50.27	47.37	46.84	48.24	43.74	41.44	42.70	42.87	40.67	45.10
Straight lateral	35.29	33.26	35.48	32.98	32.09	35.56	27.64	33.22	32.25	34.51	33.07
Anterolateral	11.08	13.58	13.40	13.86	12.65	11.69	10.39	10.85	9.75	7.52	11.39
Anterior	2.60	2.78	3.62	6.04	6.62	8.67	11.61	12.73	13.80	15.53	8.90
Direct superior	0	0	0	0.17	0.11	0.19	0.72	0.45	1.16	1.57	0.48
Other	0.03	0.11	0.13	0.12	0.29	0.14	8.20	0.05	0.17	0.21	1.06
Total (n)	**3,726**	**4,756**	**5,442**	**5,910**	**6,239**	**6,285**	**6,562**	**6,063**	**6,463**	**6,196**	**57,642**

HA: hemiarthroplasty

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary hip hemiarthroplasty in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cemented	64.98	67.41	72.69	78.57	80.05	83.92	83.73	86.15	86.18	86.42	80.05
Uncemented	35.02	32.59	27.31	21.43	19.95	16.08	16.27	13.85	13.82	13.58	19.95
Total (n)	**3,692**	**4,691**	**5,342**	**5,809**	**6,109**	**6,186**	**6,375**	**6,067**	**6,406**	**6,140**	**56,817**

HA: hemiarthroplasty

Most frequently registered

Components

TABLE The most frequently registered femur components in primary hip hemiarthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Femur (n)	**5,912**	**6,078**	**5,894**	**6,076**	**6,019**
Femur name; Proportion (%)					
Original ME Muller	28.18	28.30	24.99	24.88	25.37
Lubinus SPII	20.79	18.59	19.71	23.47	22.21
Corail Cemented	2.18	1.69	2.97	4.34	8.04
Spectron EF	7.44	7.62	9.43	5.45	6.08
C-Stem AMT	4.14	4.74	6.67	5.60	5.43
CPT	0.10	0.15	4.55	4.92	4.88
CCA stem	6.46	10.05	8.47	6.55	4.74
Alloclassic Zweymuller SL	3.70	3.50	3.09	1.99	3.17
ACCOLADE II	0.95	2.52	2.80	2.88	2.72
Lubinus Classic Plus	1.74	2.70	3.12	2.81	2.69

TABLE The most frequently registered femoral head components in primary hip hemiarthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Femoral head component (n)	**5,839**	**6,150**	**5,838**	**6,082**	**5,998**
Femoral head name; Proportion (%)					
Zimmerbiomet Unipolar Head	32.66	33.25	27.94	26.57	27.29
Link CoCr head	20.16	19.19	22.63	26.04	22.71
Modular Cathcard Unipolar head	9.59	9.90	13.39	12.84	16.61
Stainless Steel head	7.90	10.93	9.30	8.70	7.30
VERSYS ENDO	1.01	0.88	5.58	6.28	6.52
Smith & Nephew CoCr head	3.85	3.28	6.44	3.60	4.25
UHR UNITRAX	7.54	6.88	3.67	5.10	4.25
Link Modular trauma head	1.73	1.66	0.99	1.74	4.05
Smith & Nephew Uni-polar	6.03	5.93	4.08	2.20	2.35
Biolox DELTA	0.77	1.02	0.87	1.02	0.90

Types of bone cement

TABLE The most frequently registered bone cement pre-packed in a vacuum mixing system used during primary hip hemiarthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**2,541**	**2,571**	**2,894**	**3,124**	**3,159**
Cement name; Proportion (%)					
PALACOS R+G	42.78	48.35	48.96	49.04	56.57
Refobacin Bone Cement R	45.73	41.62	44.57	44.21	38.75
Refobacin Plus Bone Cement	11.45	10.04	6.39	6.75	4.69

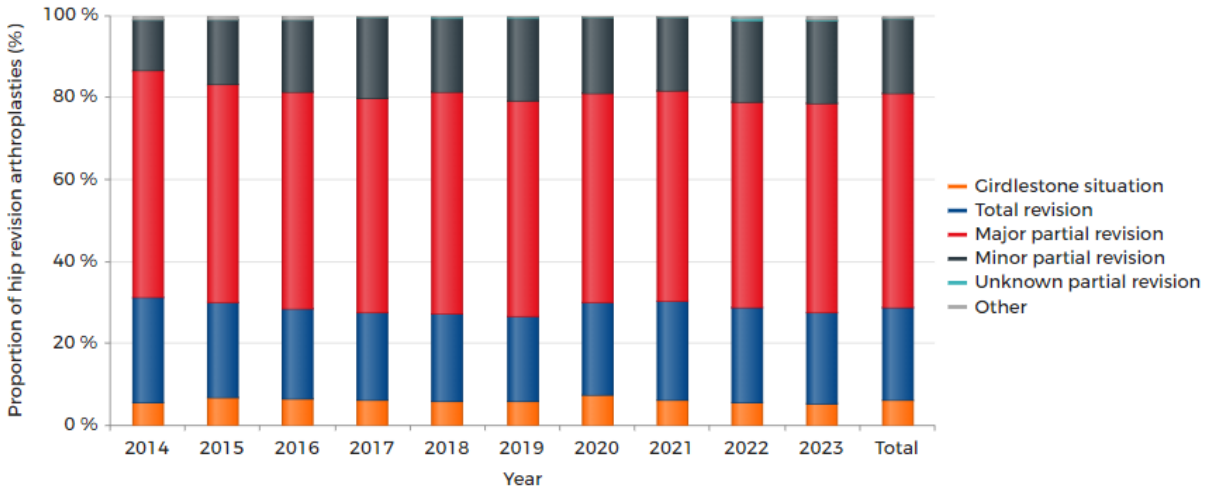
TABLE The most frequently registered separately packed bone cement used during primary hip hemiarthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Separately packed bone cement (n)	**1,665**	**1,710**	**1,586**	**1,497**	**1,342**
Cement name; Proportion (%)					
PALACOS R+G	77.36	64.15	76.04	79.49	65.42
Refobacin Bone Cement R	3.42	16.37	1.13	1.14	12.74
COPAL G+C	5.95	7.19	10.91	11.36	12.00
PALACOS MV+G	5.17	4.80	6.05	6.35	7.15
Simplex ABC TOBRA	0.00	0.06	0.00	0.27	0.89
Simplex ABC EC	0.66	0.58	0.25	0.33	0.82
COPAL G+V	0.66	0.29	0.06	0.00	0.52
Biomet Plus Bone Cement	0.00	0.00	0.00	0.00	0.37
Refobacin Revision	0.18	0.23	0.06	0.07	0.07

Hip revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in hip revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Girdlestone situation	5.47	6.74	6.53	6.32	5.87	5.92	7.51	6.32	5.72	5.21	6.15
Total revision	25.82	23.19	21.95	21.17	21.45	20.63	22.48	23.96	23.15	22.43	22.59
Major partial revision	55.30	53.07	52.85	52.18	53.96	52.55	51.13	51.26	49.90	50.82	52.31
Minor partial revision	12.34	15.77	17.55	19.87	18.07	20.16	18.39	17.84	19.93	20.08	18.03
Unknown partial revision	0.03	0.08	0.10	0.08	0.23	0.24	0.03	0.11	0.64	0.51	0.21
Other	1.04	1.15	1.01	0.39	0.42	0.50	0.46	0.51	0.67	0.95	0.71
Total (n)	**3,548**	**3,812**	**3,858**	**3,860**	**3,836**	**3,819**	**3,448**	**3,560**	**3,603**	**3,914**	**37,258**

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 1,272 (64%) major partial hip revision arthroplasties the acetabulum component was revised and in 717 (36%) major partial revision arthroplasties the femur component was revised in 2023.

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a hip revision arthroplasty in the Netherlands in 2014-2023

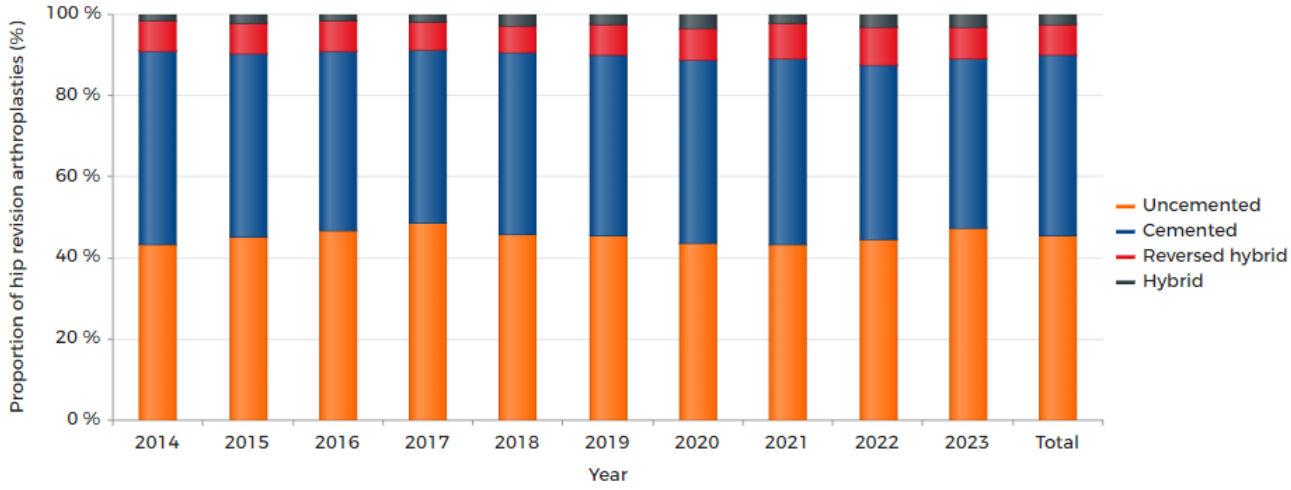
Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Hip revision arthroplasty (n)	**3,583**	**3,834**	**3,883**	**3,871**	**3,843**	**3,835**	**3,465**	**3,563**	**3,615**	**3,928**	**37,420**
Reasons for revision; Proportion (%)											
Infection	12.34	17.89	19.39	21.21	20.74	22.69	25.08	25.32	24.23	25.48	21.42
Loosening of acetabulum component	26.35	24.80	22.30	21.78	21.13	20.55	18.56	16.84	18.31	15.81	20.66
Dislocation	19.12	19.93	19.42	17.82	18.92	18.46	17.60	18.92	17.43	17.64	18.53
Loosening of femur component	20.85	19.51	18.77	18.16	19.20	17.18	16.97	17.15	15.49	14.59	17.79
Inlay wear	20.12	19.56	18.31	18.19	15.95	15.83	13.45	13.05	13.11	12.40	16.03
Peri-prosthetic fracture	11.69	11.37	12.46	14.65	14.36	14.50	17.06	16.22	16.82	16.62	14.55
Cirdlestone situation	6.42	5.74	6.05	5.24	4.79	4.51	4.33	4.86	4.20	4.43	5.06
Symptomatic MoM bearing	5.78	4.56	3.94	2.66	2.73	2.82	2.57	2.30	2.27	2.04	3.16
Peri-articular ossification	2.60	2.03	2.34	1.47	1.30	1.12	1.18	1.15	0.91	0.99	1.51
Other	11.64	11.27	10.61	10.07	11.27	12.75	10.79	11.82	10.37	10.18	11.07

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

Surgical techniques

Fixation

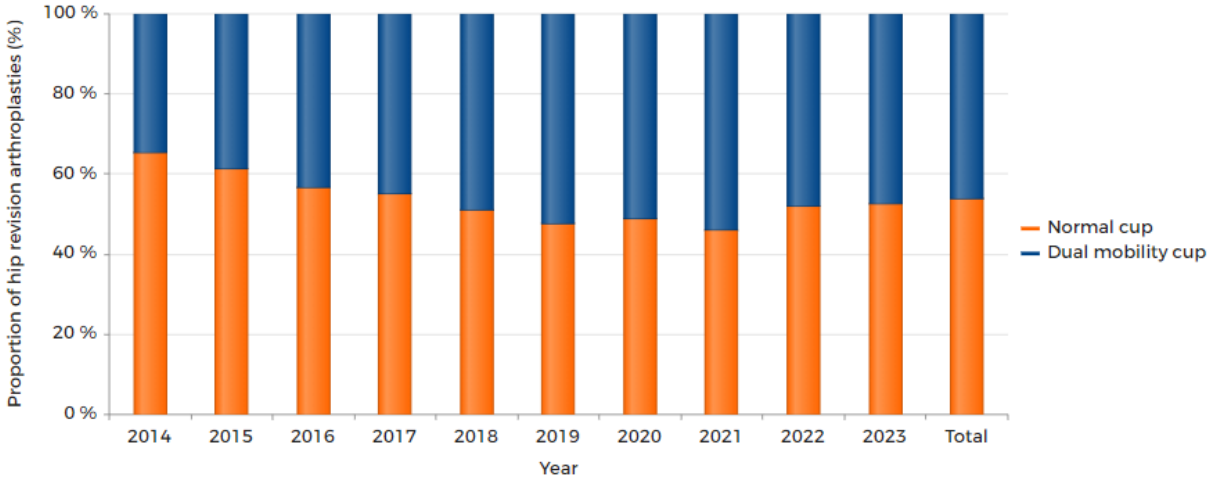
FIGURE Trend (proportion [%] per year) in type of fixation in hip revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Uncemented	43.29	45.02	46.87	48.47	45.83	45.55	43.69	43.23	44.56	47.46	45.46
Cemented	47.59	45.28	44.24	42.82	44.90	44.55	45.08	45.77	43.00	41.75	44.45
Reversed hybrid	7.57	7.51	7.34	6.73	6.61	7.31	7.88	8.79	9.24	7.83	7.66
Hybrid	1.56	2.20	1.55	1.98	2.66	2.60	3.36	2.21	3.21	2.97	2.42
Total (n)	**3,278**	**3,461**	**3,542**	**3,536**	**3,572**	**3,502**	**3,097**	**3,264**	**3,335**	**3,641**	**34,228**

Dual mobility

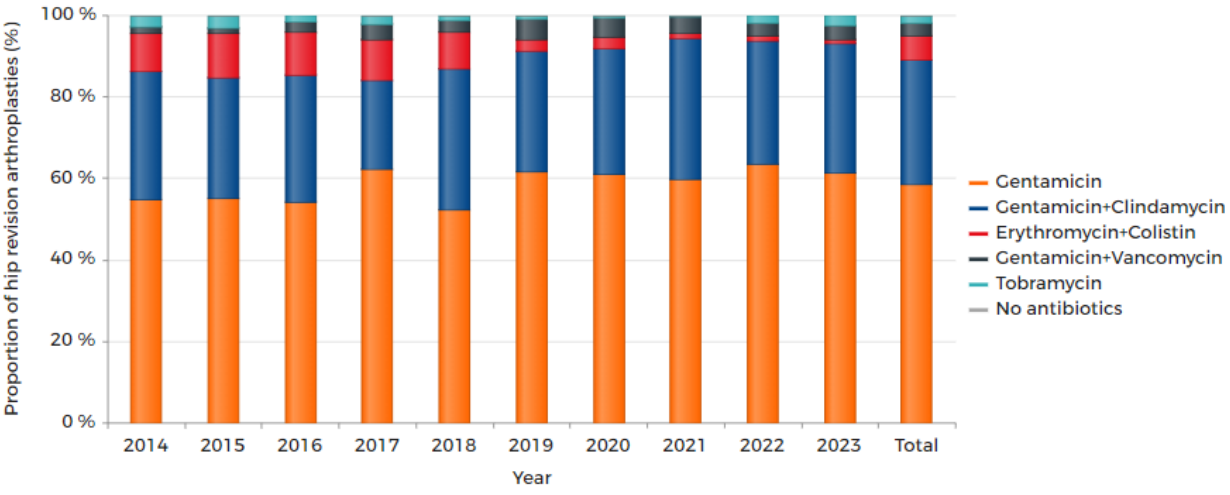
FIGURE Trend (proportion [%] per year) in type of acetabulum component in hip revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Normal cup	65.47	61.47	56.73	55.09	51.19	47.64	48.86	46.00	51.96	52.54	53.99
Dual mobility cup	34.53	38.53	43.27	44.91	48.81	52.36	51.14	54.00	48.04	47.46	46.01
Total (n)	**2,346**	**2,419**	**2,348**	**2,182**	**2,223**	**2,162**	**1,932**	**2,113**	**2,011**	**2,147**	**21,883**

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in hip revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Gentamicin	54.97	55.09	54.35	62.35	52.47	61.79	61.16	59.82	63.68	61.45	58.48
Gentamicin+Clindamycin	31.37	29.54	31.12	21.78	34.53	29.43	30.69	34.58	30.17	31.55	30.53
Erythromycin+Colistin	9.37	10.98	10.51	10.03	9	2.99	2.98	1.16	1.07	0.99	6.11
Gentamicin+Vancomycin	1.60	1.37	2.34	3.72	2.71	4.81	4.61	4.06	3.34	3.63	3.15
Tobramycin	2.57	2.90	1.69	2.06	1.18	0.91	0.50	0.32	1.74	2.38	1.65
No antibiotics	0.11	0.11	0	0.07	0.12	0.06	0.07	0.06	0	0	0.06
Total (n)	**1,750**	**1,757**	**1,713**	**1,506**	**1,700**	**1,641**	**1,411**	**1,553**	**1,498**	**1,515**	**16,044**

Most frequently registered

Most frequently registered acetabulum components

TABLE The most frequently registered cemented acetabulum components in hip revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Acetabulum cemented (n)	**1,380**	**1,177**	**1,356**	**1,296**	**1,323**
Acetabulum name; Proportion (%)					
AVANTAGE Cemented	54.42	57.18	61.58	53.83	54.26
Polarcup cemented	14.57	15.12	11.73	12.84	12.92
BiMobile DM	0.43	1.19	1.70	3.48	10.11
Trabecular Metal	2.68	4.16	4.28	6.42	4.79
Bi-Mentum Cemented Cups	0.00	0.17	5.24	5.41	2.66
Marathon	1.59	1.70	1.33	1.47	2.05
MUller low profile Durasul	1.59	1.95	1.18	1.47	1.82
DS Evolution	1.96	2.29	2.95	2.40	1.37
EXETER RIMFIT X3	4.06	2.97	2.73	2.71	1.22
Saturne Dual Mobility Cemented	3.77	1.95	0.59	1.08	1.22

TABLE The most frequently registered uncemented acetabulum components in hip revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Acetabulum uncemented (n)	**508**	**430**	**448**	**442**	**538**
Acetabulum name; Proportion (%)					
C7 - OSSEOTI	0.00	0.23	3.35	9.05	13.01
Continuum	17.52	22.09	16.29	12.90	10.59
AVANTAGE RELOAD	4.92	10.00	7.59	7.01	8.55
Allofit	8.86	6.74	10.94	9.50	8.55
DELTA-ONE TT	11.02	11.63	10.49	8.60	7.25
TRIDENT II TRITANIUM	0.00	0.00	0.45	2.94	4.83
DS Evolution	1.57	1.16	2.68	3.62	4.83
Bi-Mentum Press-fit	0.00	0.00	2.46	2.49	3.53
Saturne Dual Mobility	4.13	3.49	3.35	2.94	3.35
Pinnacle	3.35	3.02	1.12	2.71	2.97

Most frequently registered femur components

TABLE The most frequently registered cemented femur components in hip revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Femur cemented (n)	**629**	**587**	**598**	**574**	**595**
Femur name; Proportion (%)					
Lubinus SPII	26.87	22.15	23.08	28.05	34.29
EXETER	21.14	25.04	21.57	22.13	17.48
Original ME Muller	10.49	10.90	7.02	10.63	10.92
CPT	6.04	6.81	11.54	5.40	5.88
C-Stem AMT	1.91	4.60	4.35	4.70	4.71
Twinsys stem Cemented	3.50	2.39	2.01	2.61	4.03
Spectron EF	7.63	7.50	5.02	4.88	3.70
C-Stem AMT Long	2.07	2.90	6.35	4.18	3.19
TAPERLOC Hip Cemented CoCr	0.48	1.02	2.84	3.31	3.19
MP Reconstruction Prosthesis	2.86	2.56	4.68	2.61	2.35

TABLE The most frequently registered uncemented femur components in hip revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Femur uncemented (n)	**730**	**707**	**781**	**784**	**821**
Femur name; Proportion (%)					
ARCOS	9.86	12.31	22.66	21.81	22.66
RESTORATION MODULAR	21.92	17.40	10.50	12.76	14.49
MP Reconstruction Prosthesis	13.42	12.87	18.82	16.33	12.67
REDAPT	7.67	10.47	8.19	9.95	5.97
Wagner SL	4.11	3.39	3.84	2.81	5.60
Corail Revision	3.29	1.84	3.07	3.83	4.87
Revitan	7.81	10.04	6.15	4.34	4.26
Alloclassic SLL	4.52	3.11	3.20	3.44	3.78
TAPERLOC Complete	1.51	3.11	2.94	3.32	3.53
RECLAIM Revision hip	1.51	1.27	1.02	2.17	2.44

Most frequently registered types of bone cement

TABLE The most frequently registered bone cement pre-packed in a vacuum mixing system used during hip revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**470**	**460**	**575**	**565**	**575**
Cement name; Proportion (%)					
PALACOS R+G	35.74	51.96	56.70	57.88	67.65
Refobacin Bone Cement R	54.26	40.65	36.52	35.93	29.57
Refobacin Plus Bone Cement	8.94	5.87	2.78	3.89	2.78

TABLE The most frequently registered separately packed bone cement used during hip revision arthroplasties in the Netherlands in 2019-2023

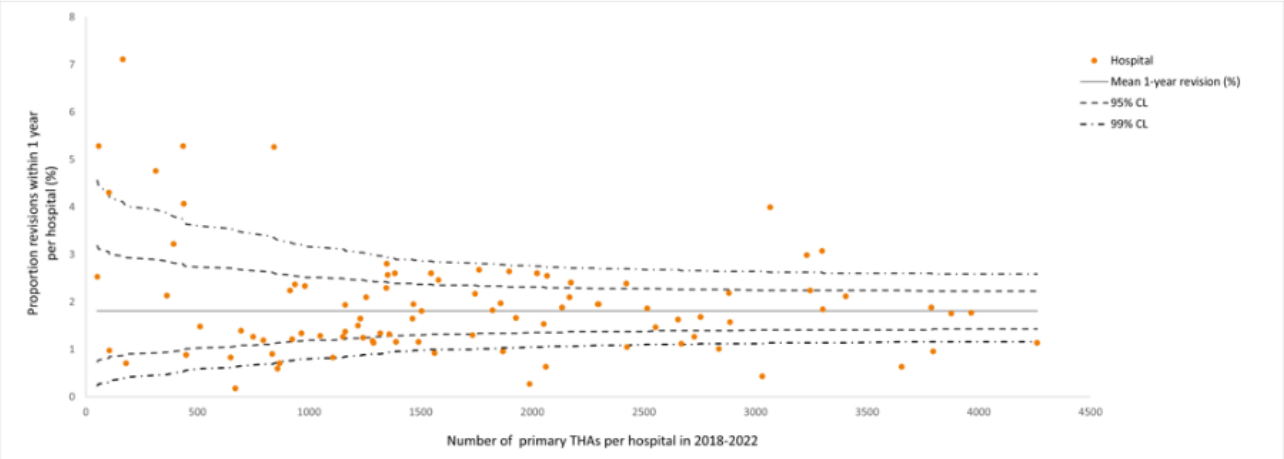
Year	2019	2020	2021	2022	2023
Separately packed bone cement (n)	**1,140**	**901**	**911**	**871**	**862**
Cement name; Proportion (%)					
COPAL G+C	28.33	29.63	35.35	29.28	36.66
PALACOS R+G	38.51	31.85	32.05	35.71	29.93
Refobacin Revision	12.63	14.65	15.26	16.65	12.88
COPAL G+V	5.09	5.99	6.48	5.40	5.92
Simplex ABC TOBRA	1.23	0.67	0.55	2.87	4.06
PALACOS MV+G	3.60	4.00	3.07	4.71	3.71
Refobacin Bone Cement R	2.89	5.55	2.20	1.95	3.60
Simplex ABC EC	4.30	4.44	1.98	1.38	1.62
Subiton G	1.93	1.78	2.85	1.61	1.16
Cemex VancoGenx	1.23	1.00	0.11	0.34	0.35

Survival total hip arthroplasty

Revision within 1 and 3 years

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 2018-2022 (n=159,661)

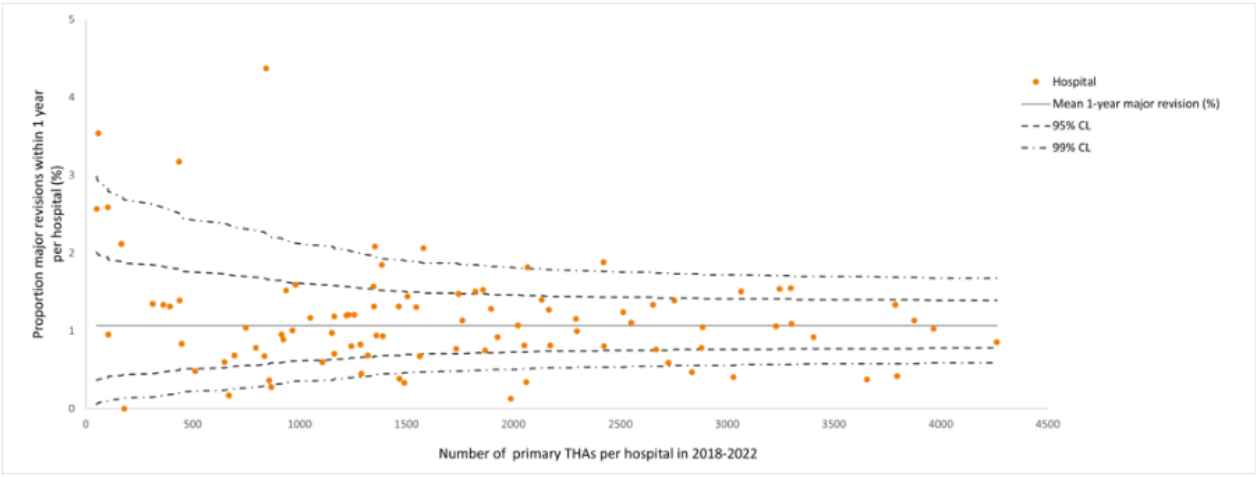


Please note: The proportions of revisions within 1 year per hospital were adjusted for casemix factors age, gender, ASA score, BMI, smoking, charnley score and diagnosis (osteoarthritis versus other).THA: total hip arthroplasty; CL: control limits.

The mean 1-year revision percentage is 1.81 in the Netherlands in 2018-2022.
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 2018-2022 (n=159,661)



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.

The mean 1-year major revision percentage is 1.01 in the Netherlands in 2018-2022.
Control limits indicate the plausible range of outcome if all hospitals perform equally well.

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 2018-2022 (n=159,661)

	Cumulative 1-year revision percentage
	Kaplan Meier (95% CI)
Any type of revision	1.77 (1.71-1.84)
Major revision	0.97 (0.92-1.02)
Only acetabulum	0.31 (0.28-0.34)
Only femur	0.44 (0.41-0.48)
Acetabulum and femur	0.21 (0.19-0.24)
Minor revision	0.78 (0.73-0.82)
DAIR	0.57 (0.53-0.61)
No DAIR	0.20 (0.18-0.23)

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

In 2018-2022, 1,953 (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 2016-2020 (n=151,211)

	Cumulative 3-year revision percentage
	Kaplan Meier (95% CI)
Any type of revision	2.64 (2.56-2.72)
Major revision	1.70 (1.63-1.77)
Only acetabulum	0.62 (0.58-0.66)
Only femur	0.68 (0.64-0.73)
Acetabulum and femur	0.39 (0.36-0.43)
Minor revision	0.91 (0.86-0.96)
DAIR	0.60 (0.56-0.63)
No DAIR	0.32 (0.29-0.35)

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

In 2016-2020, 6,740 (4.5%) 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 2018-2022 (n=159,661)

	Cumulative 1-year first revision percentage
	Kaplan Meier (95% CI)
First major revision	0.97 (0.92-1.02)
Acetabulum	0.60 (0.56-0.64)
Femur	0.73 (0.69-0.77)
Minor revision	0.78 (0.73-0.82)
Inlay	0.37 (0.34-0.40)
Femoral head	0.73 (0.69-0.77)

First major revision: 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.
First minor revision: only inlay and/or femoral head exchange (including DAIR procedures).
THA: total hip arthroplasty; CI: confidence interval

In 2018-2022, 1,953 (1.2%) primary THAs were implanted in patients who died within one year after the primary procedure.

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 2018-2022

	Major revision (n=1,706)	Minor revision (n=1,253)	Any type of revision (n=2,887)
Reasons for revision	**Proportion (%)**	**Proportion (%)**	**Proportion (%)**
Infection	19.40	73.26	40.70
Dislocation	31.89	12.05	23.76
Peri-prosthetic fracture	29.72	1.84	18.18
Loosening of femur component	15.59	0.56	9.25
Loosening of acetabulum component	8.21	0.08	4.71
Girdlestone situation	2.75	0.16	1.32
Inlay wear	0.53	0.64	0.59
Peri-articular ossification	0.53	0.08	0.42
Symptomatic MoM bearing	0.00	0.00	0.00
Other	10.38	12.69	11.50

Major revision: 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.

Minor revision: only inlay and/or femoral head exchange (including DAIR procedures).

Any type of revision includes all first revisions, including revision procedures that could not be classified as minor or major revision.

Please note: 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 2016-2020 (n=151,211)

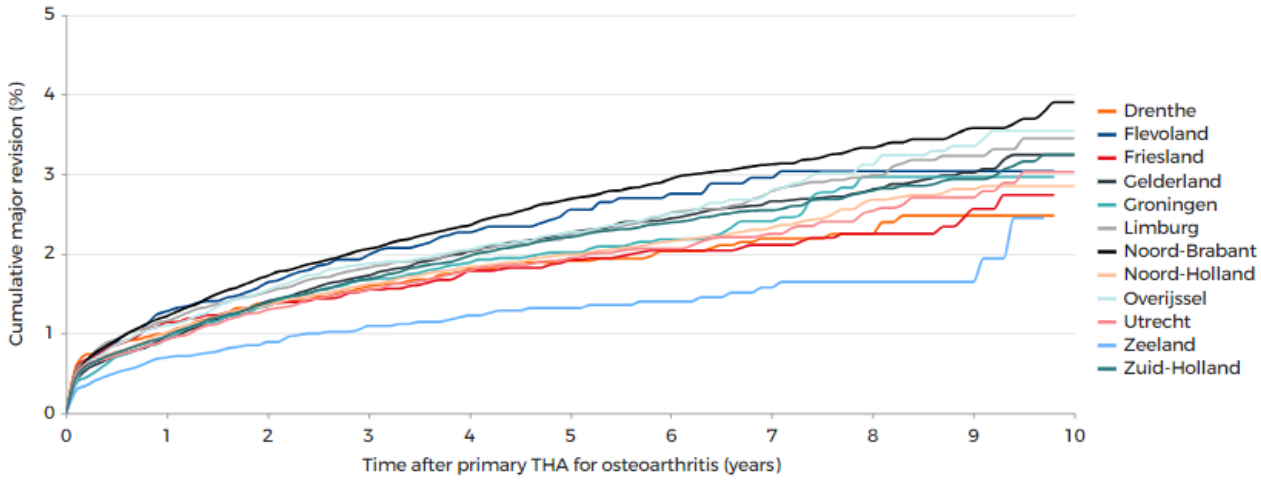
Time after primary THA	Percentage revisions (%)
Day 0-29	0.97
Day 30-182	0.63
Day 183-364	0.29
Day 365-730 (second year)	0.45
Day 731-1095 (third year)	0.31

THA: total hip arthroplasty

Revision by patient characteristics

THA by patient province

FIGURE Cumulative major revision percentages (95% CI) of total hip arthroplasties for osteoarthritis by patient province in the Netherlands in 2014-2023 (n=267,886)



	Number (n)	1yr	3yr	5yr	7yr	10yr
Drenthe	9,733	0.99 (0.79-1.19)	1.56 (1.30-1.82)	1.91 (1.61-2.22)	2.19 (1.83-2.55)	n.a.
Flevoland	5,469	1.24 (0.94-1.53)	1.93 (1.54-2.32)	2.46 (2.00-2.93)	2.95 (2.39-3.52)	n.a.
Friesland	10,980	1.08 (0.88-1.28)	1.52 (1.28-1.76)	1.88 (1.60-2.17)	2.11 (1.79-2.43)	n.a.
Gelderland	35,764	0.89 (0.79-0.99)	1.70 (1.56-1.85)	2.24 (2.06-2.42)	2.61 (2.40-2.82)	3.24 (2.89-3.59)
Groningen	9,257	0.86 (0.67-1.05)	1.67 (1.39-1.95)	2.01 (1.69-2.34)	2.41 (2.02-2.80)	n.a.
Limburg	19,123	1.13 (0.98-1.28)	1.80 (1.60-2.00)	2.18 (1.95-2.41)	2.72 (2.43-3.01)	3.45 (2.95-3.94)
Noord-Brabant	41,702	1.17 (1.07-1.28)	2.04 (1.89-2.18)	2.66 (2.48-2.83)	3.11 (2.90-3.32)	3.90 (3.47-4.33)
Noord-Holland	41,428	0.97 (0.88-1.07)	1.59 (1.46-1.72)	1.99 (1.83-2.14)	2.30 (2.12-2.48)	2.85 (2.59-3.10)
Overijssel	17,555	1.08 (0.92-1.23)	1.86 (1.64-2.07)	2.24 (2.00-2.49)	2.70 (2.40-3.00)	3.54 (3.05-4.04)
Utrecht	19,369	0.87 (0.74-1.00)	1.52 (1.34-1.71)	1.91 (1.69-2.13)	2.23 (1.97-2.49)	3.03 (2.51-3.54)
Zeeland	6,396	0.68 (0.48-0.89)	1.05 (0.78-1.31)	1.32 (1.01-1.63)	1.58 (1.19-1.97)	n.a.
Zuid-Holland	51,366	0.92 (0.84-1.01)	1.66 (1.54-1.78)	2.20 (2.06-2.35)	2.55 (2.38-2.72)	3.24 (2.91-3.58)

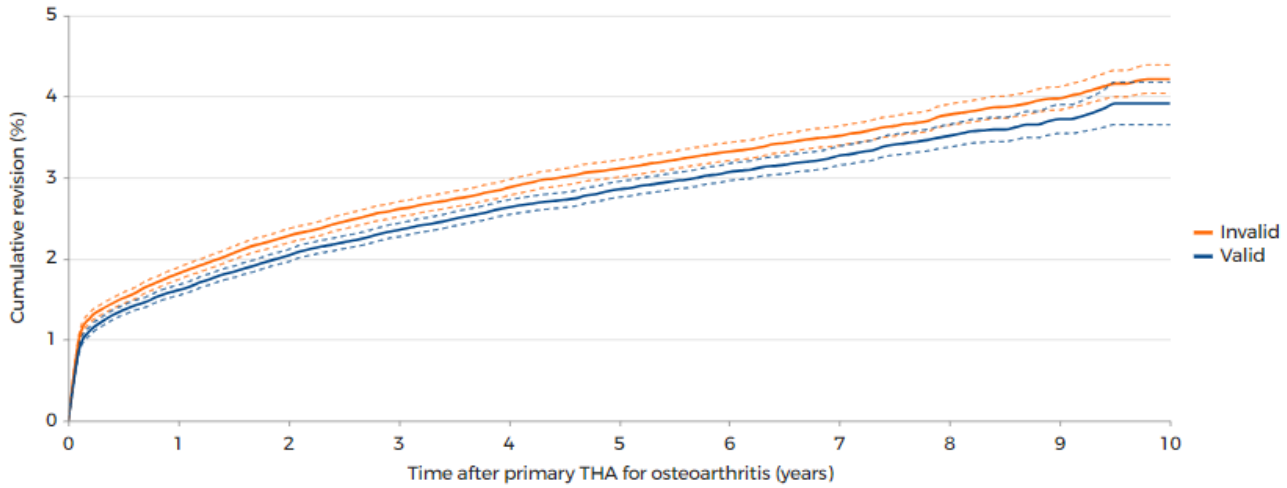
Please note: n.a. if <50 cases were at risk.

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.

THA by pre-PROM

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by valid pre-operative PROM of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2023 (n=270,202)



© LROI 2024 | H063A

	Number (n)	1yr	3yr	5yr	7yr	10yr
Valid	147,626	1.57 (1.51-1.64)	2.33 (2.24-2.41)	2.83 (2.73-2.93)	3.23 (3.11-3.35)	3.91 (3.65-4.17)
Invalid	122,573	1.76 (1.69-1.84)	2.58 (2.48-2.67)	3.09 (2.98-3.20)	3.50 (3.38-3.61)	4.21 (4.04-4.39)

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

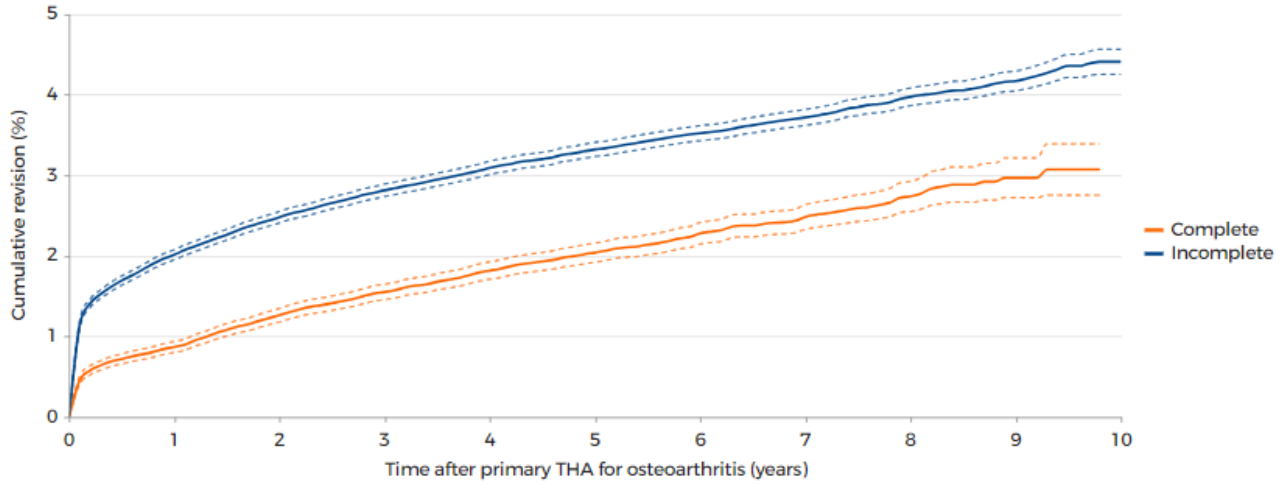
Valid: pre-operative PROM reported; Invalid: non-responders to pre-operative PROM.

THA: total hip arthroplasty; PROM: patient reported outcome measure; CI: confidence interval.

© LROI 2024 | H063B

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

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) 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 2014-2023 (n=270,202)



© LROI 2024 | H064A

	Number (n)	1yr	3yr	5yr	7yr	10yr
Complete	71,479	0.84 (0.77-0.91)	1.53 (1.44-1.63)	2.02 (1.90-2.14)	2.43 (2.28-2.58)	n.a.
Incomplete	198,720	1.96 (1.90-2.02)	2.78 (2.70-2.86)	3.30 (3.21-3.38)	3.70 (3.60-3.79)	4.41 (4.25-4.56)

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

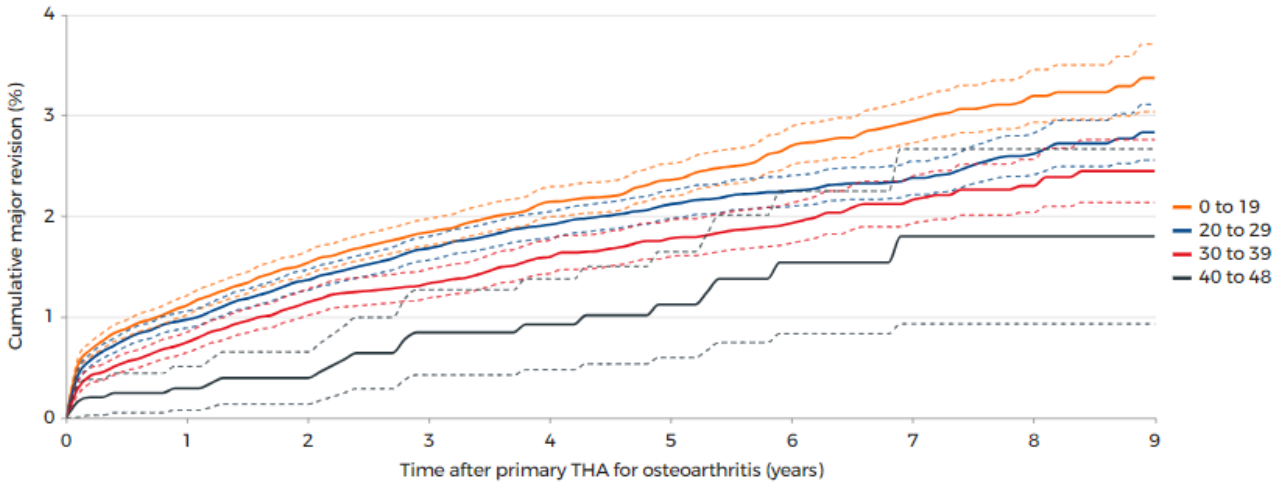
A PROM trajectory is considered complete when preoperative, 3-months postoperative and 12-months postoperative PROMs are reported.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H064B

THA by pre-OHS

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by pre-operative Oxford Hip score of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2023 (n=133,859)



© LROI 2024 | H065A

	Number (n)	1yr	3yr	5yr	9yr
0 to 19	47,836	1.07 (0.98-1.17)	1.82 (1.69-1.95)	2.35 (2.18-2.51)	3.37 (3.03-3.71)
20 to 29	55,006	0.95 (0.87-1.03)	1.66 (1.55-1.78)	2.09 (1.95-2.23)	2.83 (2.55-3.11)
30 to 39	28,720	0.71 (0.61-0.81)	1.30 (1.16-1.45)	1.75 (1.57-1.93)	2.45 (2.13-2.76)
40 to 48	2,488	0.29 (0.08-0.51)	0.85 (0.42-1.27)	1.12 (0.60-1.65)	1.80 (0.93-2.67)

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

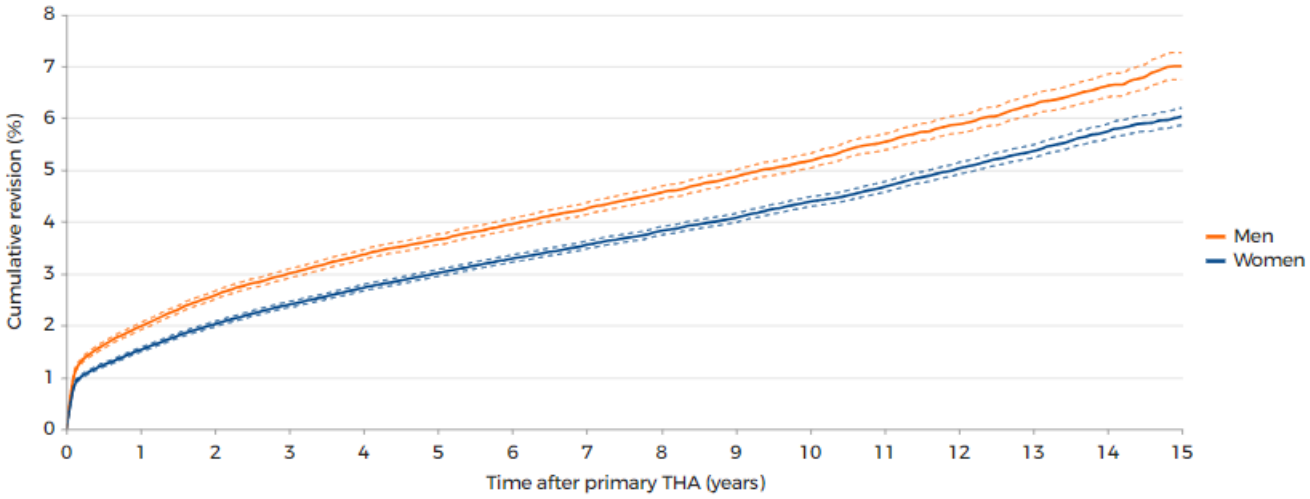
THA: total hip arthroplasty; PROM: patient reported outcome measure; CI: confidence interval.

© LROI 2024 | H065B

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 (Kaplan-Meier; 95% CI) of total hip arthroplasties by gender in the Netherlands in 2007-2023 (n=458,344)



© LROI 2024 | H066A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Men	157,584	1.91 (1.84-1.98)	2.96 (2.87-3.04)	3.63 (3.53-3.73)	4.22 (4.10-4.33)	5.15 (5.01-5.29)	7.00 (6.74-7.26)
Women	300,760	1.48 (1.43-1.52)	2.37 (2.31-2.43)	2.98 (2.92-3.05)	3.52 (3.44-3.59)	4.35 (4.26-4.45)	6.00 (5.83-6.16)

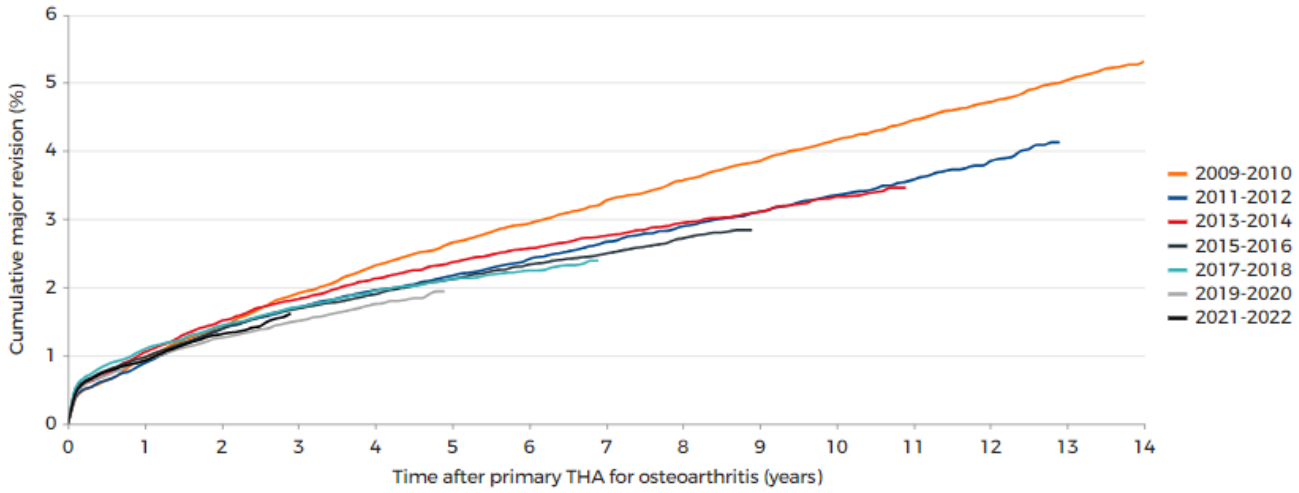
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H066B

THA by procedure year for women

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by procedure year for female patients with a primary THA for osteoarthritis in the Netherlands in 2009-2023 (n=225,903)



	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	31,047	0.92 (0.81-1.04)	1.88 (1.71-2.04)	2.61 (2.42-2.80)	3.20 (2.99-3.42)	4.13 (3.88-4.38)	5.27 (4.98-5.56)
2011-2012	33,612	0.83 (0.73-0.94)	1.69 (1.54-1.84)	2.15 (1.98-2.32)	2.63 (2.44-2.81)	3.33 (3.12-3.55)	n.a.
2013-2014	35,892	0.99 (0.88-1.10)	1.81 (1.66-1.96)	2.34 (2.17-2.51)	2.74 (2.56-2.92)	3.30 (3.10-3.51)	n.a.
2015-2016	37,935	0.95 (0.84-1.05)	1.67 (1.53-1.81)	2.10 (1.94-2.26)	2.47 (2.30-2.64)	n.a.	n.a.
2017-2018	40,079	1.04 (0.94-1.15)	1.69 (1.56-1.83)	2.10 (1.95-2.25)	2.39 (2.21-2.58)	n.a.	n.a.
2019-2020	38,593	0.91 (0.81-1.01)	1.49 (1.36-1.62)	1.94 (1.77-2.12)	n.a.	n.a.	n.a.
2021-2022	43,761	0.89 (0.80-0.99)	1.62 (1.42-1.81)	n.a.	n.a.	n.a.	n.a.

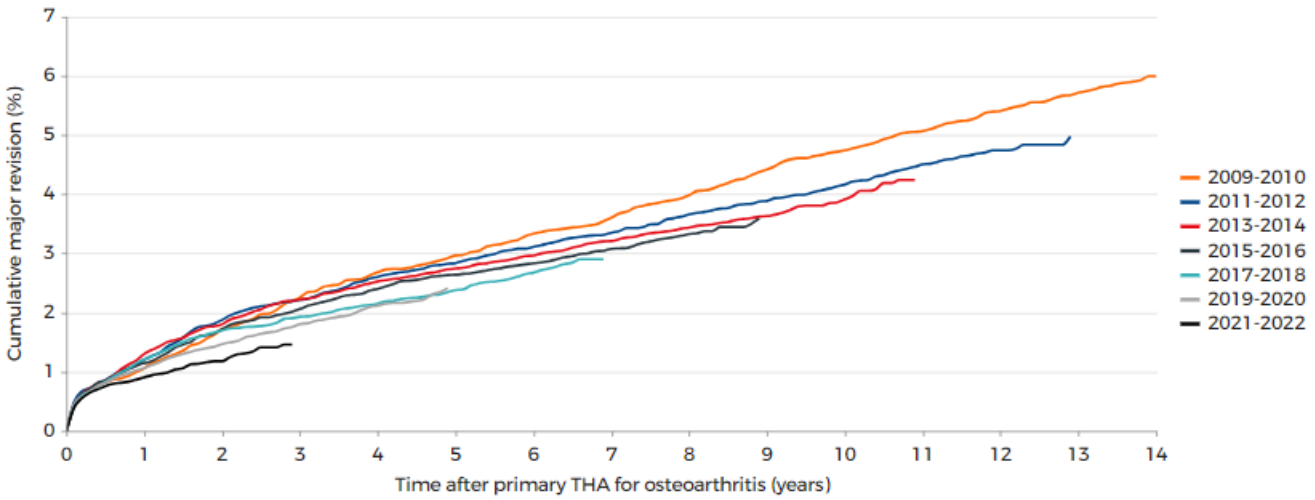
Please note: n.a. if <50 cases were at risk.

THA: total hip arthroplasty; CI: 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 by procedure year for men

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by procedure year for male patients with a primary THA for osteoarthritis in the Netherlands in 2009-2023 (n=115,768)



© LROI 2024 | H068A

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	14,460	1.00 (0.82-1.18)	2.19 (1.93-2.46)	2.92 (2.61-3.22)	3.54 (3.20-3.88)	4.71 (4.32-5.11)	5.99 (5.52-6.46)
2011-2012	16,295	1.12 (0.94-1.29)	2.19 (1.94-2.44)	2.82 (2.54-3.11)	3.31 (3.01-3.62)	4.13 (3.78-4.48)	n.a.
2013-2014	18,189	1.19 (1.02-1.36)	2.19 (1.96-2.43)	2.73 (2.47-2.99)	3.20 (2.92-3.48)	3.86 (3.54-4.18)	n.a.
2015-2016	20,315	1.10 (0.95-1.26)	2.01 (1.80-2.23)	2.63 (2.39-2.87)	3.04 (2.78-3.30)	n.a.	n.a.
2017-2018	21,579	1.14 (0.99-1.30)	1.90 (1.70-2.10)	2.34 (2.12-2.56)	2.90 (2.62-3.17)	n.a.	n.a.
2019-2020	21,443	1.02 (0.88-1.17)	1.76 (1.56-1.95)	2.41 (2.12-2.70)	n.a.	n.a.	n.a.
2021-2022	24,367	0.87 (0.74-0.99)	1.46 (1.24-1.67)	n.a.	n.a.	n.a.	n.a.

Please note: n.a. if <50 cases were at risk.

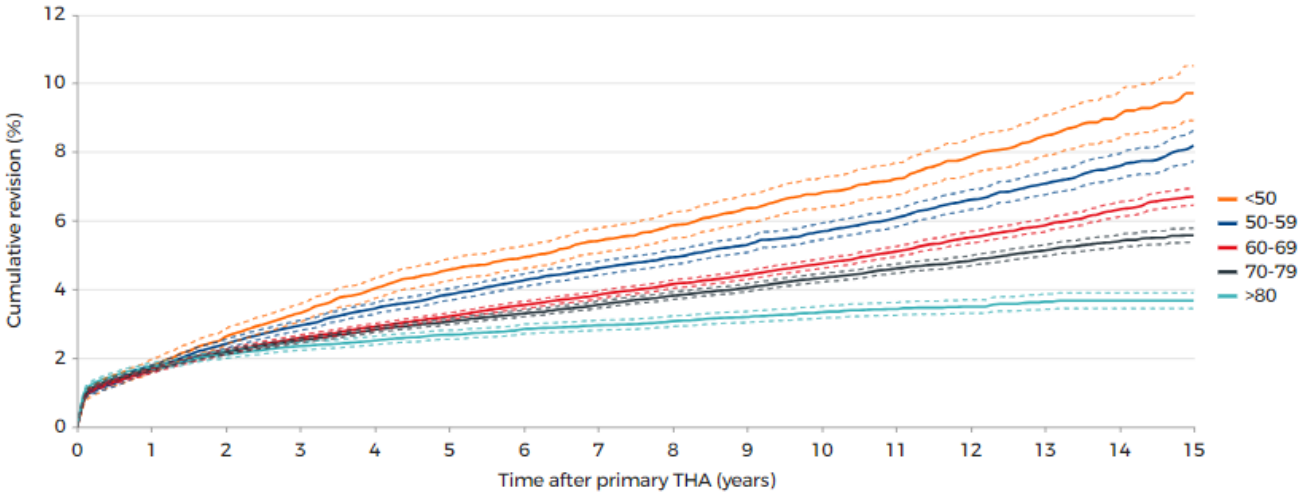
THA: total hip arthroplasty; CI: confidence interval.

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.

© LROI 2024 | H068B

THA by age category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by age category in the Netherlands in 2007-2023 (n=458,703)



© LROI 2024 | H069A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
<50	19,541	1.66 (1.48-1.84)	3.26 (3.00-3.52)	4.53 (4.21-4.84)	5.39 (5.04-5.75)	6.77 (6.33-7.20)	9.71 (8.91-10.51)
50-59	57,181	1.62 (1.52-1.73)	2.90 (2.76-3.05)	3.82 (3.65-3.99)	4.57 (4.37-4.76)	5.64 (5.40-5.88)	8.07 (7.64-8.50)
60-69	141,972	1.57 (1.50-1.63)	2.55 (2.47-2.64)	3.19 (3.09-3.28)	3.80 (3.68-3.91)	4.72 (4.58-4.85)	6.68 (6.43-6.93)
70-79	171,825	1.63 (1.57-1.69)	2.48 (2.41-2.56)	3.04 (2.95-3.12)	3.51 (3.42-3.61)	4.31 (4.19-4.43)	5.57 (5.37-5.78)
>80	68,184	1.72 (1.62-1.82)	2.33 (2.21-2.45)	2.67 (2.54-2.80)	2.94 (2.80-3.09)	3.31 (3.14-3.49)	3.67 (3.44-3.90)

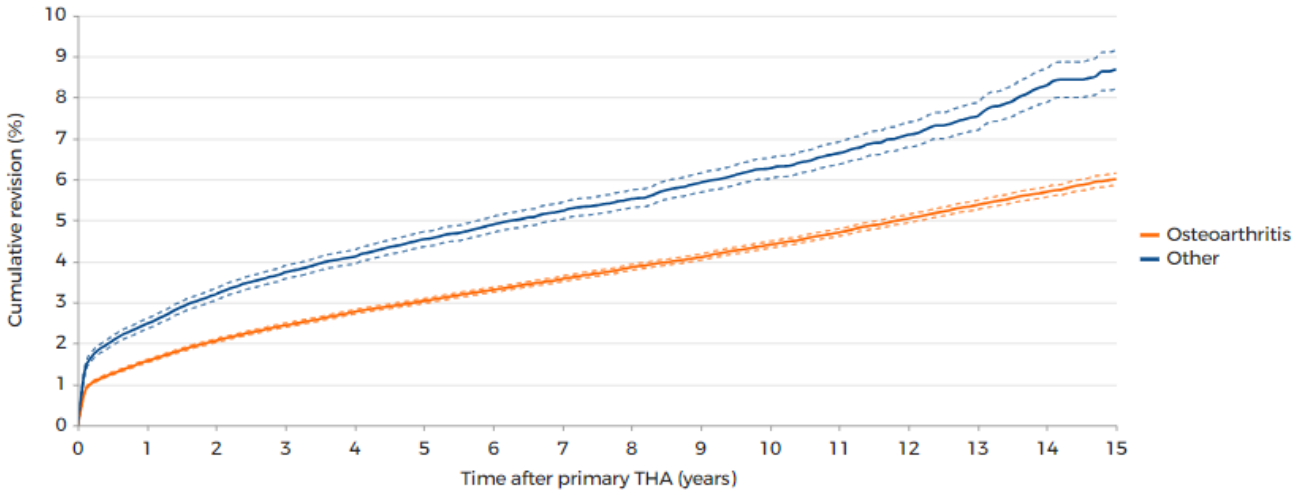
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H069B

THA by diagnosis

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by diagnosis in the Netherlands in 2007-2023 (n=454,340)



© LROI 2024 | H070A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Osteoarthritis	394,289	1.51 (1.47-1.55)	2.41 (2.36-2.46)	3.01 (2.95-3.06)	3.53 (3.47-3.60)	4.37 (4.29-4.46)	5.98 (5.83-6.13)
Other	60,051	2.40 (2.28-2.52)	3.66 (3.51-3.82)	4.50 (4.32-4.68)	5.20 (4.99-5.40)	6.25 (6.00-6.50)	8.63 (8.16-9.09)

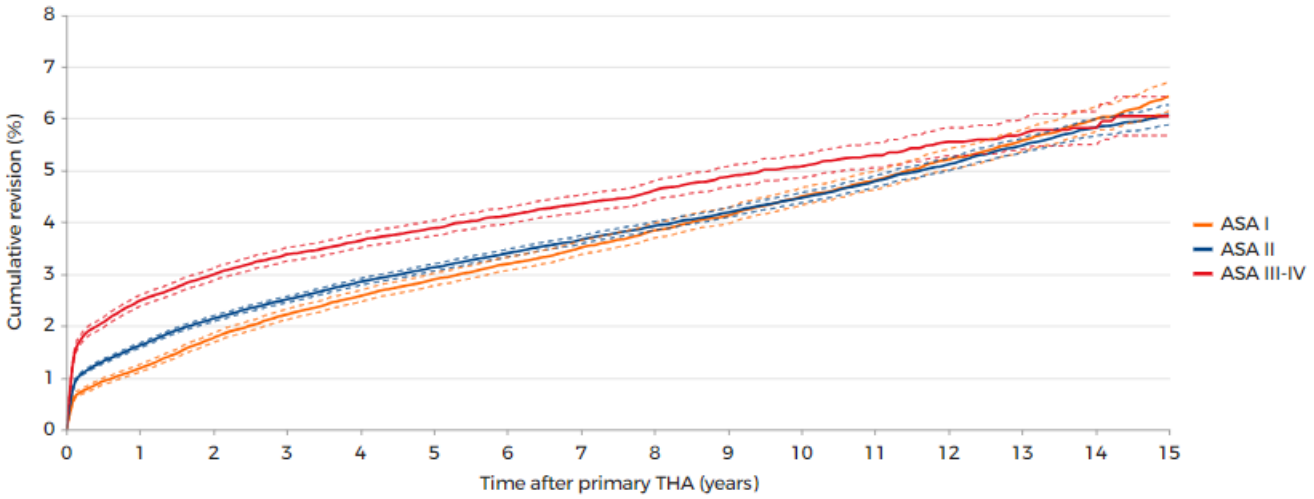
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H070B

THA by ASA score

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by ASA score in the Netherlands in 2007-2023 (n=446,604)



© LROI 2024 | H071A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
ASA I	85,106	1.13 (1.06-1.20)	2.18 (2.08-2.28)	2.86 (2.74-2.97)	3.46 (3.33-3.60)	4.45 (4.28-4.61)	6.37 (6.09-6.65)
ASA II	278,269	1.57 (1.52-1.61)	2.47 (2.41-2.53)	3.10 (3.03-3.17)	3.62 (3.55-3.70)	4.44 (4.34-4.54)	6.05 (5.86-6.24)
ASA III-IV	83,229	2.41 (2.30-2.51)	3.33 (3.20-3.46)	3.86 (3.71-4.01)	4.33 (4.17-4.50)	5.06 (4.84-5.28)	6.05 (5.67-6.42)

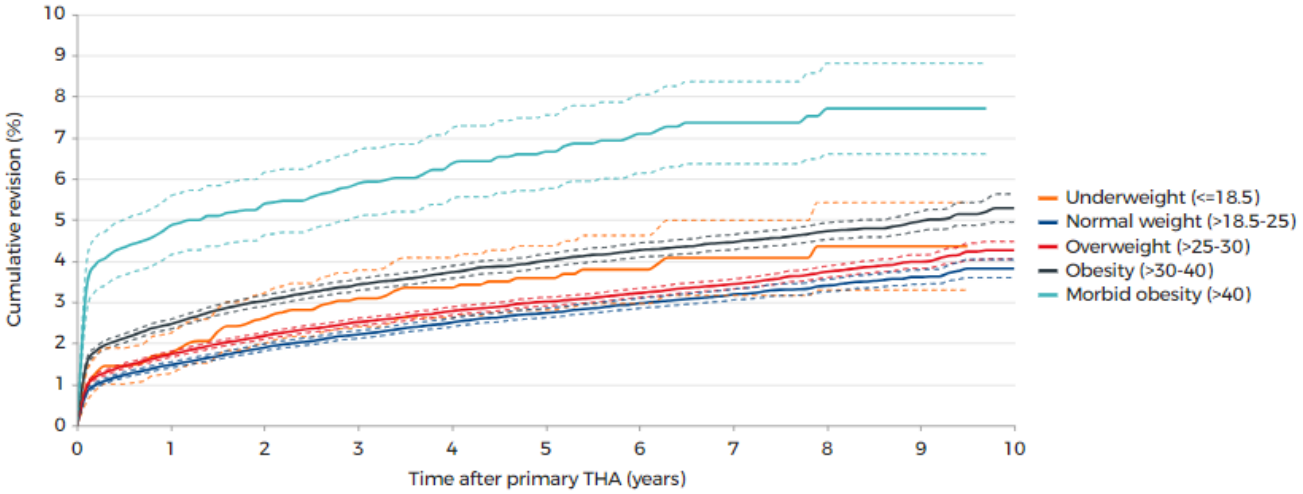
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H071B

THA by BMI category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by BMI category in the Netherlands in 2014-2023 (n=307,829)



© LROI 2024 | H072A

	Number (n)	1yr	3yr	5yr	7yr	10yr
Underweight (<=18.5)	2,894	1.68 (1.20-2.15)	3.03 (2.35-3.71)	3.58 (2.80-4.36)	4.07 (3.16-4.98)	n.a.
Normal weight (>18.5-25)	105,451	1.38 (1.31-1.45)	2.17 (2.07-2.26)	2.70 (2.59-2.81)	3.13 (3.00-3.26)	3.81 (3.59-4.03)
Overweight (>25-30)	127,411	1.61 (1.54-1.68)	2.44 (2.35-2.53)	2.97 (2.87-3.08)	3.39 (3.27-3.51)	4.26 (4.04-4.47)
Obesity (>30-40)	68,543	2.36 (2.24-2.47)	3.35 (3.21-3.49)	3.93 (3.77-4.09)	4.42 (4.24-4.60)	5.28 (4.94-5.62)
Morbid obesity (>40)	3,530	4.57 (3.87-5.26)	5.75 (4.95-6.54)	6.59 (5.70-7.47)	7.36 (6.36-8.35)	n.a.

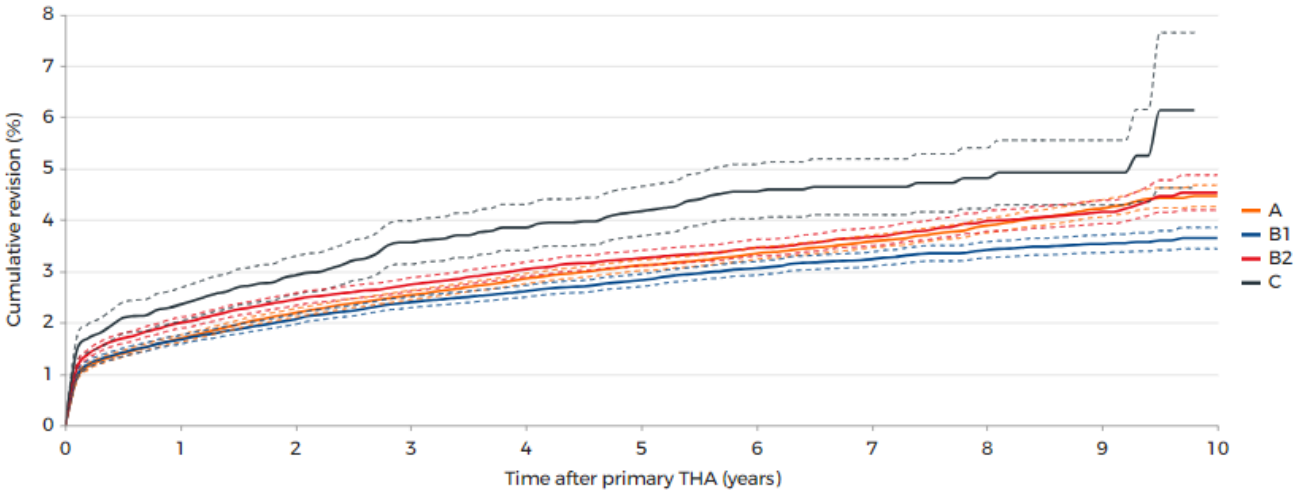
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H072B

THA by Charnley score

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by Charnley score in the Netherlands in 2014-2023 (n=293,657)



© LROI 2024 | H073A

	Number (n)	1yr	3yr	5yr	7yr	10yr
A	129,871	1.64 (1.57-1.71)	2.50 (2.41-2.59)	3.09 (2.99-3.20)	3.55 (3.43-3.67)	4.46 (4.26-4.67)
B1	88,049	1.63 (1.54-1.71)	2.37 (2.26-2.48)	2.80 (2.68-2.92)	3.21 (3.07-3.35)	3.64 (3.44-3.85)
B2	67,171	1.95 (1.84-2.05)	2.70 (2.57-2.83)	3.23 (3.08-3.38)	3.65 (3.48-3.82)	4.53 (4.19-4.87)
C	8,566	2.28 (1.96-2.60)	3.56 (3.14-3.98)	4.14 (3.66-4.61)	4.64 (4.10-5.19)	n.a.

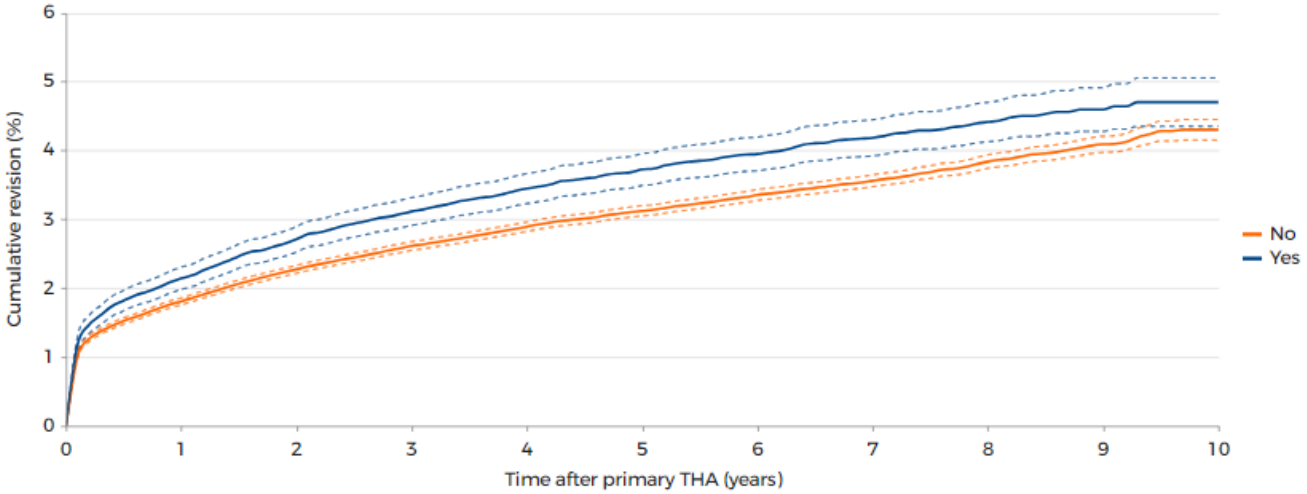
Please note: Dotted lines represent the upper and lower limits of the 95% confidence intervall; n.a. if <50 cases were at risk.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H073B

THA by Smoking

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by smoking in the Netherlands in 2014-2023 (n=303,732)



© LROI 2024 | H074A

	Number (n)	1yr	3yr	5yr	7yr	10yr
No	280,192	1.76 (1.71-1.81)	2.58 (2.52-2.64)	3.11 (3.03-3.18)	3.53 (3.45-3.62)	4.30 (4.15-4.45)
Yes	32,763	2.08 (1.92-2.24)	3.07 (2.87-3.28)	3.68 (3.45-3.91)	4.17 (3.91-4.43)	4.70 (4.35-5.05)

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

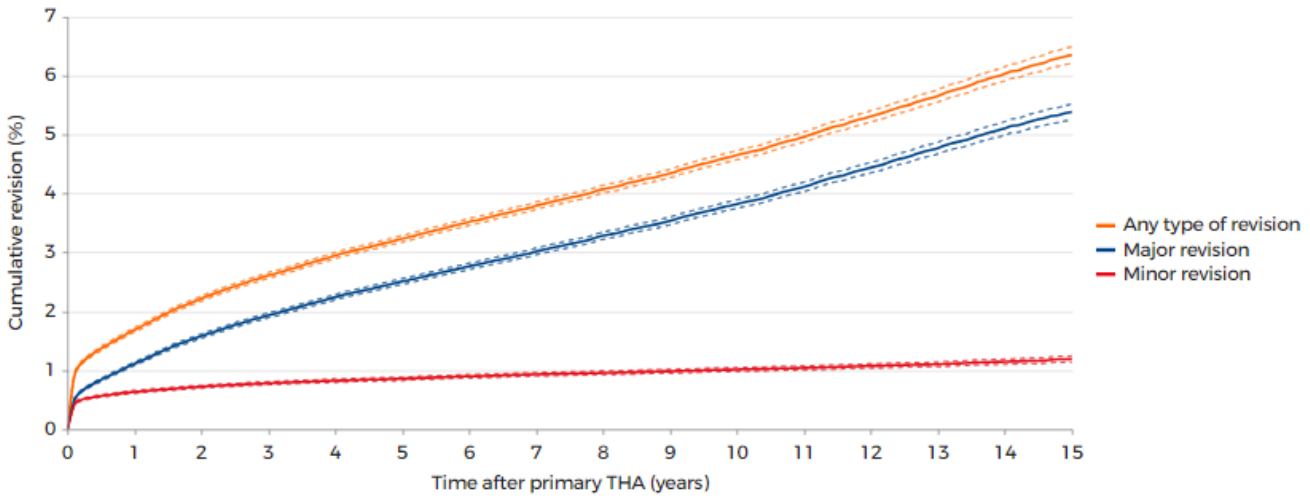
THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H074B

Revision by procedure characteristics

THA by type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by type of revision in the Netherlands in 2007-2023 (n=459,057)



	1yr	3yr	5yr	7yr	10yr	15yr
Any type of revision	1.62 (1.59-1.66)	2.57 (2.52-2.62)	3.20 (3.15-3.26)	3.75 (3.69-3.82)	4.62 (4.54-4.69)	6.32 (6.18-6.46)
Major revision	1.06 (1.03-1.09)	1.90 (1.86-1.94)	2.48 (2.43-2.53)	2.98 (2.92-3.04)	3.79 (3.72-3.86)	5.36 (5.23-5.49)
Minor revision	0.62 (0.60-0.65)	0.77 (0.75-0.80)	0.85 (0.83-0.88)	0.93 (0.90-0.96)	1.01 (0.98-1.04)	1.19 (1.14-1.24)

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

Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.

Major revision: 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.

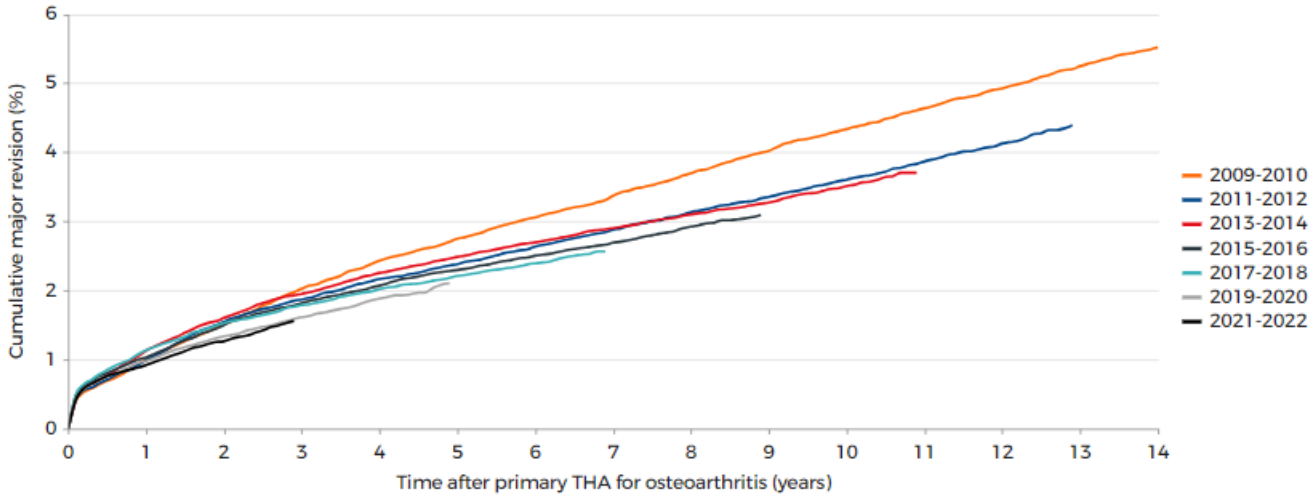
Minor revision: only inlay and/or femoral head exchange (including DAIR procedures).

THA: total hip arthroplasty; CI: confidence interval.

In 2007-2023, 73,952 (16.1%) primary THAs were implanted in patients who died within fifteen years after the primary diagnosis

THA by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by procedure year of primary THA in the Netherlands in 2009-2023 (n=342,051)



	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	45,636	0.94 (0.85-1.04)	1.98 (1.84-2.12)	2.71 (2.54-2.87)	3.31 (3.12-3.49)	4.31 (4.10-4.52)	5.49 (5.24-5.73)
2011-2012	50,114	0.93 (0.83-1.02)	1.85 (1.72-1.98)	2.36 (2.22-2.51)	2.84 (2.68-3.00)	3.58 (3.40-3.77)	n.a.
2013-2014	54,285	1.05 (0.96-1.14)	1.93 (1.80-2.06)	2.46 (2.32-2.60)	2.88 (2.73-3.04)	3.48 (3.31-3.65)	n.a.
2015-2016	58,295	1.00 (0.91-1.09)	1.79 (1.67-1.90)	2.28 (2.15-2.41)	2.66 (2.52-2.81)	n.a.	n.a.
2017-2018	61,667	1.08 (0.99-1.16)	1.76 (1.65-1.88)	2.18 (2.06-2.31)	2.56 (2.41-2.72)	n.a.	n.a.
2019-2020	60,049	0.95 (0.87-1.04)	1.59 (1.48-1.69)	2.11 (1.96-2.26)	n.a.	n.a.	n.a.
2021-2022	68,135	0.88 (0.81-0.96)	1.56 (1.41-1.71)	n.a.	n.a.	n.a.	n.a.

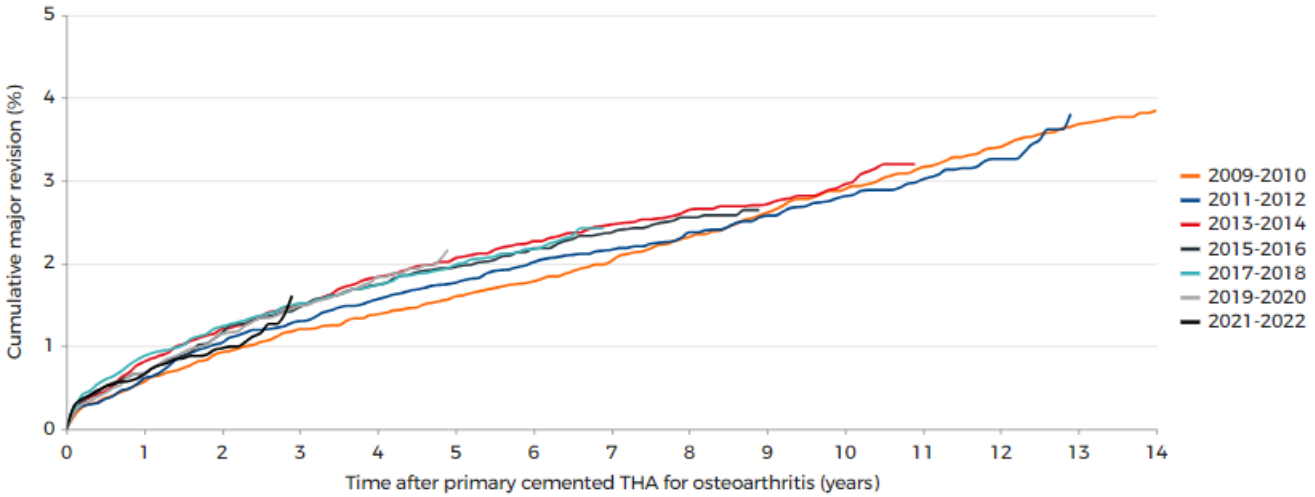
Please note: n.a. if <50 cases were at risk.

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.

THA cemented by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of cemented total hip arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2023 (n=82,500)



	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	11,503	0.53 (0.40-0.67)	1.18 (0.98-1.38)	1.56 (1.33-1.79)	1.99 (1.72-2.25)	2.87 (2.55-3.20)	3.81 (3.42-4.21)
2011-2012	12,174	0.54 (0.41-0.67)	1.28 (1.08-1.49)	1.75 (1.51-1.99)	2.15 (1.89-2.42)	2.79 (2.47-3.10)	n.a.
2013-2014	12,657	0.76 (0.61-0.92)	1.48 (1.26-1.69)	2.02 (1.77-2.27)	2.45 (2.17-2.73)	2.91 (2.59-3.22)	n.a.
2015-2016	12,617	0.67 (0.53-0.81)	1.42 (1.22-1.63)	1.94 (1.69-2.18)	2.36 (2.09-2.64)	n.a.	n.a.
2017-2018	12,464	0.83 (0.67-0.99)	1.49 (1.28-1.71)	1.94 (1.69-2.18)	2.42 (2.10-2.75)	n.a.	n.a.
2019-2020	10,381	0.67 (0.51-0.83)	1.45 (1.22-1.69)	2.16 (1.76-2.57)	n.a.	n.a.	n.a.
2021-2022	10,799	0.61 (0.46-0.75)	1.61 (1.03-2.19)	n.a.	n.a.	n.a.	n.a.

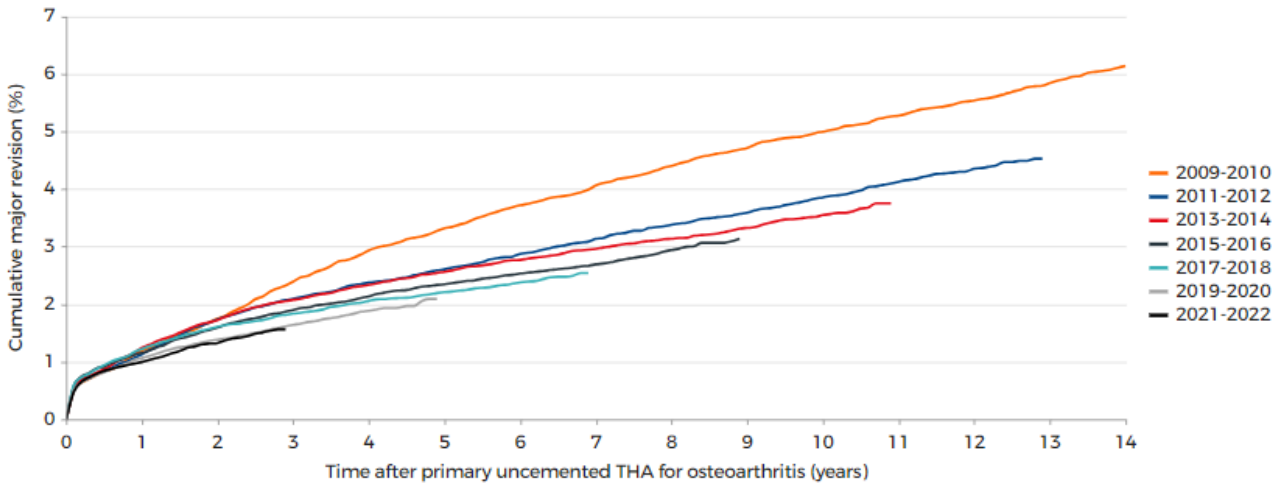
Please note: n.a. if <50 cases were at risk.

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.

THA uncemented by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of uncemented total hip arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2023 (n=227,044)



	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	23,462	1.12 (0.99-1.26)	2.33 (2.13-2.52)	3.27 (3.04-3.50)	3.99 (3.73-4.24)	4.97 (4.68-5.25)	6.10 (5.78-6.43)
2011-2012	27,083	1.07 (0.94-1.19)	2.07 (1.90-2.24)	2.59 (2.40-2.78)	3.08 (2.88-3.29)	3.83 (3.60-4.06)	n.a.
2013-2014	29,432	1.15 (1.03-1.27)	2.05 (1.89-2.21)	2.54 (2.36-2.72)	2.95 (2.75-3.14)	3.51 (3.30-3.73)	n.a.
2015-2016	32,707	1.12 (1.01-1.24)	1.87 (1.72-2.02)	2.33 (2.17-2.50)	2.66 (2.49-2.84)	n.a.	n.a.
2017-2018	36,236	1.17 (1.06-1.28)	1.81 (1.68-1.95)	2.19 (2.04-2.34)	2.54 (2.35-2.73)	n.a.	n.a.
2019-2020	36,412	1.03 (0.93-1.13)	1.61 (1.48-1.74)	2.09 (1.92-2.26)	n.a.	n.a.	n.a.
2021-2022	41,915	0.97 (0.87-1.06)	1.56 (1.41-1.71)	n.a.	n.a.	n.a.	n.a.

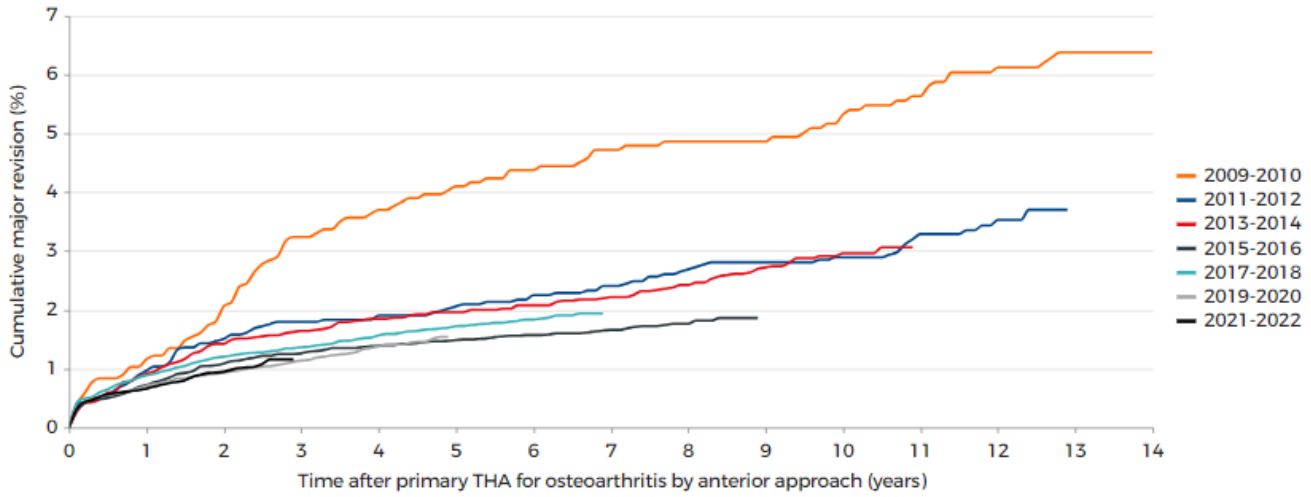
Please note: n.a. if <50 cases were at risk.

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.

THA anterior approach by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of the anterior approach for total hip arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2023 (n=86,345)



	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	1,556	1.03 (0.53-1.53)	3.24 (2.35-4.12)	4.03 (3.05-5.01)	4.72 (3.65-5.78)	5.16 (4.05-6.28)	6.38 (5.11-7.64)
2011-2012	2,812	0.89 (0.54-1.24)	1.79 (1.30-2.29)	2.02 (1.50-2.54)	2.40 (1.83-2.98)	2.89 (2.26-3.53)	n.a.
2013-2014	5,591	0.86 (0.62-1.10)	1.62 (1.29-1.96)	1.96 (1.59-2.33)	2.19 (1.81-2.58)	2.91 (2.45-3.37)	n.a.
2015-2016	10,172	0.69 (0.53-0.85)	1.25 (1.03-1.46)	1.47 (1.24-1.71)	1.65 (1.40-1.90)	n.a.	n.a.
2017-2018	17,192	0.85 (0.71-0.99)	1.35 (1.17-1.52)	1.69 (1.50-1.89)	1.94 (1.71-2.17)	n.a.	n.a.
2019-2020	21,482	0.67 (0.56-0.78)	1.12 (0.98-1.26)	1.54 (1.34-1.74)	n.a.	n.a.	n.a.
2021-2022	27,578	0.63 (0.54-0.73)	1.16 (0.99-1.32)	n.a.	n.a.	n.a.	n.a.

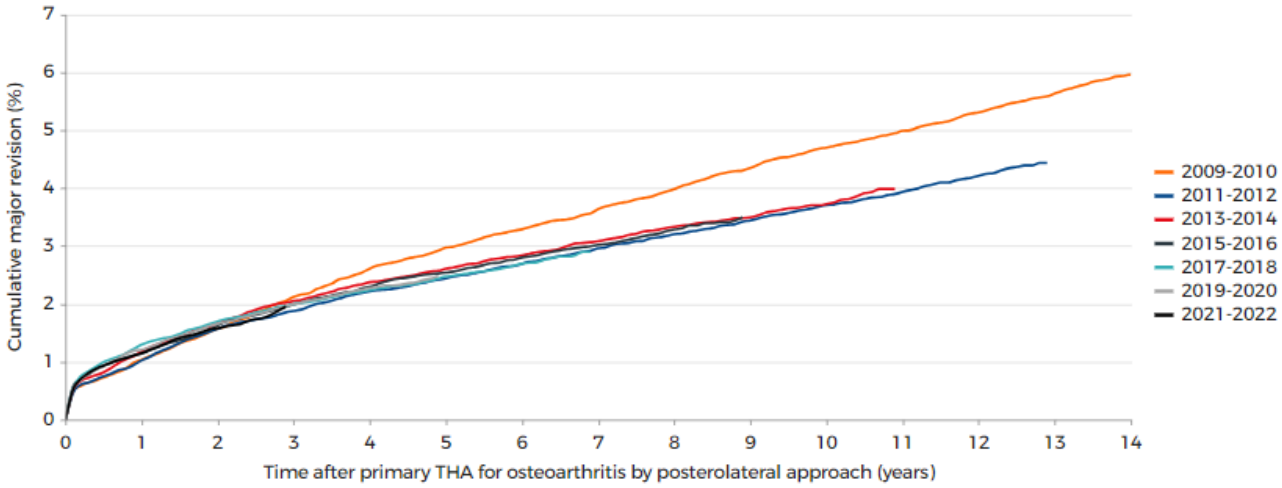
Please note: n.a. if <50 cases were at risk.

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.

THA posterior approach by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of the posterolateral approach for total hip arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2023 (n=187,778)



	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	22,452	0.98 (0.85-1.11)	2.05 (1.87-2.24)	2.92 (2.69-3.14)	3.56 (3.31-3.81)	4.68 (4.39-4.96)	5.94 (5.60-6.27)
2011-2012	26,439	0.95 (0.83-1.06)	1.85 (1.69-2.02)	2.42 (2.23-2.61)	2.91 (2.71-3.12)	3.68 (3.44-3.92)	n.a.
2013-2014	28,703	1.10 (0.98-1.22)	2.02 (1.86-2.18)	2.57 (2.39-2.76)	3.06 (2.86-3.27)	3.70 (3.48-3.93)	n.a.
2015-2016	29,752	1.11 (0.99-1.23)	1.95 (1.79-2.11)	2.52 (2.34-2.70)	2.99 (2.80-3.19)	n.a.	n.a.
2017-2018	28,951	1.22 (1.10-1.35)	1.96 (1.80-2.13)	2.44 (2.26-2.62)	2.90 (2.67-3.13)	n.a.	n.a.
2019-2020	25,474	1.19 (1.06-1.32)	1.96 (1.79-2.13)	2.48 (2.25-2.71)	n.a.	n.a.	n.a.
2021-2022	26,236	1.11 (0.98-1.23)	1.95 (1.69-2.22)	n.a.	n.a.	n.a.	n.a.

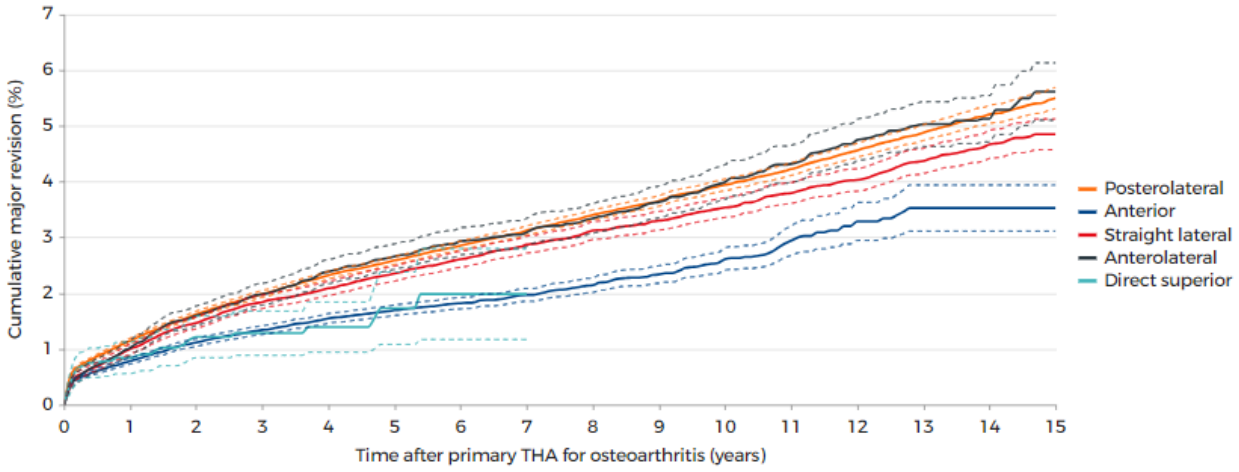
Please note: n.a. if <50 cases were at risk.

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.

THA by approach

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by approach in the Netherlands in 2007-2023 (n=390,616)



© LROI 2024 | H081A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Posterolateral	212,479	1.09 (1.05-1.14)	1.95 (1.89-2.01)	2.55 (2.48-2.63)	3.08 (3.00-3.17)	3.91 (3.81-4.02)	5.46 (5.27-5.65)
Anterior	102,641	0.75 (0.69-0.80)	1.32 (1.24-1.40)	1.67 (1.58-1.77)	1.96 (1.84-2.07)	2.54 (2.35-2.73)	3.52 (3.11-3.93)
Straight lateral	51,037	0.93 (0.85-1.02)	1.82 (1.70-1.94)	2.32 (2.19-2.46)	2.83 (2.68-2.98)	3.51 (3.33-3.69)	4.84 (4.57-5.12)
Anterolateral	20,537	0.96 (0.83-1.09)	1.96 (1.77-2.16)	2.63 (2.40-2.86)	3.05 (2.80-3.30)	3.95 (3.65-4.26)	5.61 (5.10-6.13)
Direct superior	4,298	0.84 (0.56-1.12)	1.28 (0.89-1.68)	1.73 (1.08-2.38)	1.98 (1.17-2.80)	n.a.	n.a.

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

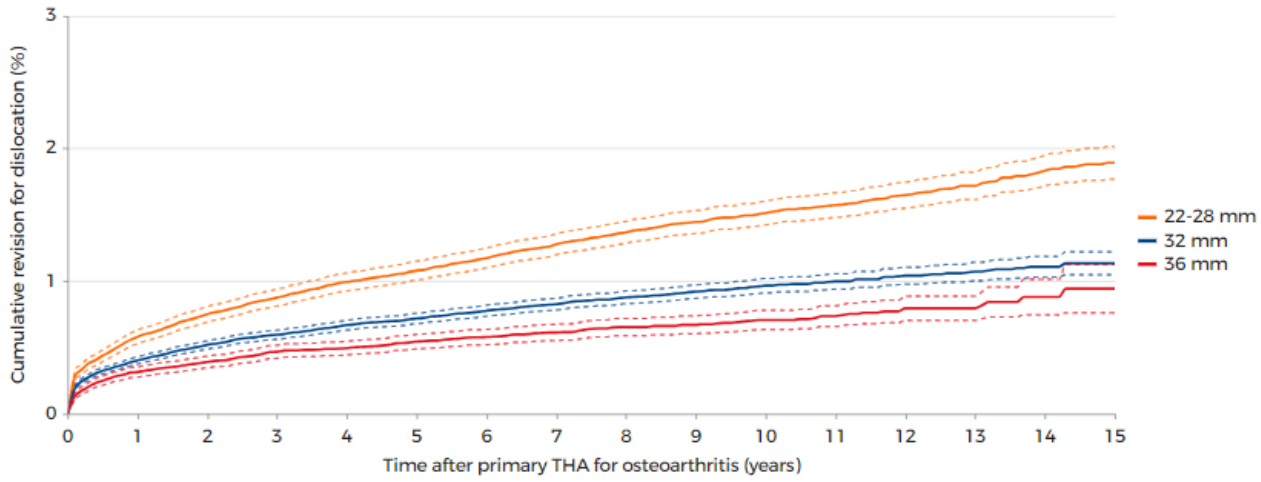
Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H081B

THA by femoral head size

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) for dislocation of total hip arthroplasties for osteoarthritis by femoral head size in the Netherlands in 2007-2023 (n=380,109)



© LROI 2024 | H082A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
22-28 mm	85,814	0.56 (0.51-0.61)	0.86 (0.80-0.93)	1.07 (1.00-1.14)	1.26 (1.18-1.34)	1.50 (1.42-1.59)	1.89 (1.77-2.01)
32 mm	211,982	0.39 (0.36-0.41)	0.59 (0.56-0.63)	0.71 (0.67-0.75)	0.82 (0.78-0.87)	0.96 (0.91-1.01)	1.13 (1.05-1.22)
36 mm	82,313	0.31 (0.27-0.35)	0.46 (0.42-0.51)	0.54 (0.48-0.59)	0.61 (0.55-0.67)	0.71 (0.63-0.78)	0.94 (0.76-1.12)

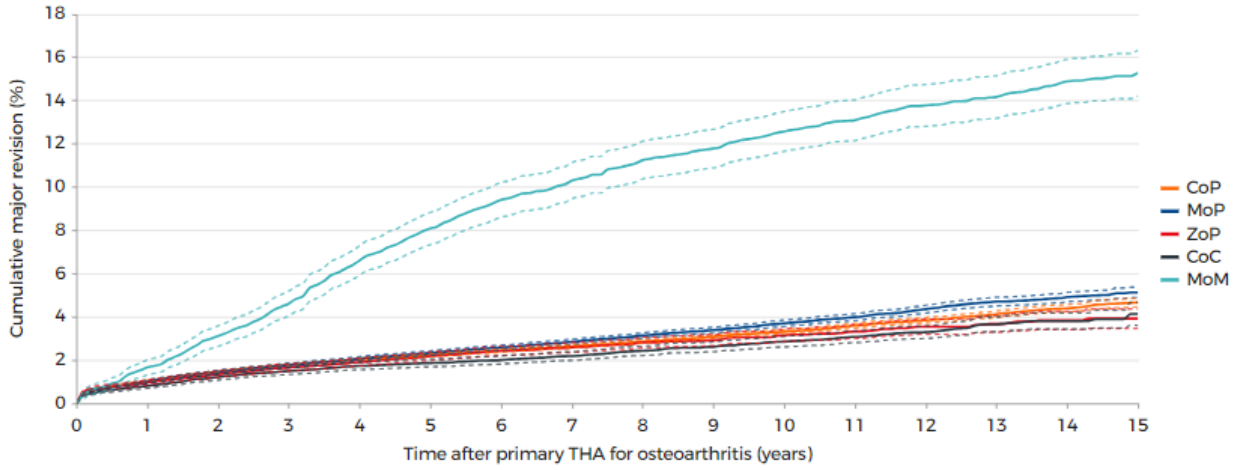
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H082B

THA by articulation

FIGURE Cumulative major revision percentages (95% CI) of total hip arthroplasties for osteoarthritis by articulation in the Netherlands in 2007-2023 (n=375,167)



© LROI 2024 | H083A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
CoP	222,216	0.99 (0.94-1.03)	1.75 (1.69-1.81)	2.20 (2.14-2.27)	2.61 (2.53-2.69)	3.29 (3.19-3.39)	4.64 (4.44-4.84)
MoP	95,822	0.96 (0.90-1.02)	1.74 (1.65-1.82)	2.30 (2.20-2.40)	2.81 (2.70-2.93)	3.67 (3.52-3.81)	5.12 (4.88-5.37)
ZoP	27,705	0.92 (0.80-1.03)	1.63 (1.47-1.78)	2.14 (1.95-2.33)	2.56 (2.34-2.78)	3.13 (2.85-3.42)	3.91 (3.46-4.36)
CoC	24,503	0.77 (0.66-0.88)	1.47 (1.31-1.62)	1.86 (1.68-2.04)	2.18 (1.98-2.37)	2.84 (2.59-3.09)	4.13 (3.60-4.66)
MoM	5,273	1.52 (1.19-1.85)	4.47 (3.91-5.03)	7.95 (7.21-8.69)	10.10 (9.28-10.93)	12.49 (11.58-13.41)	15.12 (14.08-16.16)

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

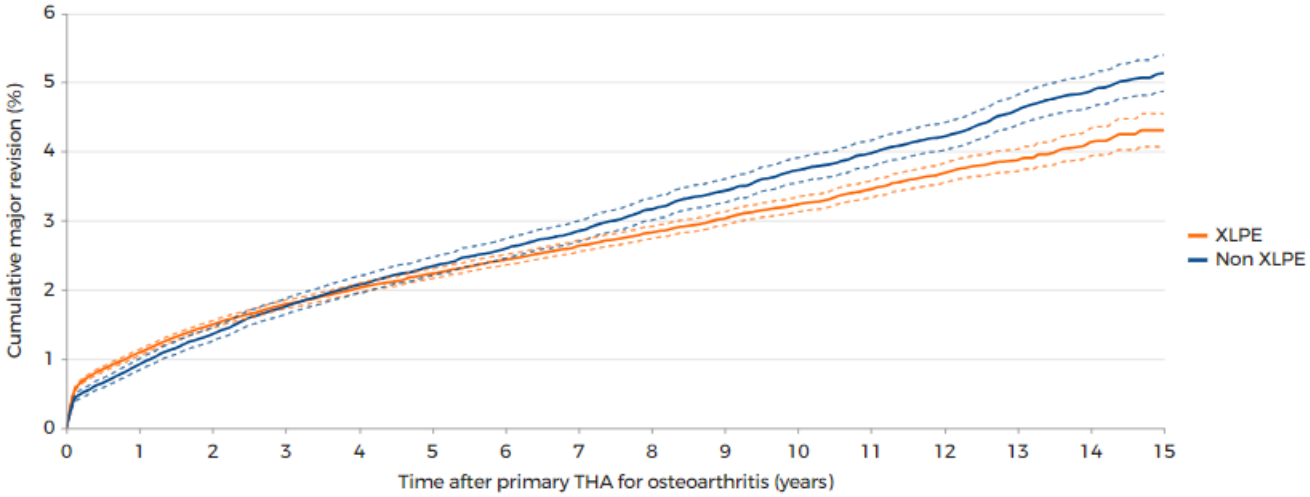
Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

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

© LROI 2024 | H083B

THA by PE type

FIGURE Cumulative major revision percentages (95% CI) of total hip arthroplasties for osteoarthritis by inlay material in the Netherlands in 2007-2023 (n=261,873)



© LROI 2024 | H084A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
XLPE	208,058	1.05 (1.00-1.09)	1.76 (1.70-1.82)	2.22 (2.15-2.29)	2.60 (2.52-2.68)	3.21 (3.11-3.32)	4.31 (4.07-4.55)
Non XLPE	54,057	0.87 (0.79-0.94)	1.72 (1.61-1.84)	2.31 (2.18-2.45)	2.82 (2.67-2.96)	3.71 (3.53-3.89)	5.12 (4.85-5.38)

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

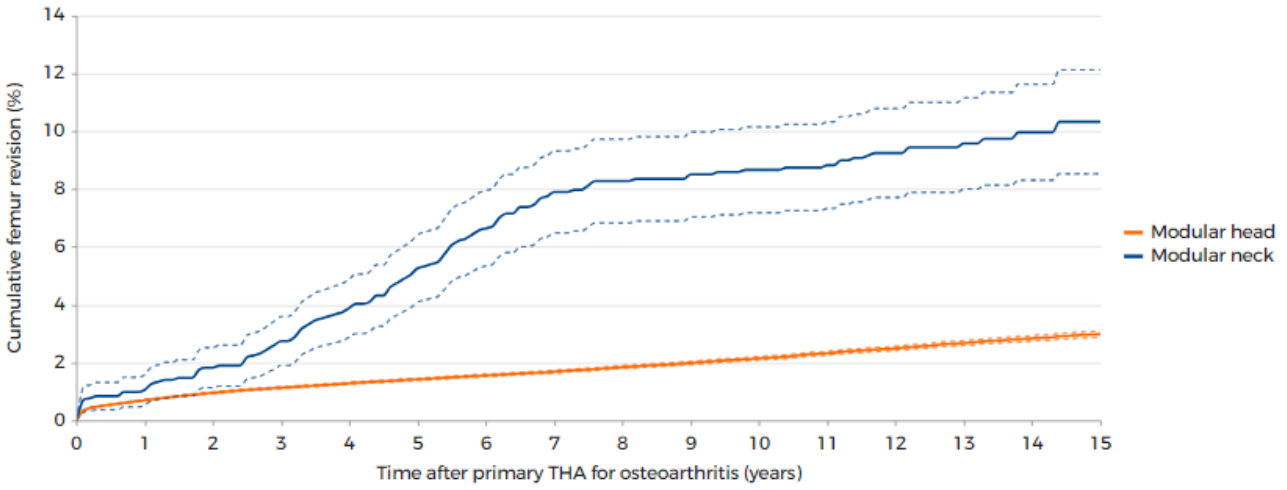
Major revision precentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

THA: total hip arthroplasty; XLPE: cross-linked polyethylene; CI: confidence interval.

© LROI 2024 | H084B

THA by modularity

FIGURE Cumulative femur revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by femur modularity in the Netherlands in 2007-2023 (n=383,515)



© LROI 2024 | H085A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Modular head	382,553	0.67 (0.64-0.69)	1.11 (1.08-1.15)	1.41 (1.37-1.45)	1.67 (1.62-1.71)	2.13 (2.07-2.19)	2.97 (2.86-3.08)
Modular neck	1,434	0.98 (0.47-1.49)	2.60 (1.77-3.43)	5.04 (3.90-6.18)	7.74 (6.34-9.15)	8.66 (7.18-10.14)	10.32 (8.52-12.11)

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

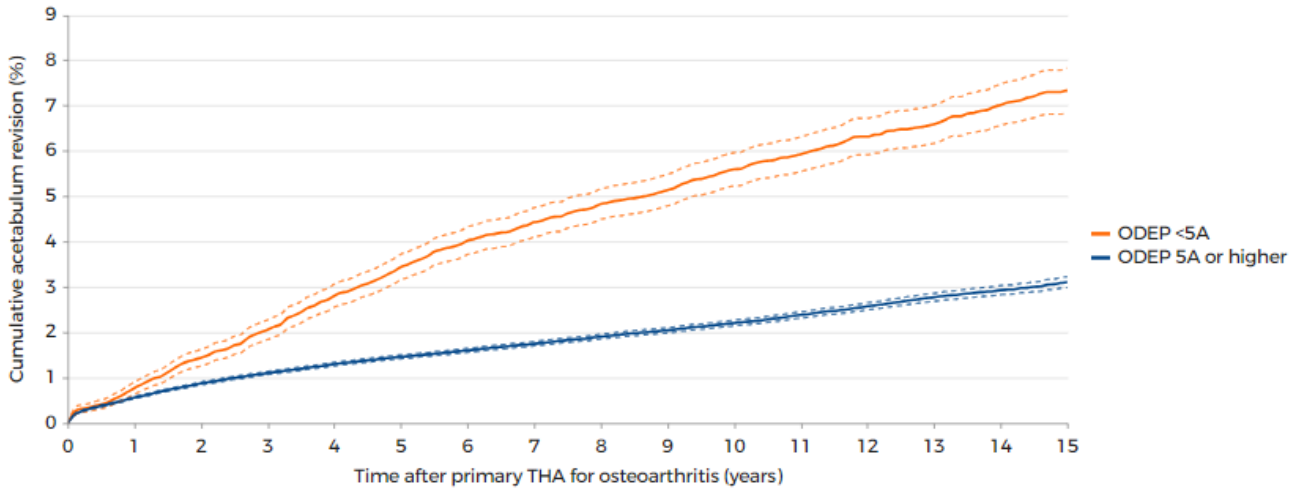
Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H085B

THA by ODEP 5A or higher acetabulum

FIGURE Cumulative acetabulum revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by ODEP rating acetabulum in the Netherlands in 2007-2023 (n= 386,877)



© LROI 2024 | H086A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
ODEP <5A	16,729	0.69 (0.56-0.81)	2.00 (1.79-2.22)	3.35 (3.07-3.63)	4.36 (4.05-4.68)	5.56 (5.20-5.93)	7.30 (6.81-7.78)
ODEP 5A or higher	370,594	0.52 (0.50-0.55)	1.08 (1.05-1.12)	1.45 (1.40-1.49)	1.73 (1.68-1.78)	2.19 (2.13-2.25)	3.09 (2.97-3.21)

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

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.

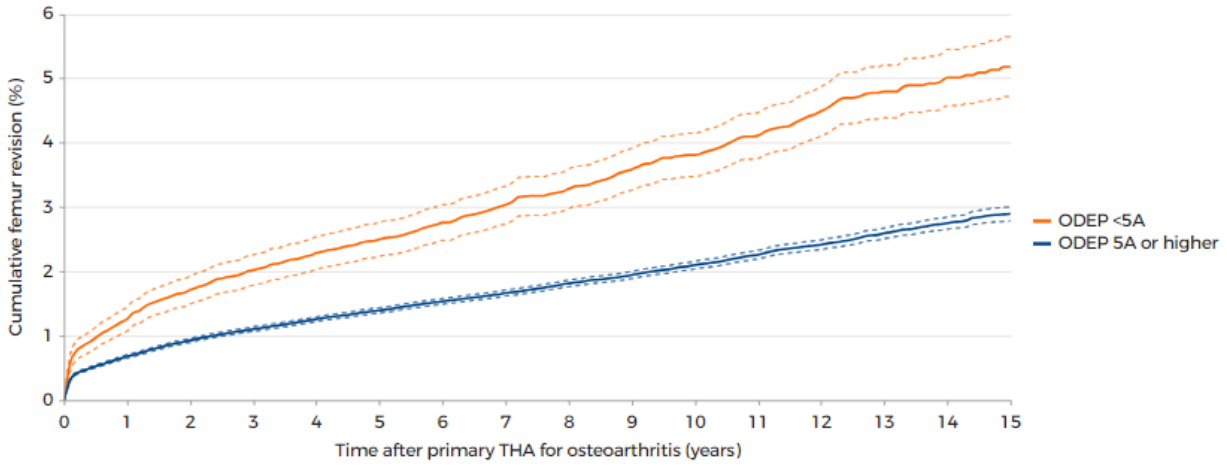
ODEP rating: ODEP provides ratings for hip femoral stems, hip acetabular cups and total knee replacement implants. Detailed information can be found at www.odep.org.uk.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H086B

THA by ODEP 5A or higher femur

FIGURE Cumulative femur revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by ODEP rating femur in the Netherlands in 2007-2023 (n= 384,537)



© LROI 2024 | H087A

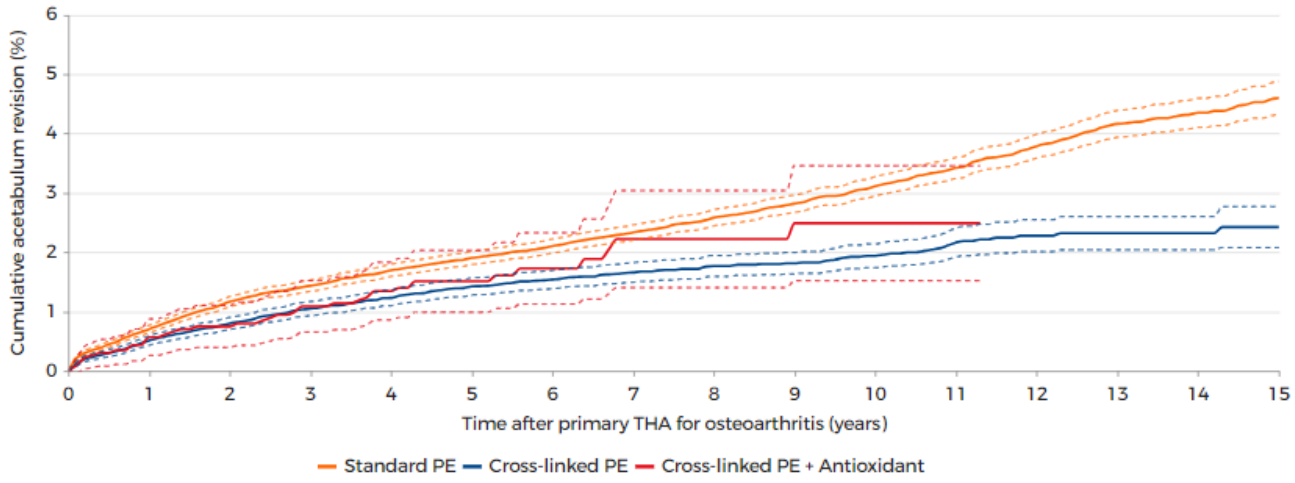
	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
ODEP <5A	13,823	1.21 (1.03-1.39)	2.00 (1.76-2.23)	2.47 (2.21-2.74)	3.01 (2.72-3.30)	3.81 (3.47-4.15)	5.18 (4.72-5.65)
ODEP 5A or higher	371,186	0.65 (0.62-0.68)	1.09 (1.05-1.12)	1.38 (1.34-1.42)	1.64 (1.60-1.69)	2.08 (2.02-2.14)	2.89 (2.78-3.00)

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

© LROI 2024 | H087B

THA by cemented material acetabulum

FIGURE Cumulative acetabulum revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by cemented acetabulum material in the Netherlands in 2007-2023 (n=98,771)



© LROI 2024 | H088A

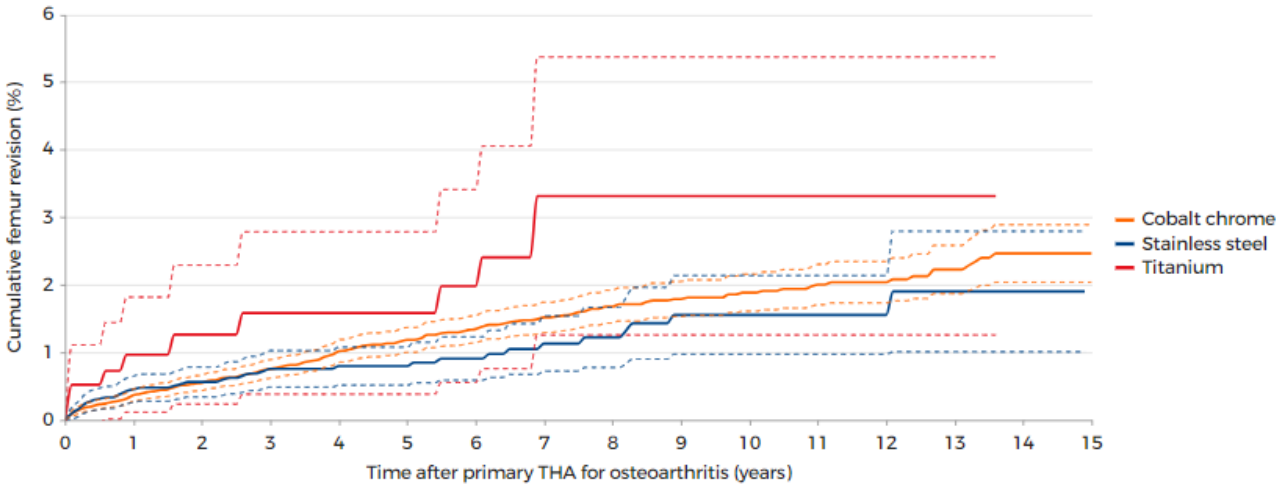
	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Standard PE	64,473	0.65 (0.59-0.72)	1.41 (1.32-1.50)	1.87 (1.76-1.98)	2.30 (2.18-2.43)	3.07 (2.91-3.23)	4.57 (4.30-4.85)
Cross-linked PE	32,093	0.46 (0.39-0.54)	1.03 (0.91-1.15)	1.39 (1.25-1.54)	1.65 (1.48-1.81)	1.94 (1.74-2.14)	2.42 (2.08-2.77)
Cross-linked PE + Antioxidant	2,311	0.43 (0.17-0.70)	1.09 (0.65-1.52)	1.51 (0.99-2.03)	2.22 (1.40-3.04)	2.49 (1.52-3.45)	n.a.

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

© LROI 2024 | H088B

THA by cemented material femur

FIGURE Cumulative femur revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by cemented femur material in the Netherlands in 2007-2023 (n=23,633)



© LROI 2024 | H089A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Cobalt chrome	18,057	0.32 (0.23-0.40)	0.74 (0.60-0.87)	1.16 (0.98-1.35)	1.49 (1.27-1.71)	1.88 (1.61-2.16)	2.46 (2.04-2.89)
Stainless steel	5,021	0.43 (0.24-0.62)	0.72 (0.46-0.98)	0.80 (0.52-1.08)	1.05 (0.67-1.43)	1.55 (0.97-2.14)	1.90 (1.01-2.79)
Titanium	585	0.97 (0.12-1.82)	1.58 (0.38-2.78)	1.58 (0.38-2.78)	3.31 (1.26-5.37)	3.31 (1.26-5.37)	n.a.

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

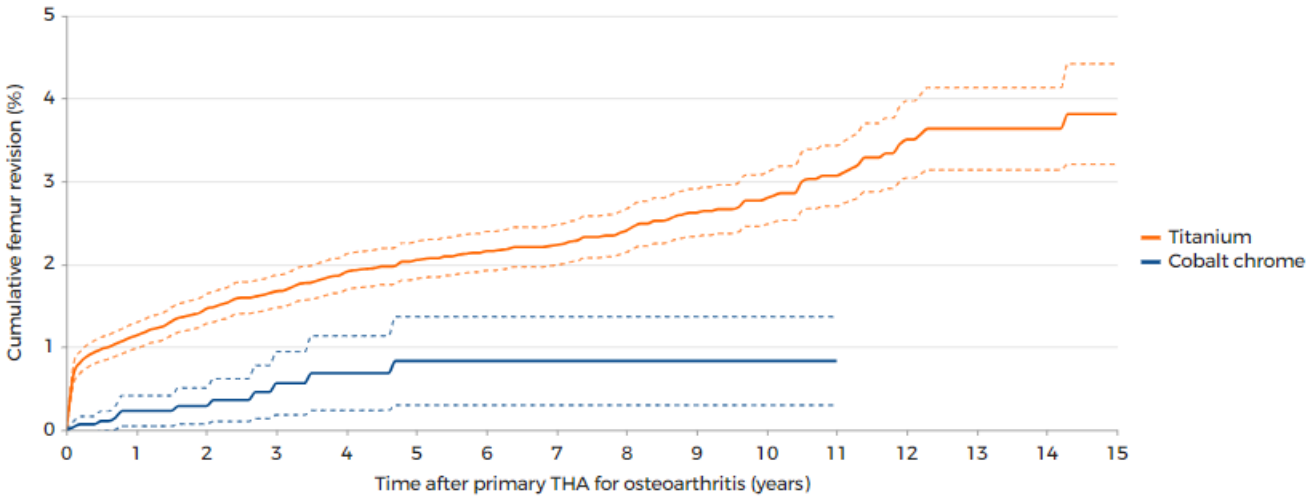
Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H089B

THA by uncemented material femur

FIGURE Cumulative femur revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by uncemented femur material in the Netherlands in 2007-2023 (n=21,287)



© LROI 2024 | H090A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Titanium	18,316	1.11 (0.95-1.26)	1.65 (1.45-1.84)	2.03 (1.81-2.25)	2.22 (1.98-2.46)	2.76 (2.45-3.07)	3.81 (3.20-4.42)
Cobalt chrome	3,018	0.23 (0.05-0.41)	0.46 (0.14-0.78)	0.83 (0.30-1.37)	0.83 (0.30-1.37)	0.83 (0.30-1.37)	n.a.

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

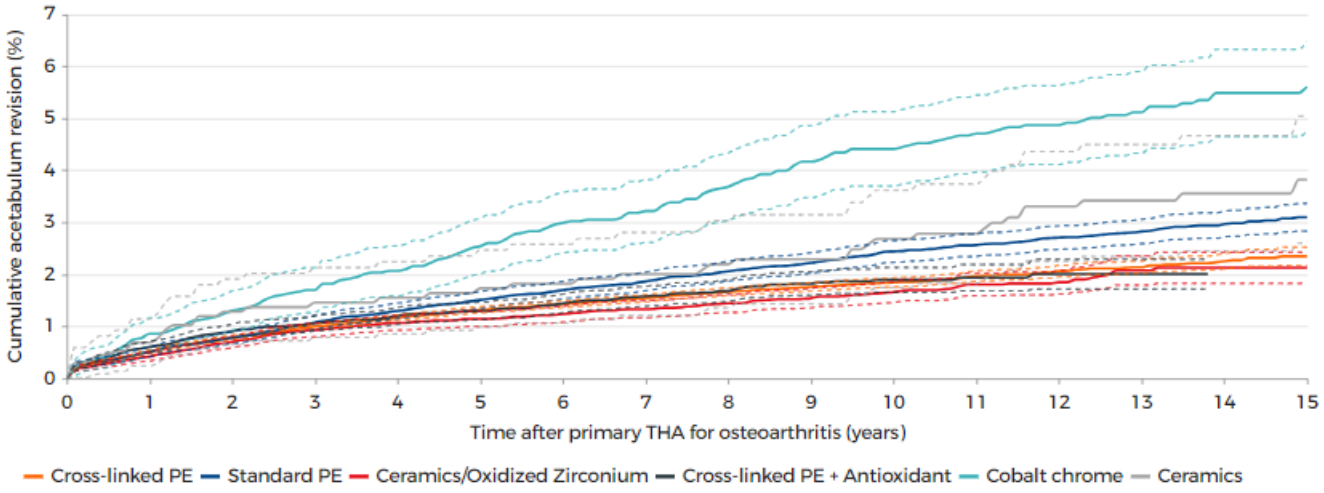
Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H090B

THA by uncemented material inlay

FIGURE Cumulative acetabulum revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties for osteoarthritis by uncemented inlay material in the Netherlands in 2007-2023 (n=252,926)



© LROI 2024 | H091A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Cross-linked PE	181,768	0.48 (0.45-0.51)	0.98 (0.93-1.03)	1.31 (1.25-1.37)	1.53 (1.46-1.60)	1.84 (1.75-1.92)	2.35 (2.17-2.52)
Standard PE	22,931	0.48 (0.39-0.57)	1.04 (0.91-1.17)	1.49 (1.33-1.64)	1.84 (1.66-2.02)	2.43 (2.23-2.64)	3.10 (2.83-3.36)
Ceramics/Oxidized Zirconium	22,548	0.41 (0.32-0.49)	0.92 (0.79-1.05)	1.15 (1.00-1.29)	1.33 (1.17-1.49)	1.65 (1.45-1.84)	2.13 (1.83-2.43)
Cross-linked PE + Antioxidant	21,078	0.58 (0.47-0.68)	1.03 (0.89-1.18)	1.29 (1.13-1.46)	1.57 (1.38-1.76)	1.89 (1.65-2.13)	n.a.
Cobalt chrome	3,524	0.77 (0.48-1.06)	1.70 (1.26-2.13)	2.51 (1.98-3.04)	3.18 (2.58-3.78)	4.41 (3.70-5.12)	5.48 (4.65-6.32)
Ceramics	1,341	0.69 (0.24-1.14)	1.37 (0.72-2.02)	1.64 (0.93-2.35)	2.01 (1.21-2.80)	2.68 (1.75-3.62)	3.82 (2.60-5.04)

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

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.

THA: total hip arthroplasty; PE: polyethylene; CI: confidence interval.

© LROI 2024 | H091B

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 2007-2023 (n=94,211)

					Type of revision (n)					Cumulative revision percentage (95% CI)					
Femur component	Acetabulum component	Primary THAs (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Only femur	Only acetabulum	Only femoral head/inlay	Unknown	1yr	3yr	5yr	7yr	10yr	14yr
All cemented THAs for osteoarthritis		**94,211**	**76 (71 - 81)**	**2,889**	**568**	**309**	**1,163**	**798**	**51**	**1.35 (1.28-1.42)**	**2.09 (2.00-2.19)**	**2.62 (2.51-2.73)**	**3.07 (2.95-3.20)**	**3.76 (3.61-3.90)**	**4.92 (4.68-5.16)**
Lubinus SPII	IP Cup	15,859	77 (72 - 81)	429	66	53	192	112	6	1.12 (0.96-1.29)	1.97 (1.75-2.20)	2.53 (2.27-2.79)	2.85 (2.56-3.13)	3.21 (2.89-3.54)	4.11 (3.53-4.69)
Original ME Muller	MUller low profile Durasul	10,415	75 (71 - 80)	295	35	5	85	167	3	1.83 (1.57-2.09)	2.40 (2.10-2.71)	2.86 (2.51-3.20)	3.11 (2.74-3.49)	3.61 (3.14-4.08)	4.49 (3.44-5.55)
Lubinus SPII	FAL Cup	7,333	75 (70 - 80)	238	56	14	87	76	5	1.82 (1.51-2.13)	2.49 (2.12-2.87)	3.07 (2.64-3.51)	3.63 (3.13-4.13)	4.35 (3.71-4.99)	5.76 (4.70-6.83)
Original ME Muller	MUller low profile	6,522	77 (73 - 81)	196	25	2	120	43	6	1.40 (1.12-1.69)	2.31 (1.94-2.68)	2.67 (2.27-3.07)	3.11 (2.67-3.55)	3.18 (2.72-3.63)	3.86 (3.14-4.58)
EXETER	EXETER RIMFIT X3	5,469	76 (69 - 80)	135	33	31	28	43	0	1.36 (1.05-1.67)	1.97 (1.58-2.35)	2.41 (1.98-2.85)	2.69 (2.21-3.17)	3.46 (2.71-4.22)	n.a.
Spectron EF	Reflection All Poly XLPE	5,046	77 (73 - 82)	130	46	15	44	25	0	0.68 (0.45-0.91)	1.47 (1.13-1.81)	1.92 (1.52-2.31)	2.59 (2.11-3.06)	2.98 (2.45-3.51)	3.29 (2.70-3.88)
STANMORE	STANMORE	3,383	75 (70 - 80)	82	27	2	44	6	3	0.71 (0.43-1.00)	1.45 (1.04-1.86)	1.87 (1.41-2.34)	2.09 (1.60-2.59)	2.62 (2.03-3.22)	3.09 (2.33-3.85)
EXETER	EXETER CONTEMPORARY HOODED	2,827*	77 (72 - 81)	107	26	23	41	14	3	1.17 (0.78-1.57)	1.72 (1.24-2.20)	2.29 (1.73-2.85)	2.92 (2.28-3.57)	4.37 (3.50-5.24)	5.05 (4.02-6.08)
Lubinus SPII	SHP	2,506*	75 (71 - 80)	51	10	3	37	1	0	0.20 (0.02-0.38)	0.65 (0.33-0.97)	0.95 (0.56-1.34)	1.69 (1.17-2.22)	2.00 (1.42-2.59)	2.51 (1.78-3.24)
EXETER	EXETER	2,447*	73 (68 - 79)	160	26	16	82	30	6	2.78 (2.13-3.43)	3.57 (2.83-4.31)	4.12 (3.33-4.91)	5.00 (4.13-5.88)	6.29 (5.29-7.29)	7.59 (6.40-8.78)
EXETER	EXETER CONTEMPORARY FLANGED	2,439*	75 (67 - 80)	85	18	9	47	9	2	0.78 (0.43-1.13)	1.42 (0.94-1.89)	2.00 (1.43-2.56)	2.29 (1.68-2.90)	3.24 (2.47-4.01)	5.78 (4.25-7.31)
STANMORE	SHP	2,097*	75 (71 - 79)	122	41	5	63	11	2	1.58 (1.05-2.12)	3.06 (2.31-3.80)	3.98 (3.13-4.84)	4.63 (3.70-5.56)	5.64 (4.57-6.71)	7.79 (6.30-9.29)
Original ME Muller	AVANTACE Cemented	2,007	77 (71 - 82)	74	3	2	8	60	1	3.17 (2.39-3.96)	3.98 (3.02-4.94)	4.75 (3.53-5.97)	5.14 (3.70-6.57)	n.a.	n.a.
CCA stem	CCB cup Low Profile	1,787*	77 (73 - 80)	67	10	11	16	29	1	2.02 (1.37-2.67)	2.81 (2.03-3.58)	3.18 (2.34-4.02)	3.63 (2.71-4.56)	4.61 (3.41-5.82)	5.44 (3.74-7.15)
Lubinus SPII	IP Cup X-Linked	1,608	78 (73 - 82)	40	8	3	10	19	0	1.69 (1.04-2.34)	2.44 (1.61-3.27)	3.23 (2.19-4.26)	3.23 (2.19-4.26)	n.a.	n.a.
C-Stem AMT	Marathon	1,520	79 (74 - 83)	20	1	3	0	16	0	1.06 (0.54-1.57)	1.37 (0.77-1.96)	1.37 (0.77-1.96)	n.a.	n.a.	n.a.
Twinsys stem Cemented	CCB cup Low Profile	1,423	80 (76 - 83)	23	1	8	6	7	1	1.04 (0.50-1.59)	1.74 (0.96-2.52)	2.05 (1.16-2.94)	2.26 (1.28-3.23)	2.26 (1.28-3.23)	n.a.
STANMORE	EXCEED ABT Cemented	1,344	76 (71 - 81)	30	6	1	13	10	0	1.04 (0.50-1.59)	1.53 (0.86-2.19)	2.08 (1.29-2.88)	3.15 (1.82-4.48)	3.15 (1.82-4.48)	n.a.
Lubinus SPII	AVANTACE Cemented	1,102	78 (72 - 83)	41	7	1	4	28	1	3.14 (2.10-4.17)	3.38 (2.29-4.47)	4.41 (2.93-5.90)	5.01 (3.13-6.88)	n.a.	n.a.
STANMORE	All Poly Arcom Cup	1,056*	74 (69 - 79)	24	5	4	14	0	1	0.29 (0.00-0.61)	1.39 (0.67-2.11)	1.81 (0.98-2.64)	1.93 (1.07-2.78)	2.62 (1.53-3.71)	n.a.
STANMORE	MULLER	879*	76 (72 - 81)	14	3	2	8	1	0	0.69 (0.14-1.23)	1.27 (0.52-2.01)	1.27 (0.52-2.01)	1.43 (0.62-2.24)	1.70 (0.74-2.65)	n.a.
Spectron EF	Mueller cup	831*	77 (72 - 81)	13	4	2	4	3	0	0.36 (0.00-0.77)	0.72 (0.15-1.30)	0.97 (0.30-1.64)	1.09 (0.38-1.80)	1.47 (0.65-2.30)	1.62 (0.74-2.49)
Spectron EF	Reflection All Poly	617*	77 (74 - 82)	53	13	0	36	4	0	0.81 (0.10-1.53)	1.81 (0.75-2.87)	2.69 (1.39-4.00)	3.25 (1.81-4.69)	6.62 (4.48-8.76)	11.36 (8.35-14.37)
Lubinus SPII	FAL Cup X-Linked	547	78 (74 - 81)	7	0	1	3	3	0	0.78 (0.02-1.55)	1.35 (0.25-2.45)	2.14 (0.25-4.02)	n.a.	n.a.	n.a.
Spectron EF	MUller low profile Durasul	503*	78 (74 - 83)	15	6	0	3	6	0	0.80 (0.02-1.58)	1.63 (0.51-2.75)	2.09 (0.81-3.37)	3.38 (1.59-5.16)	n.a.	n.a.
MS30	MUller low profile	497*	78 (74 - 82)	18	0	8	10	0	0	0.81 (0.02-1.60)	1.65 (0.52-2.79)	2.34 (0.97-3.71)	3.11 (1.50-4.73)	4.79 (2.51-7.06)	n.a.
EXETER	AVANTACE Cemented	496	75 (69 - 80)	21	6	7	1	6	1	1.39 (0.61-2.17)	1.98 (1.01-2.94)	2.53 (1.38-3.68)	2.53 (1.38-3.68)	2.78 (1.54-4.03)	n.a.
STANMORE	APOLLO	381	75 (69 - 80)	21	6	7	1	6	1	1.39 (0.61-2.17)	1.98 (1.01-2.94)	2.53 (1.38-3.68)	2.53 (1.38-3.68)	2.78 (1.54-4.03)	n.a.
STANMORE	AVANTACE Cemented	369*	79 (74 - 84)	11	0	1	0	10	0	2.18 (0.68-3.67)	3.01 (1.26-4.76)	3.01 (1.26-4.76)	3.01 (1.26-4.76)	n.a.	n.a.
GHE-huftstiel	Hüftpfanne	273*	75 (71 - 80)	27	7	3	17	0	0	0.37 (0.00-1.10)	1.51 (0.04-2.98)	2.70 (0.73-4.67)	4.39 (1.85-6.92)	7.23 (3.89-10.56)	n.a.
TAPERLOC Hip Cemented CoCr	ZCA Longevity	267	79 (75 - 83)	5	2	1	0	2	0	1.13 (0.00-2.41)	n.a.	n.a.	n.a.	n.a.	n.a.
Charnley Modular	Marathon	255*	71 (65 - 79)	11	4	5	2	0	0	0.40 (0.00-1.18)	1.21 (0.00-2.56)	1.63 (0.04-3.21)	3.98 (1.42-6.53)	4.51 (1.76-7.27)	n.a.

* Denotes prosthesis combinations with no reported use in primary THAs in 2023.

Please note: n.a. if <50 cases were at risk; THA: total hip 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 2007-2023 (n=261,312)

					Type of revision (n)					Cumulative revision percentage (95% CI)					
Femur component	Acetabulum component	Primary THAs (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Only femur	Only acetabulum	Only femoral head/inlay	Unknown	1yr	3yr	5yr	7yr	10yr	14yr
All uncemented THAs for osteoarthritis		**261,312**	**68 (62 - 74)**	**9,085**	**1,473**	**3,185**	**2,373**	**1,904**	**150**	**1.54 (1.49-1.58)**	**2.45 (2.39-2.51)**	**3.07 (3.00-3.14)**	**3.61 (3.53-3.69)**	**4.48 (4.38-4.58)**	**6.19 (6.00-6.38)**
Corail	Pinnacle	45,183	69 (63 - 75)	1,051	200	316	232	292	11	1.11 (1.01-1.21)	1.76 (1.63-1.88)	2.19 (2.04-2.34)	2.52 (2.35-2.68)	3.28 (3.05-3.51)	4.28 (3.71-4.85)
TAPERLOC Complete	Allofit	29,422	67 (61 - 73)	605	109	207	126	151	12	1.47 (1.33-1.61)	2.09 (1.91-2.26)	2.57 (2.36-2.79)	2.65 (2.41-2.89)	n.a.	n.a.
Alloclassic Zweymuller SL	Allofit	15,007	70 (64 - 77)	564	89	218	135	117	5	1.19 (1.02-1.37)	1.99 (1.77-2.22)	2.62 (2.36-2.88)	3.12 (2.83-3.41)	4.14 (3.78-4.50)	5.40 (4.86-5.94)
Polarstem	R3	14,471	70 (63 - 75)	326	30	98	54	140	4	1.70 (1.49-1.92)	2.27 (2.01-2.53)	2.70 (2.38-3.02)	3.02 (2.50-3.54)	n.a.	n.a.
CLS Spotorno	Allofit	11,963	64 (58 - 69)	578	60	219	169	111	19	2.62 (2.33-2.90)	3.64 (3.30-3.98)	4.17 (3.80-4.53)	4.68 (4.29-5.08)	5.39 (4.94-5.84)	6.60 (5.64-7.56)
TAPERLOC Complete	EXCEED ABT	8,859	69 (63 - 75)	211	37	77	42	51	4	1.40 (1.16-1.65)	1.87 (1.58-2.15)	2.17 (1.87-2.48)	2.43 (2.10-2.77)	2.80 (2.38-3.22)	n.a.
ACCOLADE	TRIDENT	7,606	69 (62 - 76)	366	51	189	51	73	2	1.40 (1.13-1.66)	2.83 (2.45-3.20)	3.70 (3.27-4.13)	4.46 (3.97-4.94)	5.48 (4.87-6.10)	n.a.
ACCOLADE II	TRIDENT	6,639	69 (62 - 75)	140	22	57	16	43	2	1.74 (1.41-2.06)	2.50 (2.06-2.94)	2.58 (2.11-3.06)	5.14 (1.50-8.78)	n.a.	n.a.
MALLORY HEAD STEMS	MALLORY HEAD	6,019*	65 (60 - 69)	239	29	23	106	75	6	1.41 (1.12-1.71)	2.25 (1.88-2.63)	2.68 (2.27-3.09)	3.18 (2.73-3.63)	3.74 (3.24-4.24)	5.19 (4.41-5.97)
Twinsys stem Cementless	RM Pressfit Vitamys cup	5,454	66 (60 - 72)	178	18	74	51	31	4	1.95 (1.58-2.32)	2.67 (2.22-3.12)	3.03 (2.54-3.53)	3.37 (2.83-3.92)	5.05 (4.13-5.97)	n.a.
ACCOLADE	TRIDENT TRITANIUM	4,539*	68 (62 - 74)	153	16	52	36	46	3	1.08 (0.78-1.38)	2.21 (1.79-2.64)	2.75 (2.27-3.23)	3.27 (2.73-3.81)	4.05 (3.34-4.76)	n.a.
TAPERLOC Complete	C7 PPS	4,302	70 (63 - 75)	79	14	29	18	16	2	1.72 (1.32-2.12)	2.22 (1.70-2.73)	n.a.	n.a.	n.a.	n.a.
TAPERLOC HIP system	EXCEED ABT	3,893*	68 (62 - 75)	131	23	35	40	25	8	1.18 (0.84-1.52)	2.31 (1.83-2.78)	2.69 (2.17-3.20)	2.91 (2.38-3.45)	3.36 (2.78-3.95)	n.a.
SL Plus	Bicon Plus	3,777*	70 (64 - 76)	291	44	146	79	19	3	1.70 (1.29-2.11)	3.97 (3.35-4.60)	5.37 (4.64-6.09)	6.40 (5.60-7.20)	7.71 (6.81-8.60)	9.55 (8.26-10.83)
TAPERLOC HIP system	MALLORY HEAD	3,670*	67 (61 - 71)	144	27	39	50	27	1	1.45 (1.06-1.83)	2.60 (2.08-3.12)	2.93 (2.39-3.48)	3.39 (2.80-3.98)	3.67 (3.04-4.29)	5.08 (4.07-6.09)
Twinsys stem Cementless	RM Pressfit cup	3,510	73 (68 - 78)	146	20	67	30	28	1	2.56 (2.03-3.08)	3.20 (2.61-3.79)	3.59 (2.96-4.22)	4.11 (3.40-4.81)	4.85 (3.99-5.71)	n.a.
Avenir Muller	Allofit	3,486	69 (62 - 74)	65	10	22	6	24	3	1.57 (1.15-2.00)	2.31 (1.68-2.95)	2.53 (1.77-3.29)	3.03 (2.00-4.06)	3.03 (2.00-4.06)	n.a.
Corail AMT	Pinnacle	3,218	69 (61 - 74)	30	4	7	7	12	0	0.65 (0.36-0.93)	1.03 (0.64-1.42)	1.27 (0.76-1.77)	n.a.	n.a.	n.a.
TAPERLOC Complete	MALLORY HEAD	3,116	67 (61 - 72)	118	20	26	32	39	1	2.09 (1.59-2.59)	3.07 (2.46-3.67)	3.37 (2.73-4.00)	3.66 (3.00-4.33)	4.12 (3.33-4.90)	n.a.
Alloclassic offset	Allofit	3,034	71 (65 - 77)	94	20	36	18	17	3	1.36 (0.95-1.77)	1.93 (1.44-2.43)	2.56 (1.97-3.15)	2.82 (2.19-3.45)	3.74 (2.93-4.56)	4.46 (3.43-5.50)
FITMORE	Allofit	2,975	67 (62 - 72)	42	9	18	3	11	1	1.16 (0.76-1.56)	1.69 (1.14-2.24)	n.a.	n.a.	n.a.	n.a.
Synergy	Reflection	2,930*	66 (60 - 72)	159	13	74	31	40	1	2.12 (1.60-2.64)	2.70 (2.11-3.29)	3.09 (2.46-3.71)	3.56 (2.88-4.23)	4.41 (3.64-5.19)	7.57 (6.20-8.95)
Alloclassic Zweymuller SL	ALLOCLASSIC Zweymuller CSF	2,903*	69 (63 - 75)	145	18	61	27	37	2	1.11 (0.72-1.49)	2.65 (2.06-3.24)	3.27 (2.62-3.92)	3.53 (2.85-4.21)	4.38 (3.61-5.15)	6.10 (5.07-7.14)
M/L Taper	Allofit IT	2,731	72 (65 - 77)	93	12	39	28	13	1	2.25 (1.69-2.82)	3.18 (2.49-3.87)	3.54 (2.79-4.29)	3.86 (3.05-4.67)	4.01 (3.15-4.87)	n.a.
Synergy	R3	2,104*	66 (60 - 72)	70	11	36	12	9	2	1.81 (1.24-2.38)	2.29 (1.65-2.93)	2.84 (2.12-3.55)	3.12 (2.36-3.87)	3.59 (2.73-4.45)	n.a.
SYMAX	TRIDENT	2,073*	69 (63 - 75)	76	7	20	20	28	1	0.58 (0.25-0.91)	1.66 (1.11-2.22)	2.22 (1.58-2.86)	2.80 (2.07-3.52)	3.25 (2.47-4.04)	4.31 (3.27-5.34)
Anthology	R3	1,843*	65 (59 - 69)	63	9	20	19	15	0	2.06 (1.41-2.71)	2.61 (1.88-3.34)	3.22 (2.40-4.03)	3.38 (2.53-4.22)	3.83 (2.84-4.81)	n.a.
SYMAX	TRIDENT TRITANIUM	1,743*	67 (61 - 73)	100	12	45	28	14	1	2.30 (1.60-3.00)	3.59 (2.71-4.47)	3.95 (3.03-4.87)	4.78 (3.76-5.80)	5.49 (4.38-6.60)	n.a.
ACCOLADE II	TRIDENT TRITANIUM	1,700	68 (61 - 74)	33	3	13	4	13	0	1.91 (1.21-2.60)	2.49 (1.50-3.49)	n.a.	n.a.	n.a.	n.a.
M/L Taper	Continuum	1,651	68 (63 - 73)	36	4	25	4	3	0	1.66 (1.04-2.29)	2.21 (1.47-2.95)	2.46 (1.65-3.27)	2.46 (1.65-3.27)	n.a.	n.a.
MALLORY HEAD STEMS	EXCEED ABT	1,637*	65 (59 - 71)	38	3	16	17	2	0	0.67 (0.28-1.07)	1.60 (0.99-2.21)	1.73 (1.09-2.36)	2.05 (1.36-2.75)	2.35 (1.60-3.10)	n.a.
OMNIFIT HA	TRIDENT	1,501*	63 (57 - 67)	152	20	73	25	30	4	3.07 (2.20-3.94)	4.48 (3.43-5.53)	6.26 (5.03-7.50)	7.73 (6.37-9.10)	9.44 (7.94-10.95)	11.22 (9.41-13.04)
Summit Tapered	Pinnacle Cription	1,362	69 (62 - 74)	36	2	9	8	16	1	1.96 (1.21-2.70)	2.47 (1.60-3.34)	3.32 (2.10-4.53)	3.71 (2.28-5.14)	n.a.	n.a.
Alloclassic Zweymuller SL	Continuum	1,267	71 (64 - 77)	37	7	14	4	11	1	1.59 (0.90-2.27)	2.17 (1.36-2.98)	2.55 (1.66-3.43)	2.86 (1.91-3.81)	3.17 (2.12-4.21)	n.a.
CLS Spotorno	RM Classic cup	1,177*	63 (58 - 68)	81	16	23	34	7	1	1.87 (1.10-2.65)	2.64 (1.73-3.56)	3.34 (2.31-4.37)	3.87 (2.76-4.98)	5.07 (3.80-6.35)	7.77 (6.07-9.47)
CLS Spotorno	Pinnacle	1,165*	67 (62 - 72)	66	8	27	15	16	0	1.29 (0.64-1.94)	2.25 (1.39-3.10)	2.79 (1.83-3.74)	3.56 (2.48-4.65)	5.22 (3.82-6.62)	n.a.
SL Plus Mia	R3	1,109*	71 (65 - 77)	35	3	17	7	8	0	1.90 (1.09-2.70)	2.73 (1.76-3.69)	3.02 (2.01-4.04)	3.02 (2.01-4.04)	3.44 (2.27-4.60)	n.a.
Optimys stem	RM Pressfit Vitamys cup	1,072	62 (55 - 69)	23	3	12	5	2	1	1.75 (0.95-2.55)	2.27 (1.32-3.23)	2.49 (1.45-3.53)	2.49 (1.45-3.53)	n.a.	n.a.
SL Plus	Reflection	1,020*	67 (61 - 73)	44	6	14	15	9	0	1.77 (0.96-2.58)	3.26 (2.17-4.35)	3.78 (2.60-4.95)	4.21 (2.96-5.46)	4.45 (3.16-5.74)	n.a.

SL Plus	Hofer-Imhoff LUBRIMET	978*	70 (64 - 76)	66	14	33	11	6	2	1.13 (0.47-1.79)	2.27 (1.33-3.21)	3.56 (2.38-4.73)	4.44 (3.13-5.76)	5.61 (4.13-7.10)	7.80 (5.92-9.68)
Alloclassic Zweymuller SL	Trilogy	966*	68 (63 - 75)	35	10	10	7	8	0	1.35 (0.62-2.07)	2.18 (1.26-3.10)	2.60 (1.59-3.60)	2.92 (1.86-3.99)	3.59 (2.40-4.77)	3.70 (2.50-4.91)
Polarstem	Reflection	927*	70 (64 - 76)	19	6	4	2	7	0	1.08 (0.41-1.75)	1.63 (0.81-2.45)	1.98 (1.07-2.88)	2.12 (1.17-3.07)	2.12 (1.17-3.07)	n.a.
TAPERLOC Complete	Continuum	829	68 (59 - 74)	20	5	7	2	6	0	1.94 (1.00-2.87)	2.48 (1.41-3.56)	2.48 (1.41-3.56)	n.a.	n.a.	n.a.
SL Plus	EP-Fit Plus	790*	68 (63 - 75)	47	10	25	11	1	0	1.27 (0.49-2.06)	3.08 (1.87-4.30)	3.75 (2.41-5.09)	4.88 (3.35-6.42)	5.66 (3.99-7.33)	6.62 (4.76-8.48)
Alloclassic Zweymuller SL	Alloclassic Variall	778*	71 (64 - 77)	23	4	10	3	5	1	1.03 (0.32-1.74)	1.94 (0.97-2.92)	2.35 (1.28-3.42)	2.63 (1.49-3.77)	2.94 (1.73-4.15)	3.20 (1.89-4.51)
CLS Spotorno	FITMORE	758*	66 (61 - 71)	41	4	20	6	10	1	1.85 (0.89-2.81)	2.38 (1.29-3.46)	2.64 (1.50-3.79)	3.33 (2.04-4.61)	4.33 (2.86-5.80)	6.00 (4.18-7.81)
DB10	SPIDERCUP	755*	71 (64 - 77)	41	2	20	10	8	1	1.46 (0.60-2.32)	2.27 (1.20-3.34)	2.85 (1.65-4.05)	3.74 (2.35-5.13)	4.74 (3.15-6.32)	7.11 (4.34-9.89)
CLS Spotorno	Morscher	712*	73 (68 - 78)	38	7	19	12	0	0	1.27 (0.45-2.10)	2.57 (1.40-3.74)	3.19 (1.88-4.50)	4.16 (2.65-5.68)	5.51 (3.72-7.30)	n.a.
Corail	Pinnacle Cription	685	71 (64 - 76)	10	1	5	3	1	0	0.75 (0.10-1.41)	2.27 (0.67-3.86)	n.a.	n.a.	n.a.	n.a.
CLS Spotorno	RM Pressfit cup	625*	66 (60 - 71)	59	5	24	21	5	4	3.05 (1.70-4.39)	4.36 (2.75-5.97)	5.69 (3.86-7.53)	6.60 (4.62-8.58)	7.85 (5.66-10.05)	11.31 (8.47-14.16)
CBH stem	RM Pressfit Vitamys cup	593*	65 (60 - 70)	24	8	7	7	2	0	1.01 (0.21-1.82)	2.38 (1.15-3.62)	3.25 (1.81-4.69)	3.96 (2.37-5.54)	4.14 (2.52-5.76)	n.a.
CBH stem	RM Pressfit cup	551*	75 (69 - 79)	25	4	7	12	2	0	2.19 (0.96-3.42)	3.68 (2.10-5.27)	3.88 (2.25-5.51)	4.29 (2.57-6.01)	4.83 (2.97-6.70)	n.a.
H-MAX S	Delta-TT	549	64 (58 - 70)	25	4	11	5	5	0	3.16 (1.63-4.69)	4.49 (2.50-6.49)	4.89 (2.76-7.02)	5.93 (3.38-8.48)	6.99 (4.08-9.89)	n.a.
Alloclassic Zweymuller SL	Trabecular Metal	547*	68 (62 - 75)	28	2	9	9	7	1	0.55 (0.00-1.17)	1.85 (0.71-2.98)	2.61 (1.26-3.95)	3.38 (1.84-4.91)	3.58 (2.00-5.16)	5.73 (3.54-7.92)

* Denotes prosthesis combinations with no reported use in primary THAs in 2023.

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 2007-2023 (n=94,211)

					Cumulative revision percentage (95% CI)					
Femur component	Acetabulum component	Primary THAs (n)	Median (IQR) age (yr)	Major revisions (n)	1yr	3yr	5yr	7yr	10yr	14yr
All cemented THAs for osteoarthritis		**94,211**	**76 (71 - 81)**	**2,158**	**0.66 (0.60-0.71)**	**1.36 (1.28-1.44)**	**1.86 (1.76-1.95)**	**2.29 (2.18-2.40)**	**2.94 (2.80-3.07)**	**4.09 (3.86-4.32)**
Lubinus SPII	IP Cup	15,859	77 (72 - 81)	340	0.56 (0.44-0.68)	1.39 (1.20-1.58)	1.93 (1.70-2.16)	2.26 (2.00-2.52)	2.65 (2.34-2.96)	3.67 (3.08-4.26)
Original ME Muller	MUller low profile Durasul	10,415	75 (71 - 80)	138	0.55 (0.41-0.70)	1.04 (0.83-1.24)	1.39 (1.13-1.64)	1.52 (1.24-1.79)	1.88 (1.51-2.24)	2.65 (1.66-3.63)
Lubinus SPII	FAL Cup	7,333	75 (70 - 80)	169	0.86 (0.64-1.07)	1.55 (1.25-1.85)	2.15 (1.78-2.53)	2.71 (2.25-3.16)	3.43 (2.83-4.04)	4.75 (3.72-5.78)
Original ME Muller	MUller low profile	6,522	77 (73 - 81)	154	0.90 (0.67-1.13)	1.74 (1.42-2.06)	2.07 (1.71-2.42)	2.46 (2.06-2.86)	2.53 (2.12-2.94)	3.11 (2.45-3.78)
EXETER	EXETER RIMFIT X3	5,469	76 (69 - 80)	98	0.72 (0.49-0.94)	1.30 (0.98-1.61)	1.73 (1.35-2.11)	2.00 (1.57-2.43)	2.68 (1.98-3.37)	n.a.
Spectron EF	Reflection All Poly XLPE	5,046	77 (73 - 82)	107	0.38 (0.21-0.55)	1.08 (0.79-1.38)	1.54 (1.18-1.89)	2.15 (1.71-2.58)	2.48 (1.99-2.96)	2.79 (2.23-3.34)
STANMORE	STANMORE	3,383	75 (70 - 80)	74	0.54 (0.29-0.78)	1.27 (0.89-1.66)	1.67 (1.22-2.11)	1.89 (1.41-2.36)	2.37 (1.80-2.94)	2.84 (2.09-3.58)
EXETER	EXETER CONTEMPORARY HOODED	2,827*	77 (72 - 81)	93	0.71 (0.40-1.02)	1.22 (0.81-1.63)	1.76 (1.27-2.25)	2.34 (1.76-2.92)	3.91 (3.07-4.76)	4.59 (3.58-5.60)
Lubinus SPII	SHP	2,506*	75 (71 - 80)	50	0.20 (0.02-0.38)	0.61 (0.30-0.92)	0.91 (0.53-1.29)	1.65 (1.13-2.17)	1.96 (1.39-2.54)	2.47 (1.74-3.20)
EXETER	EXETER	2,447*	73 (68 - 79)	132	1.76 (1.24-2.29)	2.51 (1.89-3.13)	3.11 (2.41-3.80)	3.94 (3.16-4.73)	5.18 (4.26-6.10)	6.37 (5.26-7.47)

* Denotes prosthesis combinations with no reported use in primary THAs in 2023.

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.

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 2007-2023 (n=261,312)

Femur component	Acetabulum component	Primary THAs (n)	Median (IQR) age (yr)	Major revisions (n)	Cumulative revision percentage (95% CI)					
					1yr	3yr	5yr	7yr	10yr	14yr
All uncemented THAs for osteoarthritis		**261,312**	**68 (62 - 74)**	**7,365**	**1.08 (1.04-1.12)**	**1.89 (1.83-1.94)**	**2.44 (2.38-2.51)**	**2.93 (2.85-3.00)**	**3.72 (3.62-3.81)**	**5.25 (5.08-5.43)**
Corail	Pinnacle	45,183	69 (63 - 75)	801	0.68 (0.61-0.76)	1.25 (1.14-1.36)	1.66 (1.53-1.78)	1.93 (1.79-2.08)	2.59 (2.38-2.80)	3.63 (3.06-4.20)
TAPERLOC Complete	Allofit	29,422	67 (61 - 73)	467	1.04 (0.92-1.16)	1.60 (1.44-1.75)	2.08 (1.87-2.28)	2.17 (1.94-2.40)	n.a.	n.a.
Alloclassic Zweymuller SL	Allofit	15,007	70 (64 - 77)	459	0.85 (0.71-1.00)	1.54 (1.34-1.74)	2.09 (1.86-2.33)	2.46 (2.20-2.72)	3.35 (3.03-3.68)	4.55 (4.04-5.07)
Polarstem	R3	14,471	70 (63 - 75)	197	0.88 (0.73-1.04)	1.34 (1.14-1.55)	1.75 (1.48-2.02)	2.12 (1.61-2.62)	n.a.	n.a.
CLS Spotorno	Allofit	11,963	64 (58 - 69)	472	1.92 (1.67-2.16)	2.82 (2.52-3.12)	3.32 (2.99-3.65)	3.80 (3.44-4.16)	4.48 (4.06-4.90)	5.66 (4.72-6.61)
TAPERLOC Complete	EXCEED ABT	8,859	69 (63 - 75)	165	1.06 (0.85-1.28)	1.45 (1.20-1.70)	1.66 (1.39-1.93)	1.88 (1.58-2.18)	2.25 (1.86-2.64)	n.a.
ACCOLADE	TRIDENT	7,606	69 (62 - 76)	302	1.03 (0.80-1.26)	2.23 (1.90-2.57)	3.01 (2.62-3.40)	3.62 (3.18-4.06)	4.50 (3.94-5.06)	n.a.
ACCOLADE II	TRIDENT	6,639	69 (62 - 75)	97	1.17 (0.90-1.43)	1.70 (1.34-2.05)	1.79 (1.39-2.18)	4.31 (0.71-7.91)	n.a.	n.a.
MALLORY HEAD STEMS	MALLORY HEAD	6,019*	65 (60 - 69)	173	0.95 (0.70-1.19)	1.60 (1.29-1.92)	2.00 (1.64-2.35)	2.41 (2.02-2.80)	2.79 (2.35-3.22)	3.48 (2.90-4.05)
Twinsys stem Cementless	RM Pressfit Vitamys cup	5,454	66 (60 - 72)	150	1.49 (1.16-1.81)	2.19 (1.78-2.60)	2.49 (2.04-2.94)	2.87 (2.36-3.38)	4.47 (3.58-5.36)	n.a.

* Denotes prosthesis combinations with no reported use in primary THAs in 2023.

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.

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 of patients who underwent a THA for osteoarthritis in the Netherlands in 2007-2023

Bone cement	Primary THAs (n)	Median (IQR) age (yr)	Revisions (n)	Cumulative revision percentage (95% CI)					
				1yr	3yr	5yr	7yr	10yr	14yr
Separately packed	**81,783**	**75 (69 - 80)**	**2,830**	**1.35 (1.27-1.43)**	**2.19 (2.09-2.29)**	**2.74 (2.62-2.85)**	**3.21 (3.08-3.34)**	**4.03 (3.87-4.19)**	**5.46 (5.18-5.75)**
PALACOS R+G	64,066	75 (69 - 80)	2,155	1.41 (1.31-1.50)	2.26 (2.15-2.38)	2.80 (2.66-2.93)	3.23 (3.09-3.38)	3.95 (3.77-4.13)	5.44 (5.07-5.80)
Refobacin Bone Cement R	5,666	76 (71 - 80)	178	1.09 (0.82-1.37)	1.84 (1.48-2.19)	2.25 (1.84-2.65)	2.75 (2.30-3.21)	3.73 (3.16-4.30)	4.16 (3.53-4.80)
PALACOS MV+G	3,362	76 (71 - 81)	95	0.99 (0.66-1.33)	1.52 (1.10-1.94)	2.16 (1.64-2.68)	3.06 (2.41-3.71)	3.46 (2.74-4.19)	n.a.
Simplex ABC EC	1,783	68 (57 - 75)	93	1.75 (1.14-2.36)	2.56 (1.82-3.29)	3.58 (2.70-4.45)	3.99 (3.06-4.92)	5.57 (4.35-6.79)	8.14 (5.70-10.59)
Simplex ABC TOBRA	1,735	74 (68 - 79)	109	1.63 (1.03-2.22)	2.71 (1.94-3.49)	3.35 (2.49-4.22)	4.10 (3.13-5.06)	5.91 (4.72-7.10)	8.15 (6.37-9.93)
Simplex P	1,105*	76 (72 - 80)	25	0.82 (0.28-1.35)	1.65 (0.89-2.41)	1.65 (0.89-2.41)	1.87 (1.06-2.68)	2.56 (1.51-3.61)	n.a.
Refobacin Plus Bone Cement	490*	77 (72 - 81)	22	1.43 (0.38-2.48)	2.68 (1.24-4.12)	3.33 (1.73-4.94)	3.81 (2.08-5.53)	4.50 (2.53-6.46)	5.37 (3.08-7.67)
Simplex HV	475	77 (72 - 81)	11	0.85 (0.02-1.67)	0.85 (0.02-1.67)	1.78 (0.56-3.01)	2.62 (1.08-4.16)	n.a.	n.a.
Biomet Plus Bone Cement	425	77 (72 - 82)	34	0.86 (0.23-1.49)	1.99 (0.99-2.99)	2.82 (1.53-4.10)	3.62 (2.06-5.19)	4.77 (2.86-6.68)	7.34 (4.70-9.98)
Subiton G	399	77 (72 - 82)	34	0.86 (0.23-1.49)	1.99 (0.99-2.99)	2.82 (1.53-4.10)	3.62 (2.06-5.19)	4.77 (2.86-6.68)	7.34 (4.70-9.98)
CMW 1 GENTAMICIN Bone Cement	275*	74 (70 - 79)	22	0.59 (0.01-1.17)	1.04 (0.27-1.81)	1.36 (0.48-2.24)	1.69 (0.70-2.67)	2.80 (1.48-4.12)	4.13 (2.35-5.90)
PALAMED G	406*	74 (70 - 79)	22	0.59 (0.01-1.17)	1.04 (0.27-1.81)	1.36 (0.48-2.24)	1.69 (0.70-2.67)	2.80 (1.48-4.12)	4.13 (2.35-5.90)
PALACOS R	260*	79 (74 - 83)	13	1.16 (0.00-2.46)	1.57 (0.04-3.10)	2.88 (0.77-4.99)	3.88 (1.38-6.38)	5.76 (2.52-9.01)	n.a.
PALAMED	256*	74 (70 - 79)	27	1.17 (0.00-2.49)	2.74 (0.74-4.74)	3.94 (1.55-6.34)	3.94 (1.55-6.34)	6.56 (3.44-9.67)	11.96 (7.66-16.26)
Pre-packed in a vacuum mixing system	**36,285**	**77 (71 - 81)**	**1,012**	**1.79 (1.66-1.93)**	**2.55 (2.38-2.72)**	**3.09 (2.89-3.30)**	**3.58 (3.33-3.83)**	**4.23 (3.88-4.58)**	**5.03 (4.35-5.70)**
Refobacin Bone Cement R	15,949	77 (71 - 81)	497	1.88 (1.67-2.09)	2.68 (2.42-2.94)	3.21 (2.91-3.51)	3.73 (3.37-4.09)	4.53 (4.02-5.05)	n.a.
PALACOS R+G	15,791	76 (71 - 81)	397	1.92 (1.70-2.14)	2.58 (2.31-2.86)	3.20 (2.86-3.55)	3.71 (3.20-4.22)	n.a.	n.a.
Refobacin Plus Bone Cement	3,952	77 (72 - 82)	104	1.02 (0.71-1.34)	1.89 (1.45-2.33)	2.35 (1.84-2.85)	2.79 (2.22-3.37)	3.16 (2.51-3.81)	n.a.
Cemex Genta	324*	80 (75 - 83)	8	0.93 (0.00-1.99)	1.89 (0.39-3.39)	2.24 (0.60-3.88)	2.24 (0.60-3.88)	3.22 (0.71-5.74)	n.a.

* Denotes types of bone cement with no reported use in primary THAs in 2023.

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

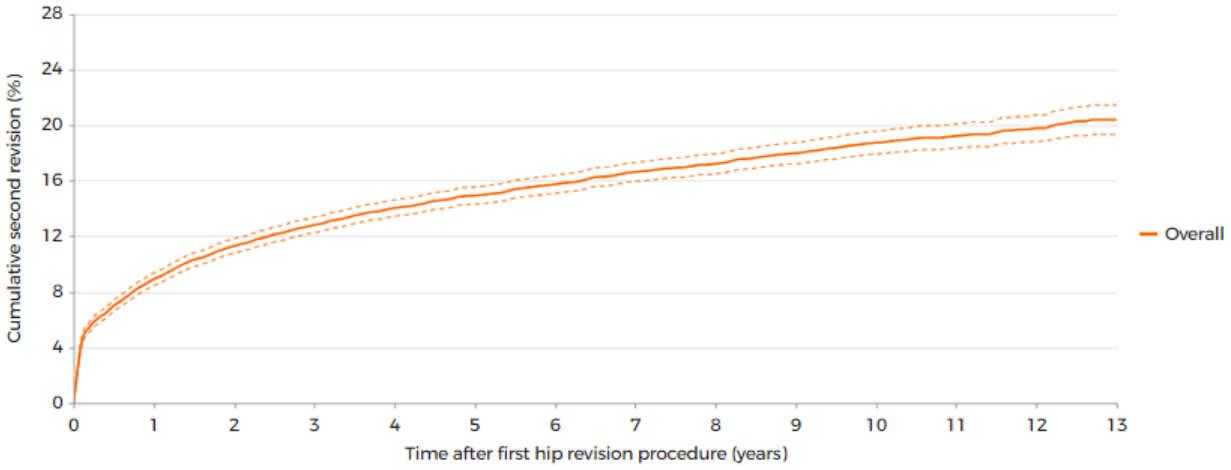
Only types of bone cement with over 250 procedures have been listed.

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 (Kaplan-Meier; 95% CI) of total hip arthroplasties after a one-stage first revision in the Netherlands in 2007-2023 (n=15,470)



© LROI 2024 | H097A

	1yr	3yr	5yr	7yr	10yr	13yr
Overall	8.57 (8.12-9.02)	12.68 (12.13-13.23)	14.89 (14.27-15.51)	16.56 (15.88-17.24)	18.68 (17.87-19.50)	20.38 (19.32-21.44)

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

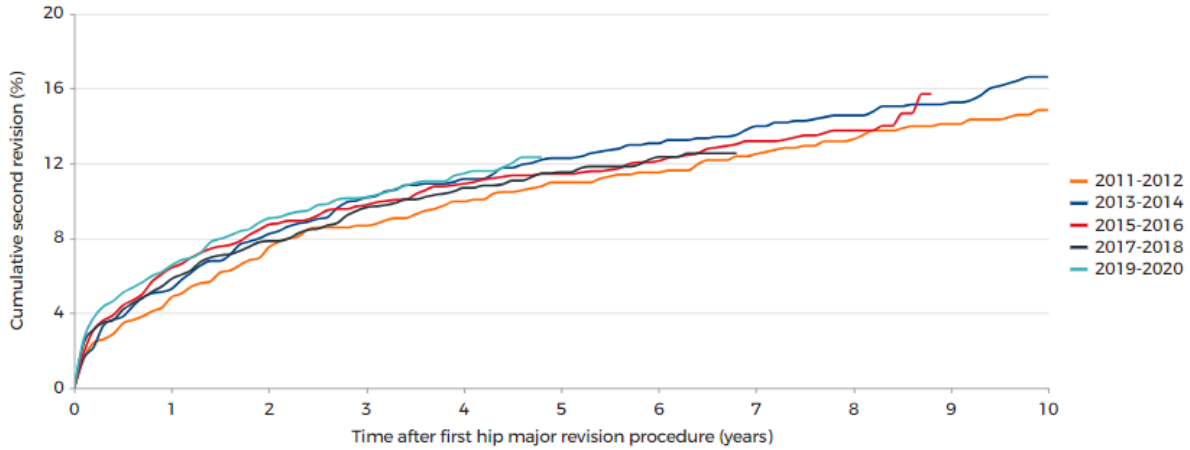
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

CI: confidence interval.

© LROI 2024 | H097B

By procedure year of first major revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties after a one-stage first revision by procedure year of first major revision in the Netherlands in 2012-2023 (n=7,543)



© LROI 2024 | H098A

	Number (n)	1yr	3yr	5yr	7yr	10yr
2011-2012	1,079	4.28 (3.07-5.49)	8.67 (6.97-10.36)	10.98 (9.08-12.87)	12.38 (10.37-14.39)	14.84 (12.63-17.06)
2013-2014	1,297	5.13 (3.93-6.34)	10.01 (8.35-11.66)	12.27 (10.45-14.09)	13.79 (11.87-15.72)	16.61 (14.44-18.78)
2015-2016	1,531	6.08 (4.88-7.28)	9.70 (8.20-11.20)	11.42 (9.80-13.05)	13.18 (11.43-14.92)	n.a.
2017-2018	1,809	5.42 (4.37-6.47)	9.46 (8.09-10.83)	11.46 (9.96-12.97)	n.a.	n.a.
2019-2020	1,827	6.20 (5.09-7.32)	10.12 (8.72-11.53)	n.a.	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.

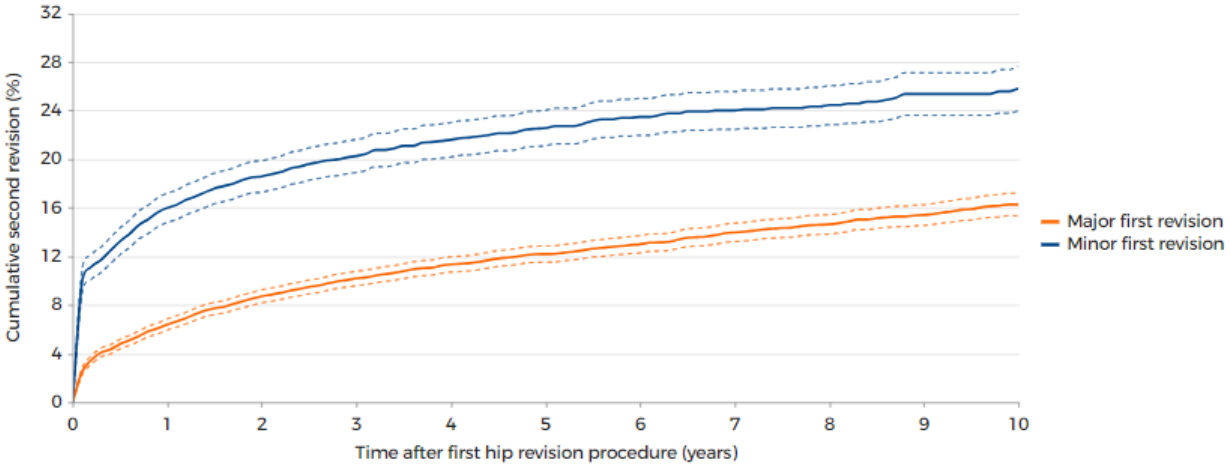
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

CI: confidence interval.

© LROI 2024 | H098B

By type of first revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties after a one-stage first revision by type of first revision in the Netherlands in 2007-2023 (n=15,470)



	Number (n)	1yr	3yr	5yr	7yr	10yr
Major first revision	11,482	6.07 (5.62-6.51)	10.05 (9.47-10.64)	12.17 (11.50-12.83)	13.89 (13.14-14.64)	16.27 (15.34-17.19)
Minor first revision	3,708	15.62 (14.43-16.80)	20.13 (18.78-21.48)	22.49 (21.03-23.95)	24.00 (22.44-25.55)	25.56 (23.77-27.35)

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

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

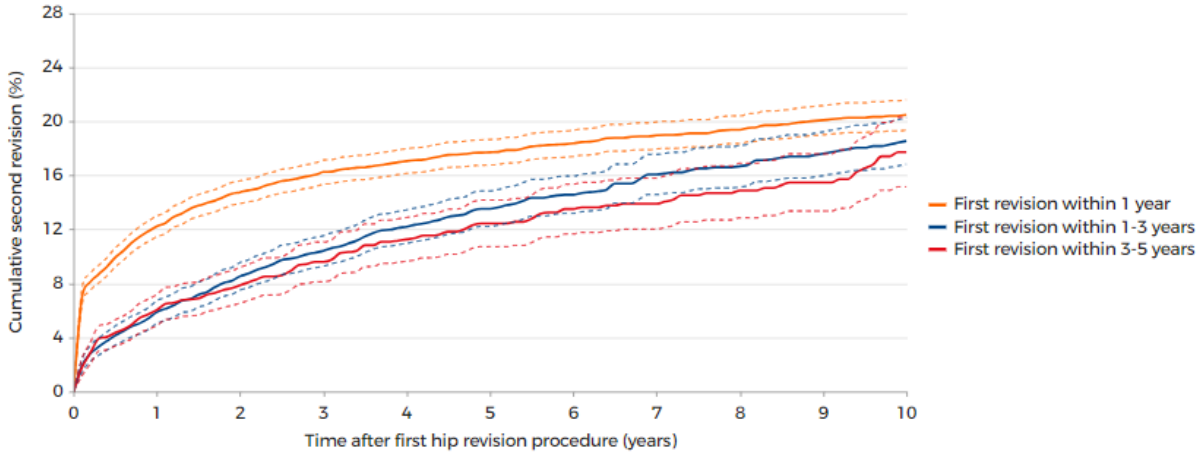
Major revision: revision of at least the acetabulum or femur component.

Minor revision: only inlay and/or femoral head exchange (including DAIR procedures).

CI: confidence interval.

By time to first revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties after a one-stage first revision by time to first revision in the Netherlands in 2007-2023 (n=15,470)



	Number (n)	1yr	3yr	5yr	7yr	10yr
First revision within 1 year	7,229	11.86 (11.10-12.62)	16.02 (15.14-16.90)	17.67 (16.73-18.61)	18.87 (17.88-19.87)	20.39 (19.27-21.50)
First revision within 1-3 years	3,095	5.41 (4.60-6.22)	10.27 (9.15-11.39)	13.52 (12.21-14.83)	16.06 (14.57-17.54)	18.40 (16.69-20.11)
First revision within 3-5 years	1,712	5.71 (4.60-6.83)	9.59 (8.12-11.06)	12.44 (10.71-14.16)	13.89 (12.01-15.78)	17.71 (15.14-20.28)

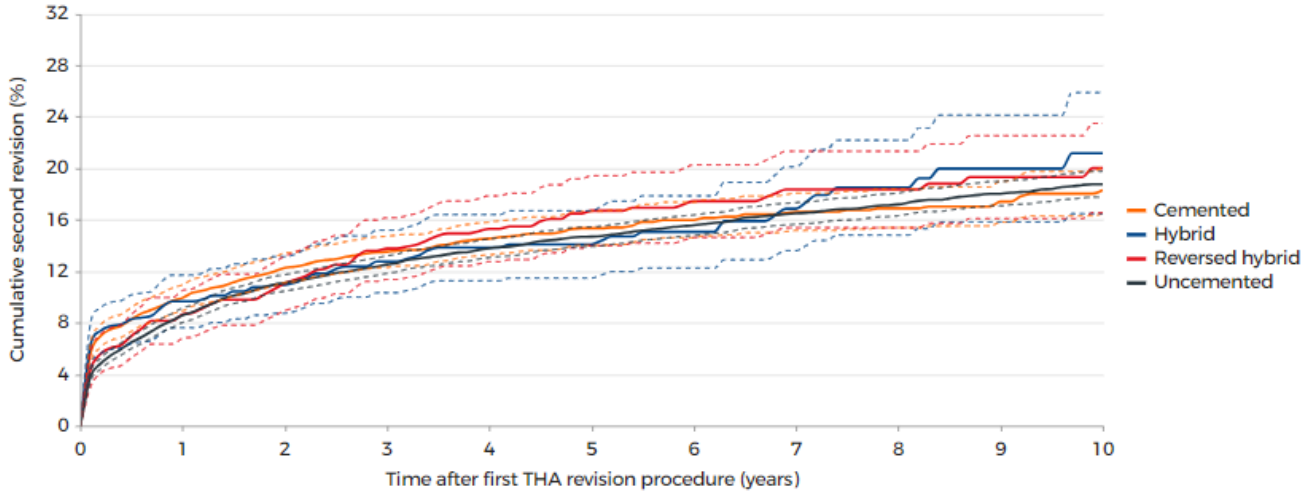
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

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 fixation of primary THA

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties after a one-stage first revision by fixation of the primary procedure in the Netherlands in 2007-2023 (n=15,224)



© LROI 2024 | H101A

	Number (n)	1yr	3yr	5yr	7yr	10yr
Uncemented	10,031	8.18 (7.63-8.72)	12.35 (11.67-13.03)	14.66 (13.90-15.42)	16.43 (15.59-17.27)	18.75 (17.75-19.75)
Cemented	3,453	9.69 (8.69-10.70)	13.46 (12.26-14.67)	15.34 (14.01-16.66)	16.52 (15.08-17.95)	18.02 (16.29-19.75)
Reversed hybrid	901	8.15 (6.35-9.96)	13.59 (11.22-15.97)	16.48 (13.79-19.17)	18.34 (15.38-21.31)	20.01 (16.53-23.48)
Hybrid	839	9.66 (7.61-11.70)	12.76 (10.33-15.19)	14.08 (11.47-16.69)	16.85 (13.60-20.11)	21.17 (16.46-25.87)

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

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

CI: confidence interval.

© LROI 2024 | H101B

Reasons for seconds revision by type of first revision

TABLE Reasons for second revision within eight 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 2007-2023

	Major revision (n=1,296)	Minor revision (n=779)	Any type of revision (n=2,146)
Reasons for second revision	**Proportion (%)**	**Proportion (%)**	**Proportion (%)**
Infection	31.71	60.98	42.87
Dislocation	26.31	25.93	25.63
Loosening of acetabulum component	18.90	4.75	13.42
Loosening of femur component	17.59	4.49	12.58
Peri-prosthetic fracture	9.95	2.44	7.13
Inlay wear	3.32	2.70	2.98
Symptomatic MoM bearing	1.39	0.39	1.03
Peri-articular ossification	1.00	0.39	0.75
Other	12.04	6.93	10.34

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

Major first revision: Revision of at least the acetabulum or femur component.

Minor first revision: Only inlay and/or femoral head exchange (including DAIR procedures).

Any type of first revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.

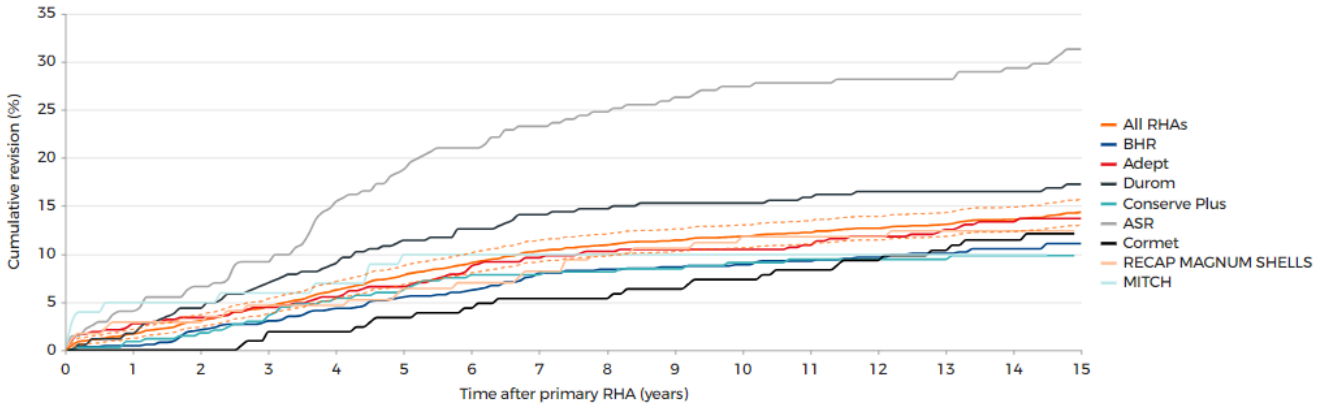
One patient may have more than one reason for second revision or re-surgery. As such, the total proportion is over 100%.

© LROI 2024 | H102

Survival resurfacing hip arthroplasty

By type of prosthesis component

FIGURE Cumulative revision percentages (Kaplan-Meier; 95% CI) of resurfacing hip arthroplasties by prosthesis component in the Netherlands in 2007-2023 (n=2,890)



© LROI 2024 | H105A

Type of RHA	Primary RHAs (n)	Median (IQR) age (yr)	Revisions (n)	Cumulative revision percentage (95% CI) 1yr	3yr	5yr	7yr	10yr	14yr
All resurfacing hip arthroplasties	**2.890**	**54 (49 - 59)**	**387**	**1.63 (1.17-2.09)**	**4.34 (3.59-5.08)**	**7.59 (6.62-8.56)**	**10.21 (9.10-11.32)**	**11.79 (10.61-12.98)**	**14.25 (12.93-15.58)**
BHR	854*	54 (48 - 58)	90	0.47 (0.01-0.93)	2.81 (1.70-3.92)	5.41 (3.89-6.93)	7.66 (5.87-9.45)	8.89 (6.97-10.81)	11.07 (8.85-13.29)
Adept	473*	54 (48 - 59)	62	2.33 (0.97-3.68)	4.45 (2.59-6.31)	6.60 (4.35-8.84)	9.61 (6.94-12.28)	10.47 (7.70-13.25)	13.69 (10.50-16.88)
Durom	344*	54 (50 - 59)	59	1.74 (0.36-3.13)	6.71 (4.06-9.36)	11.12 (7.79-14.45)	14.09 (10.39-17.78)	15.28 (11.46-19.11)	17.25 (13.20-21.31)
Conserve Plus	338*	55 (50 - 60)	32	0.89 (0.00-1.90)	2.98 (1.16-4.80)	5.99 (3.45-8.54)	7.83 (4.94-10.72)	9.10 (5.99-12.21)	9.82 (6.58-13.06)
ASR	272*	53 (47 - 56)	88	4.04 (1.70-6.39)	9.19 (5.76-12.62)	18.42 (13.81-23.03)	23.26 (18.23-28.29)	27.40 (22.07-32.72)	31.28 (25.66-36.90)
Cormet	213*	57 (50 - 61)	25	0.00 (0.00-0.00)	0.96 (0.00-2.28)	3.39 (0.92-5.85)	5.36 (2.28-8.45)	7.34 (3.77-10.92)	12.11 (7.55-16.68)
RECAP MAGNUM SHELLS	172*	55 (48 - 59)	21	2.91 (0.40-5.42)	4.65 (1.50-7.80)	5.82 (2.32-9.33)	8.19 (4.08-12.31)	11.18 (6.44-15.92)	12.39 (7.43-17.35)
MITCH	101*	57 (51 - 61)	10	4.95 (0.72-9.18)	5.94 (1.33-10.55)	8.93 (3.36-14.50)	9.93 (4.09-15.78)	9.93 (4.09-15.78)	n.a.

* Denotes types of bone cement with no reported use in primary THAs in 2020-2023.

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

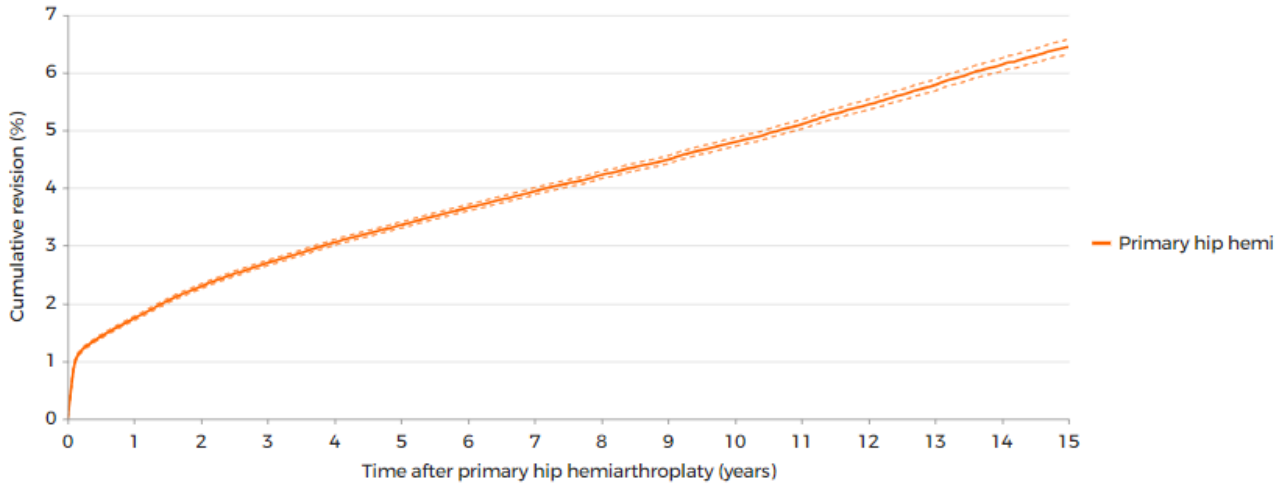
© LROI 2024 | H105B

Only types of prosthesis with over 100 procedures have been listed.

Survival hip hemiarthroplasty

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of hip hemiarthroplasties in the Netherlands in 2007-2023 (n=73,627)



© LROI 2024 | H103A

	1yr	3yr	5yr	7yr	10yr	15yr
Primary hip hemi	1.68 (1.65-1.72)	2.66 (2.62-2.71)	3.33 (3.27-3.38)	3.90 (3.84-3.96)	4.76 (4.69-4.84)	6.29 (6.17-6.41)

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

CI: confidence interval.

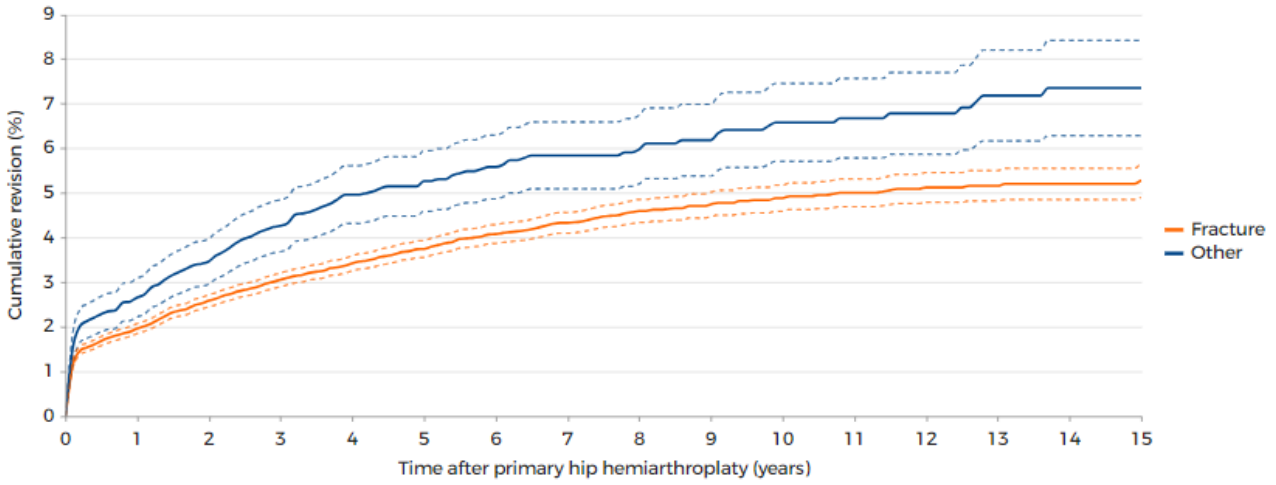
© LROI 2024 | H103B

15,682 (21.3%) of primary hemi arthroplasties were implanted in patients who died within one year, 34,673 (47.1%) within five years, 40,054 (54.4%) within ten years, and 40,634 (55.2%) within fifteen years after the primary procedure.

It is important to note that the Kaplan-Meier method estimates the proportion of failed prostheses assuming patients live indefinitely.

By diagnosis

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of hip hemiarthroplasties by diagnosis in the Netherlands in 2007-2023 (n=72,200)



© LROI 2024 | H104A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Fracture	66,522	1.89 (1.79-2.00)	3.01 (2.86-3.16)	3.74 (3.55-3.93)	4.33 (4.10-4.56)	4.88 (4.59-5.18)	5.20 (4.85-5.55)
Other	5,678	2.57 (2.14-2.99)	4.24 (3.66-4.81)	5.15 (4.48-5.81)	5.84 (5.09-6.59)	6.58 (5.71-7.45)	7.35 (6.28-8.42)

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

CI: confidence interval.

© LROI 2024 | H104B

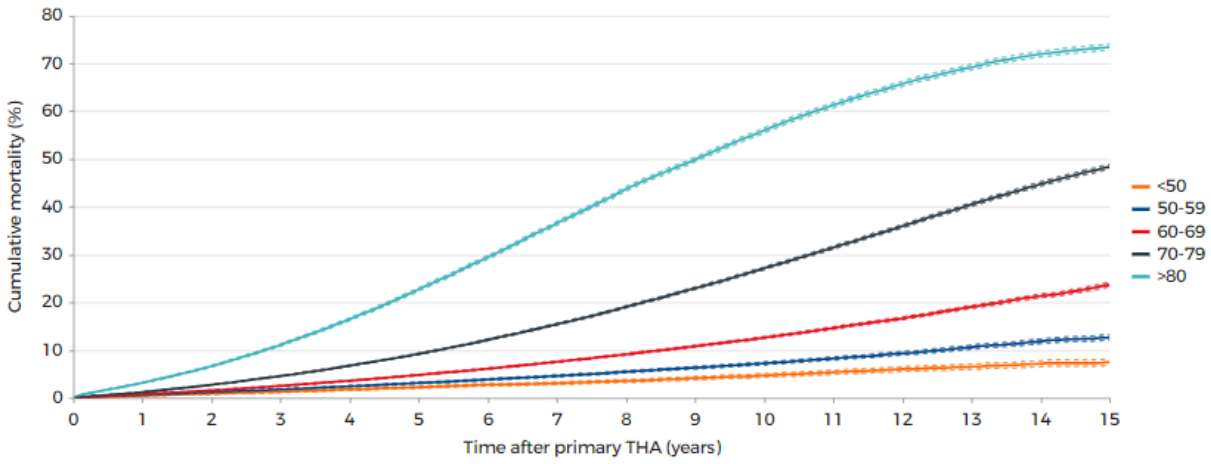
15,682 (21.3%) of primary hemi arthroplasties were implanted in patients who died within one year, 34,673 (47.1%) within five years, 40,054 (54.4%) within ten years, and 40,634 (55.2%) within fifteen years after the primary procedure.

It is important to note that the Kaplan-Meier method estimates the proportion of failed prostheses assuming patients live indefinitely.

Mortality

THA by age category

FIGURE Cumulative mortality percentage (95% CI) of patients with a total hip arthroplasty by age category in the Netherlands in 2007-2023 (n=458,818)



© LROI 2024 | H106A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
<50	19,545	0.39 (0.30-0.48)	1.20 (1.04-1.37)	2.15 (1.92-2.37)	3.00 (2.73-3.28)	4.62 (4.24-5.00)	7.37 (6.69-8.04)
50-59	57,195	0.53 (0.47-0.59)	1.67 (1.56-1.78)	3.05 (2.89-3.21)	4.51 (4.30-4.71)	7.10 (6.82-7.39)	12.55 (12.00-13.10)
60-69	142,007	0.66 (0.61-0.70)	2.39 (2.31-2.48)	4.65 (4.53-4.77)	7.39 (7.23-7.55)	12.40 (12.17-12.63)	23.43 (22.96-23.90)
70-79	171,866	1.06 (1.01-1.11)	4.38 (4.27-4.48)	8.92 (8.77-9.07)	15.07 (14.86-15.28)	26.63 (26.34-26.93)	48.03 (47.51-48.54)
>80	68,205	2.82 (2.70-2.95)	10.58 (10.33-10.83)	21.99 (21.63-22.34)	35.77 (35.33-36.21)	55.30 (54.78-55.83)	73.25 (72.63-73.87)

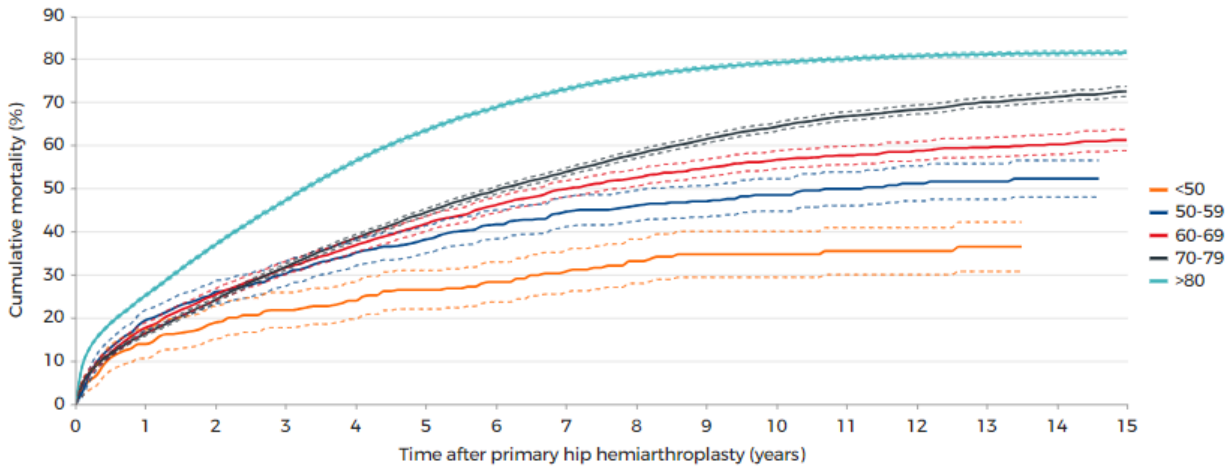
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H106B

Hip hemi by age category

FIGURE Cumulative mortality percentage (95% CI) of patients with a hip hemiarthroplasty by age category in the Netherlands in 2007-2023 (n=73,568)



© LROI 2024 | H107A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
<50	426	13.90 (10.58-17.23)	21.79 (17.72-25.87)	26.51 (22.03-30.98)	30.31 (25.48-35.14)	34.72 (29.40-40.04)	n.a.
50-59	1,122	18.27 (15.97-20.58)	29.83 (26.99-32.66)	37.72 (34.57-40.88)	44.17 (40.72-47.63)	48.48 (44.72-52.23)	n.a.
60-69	4,031	16.80 (15.63-17.97)	31.02 (29.50-32.53)	41.27 (39.56-42.99)	49.71 (47.83-51.59)	56.37 (54.29-58.44)	61.21 (58.75-63.67)
70-79	18,734	15.49 (14.96-16.01)	31.10 (30.39-31.81)	43.87 (43.05-44.68)	53.34 (52.45-54.22)	63.93 (62.94-64.92)	72.43 (71.25-73.61)
>80	49,255	23.96 (23.58-24.35)	46.26 (45.79-46.73)	62.85 (62.36-63.34)	72.69 (72.21-73.18)	79.12 (78.63-79.60)	81.47 (80.97-81.97)

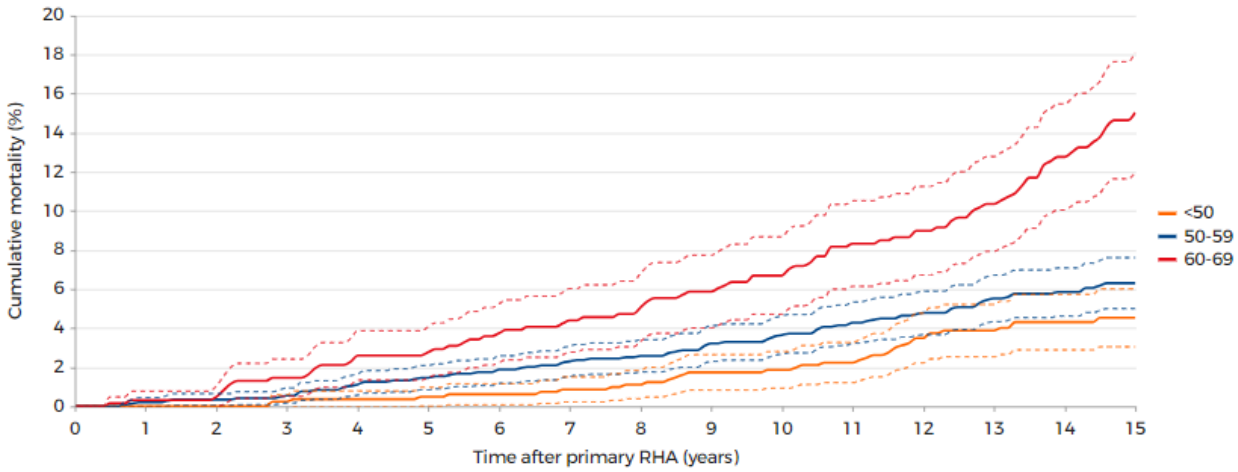
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

CI: confidence interval.

© LROI 2024 | H107B

RHA by age category

FIGURE Cumulative mortality percentage (95% CI) of patients with a resurfacing hip arthroplasty by age category in the Netherlands in 2007-2023 (n=2,882)



© LROI 2024 | H108A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
<50	810	0.00 (0.00-0.00)	0.25 (-0.09-0.59)	0.49 (0.01-0.98)	0.87 (0.23-1.50)	1.86 (0.93-2.80)	4.53 (3.05-6.01)
50-59	1,433	0.21 (-0.03-0.45)	0.49 (0.13-0.85)	1.47 (0.84-2.09)	2.23 (1.47-3.00)	3.58 (2.61-4.54)	6.30 (5.00-7.61)
60-69	614	0.33 (-0.12-0.78)	1.47 (0.52-2.42)	2.61 (1.35-3.87)	4.24 (2.64-5.83)	6.69 (4.71-8.67)	14.63 (11.64-17.62)
70-79	21	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
>80	4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

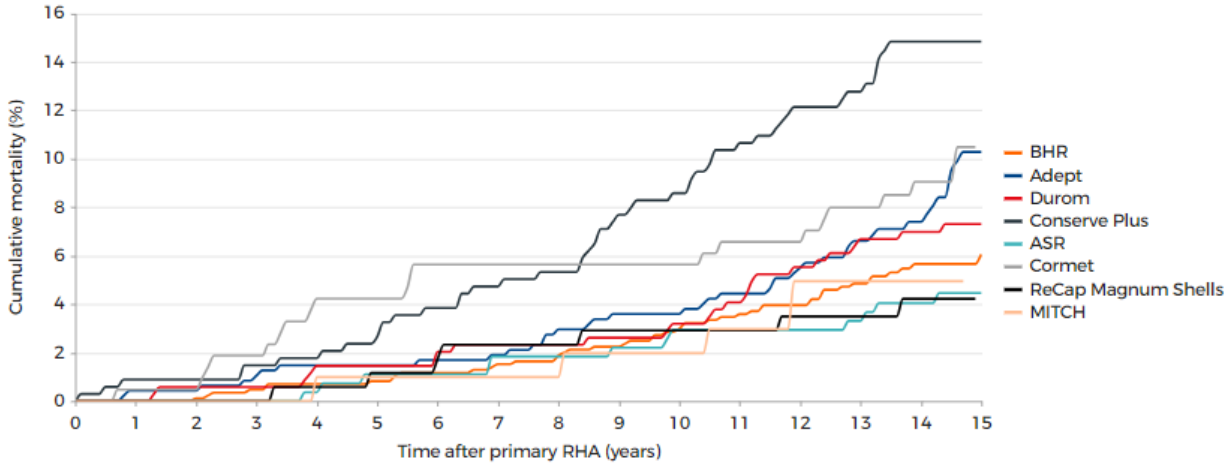
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

RHA: resurfacing hip arthroplasty; CI: confidence interval.

© LROI 2024 | H108B

RHA by type of prosthesis component

FIGURE Cumulative mortality percentage (95% CI) of patients with a resurfacing hip arthroplasty by type resurfacing in the Netherlands in 2007-2023 (n=2,767)



© LROI 2024 | H109A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
BHR	854	0.00 (0.00-0.00)	0.47 (0.01-0.93)	0.82 (0.21-1.42)	1.41 (0.62-2.20)	2.86 (1.73-3.98)	5.66 (4.04-7.27)
Adept	473	0.42 (0.00-1.01)	0.85 (0.02-1.67)	1.48 (0.39-2.57)	1.90 (0.67-3.13)	3.59 (1.92-5.27)	10.28 (7.23-13.33)
Durom	344	0.00 (0.00-0.00)	0.58 (0.00-1.38)	1.45 (0.19-2.72)	2.33 (0.73-3.92)	3.20 (1.34-5.06)	7.30 (4.55-10.06)
Conserve Plus	338	0.89 (0.00-1.89)	1.48 (0.19-2.77)	2.37 (0.75-3.99)	4.73 (2.47-7.00)	8.58 (5.59-11.57)	14.84 (10.99-18.68)
ASR	272	0.00 (0.00-0.00)	0.00 (0.00-0.00)	1.10 (0.00-2.34)	1.84 (0.24-3.43)	2.94 (0.93-4.95)	4.46 (1.99-6.92)
Cormet	213	0.47 (0.00-1.39)	1.88 (0.05-3.70)	4.23 (1.52-6.93)	5.63 (2.54-8.73)	5.63 (2.54-8.73)	10.48 (6.18-14.78)
ReCap Magnum Shells	172	0.00 (0.00-0.00)	0.00 (0.00-0.00)	1.16 (0.00-2.76)	2.33 (0.07-4.58)	2.91 (0.40-5.42)	4.22 (1.15-7.30)
MITCH	101	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.99 (0.00-2.92)	0.99 (0.00-2.92)	1.98 (0.00-4.70)	n.a.

Please note: n.a. if <50 cases were at risk.

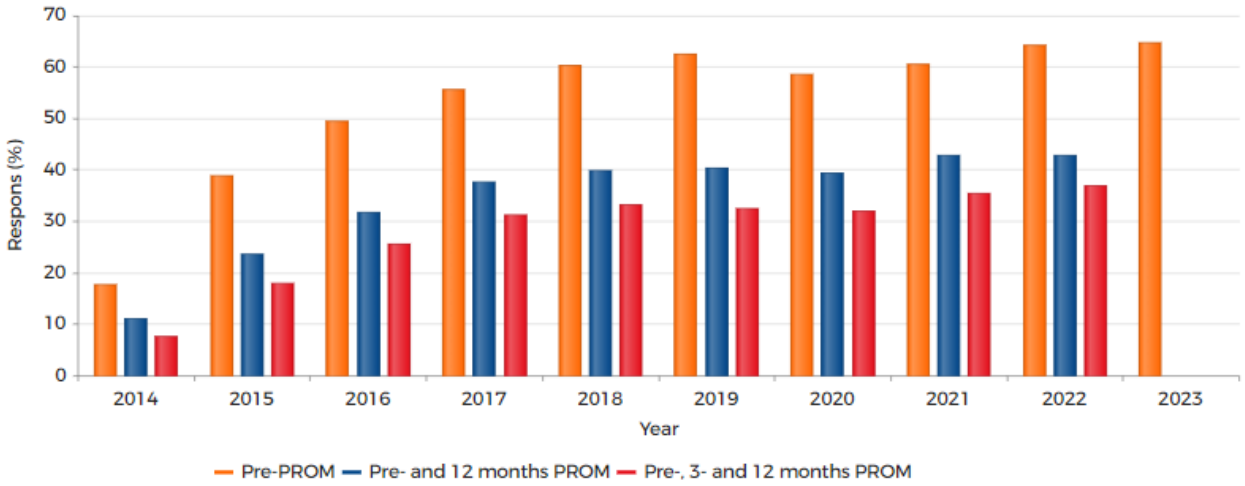
RHA: resurfacing hip arthroplasty; CI: confidence interval.

© LROI 2024 | H109B

PROMs

Response THA for osteoarhtritis

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2023



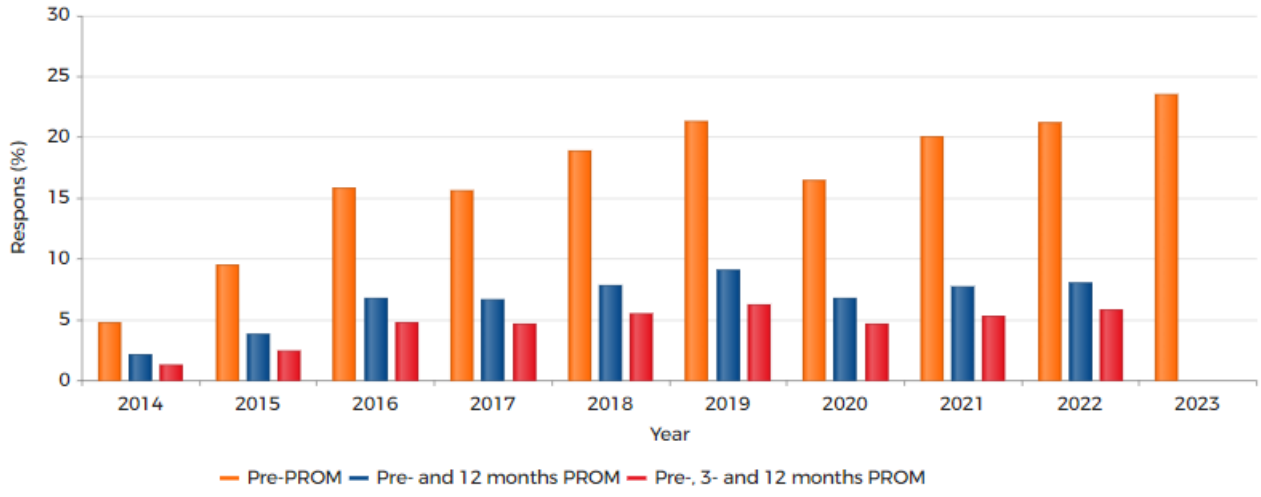
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Pre-PROM	17.80	38.81	49.55	55.53	60.32	62.57	58.61	60.42	64.26	64.82
Pre- and 12 months PROM	11.02	23.59	31.81	37.72	39.81	40.28	39.41	42.71	42.81	n.a.
Pre-, 3- and 12 months PROM	7.58	18.01	25.51	31.17	33.11	32.55	31.87	35.33	36.93	n.a.
Total THAs for osteoarthritis (n)	**24,196**	**24,837**	**25,374**	**26,175**	**27,495**	**28,557**	**23,045**	**26,906**	**31,328**	**31,288**

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2023.

THA: total hip arthroplasty; PROM: patient reported outcome measure.

Response hip revision

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a hip revision arthroplasty in the Netherlands in 2014-2023



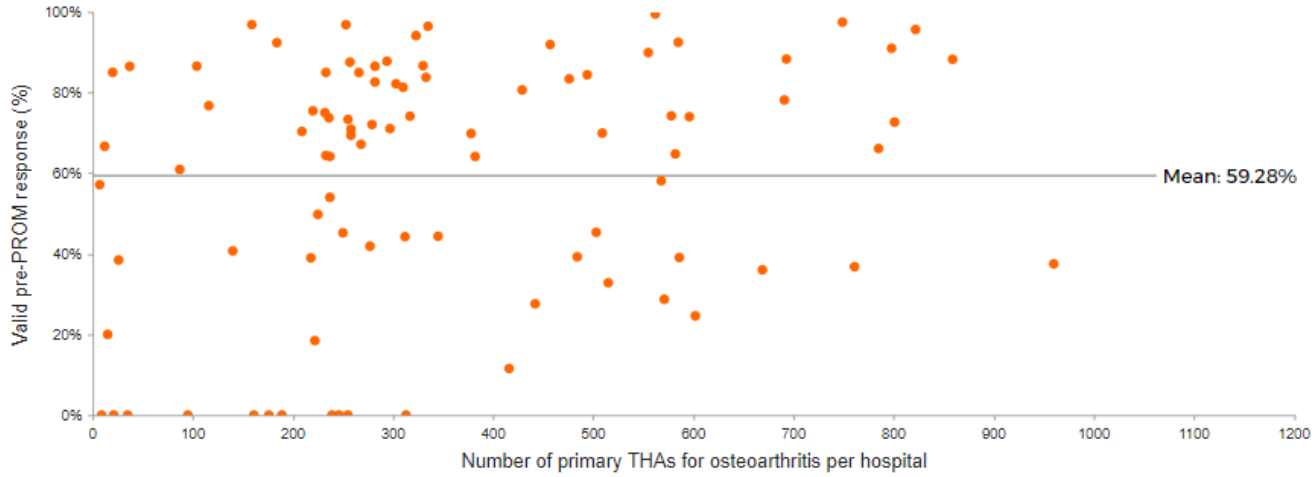
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Pre-PROM	4.74	9.53	15.83	15.58	18.92	21.27	16.41	20.08	21.23	23.52
Pre- and 12 months PROM	2.09	3.83	6.78	6.61	7.85	9.07	6.72	7.66	8.06	n.a.
Pre-, 3- and 12 months PROM	1.27	2.43	4.78	4.62	5.52	6.27	4.65	5.32	5.79	n.a.
Total hip revision arthroplasties (n)	**3,545**	**3,789**	**3,804**	**3,768**	**3,731**	**3,747**	**3,376**	**3,461**	**3,524**	**3,877**

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2023.

PROM: patient reported outcome measure.

Response pre-PROM per hospital (volume)

FIGURE Scatterplot of pre-operative response percentage of patients who underwent a primary THA for osteoarthritis per hospital in the Netherlands in 2023



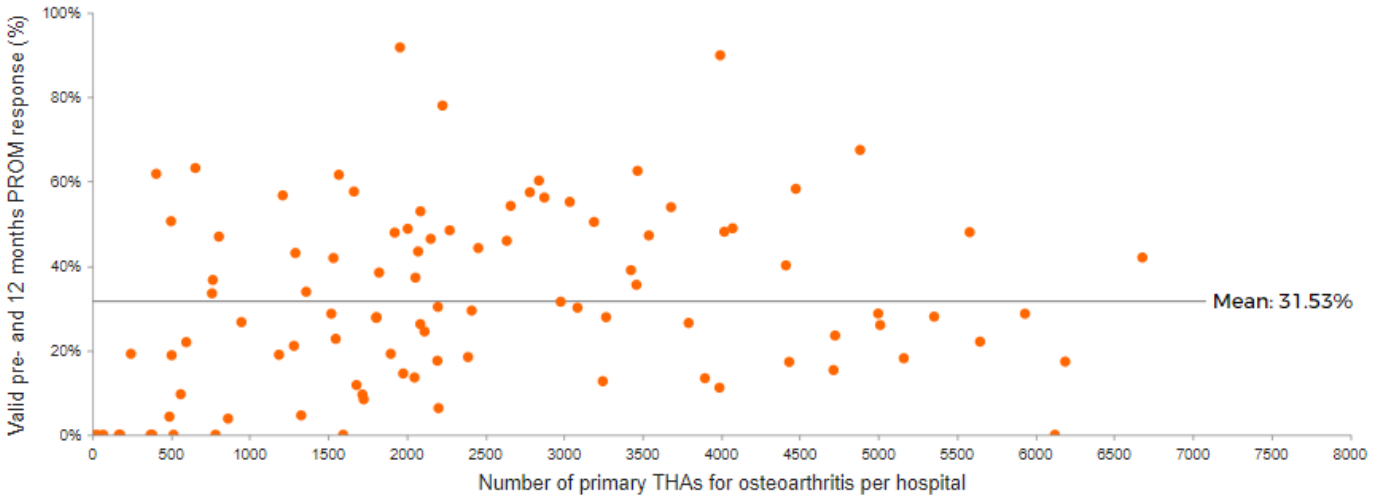
THA: total hip arthroplasty; PROM: patient reported outcome measure.

© LROI 2024 | H112

The mean pre-operative response rate is 59.3% in the Netherlands in 2023.
55 out of 90 (61%) hospitals scored above the national mean.

Response PROM trajectory per hospital (volume)

FIGURE Scatterplot of PROM trajectory (pre-operative and 12 months postoperative) response percentage of patients who underwent a primary THA for osteoarthritis per hospital in the Netherlands in 2014-2022



Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2023.
THA: total hip arthroplasty; PROM: patient reported outcome measure.

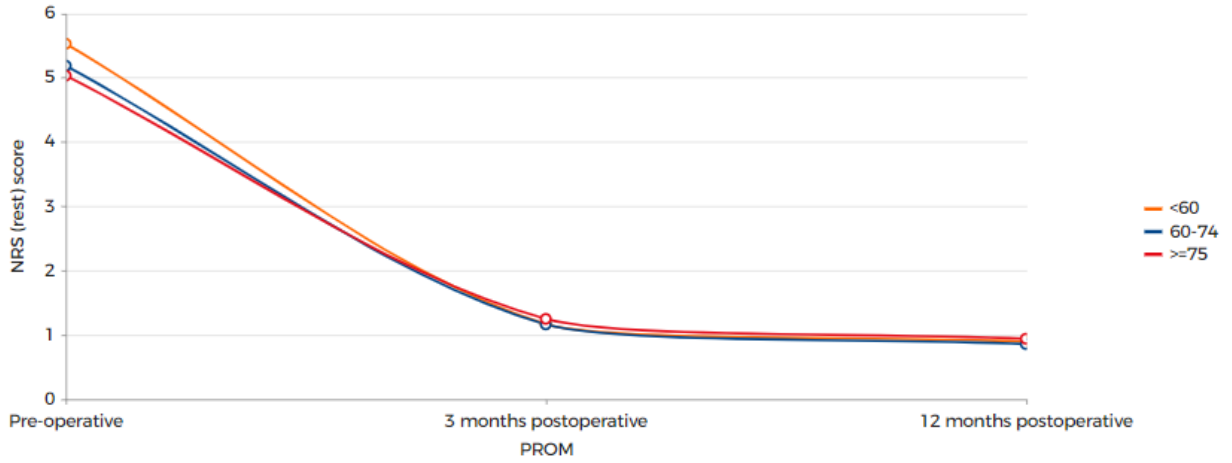
© LROI 2024 | H113

The mean PROM trajectory response rate was 31.5% in the Netherlands between 2014-2022.
44 out of 98 (45%) hospitals scored above the national mean.

Mean scores

NRS (rest)

FIGURE Mean (95% CI) 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 2014-2022



© LROI 2024 | H114A

NRS (rest) score		Pre-operative	3 months postoperative	12 months postoperative
Age category	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
<60	10,263	5.53 (5.48-5.57)	1.17 (1.13-1.20)	0.90 (0.86-0.93)
60-74	38,486	5.19 (5.16-5.21)	1.16 (1.15-1.18)	0.86 (0.84-0.88)
>=75	18,999	5.03 (4.99-5.07)	1.25 (1.22-1.28)	0.94 (0.91-0.97)
Total	67,752	5.19 (5.18-5.21)	1.19 (1.17-1.20)	0.89 (0.87-0.90)

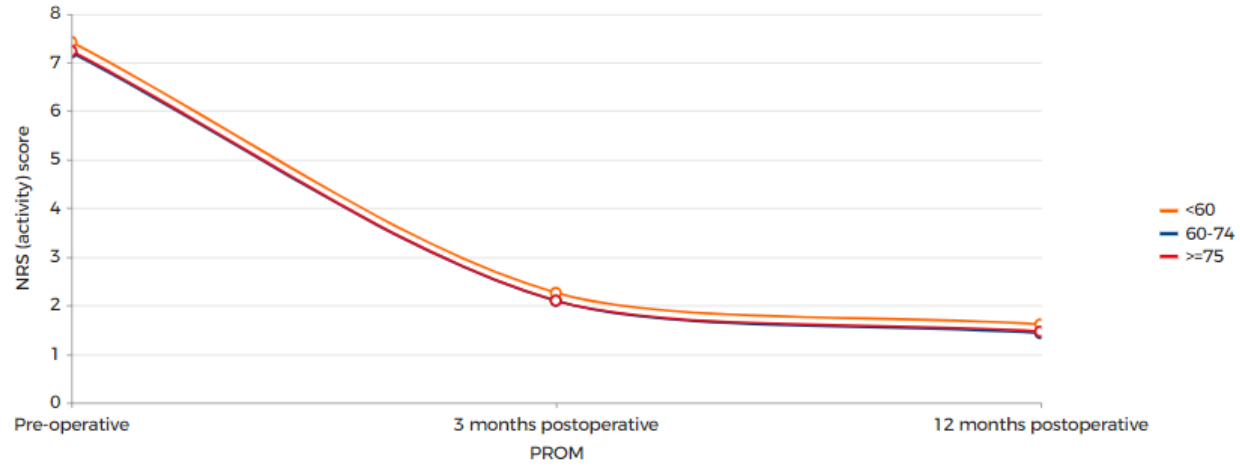
THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H114B

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 (95% CI) 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 2014-2022



© LROI 2024 | H115A

NRS (activity) score		Pre-operative	3 months postoperative	12 months postoperative
Age category	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
<60	10,263	7.42 (7.38-7.45)	2.26 (2.22-2.30)	1.61 (1.57-1.65)
60-74	38,486	7.20 (7.18-7.22)	2.09 (2.07-2.12)	1.43 (1.41-1.45)
>=75	18,999	7.23 (7.20-7.26)	2.10 (2.06-2.13)	1.46 (1.43-1.50)
Total	67,752	7.24 (7.23-7.26)	2.12 (2.10-2.14)	1.47 (1.45-1.48)

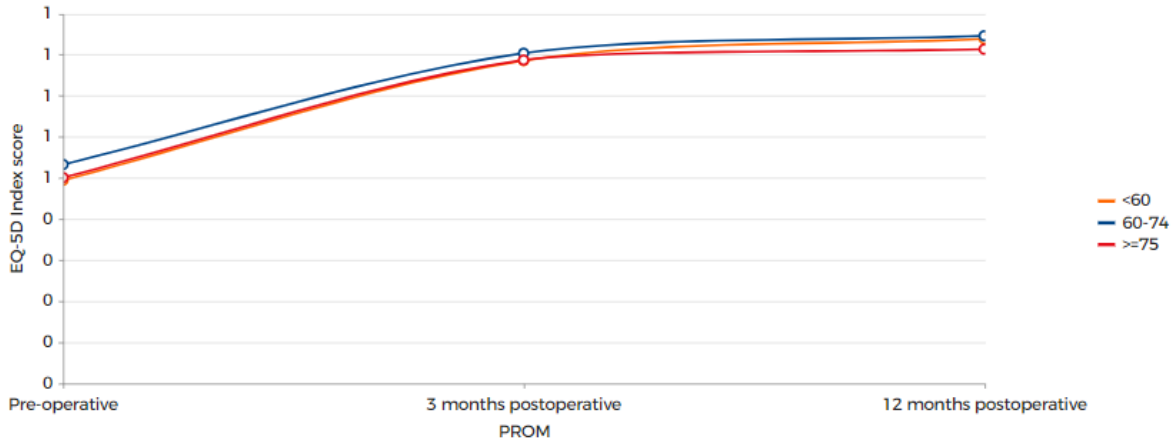
THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H115B

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 (95% CI) 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 2014-2022



© LROI 2024 | H116A

EQ-5D Index score		Pre-operative	3 months postoperative	12 months postoperative
Age category	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
<60	10,263	0.49 (0.49-0.50)	0.79 (0.78-0.79)	0.84 (0.84-0.84)
60-74	38,486	0.53 (0.53-0.54)	0.80 (0.80-0.81)	0.85 (0.84-0.85)
>=75	18,999	0.50 (0.50-0.50)	0.79 (0.78-0.79)	0.81 (0.81-0.82)
Total	67,752	0.52 (0.52-0.52)	0.80 (0.79-0.80)	0.84 (0.83-0.84)

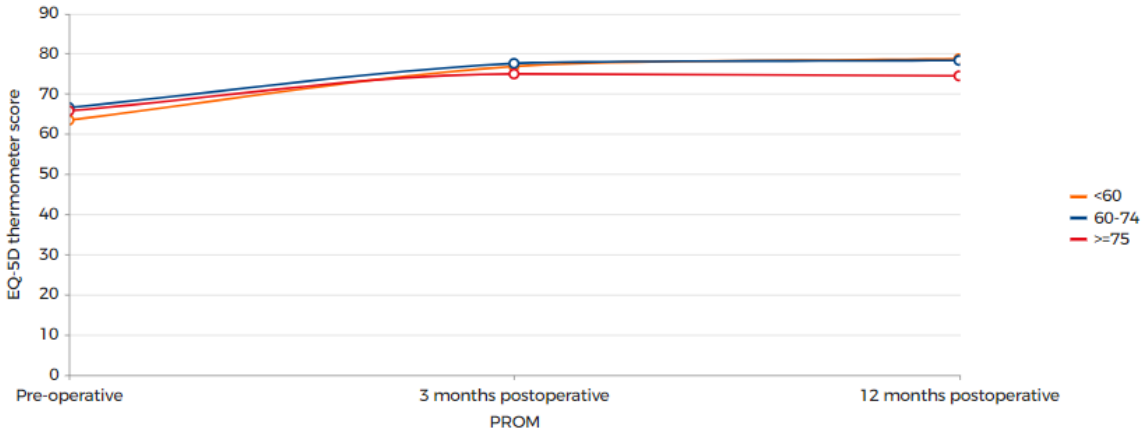
THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H116B

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 (95% CI) 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 2014-2022



© LROI 2024 | H117A

EQ-5D thermometer score		Pre-operative	3 months postoperative	12 months postoperative
Age category	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
<60	10,263	63.45 (63.06-63.85)	76.82 (76.47-77.17)	78.72 (78.36-79.08)
60-74	38,486	66.57 (66.37-66.77)	77.57 (77.37-77.76)	78.32 (78.12-78.52)
>=75	18,999	65.76 (65.47-66.06)	74.94 (74.65-75.23)	74.46 (74.16-74.76)
Total	67,752	65.87 (65.72-66.02)	76.72 (76.58-76.87)	77.31 (77.16-77.46)

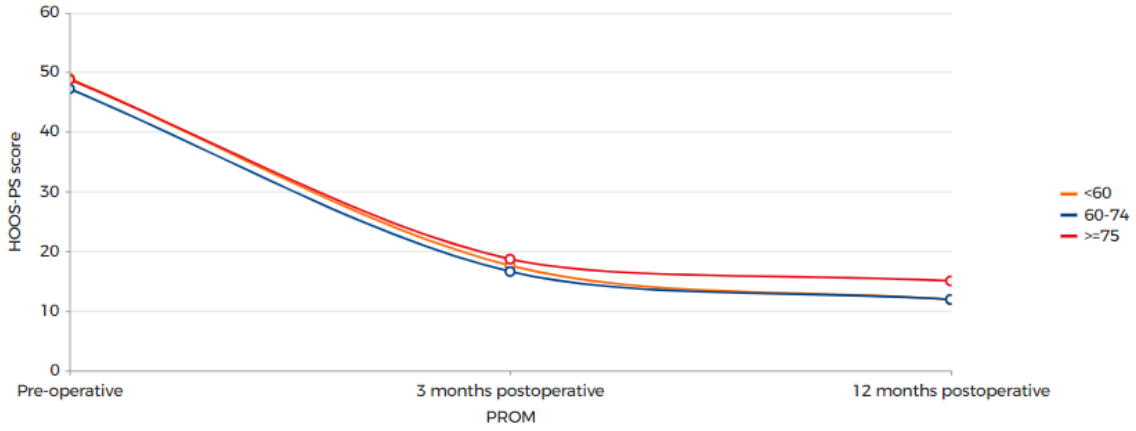
THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | H117B

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 (95% CI) 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 2014-2022



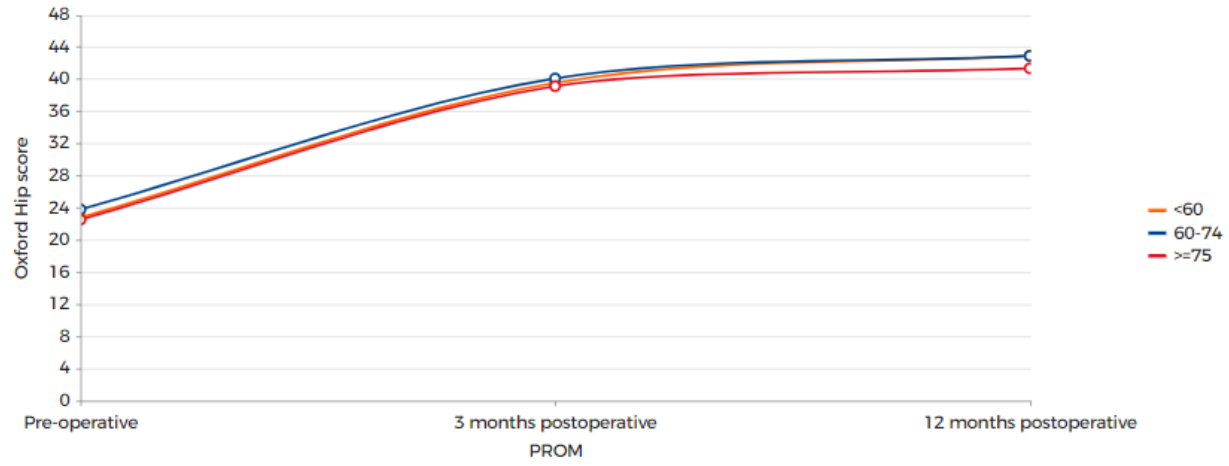
HOOS-PS score		Pre-operative	3 months postoperative	12 months postoperative
Age category	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
<60	10,263	48.96 (48.63-49.29)	17.61 (17.33-17.89)	11.86 (11.59-12.13)
60-74	38,486	47.22 (47.04-47.39)	16.60 (16.46-16.74)	11.93 (11.79-12.07)
>=75	18,999	48.77 (48.50-49.04)	18.67 (18.44-18.90)	15.03 (14.79-15.27)
Total	67,752	47.91 (47.77-48.04)	17.30 (17.19-17.42)	12.74 (12.62-12.85)

THA: total hip arthroplasty; CI: confidence interval.

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 (95% CI) 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 2014-2022



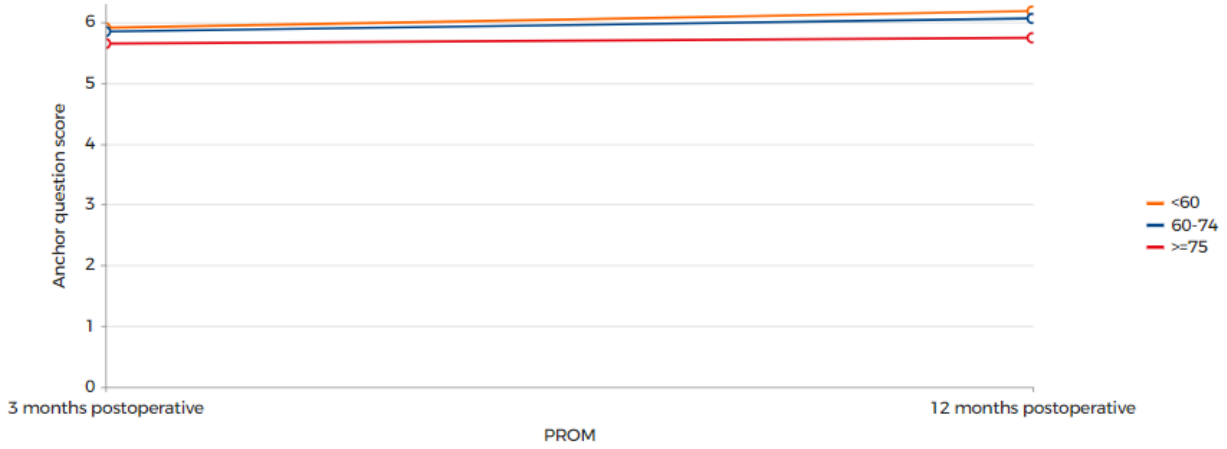
Oxford Hip score		Pre-operative	3 months postoperative	12 months postoperative
Age category	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
<60	10,263	22.79 (22.63-22.96)	39.54 (39.40-39.69)	42.89 (42.76-43.03)
60-74	38,486	23.80 (23.72-23.89)	40.08 (40.01-40.15)	42.90 (42.83-42.96)
>=75	18,999	22.53 (22.39-22.66)	39.13 (39.02-39.24)	41.35 (41.24-41.45)
Total	67,752	23.29 (23.23-23.36)	39.74 (39.68-39.79)	42.47 (42.41-42.52)

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.

Anchor question: Daily functioning

FIGURE Mean (95% CI) 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 2014-2022



Anchor question score		3 months postoperative	12 months postoperative
Age category	n	Mean (95% CI)	Mean (95% CI)
<60	10,263	5.91 (5.88-5.93)	6.18 (6.16-6.20)
60-74	38,486	5.84 (5.83-5.86)	6.06 (6.05-6.07)
>=75	18,999	5.65 (5.63-5.67)	5.74 (5.72-5.76)
Total	67,752	5.80 (5.79-5.81)	5.99 (5.98-6.00)

THA: total hip arthroplasty; CI: confidence interval.

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

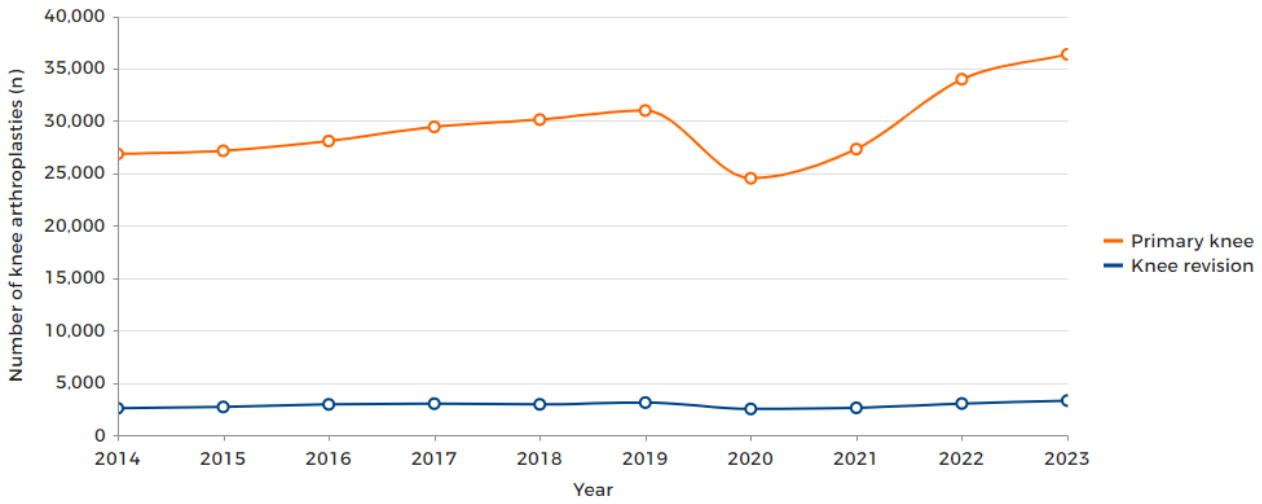
TABLE Number of registered knee arthroplasties per year of surgery (2007-2023) in the LROI in April 2024

Year of surgery	Total knee arthroplasty	Unicondylar knee arthroplasty	Patellofemoral knee arthroplasty	Unknown/ missing	Revision arthroplasty	Total
2007	7,034	779	47	878	595	**9,333**
2008	11,747	1,221	92	405	908	**14,373**
2009	16,792	1,547	139	175	1,300	**19,953**
2010	18,508	1,716	143	241	1,624	**22,232**
2011	19,521	1,586	116	208	1,793	**23,224**
2012	21,727	1,578	171	254	2,117	**25,847**
2013	22,301	1,805	135	207	2,309	**26,757**
2014	24,242	2,364	116	118	2,556	**29,396**
2015	24,244	2,693	156	48	2,686	**29,827**
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	4,072	183	29	2,930	**33,049**
2019	25,885	4,888	175	43	3,101	**34,092**
2020	19,615	4,725	158	22	2,496	**27,016**
2021	21,517	5,666	108	13	2,602	**29,906**
2022	26,837	6,995	116	26	3,013	**36,987**
2023	28,286	7,903	126	36	3,292	**39,643**
Total (n)	**364,530**	**56,147**	**2,293**	**2,846**	**39,245**	**465,061**

Please note: The LROI is nearly complete as of 2010.

Type of procedures

FIGURE Number of primary knee arthroplasties and knee revision arthroplasties registered in the LROI in the Netherlands in 2014-2023

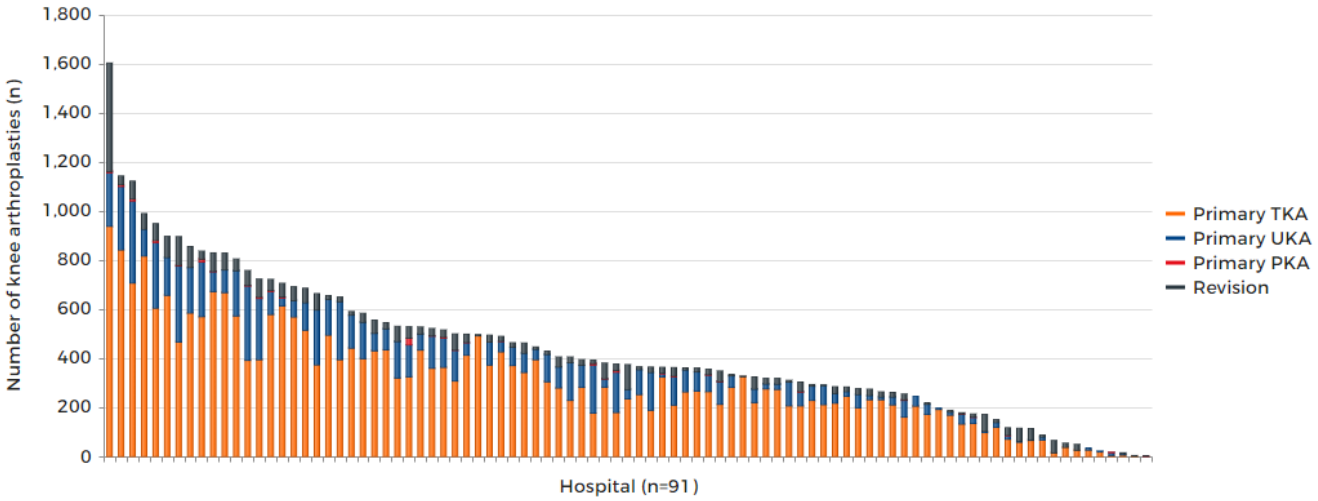


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Primary knee	26,840	27,141	28,075	29,428	30,119	30,991	24,520	27,304	33,974	36,351	**294,743**
Knee revision	2,556	2,686	2,926	2,997	2,930	3,101	2,496	2,602	3,013	3,292	**28,599**
Total (n)	**29,396**	**29,827**	**31,001**	**32,425**	**33,049**	**34,092**	**27,016**	**29,906**	**36,987**	**39,643**	**323,342**

Out of 36,351 primary knee arthroplasties that were performed in 2023, 2.3% (n=1,181) was performed bilaterally.

Type of procedure per hospital

FIGURE Number of primary knee arthroplasties and knee revision arthroplasties per hospital in the Netherlands in 2023 (n=39,607)

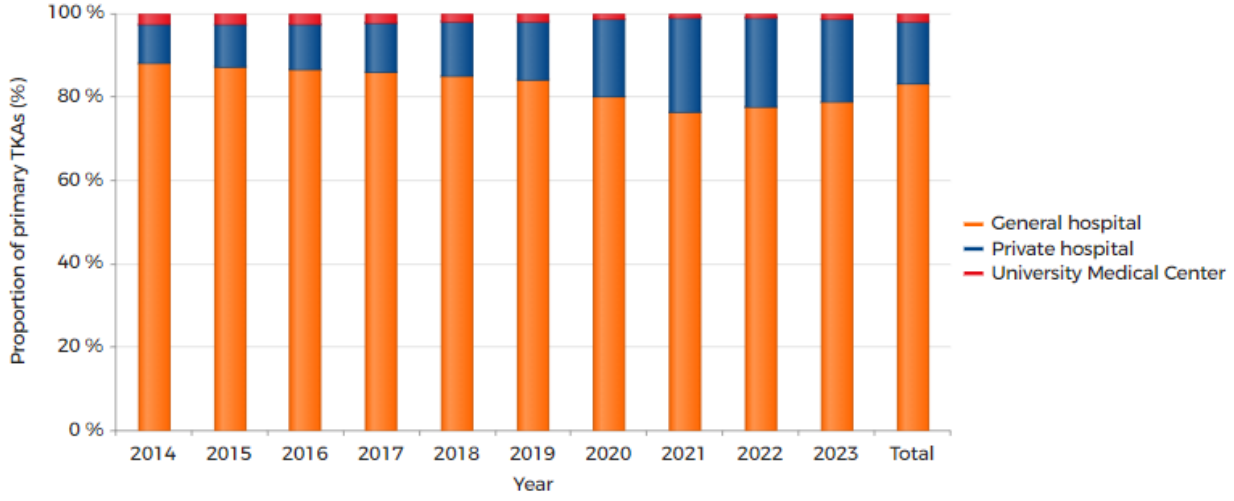


TKA: total knee arthroplasty; UKA: unicondylar knee arthroplasty; PKA: patellofemoral knee arthroplasty

© LROI 2024 | K003

Type of hospital - primary

FIGURE Trend (proportion [%] per year) in type of hospital performing primary total knee arthroplasties in the Netherlands in 2014-2023



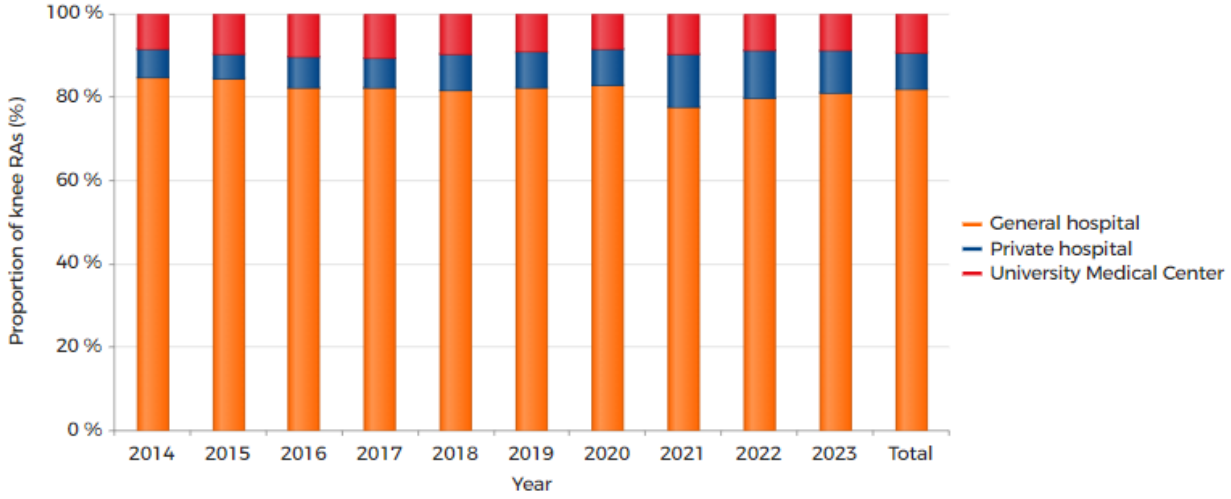
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
General hospital	88.03	87.08	86.67	86.05	85.07	84.08	80.15	76.50	77.45	78.72	83.02
Private hospital	9.19	10.25	10.71	11.67	13.05	13.96	18.41	22.44	21.37	19.99	15.05
University Medical Center	2.78	2.68	2.62	2.28	1.88	1.96	1.44	1.06	1.19	1.29	1.92
Total (n)	**24,242**	**24,244**	**24,884**	**25,555**	**25,835**	**25,885**	**19,615**	**21,517**	**26,837**	**28,286**	**246,900**

Please note: The number of general hospitals that performed primary total knee arthroplasties decreased from 69 to 63 between 2014-2023; the number of private hospitals increased from 13 to 20 and the number of University Medical Centers remained 7 between 2014-2023.

© LROI 2024 | K004

Type of hospital - revision

FIGURE Trend (proportion [%] per year) in type of hospital performing primary total knee arthroplasties in the Netherlands in 2014-2023

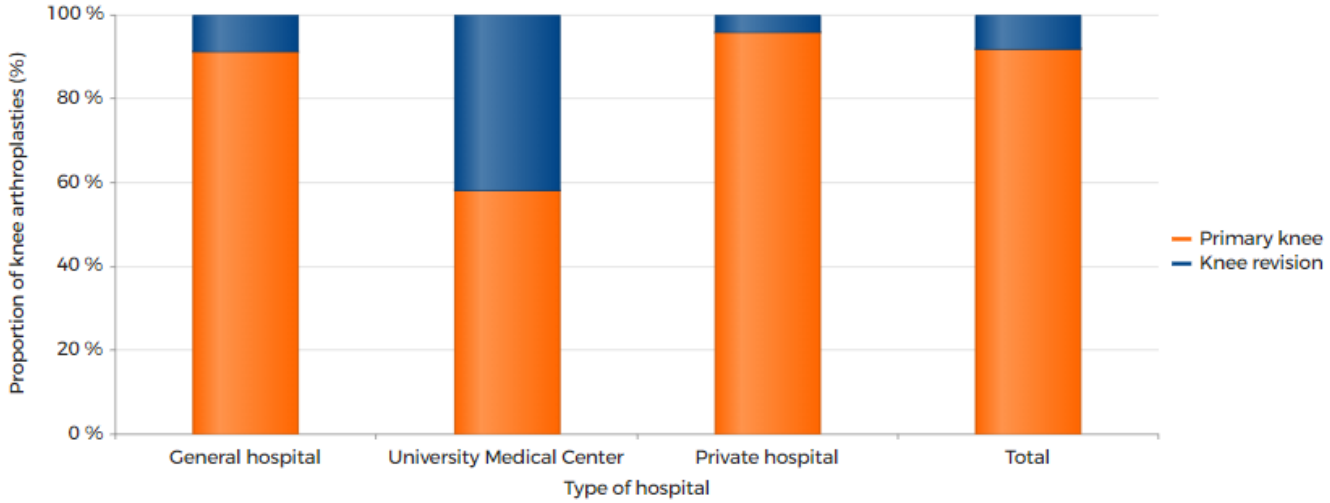


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
General hospital	84.74	84.51	82.19	82.15	81.54	82.36	82.93	77.67	79.89	80.86	81.84
Private hospital	6.69	5.81	7.38	7.14	8.81	8.51	8.49	12.45	11.18	10.48	8.73
University Medical Center	8.57	9.68	10.42	10.71	9.66	9.13	8.57	9.88	8.93	8.66	9.43
Total (n)	**2,556**	**2,686**	**2,926**	**2,997**	**2,930**	**3,101**	**2,496**	**2,602**	**3,013**	**3,292**	**28,599**

Please note: The number of general hospitals that performed knee revision arthroplasties decreased from 68 to 62 between 2014-2023; the number of private hospitals increased from 10 to 17 and the number of University Medical Centers remained 7 between 2014-2023.

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 2023



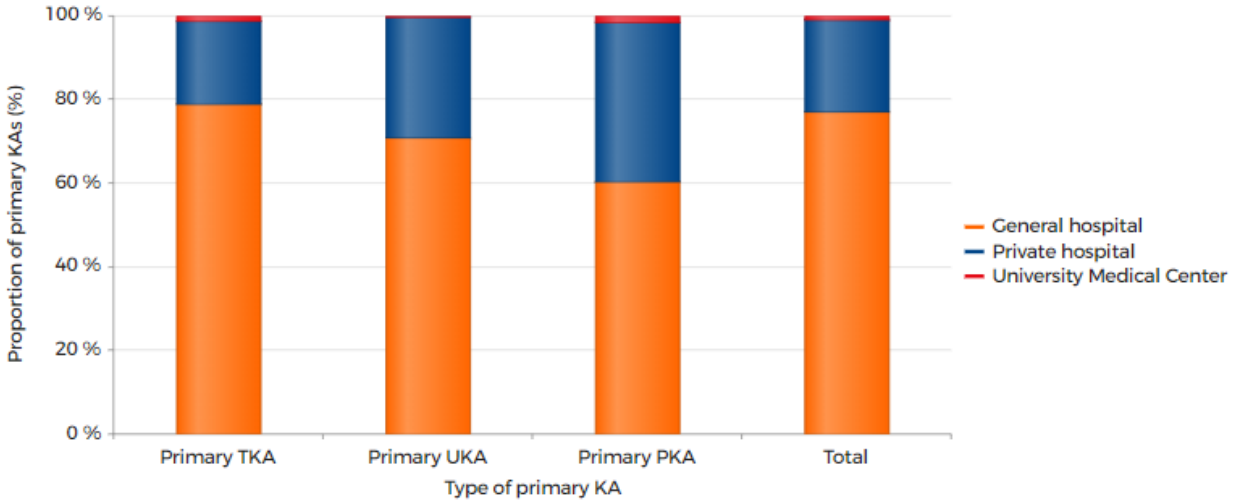
	General hospital	University Medical Center	Private hospital	Total
Primary knee	91.31	58.15	95.86	91.70
Knee revision	8.69	41.85	4.14	8.30
Total (n)	**30,621**	**681**	**8,341**	**39,643**

Please note: in 2023, 63 general hospitals, 7 UMCs and 21 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 2023



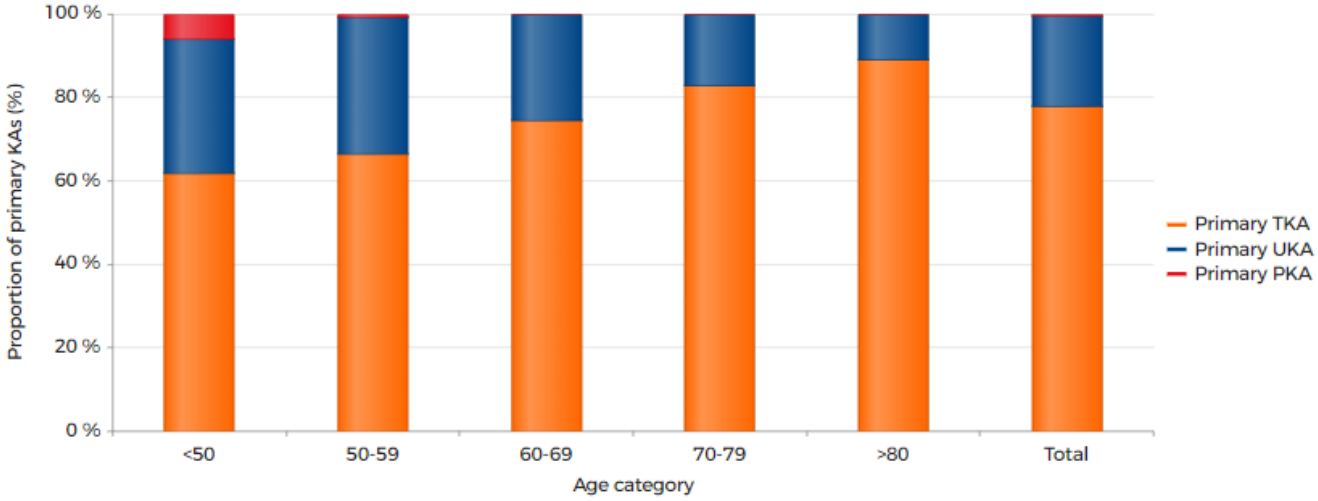
	Primary TKA	Primary UKA	Primary PKA	Total
General hospital	78.72	70.91	60.32	76.96
Private hospital	19.99	28.77	38.10	21.96
University Medical Center	1.29	0.32	1.59	1.08
Total (n)	**28,286**	**7,903**	**126**	**36,315**

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.

© LROI 2024 | K007

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 2023



	<50	50-59	60-69	70-79	>80	Total
Primary TKA	61.67	66.58	74.44	82.72	88.87	77.89
Primary UKA	32.30	32.60	25.33	17.14	11.05	21.76
Primary PKA	6.03	0.82	0.23	0.14	0.08	0.35
Total (n)	**514**	**5,362**	**12,277**	**14,323**	**3,838**	**36,314**

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

© LROI 2024 | K008

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 2023

	TKA	UKA	PFA	Total
N(%)	**28,286 (77.8)**	**7,903 (21.8)**	**126 (0.4)**	**36,351**
Mean age (years) (SD)	69.6 (8.8)	66 (8.6)	57.4 (11.2)	68.8 (8.9)
Age (years) (%)				
<50	1	2	25	1
50-59	13	22	35	15
60-69	32	39	22	34
70-79	42	31	16	39
>80	12	5	2	11
Gender (%)				
Men	39	46	23	40
Women	61	54	77	60
ASA score (%)				
ASA I	9	13	19	10
ASA II	63	67	69	64
ASA III-IV	28	20	12	26
Type of hospital (%)				
General	79	71	60	77
UMC	1	0	2	1
Private	20	29	38	22
Diagnosis (%)				
Osteoarthritis	97	98	98	97
Post-traumatic	1	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	45	43	38
B1 Both knee joints affected	36	33	40	35
B2 Contralateral knee with a TKA	24	20	16	23
C Multiple joints affected or chronic disease that affects quality of life	4	2	1	4
Mean BMI (kg/m) (SD)	29.5 (5.0)	29.1 (4.4)	28.7 (4.0)	29.4 (4.8)
Body Mass Index (kg/m) (%)				
Underweight (<=18.5)	0	0	0	0
Normal weight (>18.5-25)	19	18	16	19
Overweight (>25-30)	41	43	49	42
Obesity (>30-40)	36	35	33	37
Morbid obesity (>40)	3	1	1	3
Smoking (%)				
No	92	91	88	93
Yes	7	8	11	7

Total contains 36 (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 2023

	Osteoarthritis	Post-traumatic	Rheumatoid arthritis	Osteonecrosis	Other	Total
N(%)	**35,211 (96.8)**	**412 (1.2)**	**223 (0.6)**	**195 (0.6)**	**310 (0.8)**	**36,351**
Mean age (years) (SD)	68.9 (8.8)	64.2 (11.1)	65.1 (11.6)	69 (10.7)	65.3 (14.0)	68.8 (8.9)
Age (years) (%)						
<50	1	8	9	3	9	1
50-59	15	26	18	17	18	15
60-69	34	34	29	27	30	34
70-79	40	22	39	37	30	39
>80	11	10	4	15	13	11
Gender (%)						
Men	40	43	26	41	39	40
Women	60	57	74	59	61	60
ASA score (%)						
ASA I	10	13	1	9	6	10
ASA II	64	64	70	63	55	64
ASA III-IV	26	23	29	28	28	26
Type of hospital (%)						
General	77	69	87	79	62	77
UMC	1	8	4	4	15	1
Private	22	23	8	17	23	22
Charnley-score (%)						
A One knee joint affected	37	75	20	73	44	38
B1 Both knee joints affected	35	14	33	14	20	35
B2 Contralateral knee with a TKA	23	7	23	10	9	23
C Multiple joints affected or chronic disease that affects quality of life	4	5	24	3	5	4
Mean BMI (kg/m) (SD)	29.4 (4.8)	28 (4.8)	28.1 (5.5)	27.8 (4.5)	28.8 (5.2)	29.4 (4.8)
Body Mass Index (kg/m) (%)						
Underweight (<=18.5)	0	0	1	1	1	0
Normal weight (>18.5-25)	18	30	29	29	19	19
Overweight (>25-30)	41	41	39	43	30	42
Obesity (>30-40)	36	27	27	26	29	37
Morbid obesity (>40)	3	1	2	1	2	3
Smoking (%)						
No	92	90	91	89	73	93
Yes	7	9	9	10	14	7

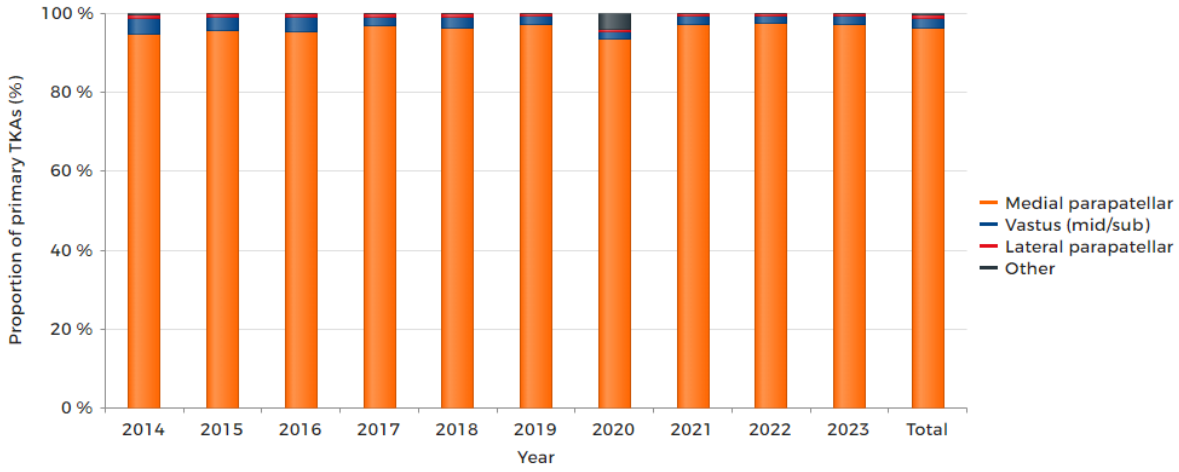
Please note: diagnosis 'Other' (310: 1%) includes other (59), inflammatory arthritis (55), fracture (acute) (19), tumour (metastasis) (4), tumour (primary) (22) and 151 primary knee arthroplasties where the diagnosis was not registered.
General: general hospital; UMC: university medical centre; Private: 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 2014-2023

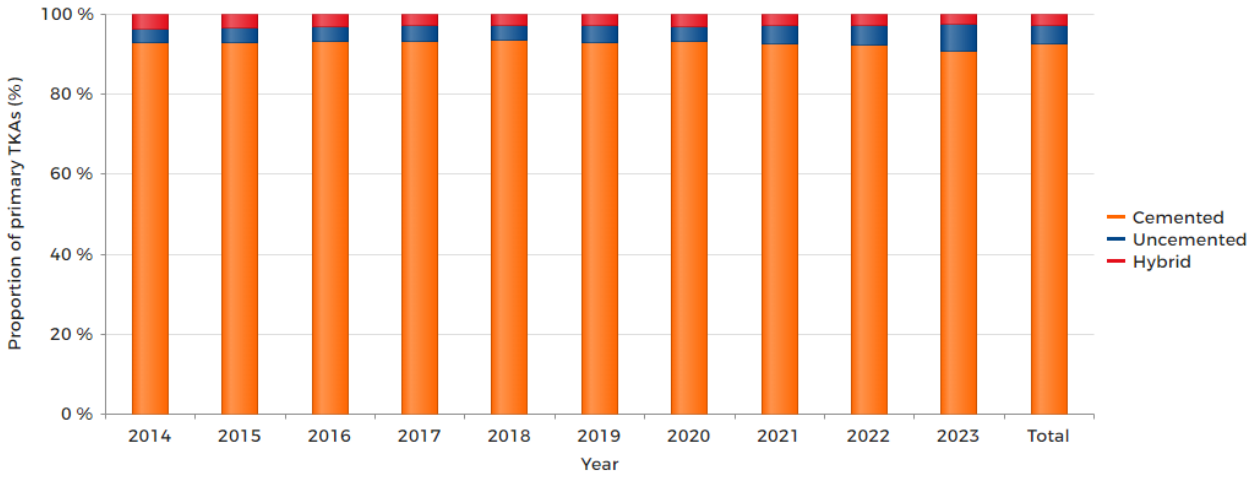


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Medial parapatellar	94.68	95.62	95.54	96.85	96.31	97.31	93.50	97.25	97.45	97.18	96.25
Vastus (mid/sub)	4.17	3.38	3.52	2.17	2.76	2.16	1.95	2.10	2.01	2.26	2.65
Lateral parapatellar	0.96	0.96	0.86	0.86	0.84	0.46	0.51	0.59	0.42	0.45	0.69
Other	0.20	0.05	0.08	0.12	0.10	0.06	4.04	0.06	0.12	0.11	0.41
Total (n)	**24,099**	**24,157**	**24,864**	**25,551**	**25,831**	**25,834**	**19,560**	**21,444**	**26,773**	**28,226**	**246,339**

TKA: total knee arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary total knee arthroplasties in the Netherlands in 2014-2023



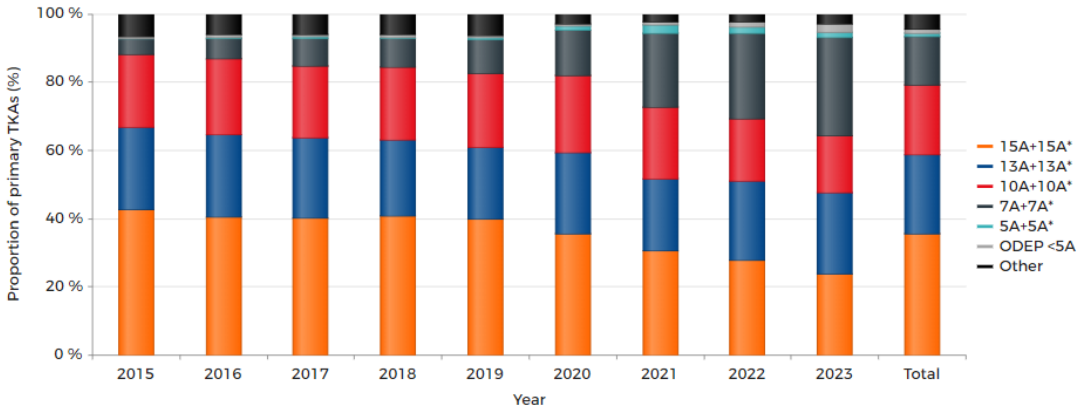
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cemented	92.86	93.04	93.29	93.38	93.57	92.83	93.29	92.49	92.27	90.94	92.76
Uncemented	3.37	3.59	3.64	3.94	3.71	4.48	3.62	4.81	5.12	6.74	4.35
Hybrid	3.77	3.37	3.07	2.68	2.72	2.69	3.09	2.70	2.61	2.32	2.89
Total (n)	**24,012**	**24,073**	**24,772**	**25,444**	**25,709**	**25,694**	**19,545**	**21,410**	**26,705**	**28,169**	**245,533**

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 2015-2023

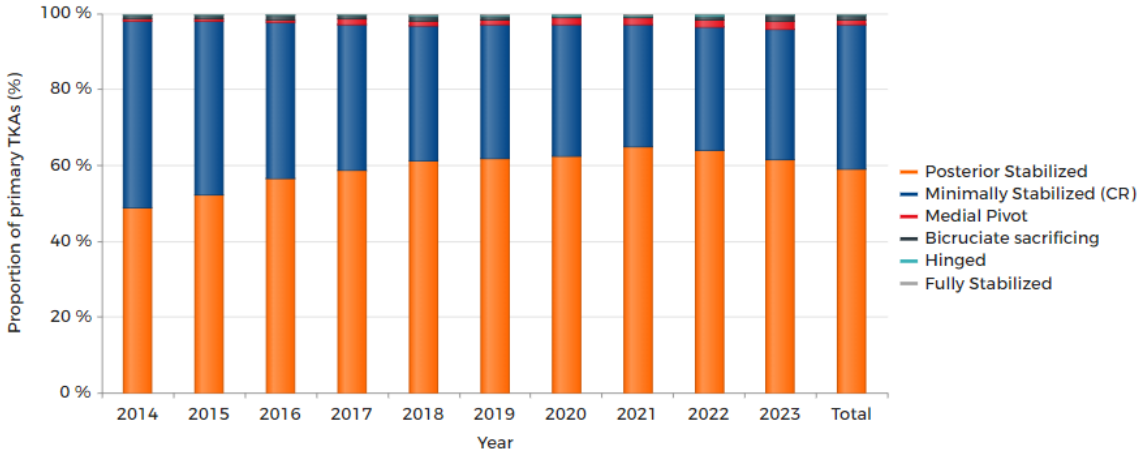


	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
15A+15A*	42.72	40.42	40.20	40.86	39.84	35.64	30.67	27.73	23.92	35.62
13A+13A*	24.05	24.18	23.51	22.35	21.19	23.70	21.10	23.19	23.60	22.99
10A+10A*	21.43	22.30	21.05	21.32	21.44	22.50	20.91	18.33	16.70	20.53
7A+7A*	4.47	5.92	7.94	8.22	10.01	13.22	21.76	25.14	28.76	14.16
5A+5A*	0.03	0.35	0.58	0.20	0.60	1.32	2.34	1.72	1.60	0.96
ODEP <5A	0.64	0.73	0.62	1.18	0.73	0.63	0.93	1.62	2.62	1.12
Other	6.66	6.10	6.09	5.87	6.21	2.99	2.30	2.28	2.80	4.62
Total (n)	**23,331**	**23,391**	**23,701**	**24,550**	**24,535**	**17,710**	**20,864**	**25,929**	**26,593**	**210,604**

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.
© LROI 2024 | K013

Type of femur component

FIGURE Trend (proportion [%] per year) in type of femur component in primary total knee arthroplasties in the Netherlands in 2014-2023

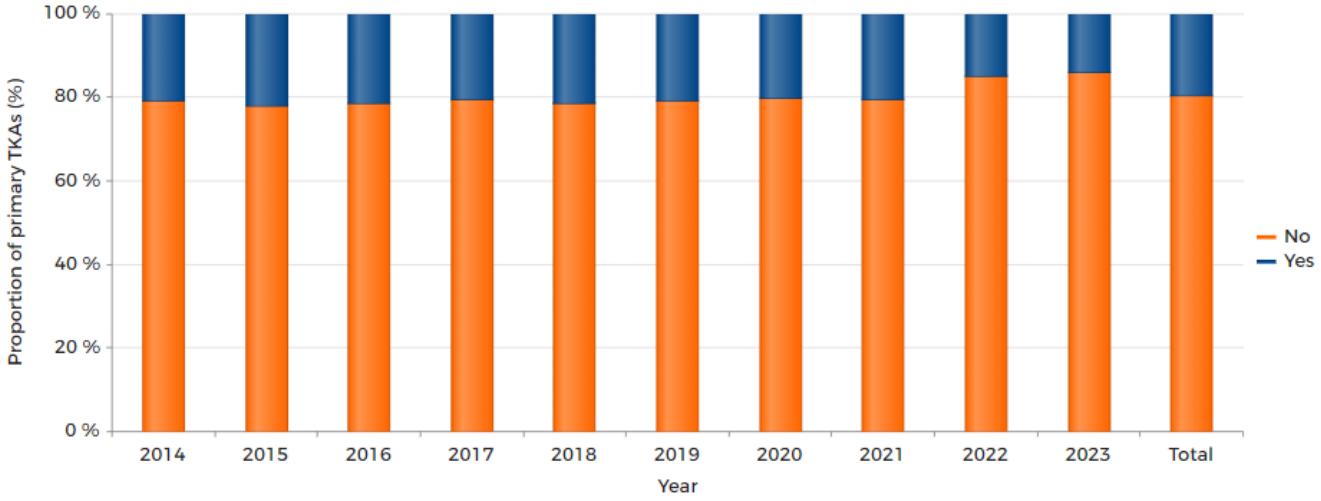


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Posterior Stabilized	48.86	52.16	56.65	58.74	61.18	61.68	62.52	64.90	64.06	61.55	59.18
Minimally Stabilized (CR)	49.21	45.90	40.97	38.20	35.60	35.32	34.65	32.19	32.46	34.32	37.90
Medial Pivot	0.42	0.59	0.82	1.54	1.24	1.44	1.64	1.67	1.76	2.07	1.32
Bicruciate sacrificing	1.04	0.88	1.06	0.97	1.33	0.77	0.50	0.51	1.08	1.47	0.99
Hinged	0.27	0.24	0.24	0.25	0.31	0.35	0.40	0.42	0.33	0.37	0.32
Fully Stabilized	0.19	0.23	0.26	0.30	0.34	0.44	0.30	0.31	0.31	0.22	0.29
Total (n)	**24,050**	**23,868**	**23,758**	**23,980**	**24,994**	**24,865**	**18,180**	**21,146**	**26,397**	**27,067**	**238,305**

TKA: total knee arthroplasty.
© LROI 2024 | K014

Implantation of patella

FIGURE Trend (proportion [%] per year) in implantation of patella in primary total knee arthroplasties in the Netherlands in 2014-2023



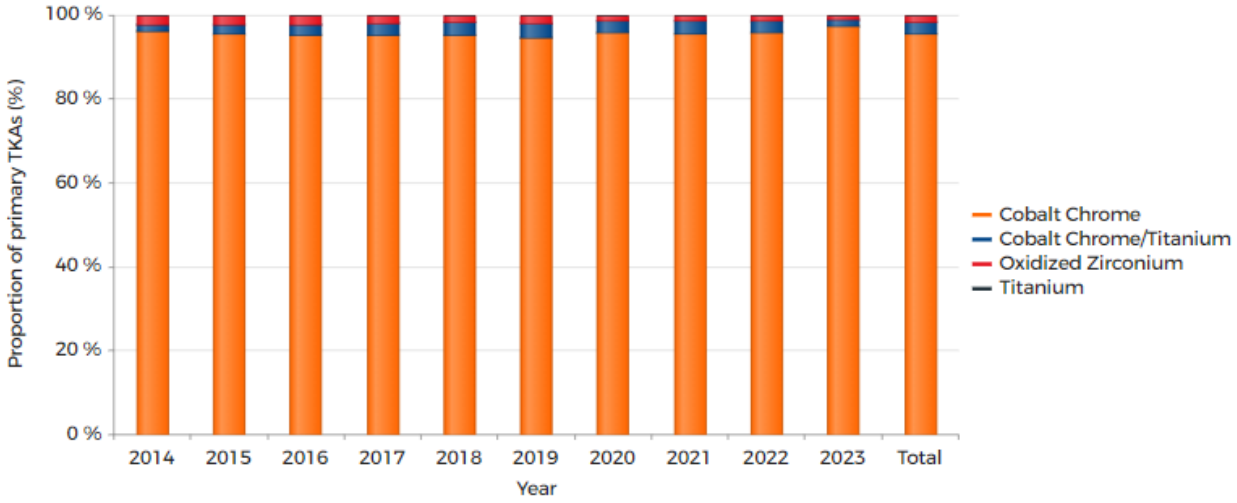
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
No	79.04	78.01	78.51	79.42	78.55	79.21	79.75	79.49	85.07	85.87	80.42
Yes	20.96	21.99	21.49	20.58	21.45	20.79	20.25	20.51	14.93	14.13	19.58
Total (n)	**24,155**	**24,080**	**24,711**	**25,334**	**25,661**	**25,651**	**19,340**	**21,361**	**26,646**	**28,056**	**244,995**

TKA: total knee arthroplasty.

Materials

Femur component

FIGURE Trend (proportion [%] per year) in femur material in primary total knee arthroplasties in the Netherlands in 2014-2023

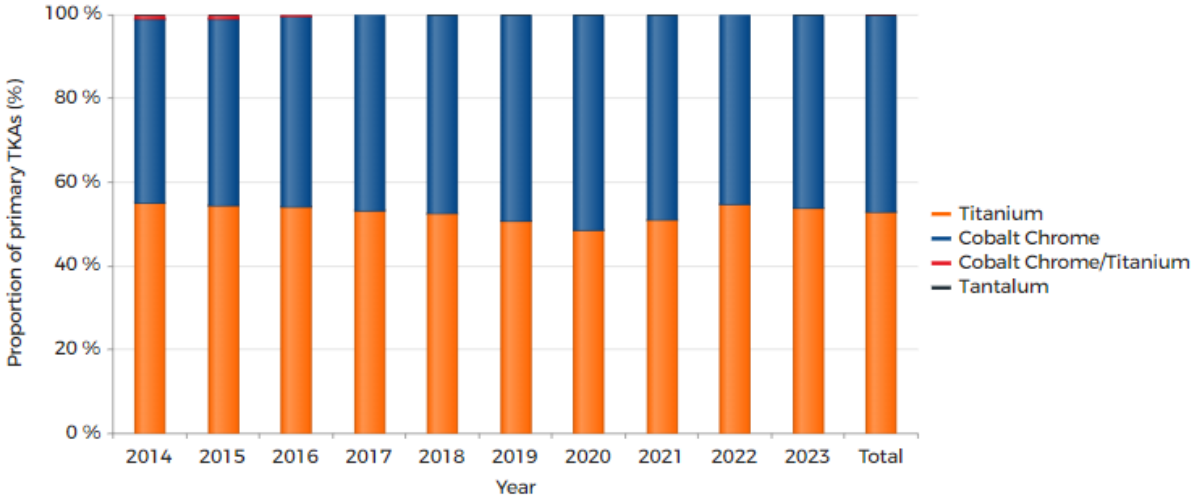


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cobalt Chrome	96.19	95.42	95.06	95.14	95.36	94.69	95.94	95.55	95.75	97.23	95.64
Cobalt Chrome/Titanium	1.44	2.21	2.60	2.72	2.96	3.27	2.70	2.91	2.77	1.58	2.50
Oxidized Zirconium	2.31	2.22	2.18	1.98	1.50	1.81	1.26	1.43	1.42	1.15	1.73
Titanium	0.06	0.16	0.16	0.15	0.18	0.24	0.10	0.11	0.06	0.04	0.13
Total (n)	**24,050**	**23,868**	**23,758**	**23,980**	**24,994**	**24,865**	**18,173**	**21,127**	**26,352**	**27,000**	**238,167**

TKA: total knee arthroplasty.

Tibia component

FIGURE Trend (proportion [%] per year) in tibia material in primary total knee arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Titanium	55.15	54.50	54.08	53.03	52.67	50.83	48.52	51.15	54.57	53.91	52.99
Cobalt Chrome	43.70	44.47	45.59	46.97	47.32	49.15	51.48	48.84	45.43	46.09	46.76
Cobalt Chrome/Titanium	1.14	1.03	0.34	0	0	0	0	0	0	0	0.25
Tantalum	0.01	0.00	0	0	0.02	0.02	0.01	0.00	0	0.00	0.01
Total (n)	**24,045**	**23,899**	**24,127**	**24,154**	**25,012**	**25,049**	**18,185**	**21,137**	**26,277**	**27,078**	**238,963**

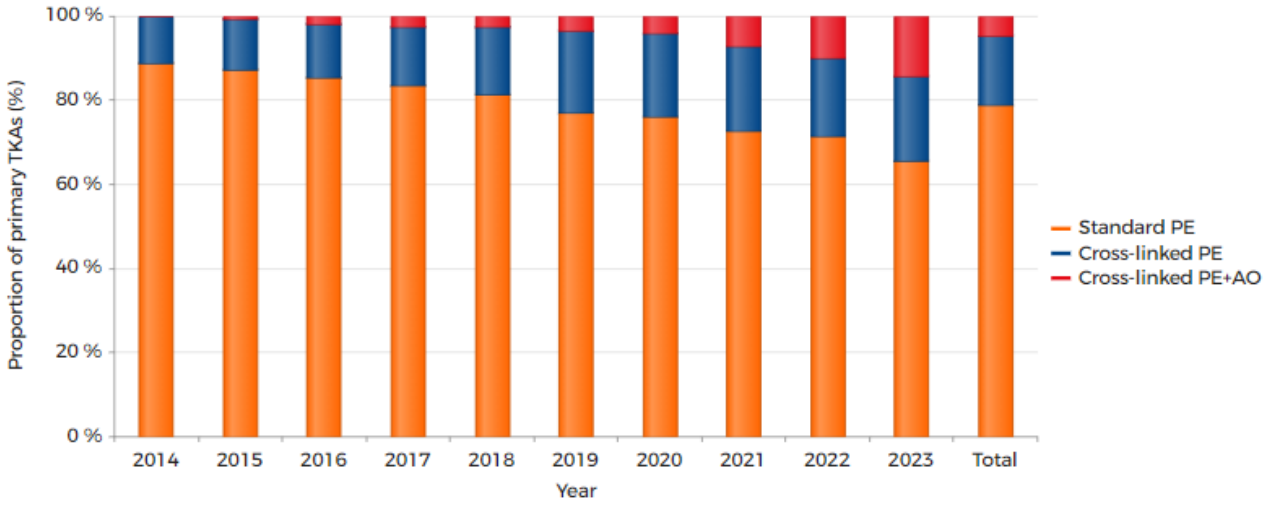
Please note: A standard PE tibia component was implanted in 1 (<0.00%) primary TKAs in 2014-2023.

TKA: total knee arthroplasty; PE:polyethylene.

© LROI 2024 | K017

Insert

FIGURE Trend (proportion [%] per year) in insert material in primary total knee arthroplasties in the Netherlands in 2014-2023



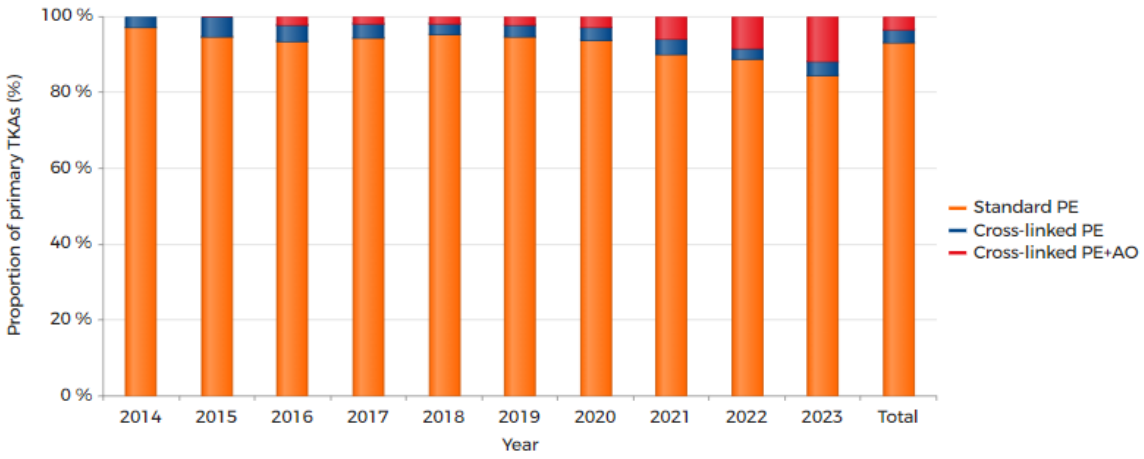
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Standard PE	88.65	87.07	85.23	83.55	81.24	77.04	76.00	72.55	71.47	65.41	78.72
Cross-linked PE	11.28	12.08	12.70	13.95	15.99	19.36	19.87	20.23	18.38	20.09	16.35
Cross-linked PE+AO	0.07	0.85	2.07	2.50	2.78	3.60	4.13	7.21	10.15	14.50	4.94
Total (n)	**23,609**	**23,550**	**24,018**	**24,476**	**25,210**	**24,927**	**18,099**	**21,152**	**26,254**	**26,903**	**238,198**

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

© LROI 2024 | K018

Patella component

FIGURE Trend (proportion [%] per year) in patella material in primary total knee arthroplasties in the Netherlands in 2014-2023



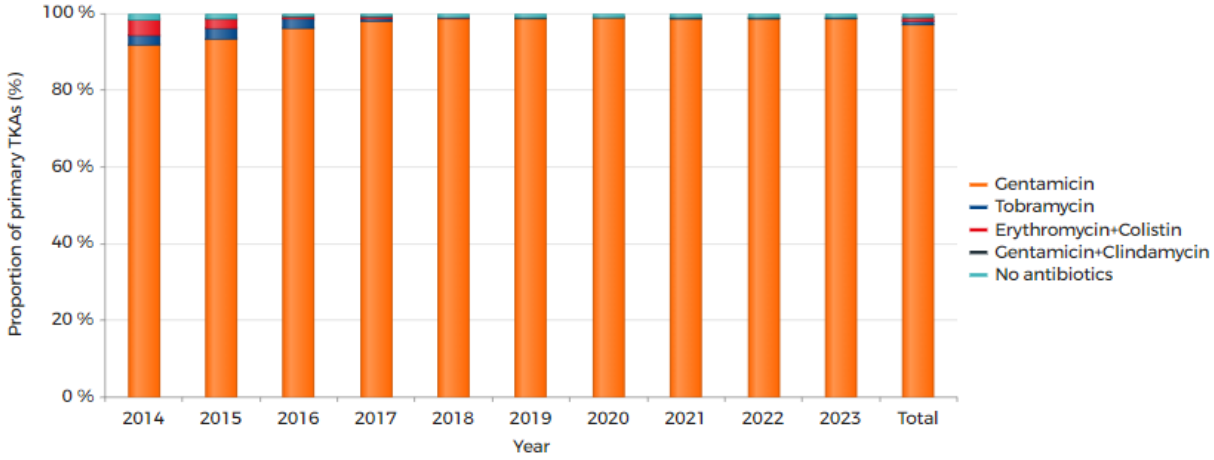
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Standard PE	97.04	94.73	93.39	94.32	95.31	94.65	93.69	89.89	88.76	84.48	92.97
Cross-linked PE	2.96	4.97	4.18	3.66	2.62	3.13	3.50	4.13	2.79	3.71	3.57
Cross-linked PE+AO	0	0.30	2.43	2.01	2.07	2.21	2.81	5.98	8.45	11.80	3.46
Total (n)	**5,062**	**5,296**	**5,311**	**5,215**	**5,505**	**5,332**	**3,917**	**4,380**	**3,977**	**3,957**	**47,952**

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 2014-2023



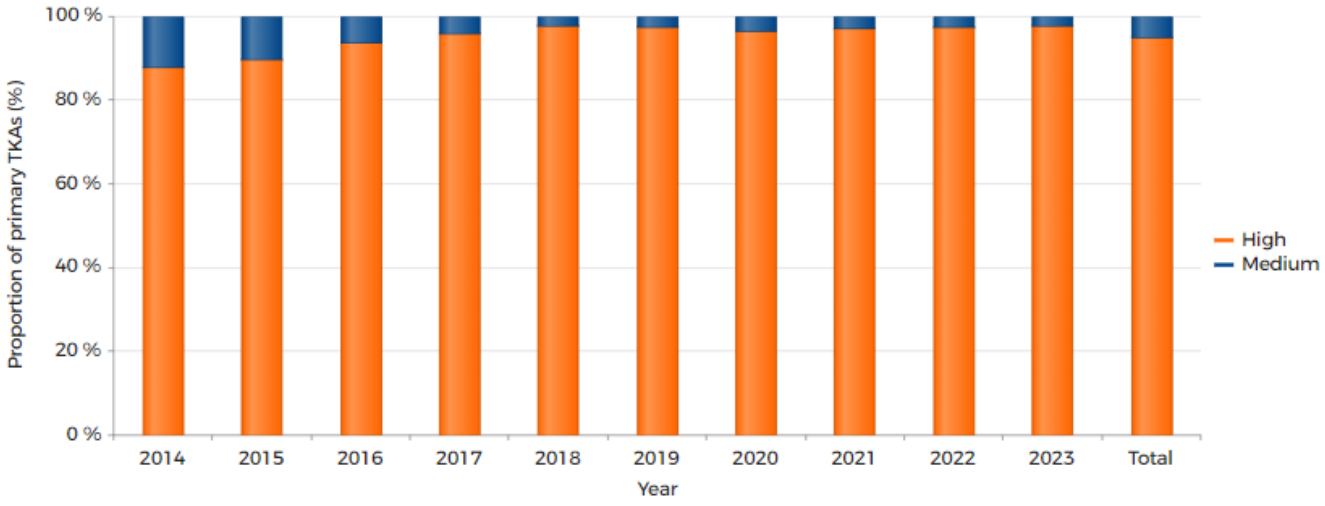
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Gentamicin	91.70	93.22	96.29	98.13	98.56	98.72	98.89	98.64	98.54	98.71	97.07
Tobramycin	2.63	2.81	2.20	0.62	0	0	0	0.03	0.18	0.05	0.89
Erythromycin+Colistin	3.89	2.51	0.69	0.47	0.31	0	0	0	0	0	0.82
Gentamicin+Clindamycin	0.11	0.11	0.15	0.09	0.15	0.10	0.05	0.17	0.06	0.09	0.11
No antibiotics	1.67	1.36	0.68	0.69	0.98	1.18	1.06	1.17	1.23	1.14	1.12
Total (n)	**22,280**	**22,473**	**22,636**	**22,281**	**22,374**	**22,031**	**16,201**	**18,787**	**23,415**	**22,714**	**215,192**

Please note: Bone cement with gentamicin and vancomycin was used in 16 (<0.01%) primary TKAs in 2014-2023.

TKA: total knee arthroplasty.

Viscosity

FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary total knee arthroplasties in the Netherlands in 2014-2023



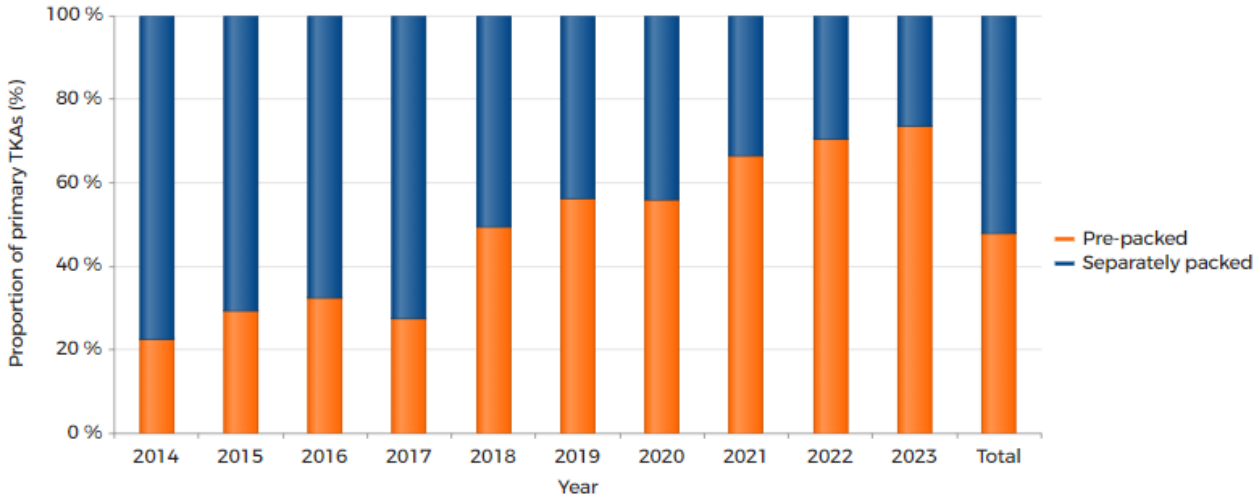
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
High	87.94	89.66	93.53	95.79	97.66	97.22	96.43	97.21	97.25	97.59	94.96
Medium	12.06	10.34	6.47	4.21	2.34	2.78	3.57	2.79	2.75	2.41	5.04
Total (n)	**22,280**	**22,475**	**22,637**	**22,281**	**22,380**	**22,029**	**16,199**	**18,777**	**23,417**	**22,713**	**215,188**

Please note: Low viscosity was used in 20 (<0.00%) primary TKAs in 2014-2023.

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 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Pre-packed	22.69	29.25	32.38	27.45	49.39	56.13	55.92	66.46	70.58	73.69	48.00
Separately packed	77.31	70.75	67.62	72.55	50.61	43.87	44.08	33.54	29.42	26.31	52.00
Total (n)	**22,280**	**22,475**	**22,637**	**22,281**	**22,380**	**22,035**	**16,202**	**18,787**	**23,417**	**22,714**	**215,208**

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 2019-2023

Year	2019	2020	2021	2022	2023
Total knee arthroplasties (n)	**24,865**	**18,180**	**21,146**	**26,398**	**27,067**
Femur name; Proportion (%)					
Genesis II	23.49	22.23	21.26	20.23	19.30
VANGUARD COMPLETE KNEE	21.76	20.71	19.05	16.43	13.94
NexGen	21.99	19.47	17.31	17.50	13.73
Persona	0.78	3.40	9.44	11.74	13.50
ATTUNE	1.79	3.66	7.04	9.74	12.93
TRIATHLON	6.01	8.53	9.56	9.50	12.11
PFC / SIGMA	9.14	8.54	7.27	6.72	6.31
balanSys	1.34	1.86	1.74	1.76	1.81
Journey II BCS	0.77	0.50	0.51	1.08	1.47
MRK	0.85	0.93	1.03	1.13	0.99

Types of bone cement

TABLE The most frequently registered bone cement pre-packed in a vacuum mixing system used during primary total knee arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**12,327**	**9,041**	**12,435**	**16,474**	**16,679**
Cement name; Proportion (%)					
PALACOS R+G	48.17	51.70	49.26	49.74	57.11
Refobacin Bone Cement R	44.03	39.37	45.15	43.74	37.63
Refobacin Plus Bone Cement	7.79	8.94	5.55	6.53	5.26
Cemex Genta	0.01	0.00	0.03	0.00	0.01

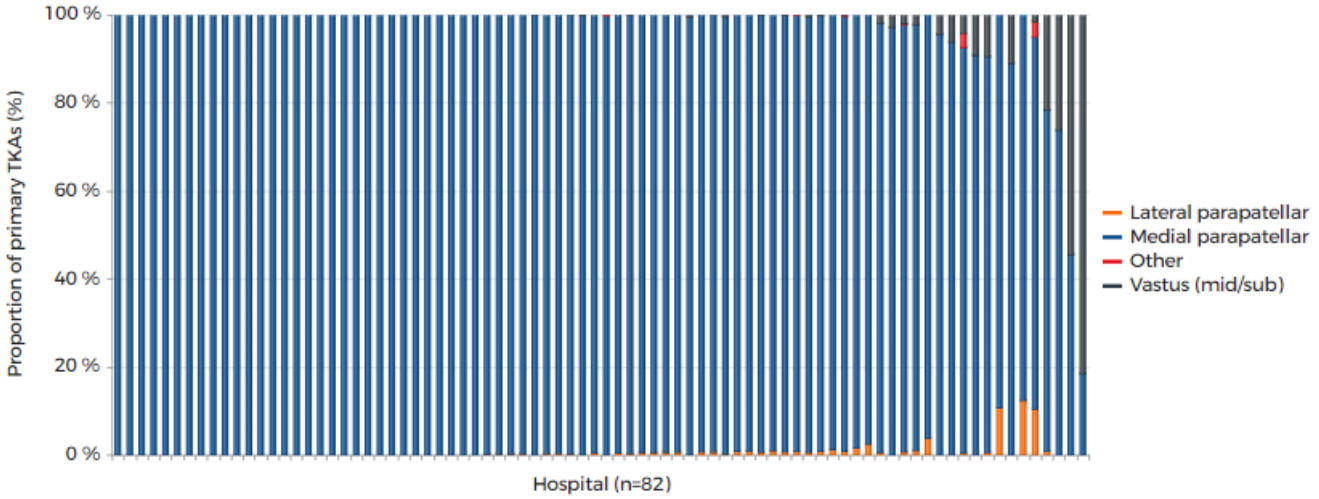
TABLE The most frequently registered separately packed bone cement used during primary total knee arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Separately packed bone cement (n)	**9,643**	**7,119**	**6,281**	**6,870**	**5,963**
Cement name; Proportion (%)					
PALACOS R+G	83.41	70.09	81.74	80.09	71.00
Refobacin Bone Cement R	5.92	16.70	5.83	6.16	15.08
Subiton G	3.44	4.96	5.80	5.65	5.75
Biomet Bone Cement R	1.05	1.57	3.49	4.16	4.19
PALACOS MV+G	2.90	3.15	2.37	3.07	3.24
Refobacin Revision	0.06	0.06	0.19	0.10	0.27
Simplex ABC TOBRA	0.00	0.00	0.08	0.61	0.20
Biomet Plus Bone Cement	1.65	0.84	0.02	0.00	0.15
COPAL G+C	0.16	0.06	0.30	0.09	0.08
Simplex HV	1.12	2.47	0.02	0.00	0.03

Practice variation

Surgical approach

FIGURE Distribution of surgical approach used during primary total knee arthroplasties per hospital in the Netherlands in 2023 (n=28,226)



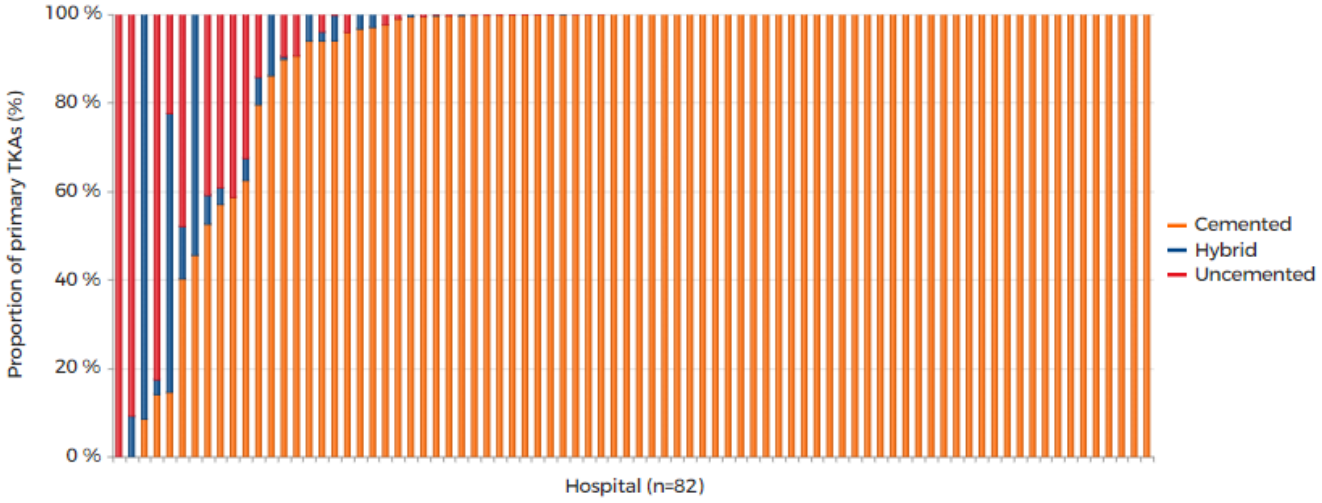
Please note: Hospitals with fewer than 50 procedures are not shown.

TKA: total knee arthroplasty

© LROI 2024 | K026

Fixation

FIGURE Distribution of type of fixation used during primary total knee arthroplasties per hospital in the Netherlands in 2023 (n=28,041)



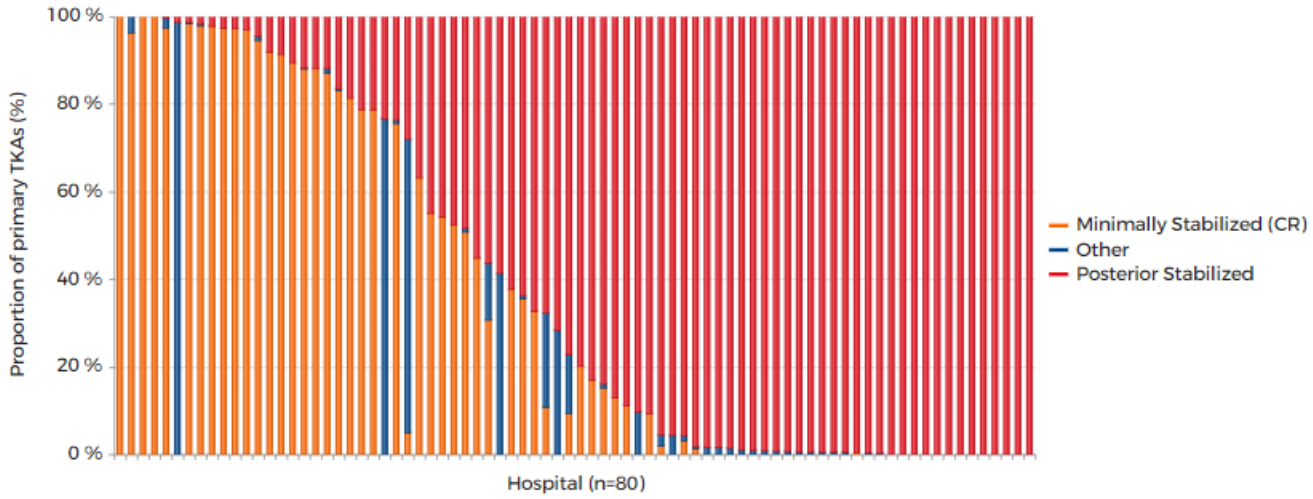
Please note: Hospitals with fewer than 50 procedures are not shown.

TKA: total knee arthroplasty

© LROI 2024 | K027

Type of femur component

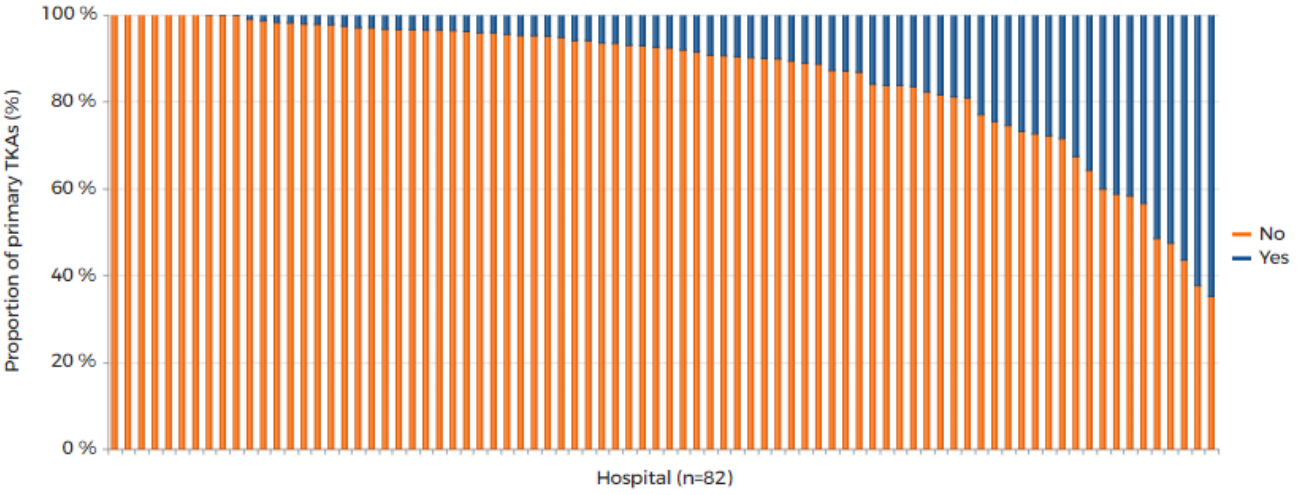
FIGURE Distribution of type of femur component used during primary total knee arthroplasties per hospital in the Netherlands in 2023 (n=26,902)



Please note: Hospitals with fewer than 50 procedures are not shown.
TKA: total knee arthroplasty
© LROI 2024 | K028

Implantation of patella

FIGURE Distribution of implantation of patella during primary total knee arthroplasties per hospital in the Netherlands in 2023 (n=27,925)



Please note: Hospitals with fewer than 50 procedures are not shown.
TKA: total knee arthroplasty
© LROI 2024 | K029

Robot assistance

FIGURE Distribution of robot assistance used during primary total knee arthroplasties per hospital in the Netherlands in 2022-2023 (n=50,715)

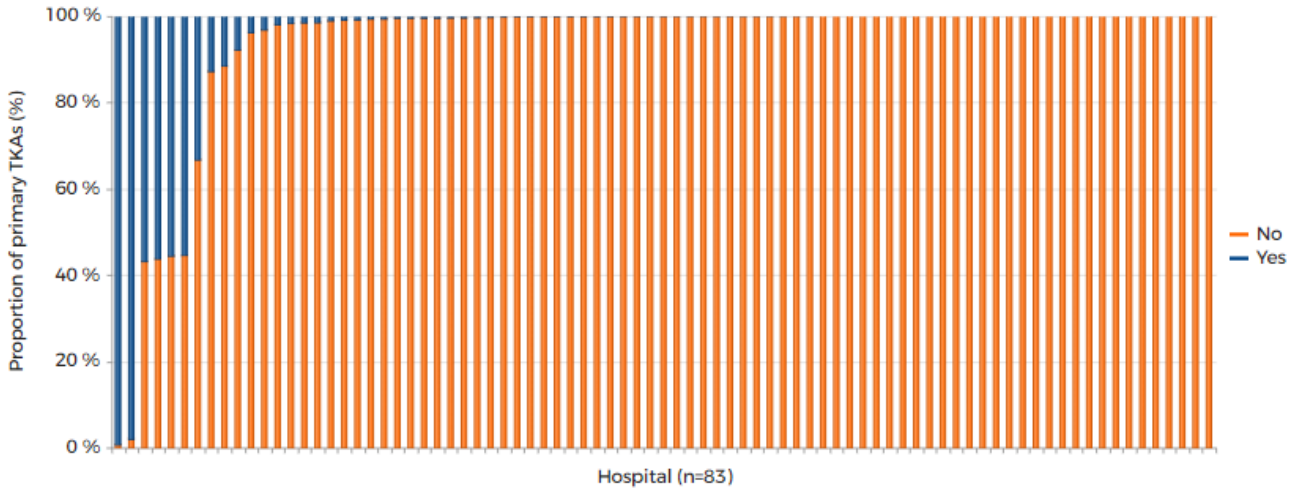
Please note: Hospitals with fewer than 50 procedures are not shown.

TKA: total knee arthroplasty

© LROI 2024 | K030

PSI

FIGURE Distribution of PSI used during primary total knee arthroplasties per hospital in the Netherlands in 2022-2023 (n=50,756)



Please note: Hospitals with fewer than 50 procedures are not shown.

TKA: total knee arthroplasty

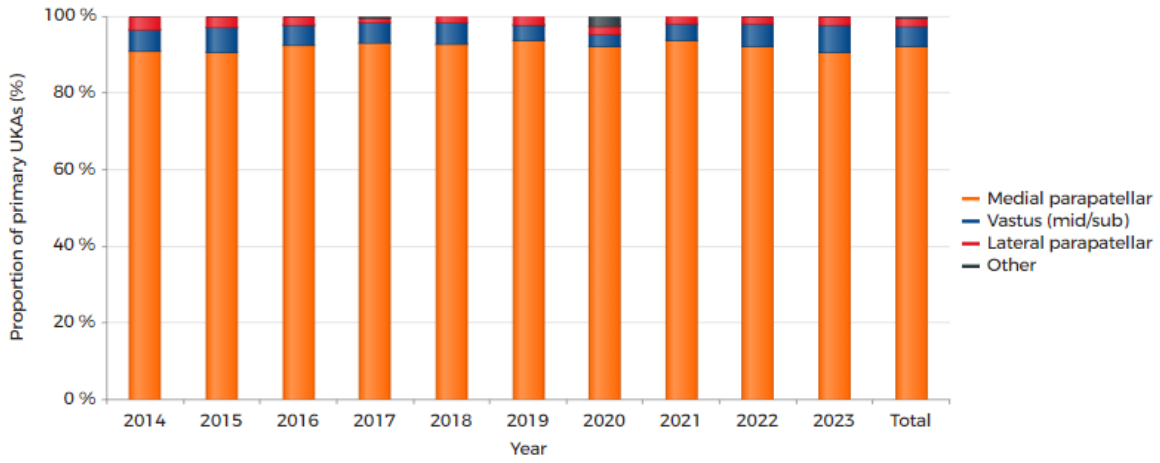
© LROI 2024 | K031

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 2014-2023

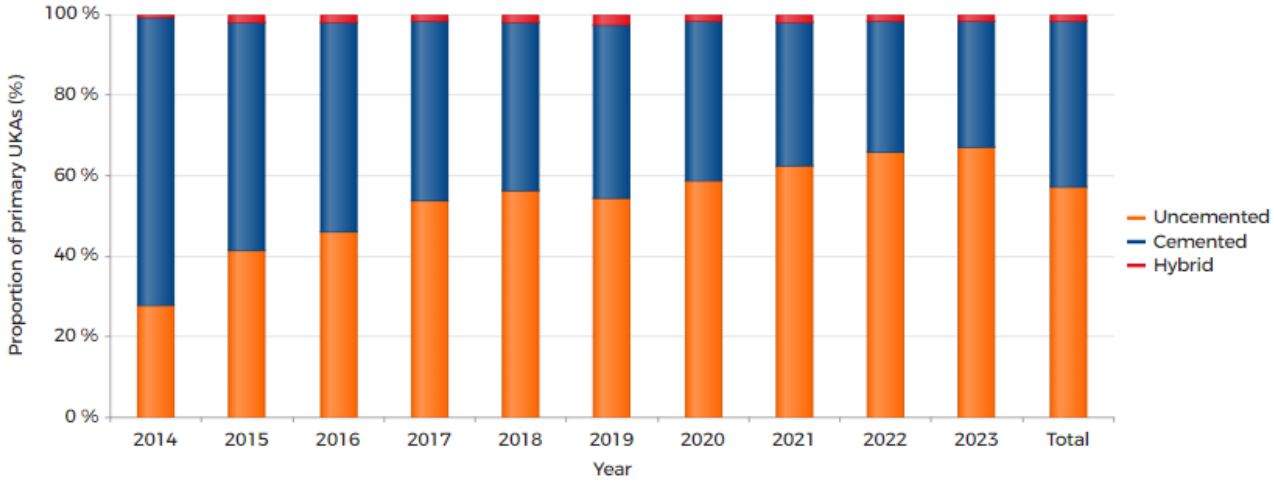


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Medial parapatellar	91.03	90.70	92.28	92.98	92.87	93.60	92.15	93.75	92.17	90.46	92.21
Vastus (mid/sub)	5.55	6.30	5.37	5.41	5.33	4.06	3.10	4.32	5.84	7.12	5.30
Lateral parapatellar	3.12	2.89	2.11	1.23	1.79	2.34	2.16	1.94	1.87	2.37	2.12
Other	0.30	0.11	0.24	0.38	0	0	2.59	0	0.13	0.04	0.36
Total (n)	**2,342**	**2,668**	**2,940**	**3,662**	**4,070**	**4,877**	**4,714**	**5,631**	**6,969**	**7,876**	**45,749**

UKA: unicondylar knee arthroplasty

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary unicondylar knee arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Uncemented	27.87	41.43	46.09	53.65	56.20	54.26	58.74	62.30	65.80	67.07	57.18
Cemented	71.28	56.63	52.01	44.60	41.93	43.00	39.67	35.76	32.48	31.23	40.99
Hybrid	0.85	1.94	1.90	1.75	1.87	2.74	1.59	1.95	1.72	1.70	1.83
Total (n)	**2,347**	**2,677**	**2,942**	**3,657**	**4,066**	**4,860**	**4,714**	**5,655**	**6,982**	**7,889**	**45,789**

UKA: unicondylar knee arthroplasty

Most frequently registered

Unicondylar knee prostheses

TABLE The most frequently registered primary unicondylar knee arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Unicondylar knee arthroplasties (n)	**4,443**	**4,072**	**5,467**	**6,859**	**7,691**
Femur name; Proportion (%)					
OXFORD PKR Uncemented	54.76	58.87	65.76	68.60	70.56
Physica ZUK	13.23	17.41	16.57	15.18	13.12
OXFORD PKR Cemented	27.37	19.94	13.99	11.72	10.97
balanSys UNI	0.97	1.45	1.39	1.01	2.05
Journey Uni	1.69	1.65	0.70	1.33	1.86

Types of bone cement

TABLE The most frequently registered bone cement pre-packed in a vacuum mixing system used during primary unicondylar knee arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**895**	**629**	**935**	**1,113**	**998**
Cement name; Proportion (%)					
PALACOS R+G	31.96	50.87	63.42	59.12	70.84
Refobacin Bone Cement R	63.80	43.40	34.97	38.81	26.85
Refobacin Plus Bone Cement	4.25	5.72	1.60	2.07	2.30

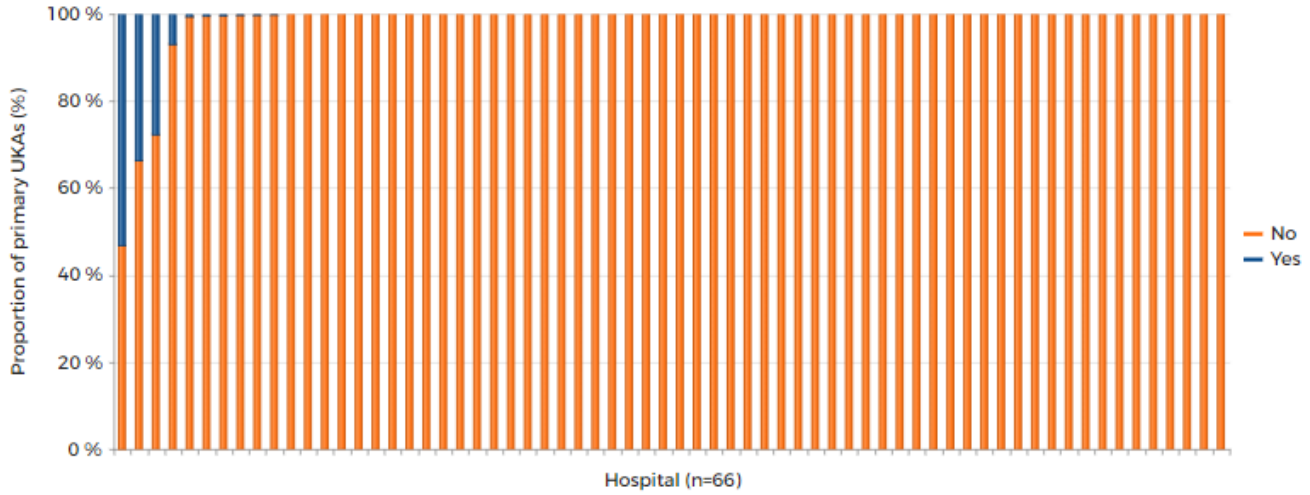
TABLE The most frequently registered separately packed bone cement used during primary unicondylar knee arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Separately packed bone cement (n)	**1,156**	**1,066**	**965**	**1,011**	**1,161**
Cement name; Proportion (%)					
PALACOS R+G	79.50	70.17	78.86	79.33	74.59
Biomet Bone Cement R	0.09	5.44	7.36	10.78	8.61
PALACOS MV+G	9.60	8.63	7.77	6.63	7.32
Refobacin Bone Cement R	3.55	10.79	2.69	0.30	6.55
Subiton G	1.64	2.91	2.49	2.47	2.76

Practice variation

Robot assistance

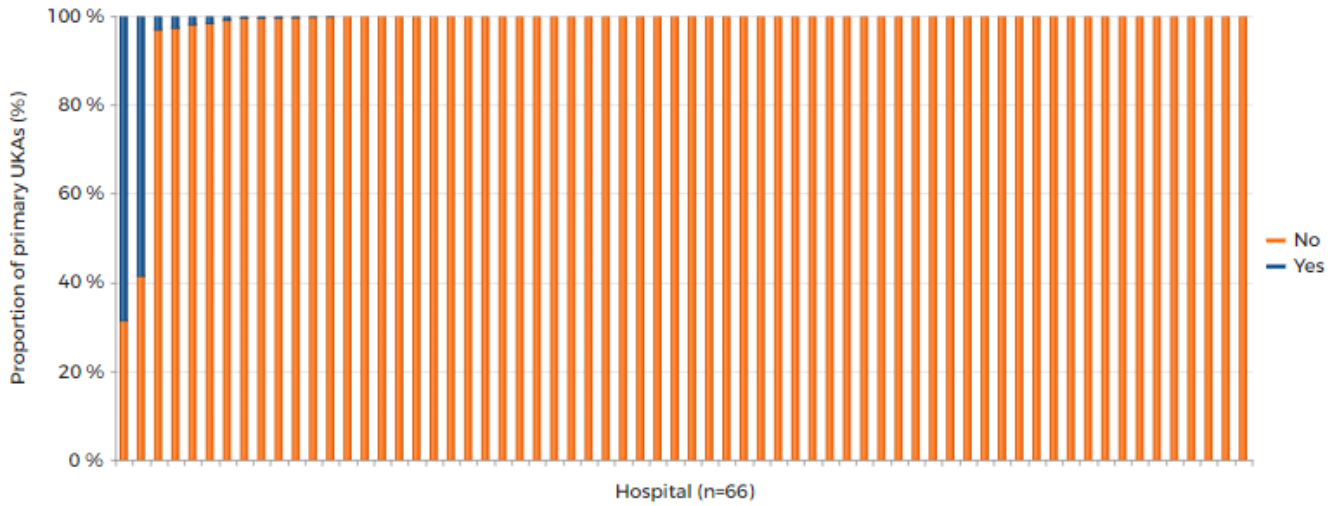
FIGURE Distribution of robot assistance used during primary unicondylar knee arthroplasties per hospital in the Netherlands in 2022-2023 (n=12,883)



© LROI 2024 | K037

PSI

FIGURE Distribution of PSI used during primary unicondylar knee arthroplasties per hospital in the Netherlands in 2022-2023 (n=12,894)



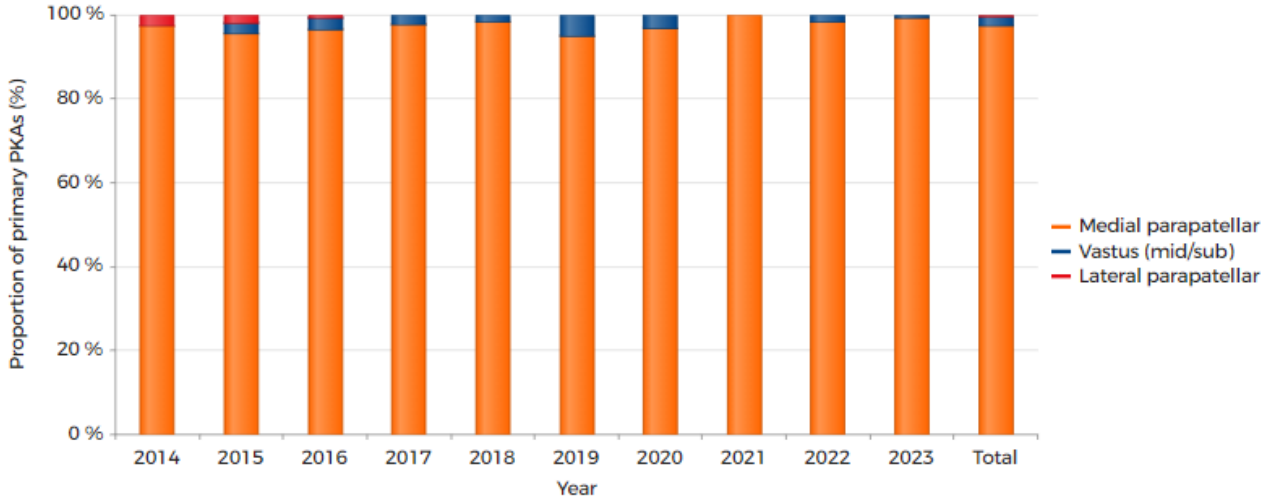
© LROI 2024 | K038

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 2014-2023



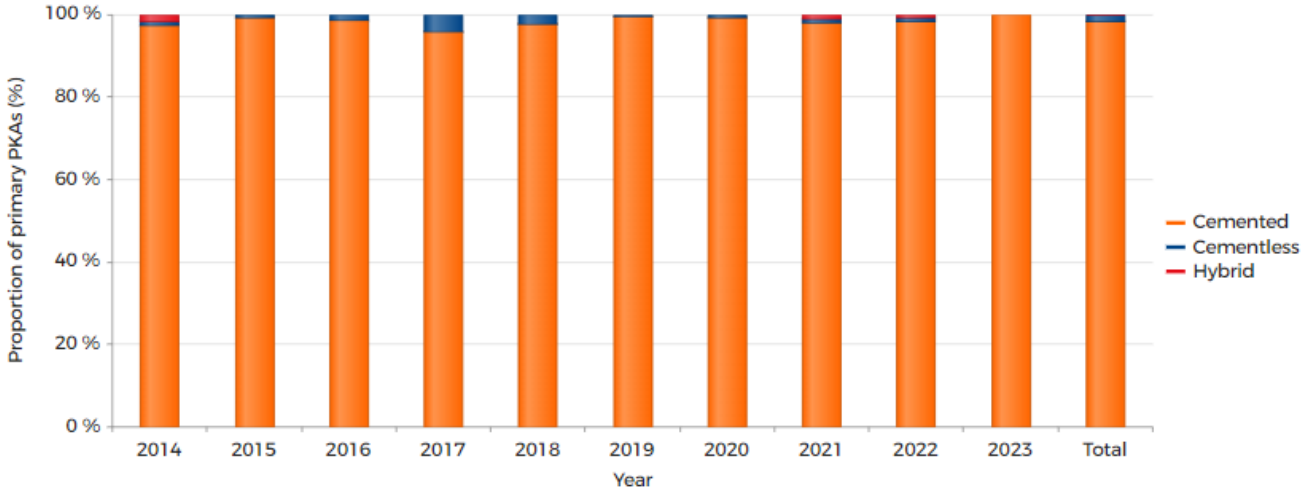
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Medial parapatellar	97.37	95.48	96.50	97.60	98.34	94.86	96.84	100	98.28	99.21	97.30
Vastus (mid/sub)	0	2.58	2.80	2.40	1.66	5.14	3.16	0	1.72	0.79	2.22
Lateral parapatellar	2.63	1.94	0.70	0	0	0	0	0	0	0	0.49
Total (n)	**114**	**155**	**143**	**167**	**181**	**175**	**158**	**107**	**116**	**126**	**1,442**

PKA: patellofemoral knee arthroplasty

© LROI 2024 | K039

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary patellofemoral knee arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cemented	97.39	99.35	98.61	95.83	97.80	99.43	99.37	98.13	98.28	100	98.41
Cementless	0.87	0.65	1.39	4.17	2.20	0.57	0.63	0.93	0.86	0	1.31
Hybrid	1.74	0	0	0	0	0	0	0.93	0.86	0	0.28
Total (n)	**115**	**155**	**144**	**168**	**182**	**175**	**158**	**107**	**116**	**126**	**1,446**

PKA: patellofemoral knee arthroplasty

© LROI 2024 | K040

Most frequently registered

Patellofemoral knee prostheses

TABLE The most frequently registered primary patellofemoral knee arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Patellofemoral knee arthroplasties (n)	**158**	**142**	**101**	**97**	**114**
Femur name; Proportion (%)					
Gender Solutions Patello-Femoral Joint	53.16	57.75	49.50	71.13	57.89
Journey PFJ	25.95	23.94	24.75	12.37	19.30
AVON	14.56	13.38	20.79	12.37	13.16
Restoris MCK	0.00	0.00	1.98	4.12	5.26
Patellofemoral Hermes	0.00	0.00	0.00	0.00	4.39

Types of bone cement

TABLE The most frequently registered bone cement pre-packed in a vacuum mixing system used during primary patellofemoral knee arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**38**	**41**	**43**	**36**	**45**
Cement name; Proportion (%)					
PALACOS R+G	44.74	51.22	62.79	55.56	62.22
Refobacin Bone Cement R	31.58	34.15	25.58	30.56	31.11
Refobacin Plus Bone Cement	23.68	14.63	11.63	13.89	6.67

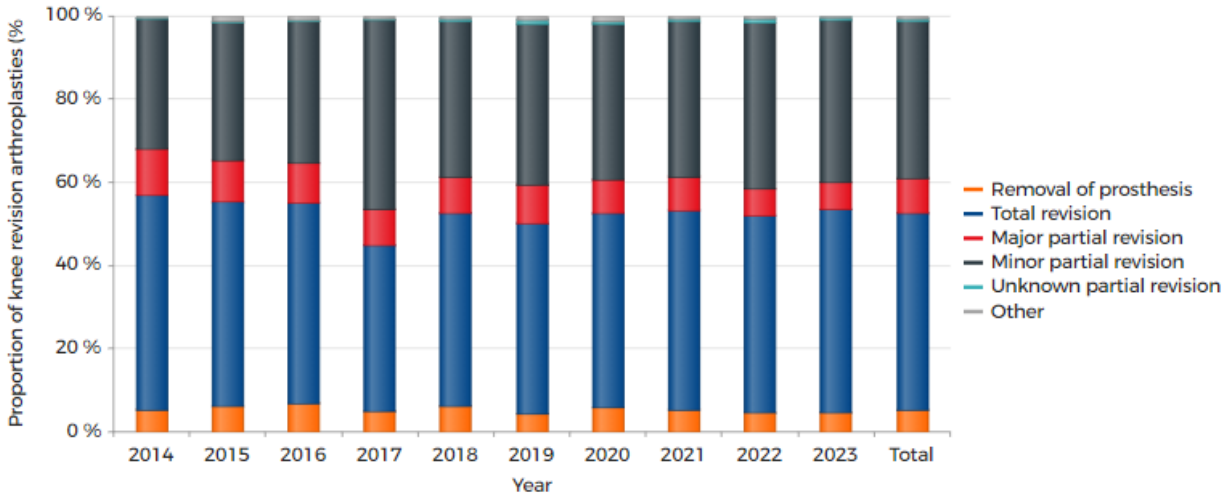
TABLE The most frequently registered separately packed bone cement used during primary patellofemoral knee arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Separately packed bone cement (n)	**66**	**87**	**50**	**57**	**59**
Cement name; Proportion (%)					
PALACOS R+G	87.88	97.70	96.00	96.49	89.83
Subiton G	6.06	1.15	2.00	1.75	6.78
PALACOS MV+G	0.00	0.00	0.00	0.00	1.69
Refobacin Bone Cement R	4.55	1.15	2.00	1.75	1.69

Knee revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in knee revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Removal of prosthesis	5.37	6.16	6.67	4.80	6.20	4.40	5.98	5.28	4.73	4.57	5.38
Total revision	51.62	49.03	48.43	39.95	46.47	45.55	46.55	47.96	47.24	48.78	47.09
Major partial revision	11.10	9.93	9.46	8.81	8.46	9.29	8.03	7.82	6.46	6.55	8.53
Minor partial revision	31.20	33.23	34.02	45.39	37.50	38.63	37.56	37.63	40.01	39.15	37.59
Unknown partial revision	0.20	0.26	0.21	0.24	0.65	1.13	0.64	0.42	0.83	0.43	0.51
Other	0.51	1.38	1.20	0.82	0.72	1.00	1.24	0.89	0.73	0.52	0.89
Total (n)	**2,532**	**2,678**	**2,907**	**2,939**	**2,920**	**3,091**	**2,492**	**2,596**	**3,002**	**3,280**	**28,437**

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

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a knee revision arthroplasty in the Netherlands in 2014-2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Knee revision arthroplasty (n)	**2,556**	**2,686**	**2,926**	**2,997**	**2,930**	**3,101**	**2,496**	**2,602**	**3,013**	**3,292**	**28,599**
Reasons for revision; Proportion (%)											
instability	25.31	26.43	25.12	27.66	25.80	27.38	26.28	26.25	24.63	21.93	25.63
Patellar pain	22.89	23.05	21.46	19.72	18.94	20.15	18.71	17.76	23.96	22.60	20.97
Loosening of tibia component	22.34	20.59	21.87	20.92	19.49	20.74	19.51	19.02	18.62	16.83	19.94
Infection	14.75	16.46	19.58	20.25	20.82	20.15	23.68	22.02	22.93	24.30	20.59
Malalignment	15.65	14.67	13.88	11.34	10.72	10.16	10.62	11.03	8.89	10.18	11.62
Progression of osteoarthritis	9.08	8.30	9.26	8.21	8.70	7.97	7.57	8.95	11.98	12.73	9.36
Loosening of femur component	9.98	9.49	9.02	8.91	8.36	8.58	8.01	8.80	8.46	8.48	8.79
Inlay wear	8.37	7.82	7.55	6.77	6.55	7.13	6.97	7.72	10.26	8.96	7.83
Revision after knee removal	6.89	5.73	6.25	5.57	4.88	4.16	5.05	4.27	4.81	4.28	5.16
Arthrofibrosis	4.73	5.06	4.27	4.87	4.61	5.26	3.93	4.30	3.88	4.16	4.51
Patella dislocation	2.46	2.79	2.08	2.44	2.22	2.45	2.80	2.19	2.56	1.52	2.33
Peri-prosthetic fracture	2.23	2.27	1.71	1.77	1.54	1.90	2.60	2.65	2.56	2.67	2.18
Loosening of patella component	2.03	1.53	1.91	1.77	1.43	1.74	1.76	1.73	1.59	1.97	1.75
Bearing dislocation									3.72	4.07	
Other	8.10	8.64	8.30	7.41	7.68	7.80	7.49	8.65	8.70	7.59	8.02

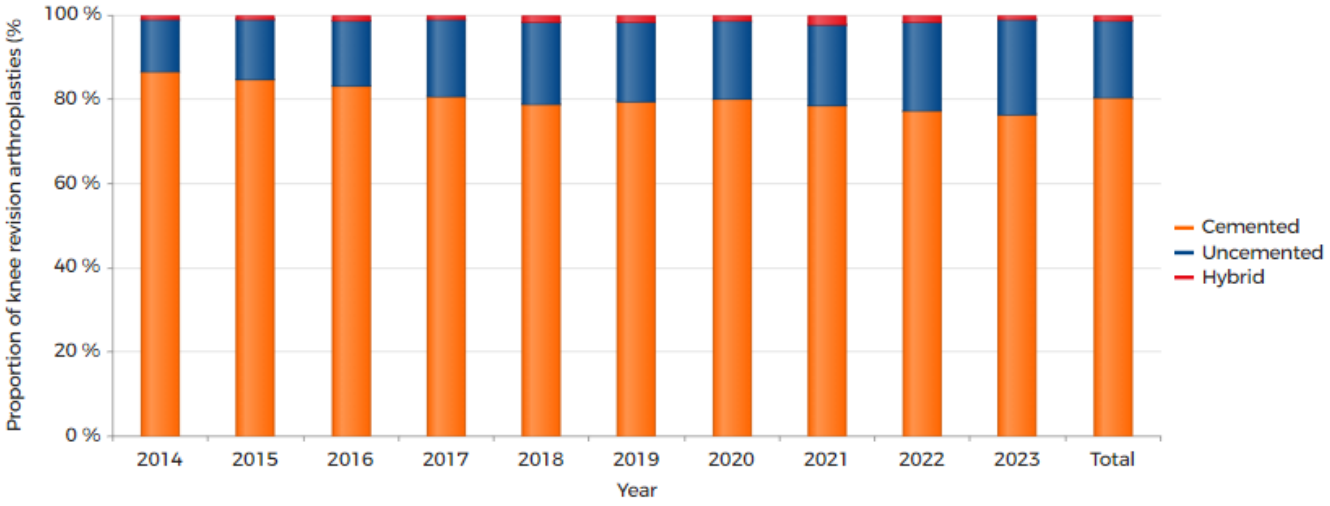
One patient may have more than one reason for revision. As such, the total proportion is over 100%.

Please note: Bearing dislocation was not registered before 2022.

Surgical techniques

Fixation

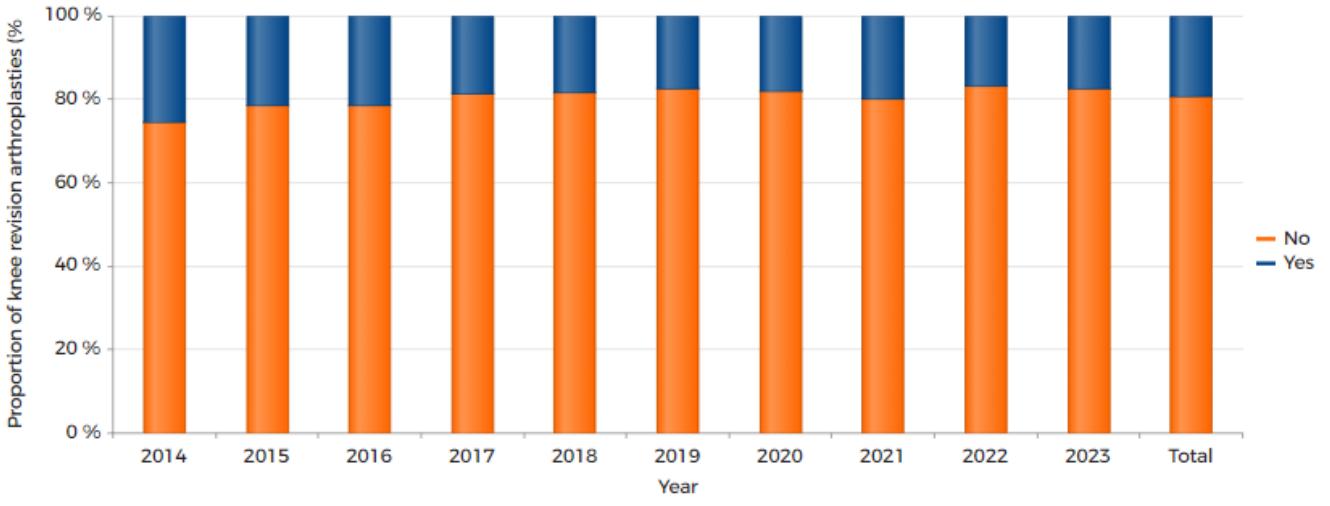
FIGURE Trend (proportion [%] per year) in type of fixation in knee revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cemented	86.60	84.85	83.11	80.81	78.80	79.38	80.12	78.44	77.23	76.41	80.40
Uncemented	12.23	13.92	15.57	17.96	19.55	18.87	18.42	19.37	21.12	22.57	18.14
Hybrid	1.17	1.24	1.31	1.24	1.65	1.75	1.46	2.19	1.65	1.01	1.46
Total (n)	**2,314**	**2,429**	**2,665**	**2,751**	**2,670**	**2,857**	**2,253**	**2,375**	**2,780**	**3,057**	**26,151**

Conversion to TKA

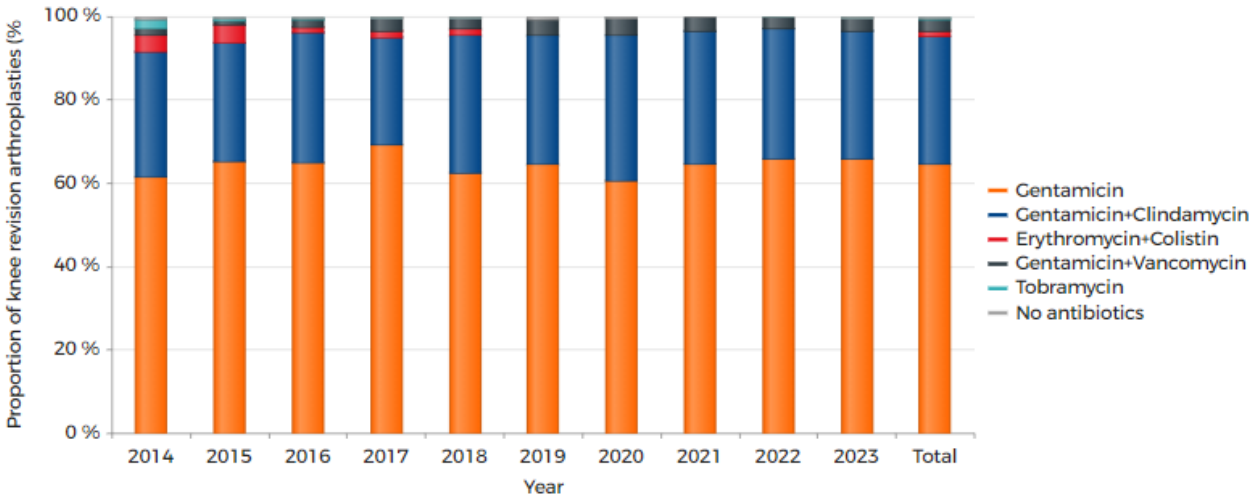
FIGURE Trend (proportion [%] per year) in conversion of a unicondylar or patellofemoral knee arthroplasty to a total knee arthroplasty in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
No	74.58	78.63	78.62	81.27	81.49	82.43	82.01	80.09	83.12	82.42	80.69
Yes	25.42	21.37	21.38	18.73	18.51	17.57	17.99	19.91	16.88	17.58	19.31
Total (n)	**2,061**	**2,246**	**2,638**	**2,771**	**2,637**	**2,778**	**2,285**	**2,401**	**2,902**	**3,225**	**25,944**

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in knee revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Gentamicin	61.61	65.24	65.06	69.28	62.39	64.53	60.51	64.46	65.77	65.77	64.55
Gentamicin+Clindamycin	29.79	28.56	31.09	25.57	33.05	31.00	35.10	31.91	31.26	30.60	30.69
Erythromycin+Colistin	4.06	4.18	1.32	1.54	1.77	0	0	0	0	0	1.32
Gentamicin+Vancomycin	1.60	1.03	1.71	3.02	2.20	3.56	3.93	3.40	2.81	3.22	2.61
Tobramycin	2.08	0.67	0.34	0.05	0.05	0	0	0	0.11	0.10	0.35
No antibiotics	0.85	0.31	0.49	0.53	0.54	0.91	0.46	0.23	0.05	0.31	0.47
Total (n)	**1,873**	**1,936**	**2,052**	**1,885**	**1,861**	**1,968**	**1,527**	**1,705**	**1,849**	**1,928**	**18,584**

Most frequently registered

Components

TABLE The most frequently registered femur components in knee revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Femur (n)	1,314	1,028	1,158	1,277	1,390
Femur name; Proportion (%)					
Legion	23.74	23.83	20.03	17.85	18.42
NexGen	20.09	18.48	18.57	19.66	17.55
ATTUNE	1.22	2.53	4.15	8.85	10.07
Genesis II	7.99	8.66	7.51	9.71	9.50
TRIATHLON	5.94	8.56	8.46	7.99	8.42
VANGUARD COMPLETE KNEE	6.77	5.54	7.94	6.73	7.34
Persona	0.08	0.88	2.16	3.05	5.97
VANGUARD 360	5.10	6.32	6.04	6.26	4.60
PFC / SIGMA	4.72	6.03	5.53	3.99	4.17
RT Plus	3.04	3.40	3.97	3.99	3.53

TABLE The most frequently registered tibia components in knee revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Tibia (n)	**1,417**	**1,116**	**1,245**	**1,376**	**1,508**
Tibia name; Proportion (%)					
Legion	25.69	24.10	20.32	17.59	20.09
NexGen	19.83	15.95	15.50	17.59	16.38
ATTUNE	1.91	3.05	4.74	8.36	9.55
TRIATHLON	6.28	8.96	9.08	8.65	8.75
Genesis II	5.15	4.93	4.82	7.05	6.96
VANGUARD 360	6.92	6.99	7.39	6.76	5.44
Persona	0.07	0.81	2.01	2.83	5.31
RT Plus	2.82	4.39	5.78	5.31	5.17
VANGUARD COMPLETE KNEE	4.94	4.03	5.54	5.60	5.04
S-ROM	10.59	9.50	7.47	4.07	3.78

TABLE The most frequently registered insert components in knee revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Insert (n)	**2,284**	**1,754**	**1,970**	**2,228**	**2,502**
Insert name; Proportion (%)					
Genesis II	26.09	26.23	24.47	23.97	24.50
NexGen	18.30	16.31	14.16	14.63	12.87
VANGUARD COMPLETE KNEE	10.16	7.92	8.68	8.93	8.59
TRIATHLON	5.82	7.18	7.97	8.12	8.35
OXFORD PKR	4.07	5.25	5.94	7.45	7.55
ATTUNE	1.23	2.17	2.94	5.30	7.11
Persona	0.13	0.86	1.73	2.78	4.76
PFC / SIGMA	5.60	5.76	5.43	3.95	4.08
RT Plus	1.88	2.91	3.50	3.50	3.80
VANGUARD SSK	3.50	4.22	4.01	4.40	3.24

TABLE The most frequently registered patella components in knee revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Patella (n)	**1,185**	**947**	**941**	**986**	**1,029**
Patella name; Proportion (%)					
Genesis II	45.65	50.58	45.16	44.62	49.76
VANGUARD	15.27	13.20	15.09	17.55	15.06
NexGen	15.61	12.78	12.01	10.45	9.33
ATTUNE	2.03	2.64	3.83	5.98	7.68
TRIATHLON	4.47	5.49	7.55	4.87	4.47
PFC / SIGMA	7.17	5.39	6.06	4.77	4.18
Persona	0.08	1.27	2.13	3.96	3.79
balanSys	1.27	2.01	2.76	2.33	2.62
LCS	2.78	2.75	2.13	1.93	1.07
AGC	1.60	0.53	0.85	0.61	0.97

Types of bone cement

TABLE The most frequently registered bone cement pre-packed in a vacuum mixing system used during knee revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**705**	**488**	**674**	**801**	**863**
Cement name; Proportion (%)					
PALACOS R+G	38.87	50.20	48.66	48.44	57.01
Refobacin Bone Cement R	53.05	39.75	41.10	43.45	38.35
Refobacin Plus Bone Cement	7.66	6.15	8.01	6.62	4.63

TABLE The most frequently registered separately packed bone cement used during knee revision arthroplasties in the Netherlands in 2019-2023

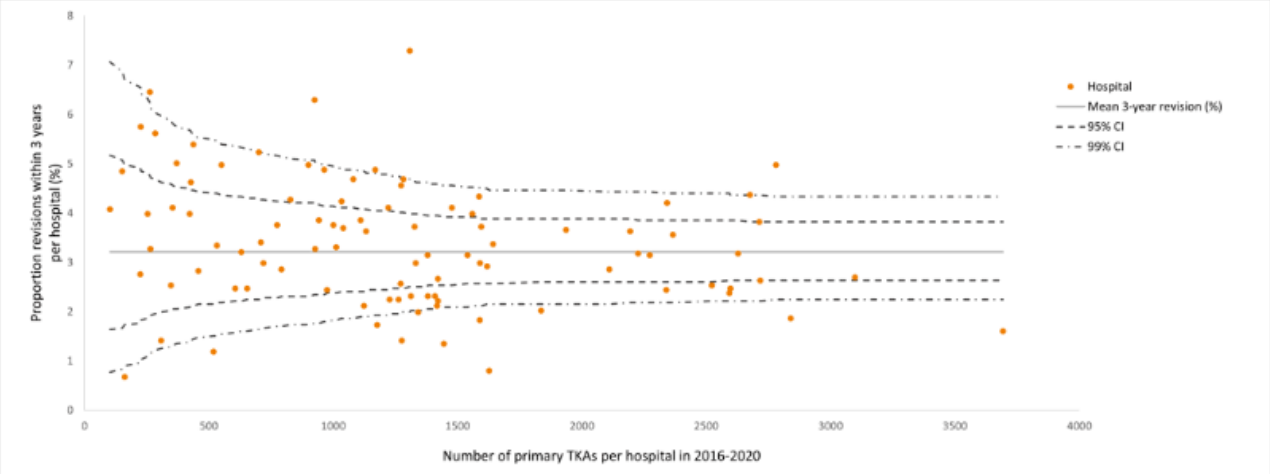
Year	2019	2020	2021	2022	2023
Separately packed bone cement (n)	**1,232**	**1,009**	**1,002**	**1,009**	**1,043**
Cement name; Proportion (%)					
COPAL G+C	36.44	38.16	39.12	40.04	44.39
PALACOS R+G	37.99	30.62	33.93	32.61	27.52
Refobacin Revision	11.04	12.69	12.38	14.27	11.89
COPAL G+V	4.63	4.46	5.19	4.26	4.31
Subiton G	2.68	4.26	4.69	4.16	3.84
Refobacin Bone Cement R	3.00	6.05	1.90	1.98	3.45
PALACOS MV+G	1.46	1.78	1.60	1.88	2.49
Cemex VancoGenx	0.89	1.09	0.40	0.50	0.86
Biomet Bone Cement R	0.81	0.50	0.40	0.00	0.58
G3A	0.00	0.00	0.10	0.00	0.38

Survival total knee arthroplasty

Revision within 1 and 3 years

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 2016-2020 (n=121,263)



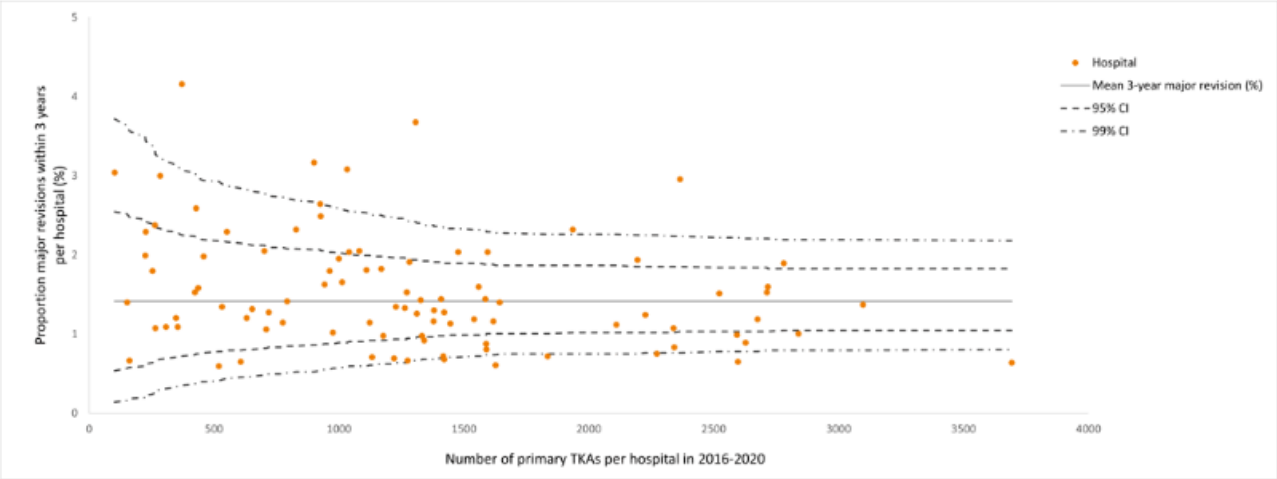
Please note: The proportion of revisions within 3 years per hospital were adjusted for casemix factors age, gender, ASA score and diagnosis (osteoarthritis versus other).

TKA: total knee arthroplasty; CL: control limits.

The mean 3-years revision percentage is 3.21 in the Netherlands in 2016-2020.
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 2016-2020 (n=121,263)



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.

The mean 3-years major revision percentage is 1.41 in the Netherlands in 2016-2020.
Control limits indicate the plausible range of outcome if all hospitals perform equally well.

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 2018-2022 (n=119,268)

	Cumulative 1-year revision percentage
	Kaplan Meier (95% CI)
Any type of revision	1.07 (1.01-1.13)
Major revision	0.28 (0.25-0.31)
Only tibia	0.07 (0.05-0.08)
Only femur	0.04 (0.03-0.05)
Femur and tibia	0.18 (0.16-0.21)
Minor revision	0.77 (0.72-0.82)
DAIR	0.53 (0.49-0.58)
No DAIR	0.22 (0.20-0.25)
Patella addition	0.05 (0.04-0.07)

Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
Major revision: revision of at least the femur or tibia component.
Minor revision: only inlay and/or patella exchange (including DAIR procedures).
TKA: total knee arthroplasty; CI: confidence interval

In 2018-2022, 888 (0.7%) 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 2016-2020 (n=121,263)

	Cumulative 3-year revision percentage
	Kaplan Meier (95% CI)
Any type of revision	3.20 (3.10-3.30)
Major revision	1.26 (1.20-1.33)
Only tibia	0.24 (0.22-0.27)
Only femur	0.12 (0.10-0.14)
Femur and tibia	0.91 (0.85-0.96)
Minor revision	1.86 (1.79-1.94)
DAIR	0.59 (0.54-0.63)
No DAIR	0.79 (0.74-0.84)
Patella addition	0.51 (0.47-0.55)

Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
Major revision: revision of at least the femur or tibia component.
Minor revision: only inlay and/or patella exchange (including DAIR procedures).
TKA: total knee arthroplasty; CI: confidence interval

In 2016-2020, 3,921 (3.2%) 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 minor revision in the Netherlands in 2018-2022 (n=121,263)

	Cumulative 3-year first revision percentage
	Kaplan Meier (95% CI)
First major revision	1.40 (1.34-1.47)
Tibia	1.28 (1.22-1.34)
Femur	1.17 (1.11-1.23)
First minor revision	1.86 (1.79-1.94)
Inlay	1.33 (1.27-1.40)
Patella addition	0.86 (0.80-0.91)

First 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.
First minor revision: only inlay and/or patella exchange (including DAIR procedures).
TKA: total knee arthroplasty; CI: confidence interval

In 2016-2020, 3,921 (3.2%) primary THAs were implanted in patients who died within three year after the primary procedure.

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 2016-2020

	Major revision (n=1,714)	Minor revision (n=2,259)	Any type of revision (n=3,893)
Reasons for revision	**Proportion (%)**	**Proportion (%)**	**Proportion (%)**
Patellar pain	8.81	38.16	26.59
Instability	31.04	22.53	26.05
Infection	21.59	31.25	25.53
Loosening of tibia component	30.57	0.35	13.15
Malalignment	26.31	1.51	12.07
Arthrofibrosis	11.03	6.42	8.50
Loosening of femur component	8.81	0.18	3.85
Patellar dislocation	4.08	4.21	4.06
Peri-prosthetic fracture	4.84	0.27	2.34
Revision after knee removal	3.68	0.40	1.46
Insert wear	0.41	1.24	0.92
Loosening of patella component	0.64	0.62	0.64
Progression of osteoarthritis	0.12	1.51	0.95
Other	6.24	10.85	9.20

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.

Minor revision: only inlay and/or patella exchange (including DAIR procedures).

Any type of revision includes all first revisions, including revision procedures that could not be classified as minor or major revision.

Please note: 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 2016-2020 (n=121,263)

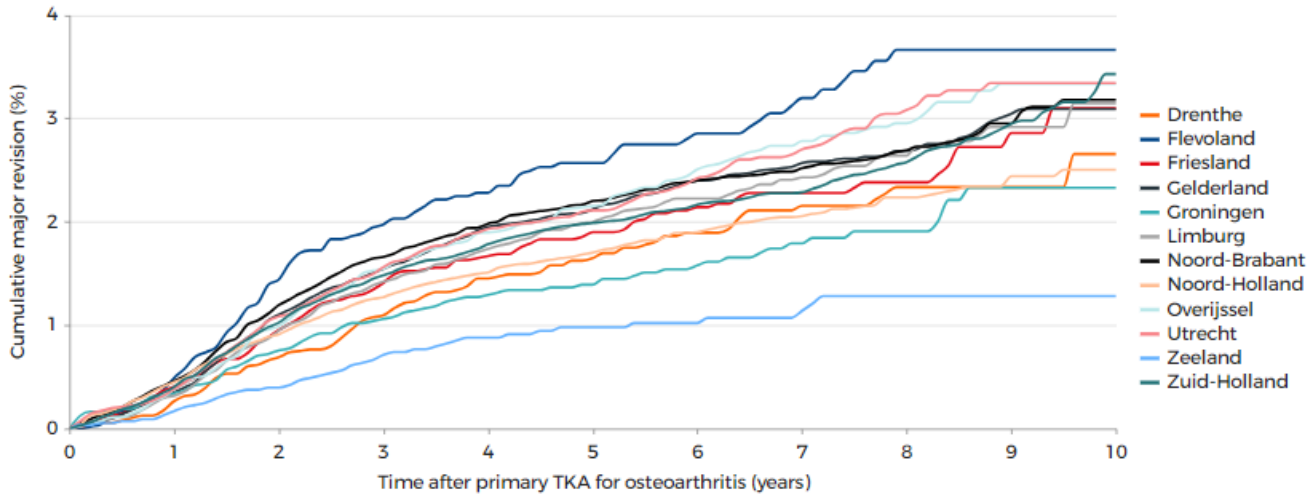
Time after primary TKA	Percentage revisions (%)
Day 0-29	0.36
Day 30-182	0.37
Day 183-364	0.43
Day 365-730 (second year)	1.29
Day 731-1095 (third year)	0.75

TKA: total knee arthroplasty

Revision by patient characteristics

TKA by patient province

FIGURE Cumulative major revision percentages (95% CI) of total knee arthroplasties for osteoarthritis by patient province in the Netherlands in 2014-2023 (n=234,054)



	Number (n)	1yr	3yr	5yr	7yr	10yr
Drenthe	9,132	0.18 (0.09-0.27)	1.08 (0.84-1.32)	1.62 (1.31-1.94)	2.11 (1.72-2.50)	n.a.
Flevoland	5,103	0.38 (0.20-0.55)	1.94 (1.53-2.36)	2.57 (2.07-3.07)	3.12 (2.51-3.73)	n.a.
Friesland	9,330	0.37 (0.24-0.50)	1.34 (1.08-1.60)	1.85 (1.53-2.17)	2.28 (1.89-2.66)	n.a.
Gelderland	31,033	0.31 (0.24-0.37)	1.51 (1.35-1.66)	2.09 (1.90-2.27)	2.53 (2.31-2.75)	3.09 (2.76-3.42)
Groningen	7,429	0.31 (0.18-0.44)	1.04 (0.78-1.30)	1.39 (1.08-1.70)	1.79 (1.40-2.18)	n.a.
Limburg	17,320	0.30 (0.21-0.38)	1.38 (1.19-1.58)	1.98 (1.74-2.23)	2.40 (2.11-2.70)	3.15 (2.53-3.76)
Noord-Brabant	34,983	0.41 (0.34-0.48)	1.64 (1.50-1.79)	2.17 (1.99-2.34)	2.49 (2.29-2.68)	3.18 (2.84-3.52)
Noord-Holland	35,179	0.41 (0.34-0.48)	1.25 (1.13-1.38)	1.68 (1.53-1.84)	2.04 (1.86-2.23)	2.50 (2.22-2.79)
Overijssel	16,749	0.31 (0.22-0.39)	1.53 (1.32-1.74)	2.14 (1.88-2.40)	2.73 (2.41-3.05)	3.33 (2.89-3.78)
Utrecht	15,530	0.32 (0.23-0.41)	1.49 (1.28-1.71)	2.10 (1.83-2.36)	2.65 (2.32-2.98)	3.34 (2.88-3.80)
Zeeland	5,757	0.13 (0.03-0.22)	0.66 (0.43-0.90)	0.98 (0.68-1.28)	1.07 (0.75-1.40)	n.a.
Zuid-Holland	46,673	0.35 (0.29-0.40)	1.45 (1.33-1.57)	1.98 (1.83-2.13)	2.28 (2.11-2.44)	3.43 (2.93-3.92)

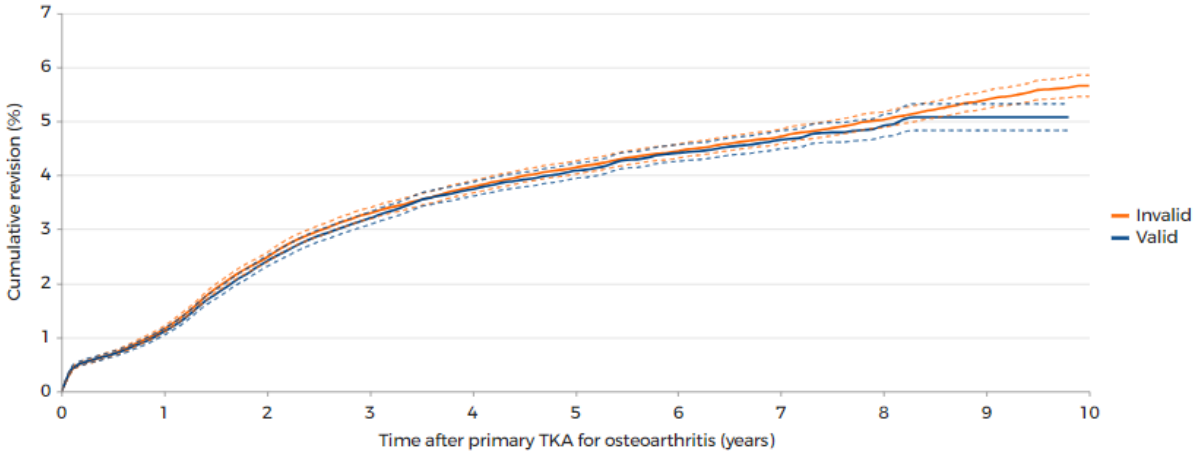
Please note: n.a. if <50 cases were at risk.

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.

TKA: total knee arthroplasty CI: confidence interval.

TKA by pre-PROM

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by valid pre-operative PROM of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2023 (n=236,551)



© LROI 2024 | K063A

	Number (n)	1yr	3yr	5yr	7yr	10yr
Valid	109,087	1.00 (0.94-1.06)	3.14 (3.02-3.25)	4.04 (3.90-4.18)	4.62 (4.45-4.78)	n.a.
Invalid	127,464	1.04 (0.98-1.10)	3.25 (3.14-3.35)	4.11 (3.98-4.23)	4.68 (4.54-4.81)	5.65 (5.45-5.85)

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

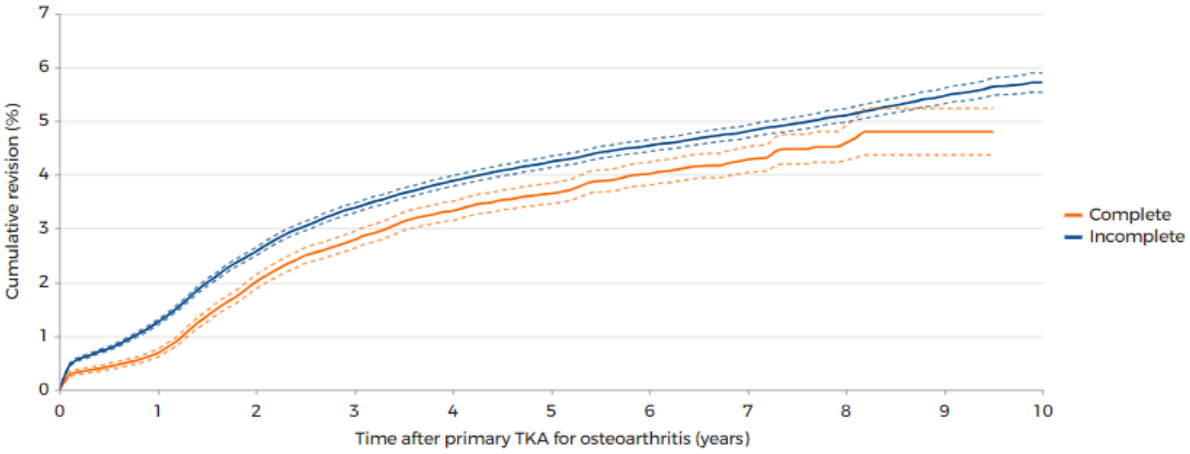
Valid: pre-operative PROM reported; Invalid: non-responders to pre-operative PROM.

TKA: total knee arthroplasty; PROM: patient reported outcome measure; CI: confidence interval.

© LROI 2024 | K063B

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

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by complete PROM (pre-, 6mnd, 12mnd) of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2023 (n=236,551)



© LROI 2024 | K064A

	Number (n)	1yr	3yr	5yr	7yr	10yr
Complete	49,370	0.62 (0.55-0.68)	2.72 (2.57-2.88)	3.63 (3.44-3.82)	4.24 (4.01-4.48)	n.a.
Incomplete	187,181	1.13 (1.09-1.18)	3.33 (3.24-3.42)	4.20 (4.10-4.30)	4.77 (4.65-4.88)	5.71 (5.53-5.89)

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

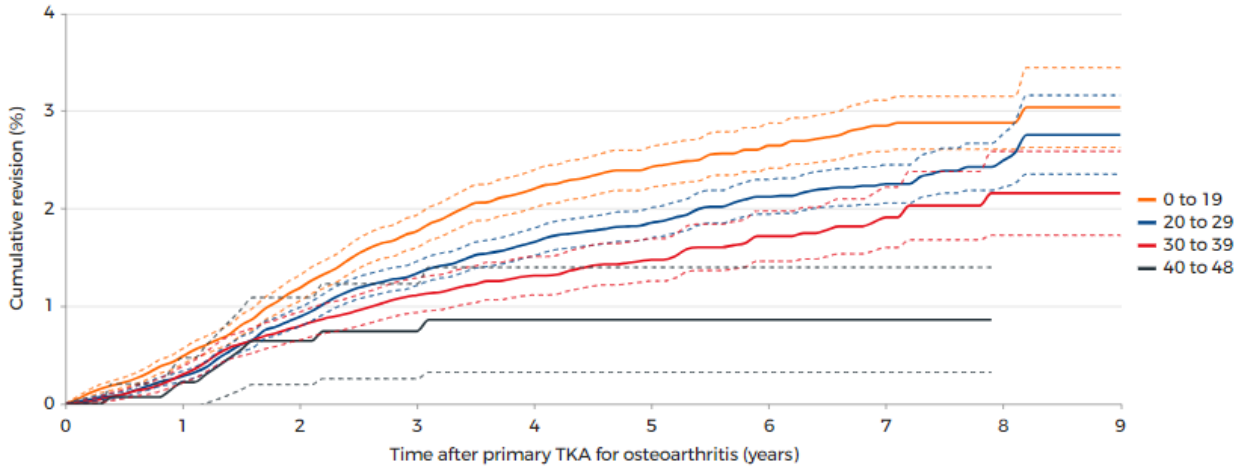
A PROM trajectory is considered complete when preoperative, 6-months postoperative and 12-months postoperative PROMs are reported.

TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K064B

TKA by pre-OKS

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by pre-operative Oxford Knee score of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2023 (n=97,176)



	Number (n)	1yr	3yr	5yr	9yr
0 to 19	31,857	0.42 (0.34-0.49)	1.73 (1.56-1.89)	2.39 (2.18-2.60)	3.03 (2.63-3.44)
20 to 29	45,101	0.25 (0.20-0.30)	1.29 (1.17-1.41)	1.82 (1.67-1.97)	2.75 (2.35-3.16)
30 to 39	18,402	0.24 (0.17-0.32)	1.09 (0.92-1.27)	1.46 (1.24-1.67)	2.16 (1.73-2.59)
40 to 48	1,554	0.14 (-0.06-0.34)	0.74 (0.26-1.23)	0.86 (0.32-1.40)	n.a.

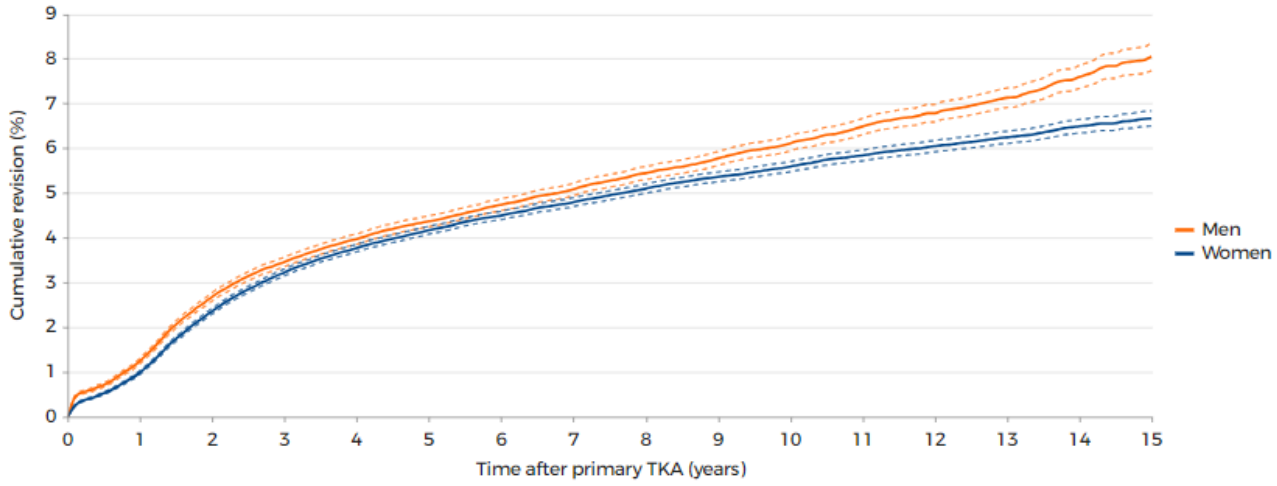
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

TKA: total knee arthroplasty; PROM: patient reported outcome measure; 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 (Kaplan-Meier; 95% CI) of total knee arthroplasties by gender in the Netherlands in 2007-2023 (n=346,802)



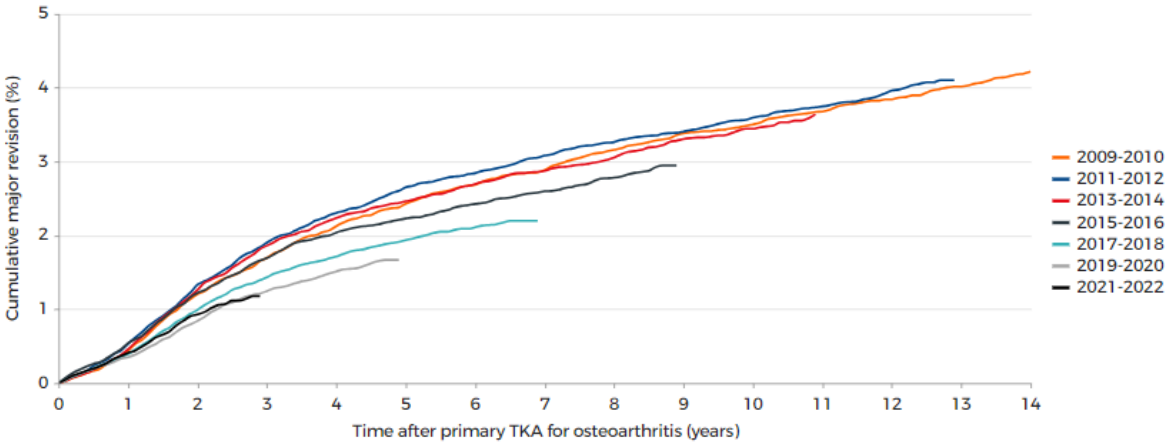
	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Men	129,398	1.11 (1.05-1.17)	3.40 (3.30-3.51)	4.34 (4.21-4.46)	5.04 (4.90-5.18)	6.06 (5.90-6.23)	7.97 (7.68-8.27)
Women	233,545	0.87 (0.84-0.91)	3.16 (3.08-3.23)	4.13 (4.04-4.21)	4.76 (4.66-4.86)	5.56 (5.45-5.67)	6.65 (6.49-6.82)

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

TKA: total knee arthroplasty; CI: confidence interval.

TKA by procedure year for women

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by procedure year for female patients with a primary TKA for osteoarthritis in the Netherlands in 2009-2023 (n=194,210)



	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	23,735	0.37 (0.29-0.45)	1.65 (1.48-1.82)	2.38 (2.18-2.58)	2.85 (2.63-3.08)	3.48 (3.23-3.73)	4.19 (3.91-4.47)
2011-2012	27,194	0.44 (0.36-0.52)	1.84 (1.68-2.01)	2.60 (2.40-2.80)	3.05 (2.84-3.26)	3.56 (3.33-3.79)	n.a.
2013-2014	30,181	0.38 (0.31-0.45)	1.81 (1.66-1.97)	2.44 (2.26-2.62)	2.86 (2.66-3.05)	3.44 (3.22-3.66)	n.a.
2015-2016	31,318	0.46 (0.38-0.53)	1.66 (1.51-1.80)	2.21 (2.04-2.38)	2.58 (2.39-2.76)	n.a.	n.a.
2017-2018	32,489	0.35 (0.29-0.42)	1.39 (1.26-1.53)	1.91 (1.76-2.06)	2.20 (2.02-2.37)	n.a.	n.a.
2019-2020	28,487	0.33 (0.26-0.40)	1.21 (1.08-1.34)	1.67 (1.50-1.84)	n.a.	n.a.	n.a.
2021-2022	30,005	0.37 (0.30-0.44)	1.18 (1.00-1.35)	n.a.	n.a.	n.a.	n.a.

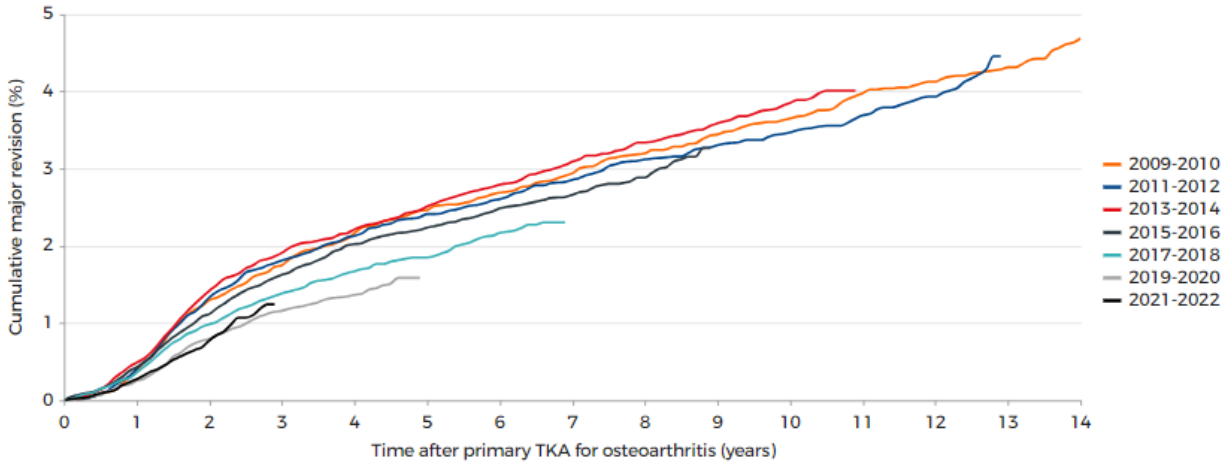
Please note: n.a. if <50 cases were at risk.

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.

TKA: total knee arthroplasty; CI: confidence interval.

TKA by procedure year for men

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by procedure year for male patients with a primary TKA for osteoarthritis in the Netherlands in 2009-2023 (n=107,853)



© LROI 2024 | K068A

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	11,406	0.30 (0.20-0.40)	1.73 (1.48-1.98)	2.45 (2.16-2.75)	2.91 (2.58-3.23)	3.62 (3.26-3.99)	4.63 (4.20-5.06)
2011-2012	13,810	0.31 (0.22-0.41)	1.78 (1.55-2.00)	2.37 (2.11-2.63)	2.83 (2.54-3.12)	3.45 (3.12-3.77)	n.a.
2013-2014	16,022	0.44 (0.33-0.54)	1.86 (1.65-2.08)	2.46 (2.21-2.71)	3.04 (2.77-3.32)	3.81 (3.49-4.14)	n.a.
2015-2016	17,639	0.38 (0.29-0.47)	1.59 (1.40-1.78)	2.20 (1.98-2.43)	2.63 (2.39-2.88)	n.a.	n.a.
2017-2018	18,676	0.29 (0.21-0.37)	1.35 (1.18-1.52)	1.85 (1.65-2.05)	2.30 (2.06-2.55)	n.a.	n.a.
2019-2020	16,788	0.20 (0.14-0.27)	1.15 (0.98-1.31)	1.58 (1.36-1.81)	n.a.	n.a.	n.a.
2021-2022	18,275	0.24 (0.16-0.31)	1.24 (0.97-1.51)	n.a.	n.a.	n.a.	n.a.

Please note: n.a. if <50 cases were at risk.

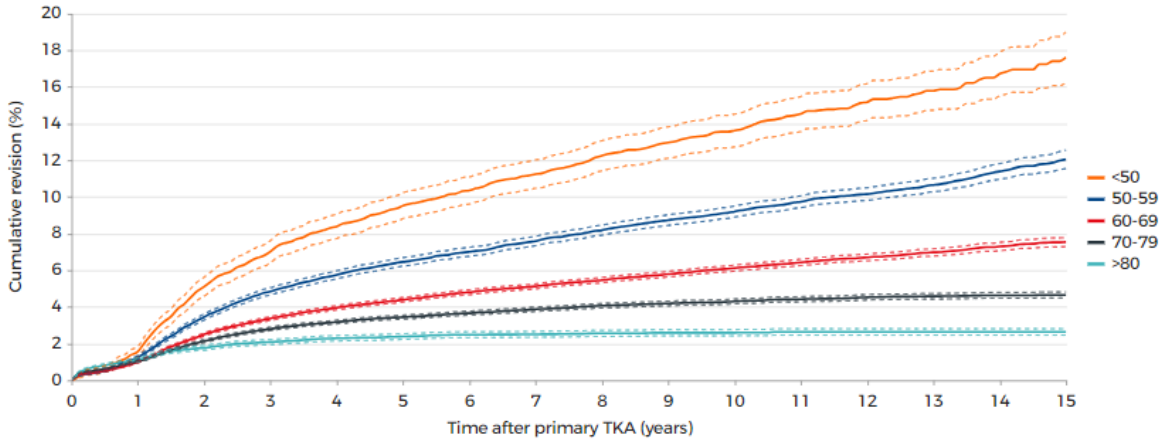
Major revision percentage: First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K068B

TKA by age category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by age category in the Netherlands in 2007-2023 (n=363,147)



© LROI 2024 | K069A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
<50	7,408	1.39 (1.12-1.66)	6.79 (6.20-7.39)	9.36 (8.66-10.05)	11.16 (10.38-11.93)	13.55 (12.66-14.44)	17.39 (16.06-18.73)
50-59	51,402	1.08 (0.99-1.17)	4.77 (4.57-4.96)	6.40 (6.17-6.63)	7.54 (7.28-7.79)	9.12 (8.82-9.42)	11.97 (11.48-12.46)
60-69	125,588	0.87 (0.82-0.93)	3.30 (3.19-3.40)	4.34 (4.22-4.46)	5.08 (4.94-5.22)	6.08 (5.92-6.24)	7.52 (7.27-7.76)
70-79	134,658	0.94 (0.88-0.99)	2.75 (2.65-2.84)	3.43 (3.32-3.53)	3.84 (3.73-3.96)	4.28 (4.15-4.41)	4.65 (4.49-4.81)
>80	44,091	1.04 (0.95-1.14)	2.07 (1.93-2.21)	2.37 (2.22-2.52)	2.50 (2.34-2.66)	2.59 (2.42-2.76)	2.64 (2.46-2.81)

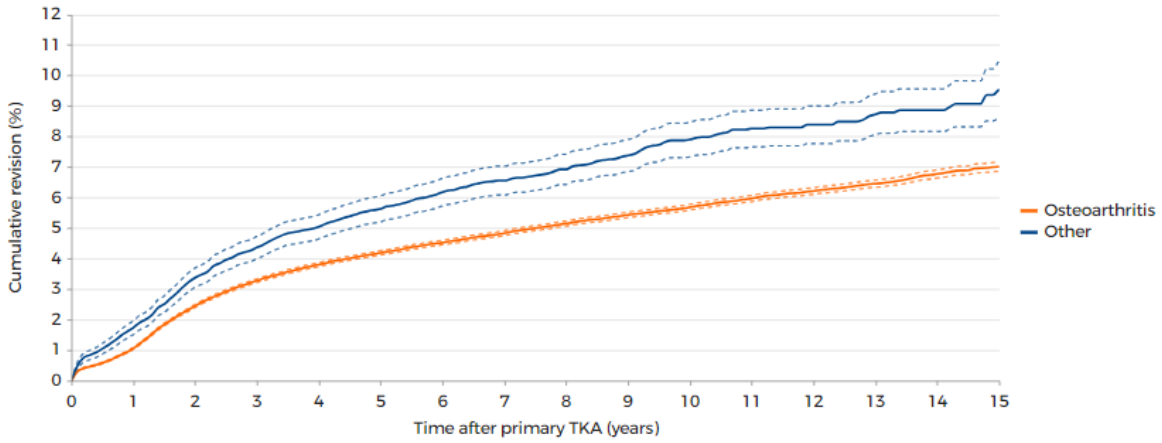
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K069B

TKA by diagnosis

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by diagnosis in the Netherlands in 2007-2023 (n=360,570)



© LROI 2024 | K070A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Osteoarthritis	347,198	0.94 (0.90-0.97)	3.21 (3.15-3.27)	4.15 (4.08-4.22)	4.79 (4.71-4.87)	5.65 (5.55-5.74)	7.00 (6.84-7.15)
Other	13,372	1.60 (1.39-1.82)	4.26 (3.90-4.62)	5.59 (5.17-6.01)	6.56 (6.08-7.03)	7.87 (7.31-8.44)	9.36 (8.51-10.21)

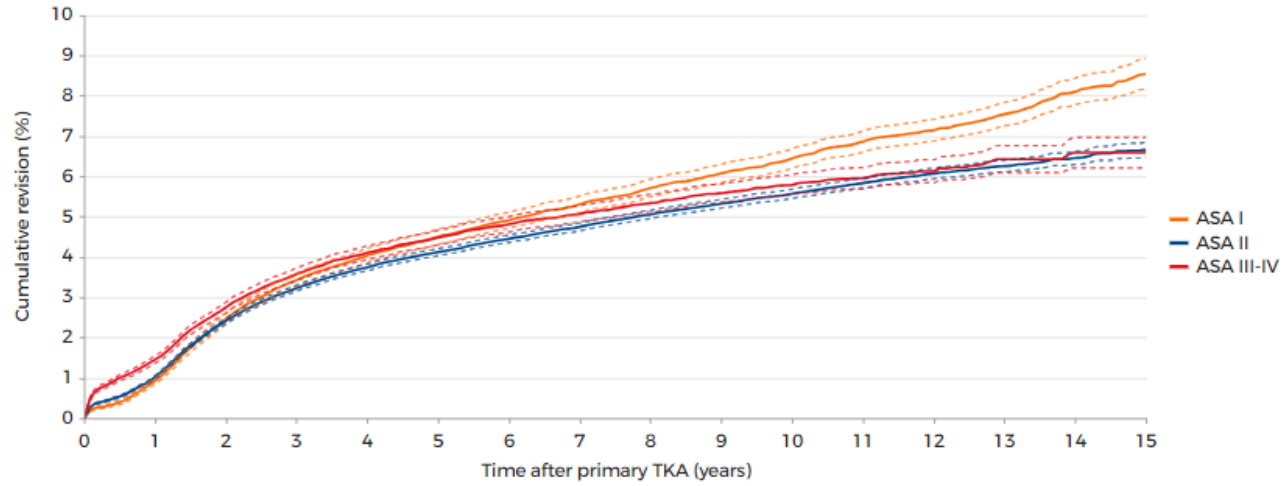
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K070B

TKA by ASA score

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by ASA score in the Netherlands in 2007-2023 (n=354,004)



© LROI 2024 | K071A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
ASA I	53,022	0.80 (0.73-0.88)	3.36 (3.20-3.52)	4.45 (4.26-4.64)	5.25 (5.05-5.46)	6.38 (6.14-6.62)	8.51 (8.13-8.88)
ASA II	233,400	0.89 (0.85-0.93)	3.16 (3.08-3.23)	4.08 (3.99-4.17)	4.71 (4.61-4.81)	5.53 (5.42-5.65)	6.63 (6.45-6.82)
ASA III-IV	67,582	1.34 (1.25-1.43)	3.49 (3.34-3.64)	4.43 (4.25-4.61)	5.04 (4.84-5.24)	5.77 (5.53-6.02)	6.58 (6.20-6.96)

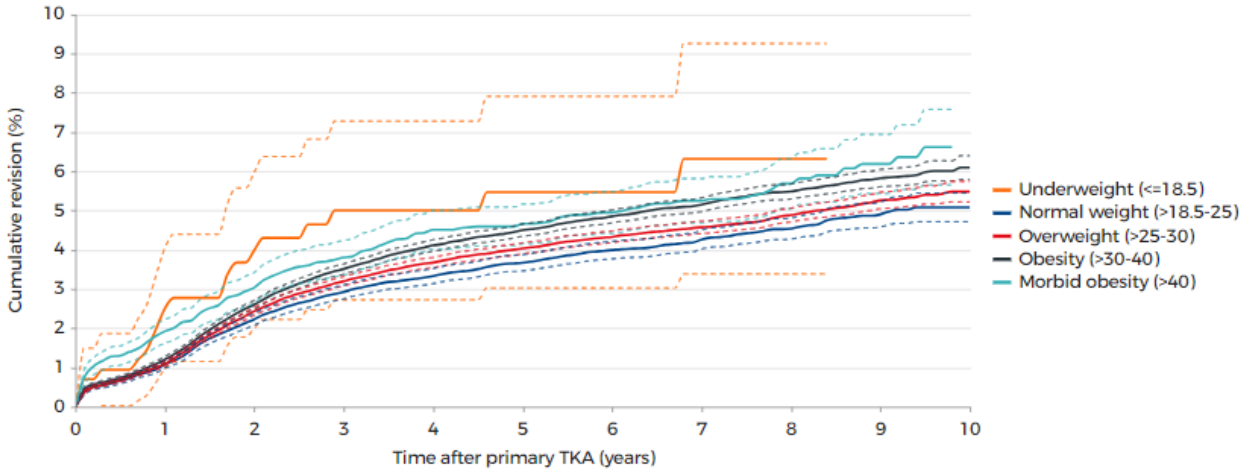
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

THA: total hip arthroplasty; CI: confidence interval.

© LROI 2024 | K071B

TKA by BMI category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by BMI category in the Netherlands in 2014-2023 (n=242,597)



© LROI 2024 | K072A

	Number (n)	1yr	3yr	5yr	7yr	10yr
Underweight (<=18.5)	432	1.98 (0.62-3.33)	5.00 (2.72-7.27)	5.46 (3.03-7.90)	6.32 (3.38-9.25)	n.a.
Normal weight (>18.5-25)	42,972	0.96 (0.86-1.05)	2.87 (2.70-3.05)	3.65 (3.44-3.86)	4.18 (3.94-4.42)	5.08 (4.71-5.44)
Overweight (>25-30)	99,827	1.00 (0.94-1.06)	3.14 (3.02-3.26)	4.00 (3.86-4.14)	4.55 (4.39-4.71)	5.48 (5.22-5.74)
Obesity (>30-40)	91,122	1.09 (1.02-1.16)	3.45 (3.32-3.58)	4.45 (4.30-4.60)	5.11 (4.93-5.28)	6.09 (5.79-6.40)
Morbid obesity (>40)	8,244	1.80 (1.51-2.09)	3.75 (3.31-4.18)	4.59 (4.09-5.09)	5.25 (4.69-5.81)	n.a.

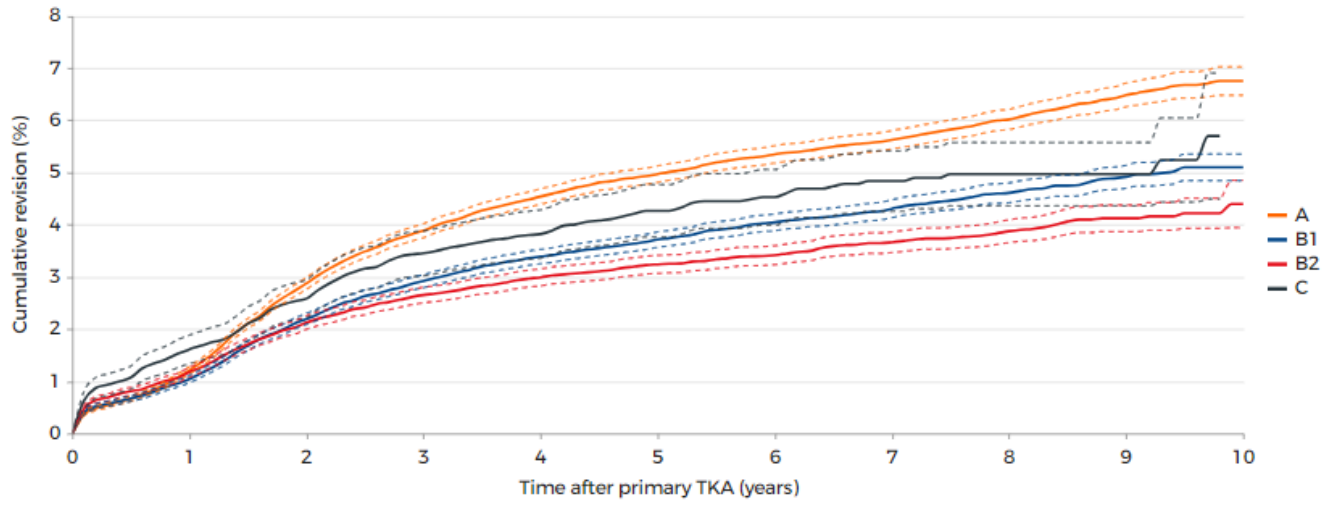
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K072B

TKA by Charnley score

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by charnley score in the Netherlands in 2014-2023 (n=242,597)



© LROI 2024 | K073A

	Number (n)	1yr	3yr	5yr	7yr	10yr
A	96,032	1.07 (1.01-1.14)	3.82 (3.69-3.95)	4.93 (4.77-5.08)	5.59 (5.41-5.76)	6.75 (6.48-7.02)
B1	83,988	0.96 (0.89-1.02)	2.86 (2.74-2.99)	3.67 (3.52-3.81)	4.26 (4.09-4.42)	5.10 (4.84-5.35)
B2	53,494	1.06 (0.98-1.15)	2.61 (2.46-2.76)	3.22 (3.05-3.40)	3.64 (3.45-3.84)	4.40 (3.94-4.85)
C	8,488	1.53 (1.26-1.79)	3.43 (3.00-3.86)	4.26 (3.76-4.77)	4.83 (4.25-5.41)	n.a.

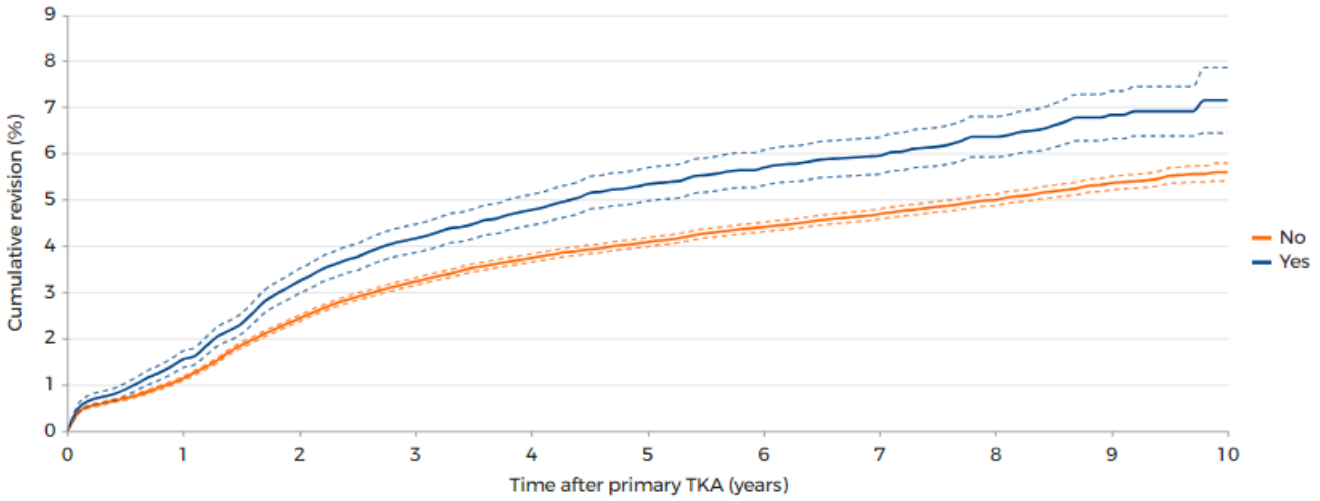
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K073B

TKA by smoking

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by smoking in the Netherlands in 2014-2023 (n=238,445)



© LROI 2024 | K074A

	Number (n)	1yr	3yr	5yr	7yr	10yr
No	226,451	1.03 (0.99-1.07)	3.17 (3.09-3.25)	4.05 (3.95-4.15)	4.65 (4.54-4.76)	5.60 (5.40-5.79)
Yes	20,027	1.40 (1.23-1.57)	4.11 (3.81-4.41)	5.28 (4.92-5.64)	5.93 (5.54-6.33)	7.15 (6.44-7.86)

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

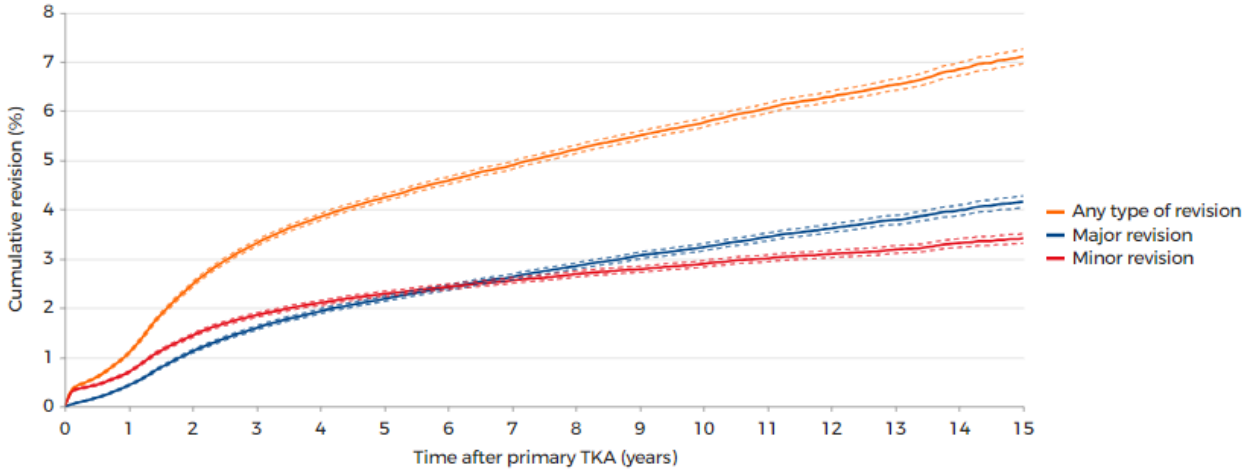
TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K074B

Revision by procedure characteristics

TKA by type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by type of revision in the Netherlands in 2007-2023 (n=363,416)



© LROI 2024 | K075A

	1yr	3yr	5yr	7yr	10yr	15yr
Any type of revision	0.96 (0.93-0.99)	3.24 (3.18-3.31)	4.20 (4.13-4.27)	4.86 (4.78-4.94)	5.73 (5.64-5.82)	7.08 (6.93-7.23)
Major revision	0.36 (0.34-0.38)	1.55 (1.51-1.59)	2.15 (2.10-2.21)	2.60 (2.54-2.66)	3.21 (3.14-3.28)	4.14 (4.02-4.26)
Minor revision	0.63 (0.60-0.66)	1.82 (1.77-1.87)	2.27 (2.22-2.32)	2.54 (2.48-2.60)	2.88 (2.81-2.94)	3.40 (3.30-3.49)

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

Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.

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.

Minor revision: only insert and/or patella exchange (including patella addition).

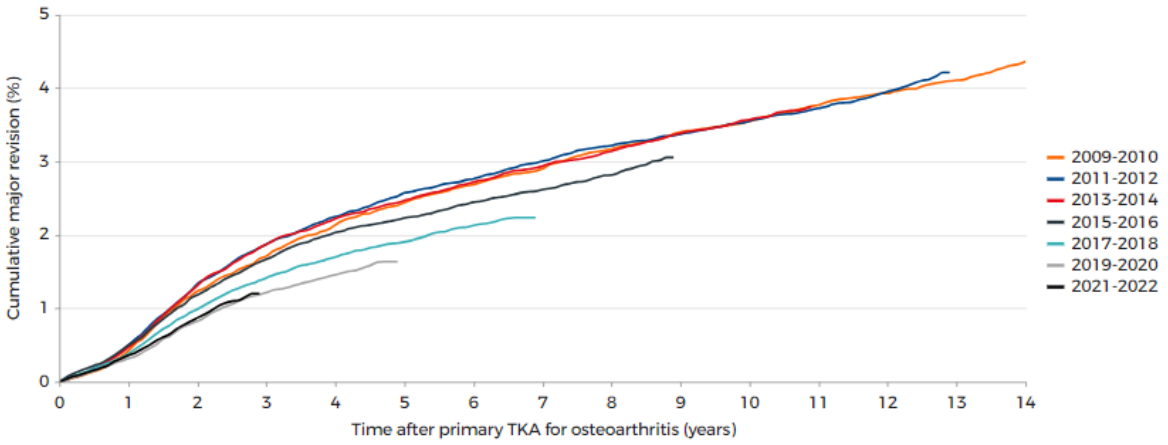
TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K075B

In 2007-2023, 52,473 (14.4%) primary TKAs were implanted in patients who died within fifteen years after the primary diagnosis

TKA by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties by procedure year of primary TKA in the Netherlands in 2009-2023 (n=302,471)



	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	35,204	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 (3.32-3.73)	4.32 (4.09-4.56)
2011-2012	41,140	0.41 (0.34-0.47)	1.82 (1.69-1.96)	2.53 (2.37-2.68)	2.98 (2.81-3.15)	3.52 (3.34-3.71)	n.a.
2013-2014	46,376	0.40 (0.34-0.46)	1.82 (1.70-1.95)	2.44 (2.29-2.58)	2.91 (2.75-3.07)	3.56 (3.38-3.74)	n.a.
2015-2016	48,996	0.43 (0.37-0.49)	1.63 (1.52-1.75)	2.21 (2.07-2.34)	2.59 (2.45-2.74)	n.a.	n.a.
2017-2018	51,172	0.33 (0.28-0.38)	1.38 (1.27-1.48)	1.89 (1.77-2.01)	2.23 (2.09-2.37)	n.a.	n.a.
2019-2020	45,283	0.28 (0.23-0.33)	1.19 (1.08-1.29)	1.64 (1.50-1.77)	n.a.	n.a.	n.a.
2021-2022	48,285	0.32 (0.27-0.37)	1.20 (1.05-1.35)	n.a.	n.a.	n.a.	n.a.

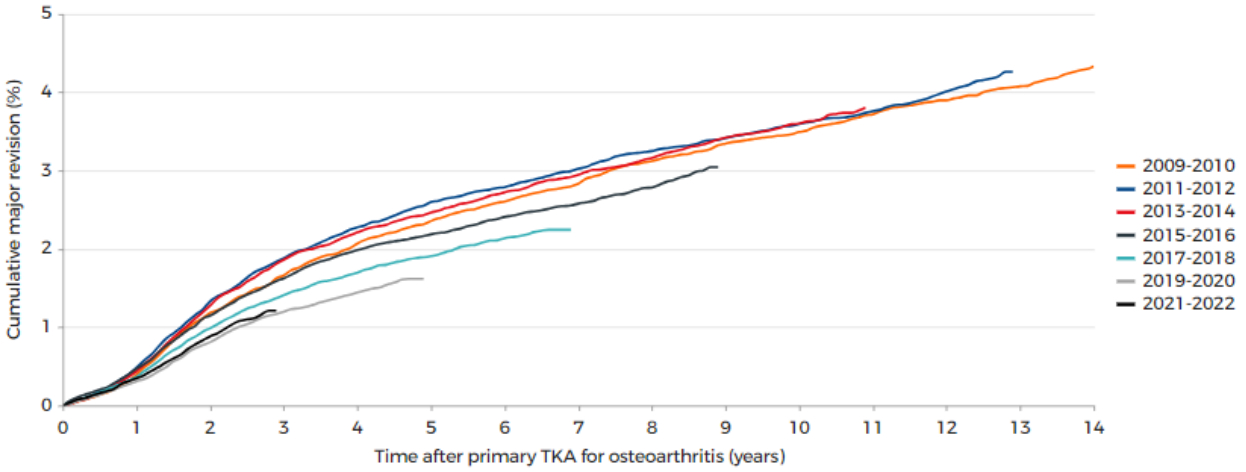
Please note: n.a. if <50 cases were at risk.

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.

TKA: total knee arthroplasty; CI: confidence interval.

TKA cemented by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of cemented total knee arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2023 (n=274,696)



© LROI 2024 | K077A

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	28,066	0.32 (0.25-0.38)	1.62 (1.47-1.77)	2.31 (2.13-2.49)	2.80 (2.60-2.99)	3.46 (3.24-3.68)	4.29 (4.04-4.55)
2011-2012	34,188	0.40 (0.33-0.47)	1.83 (1.69-1.98)	2.55 (2.38-2.72)	2.99 (2.81-3.17)	3.57 (3.37-3.77)	n.a.
2013-2014	40,224	0.37 (0.31-0.43)	1.81 (1.68-1.94)	2.43 (2.28-2.58)	2.92 (2.75-3.08)	3.59 (3.40-3.78)	n.a.
2015-2016	43,558	0.40 (0.34-0.46)	1.59 (1.47-1.71)	2.16 (2.02-2.30)	2.55 (2.40-2.70)	n.a.	n.a.
2017-2018	46,002	0.32 (0.27-0.37)	1.37 (1.26-1.48)	1.89 (1.77-2.02)	2.24 (2.09-2.39)	n.a.	n.a.
2019-2020	40,299	0.27 (0.22-0.33)	1.17 (1.06-1.27)	1.62 (1.48-1.76)	n.a.	n.a.	n.a.
2021-2022	42,648	0.31 (0.26-0.36)	1.21 (1.05-1.37)	n.a.	n.a.	n.a.	n.a.

Please note: n.a. if <50 cases were at risk.

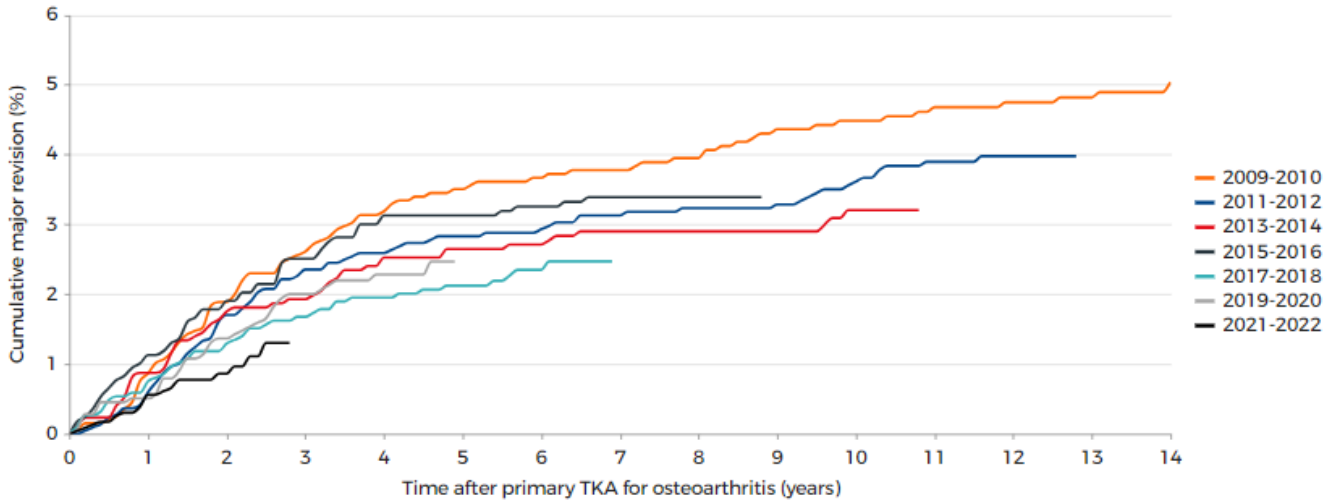
Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

TKA: total knee arthroplasty

© LROI 2024 | K077B

TKA uncemented by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of uncemented total knee arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2023 (n=13,556)



© LROI 2024 | K078A

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	1,983	0.76 (0.38-1.14)	2.56 (1.86-3.26)	3.50 (2.69-4.32)	3.78 (2.93-4.63)	4.48 (3.55-5.42)	4.89 (3.91-5.88)
2011-2012	2,190	0.41 (0.14-0.68)	2.26 (1.64-2.89)	2.83 (2.13-3.53)	3.13 (2.39-3.87)	3.56 (2.76-4.35)	n.a.
2013-2014	1,727	0.87 (0.43-1.31)	1.93 (1.28-2.58)	2.65 (1.88-3.41)	2.90 (2.10-3.70)	3.20 (2.33-4.07)	n.a.
2015-2016	1,694	1.01 (0.53-1.48)	2.51 (1.76-3.26)	3.13 (2.29-3.96)	3.39 (2.52-4.26)	n.a.	n.a.
2017-2018	1,876	0.59 (0.24-0.94)	1.67 (1.09-2.26)	2.12 (1.46-2.78)	2.47 (1.73-3.22)	n.a.	n.a.
2019-2020	1,771	0.51 (0.18-0.84)	2.00 (1.34-2.66)	2.47 (1.67-3.27)	n.a.	n.a.	n.a.
2021-2022	2,320	0.39 (0.14-0.64)	n.a.	n.a.	n.a.	n.a.	

Please note: n.a. if <50 cases were at risk.

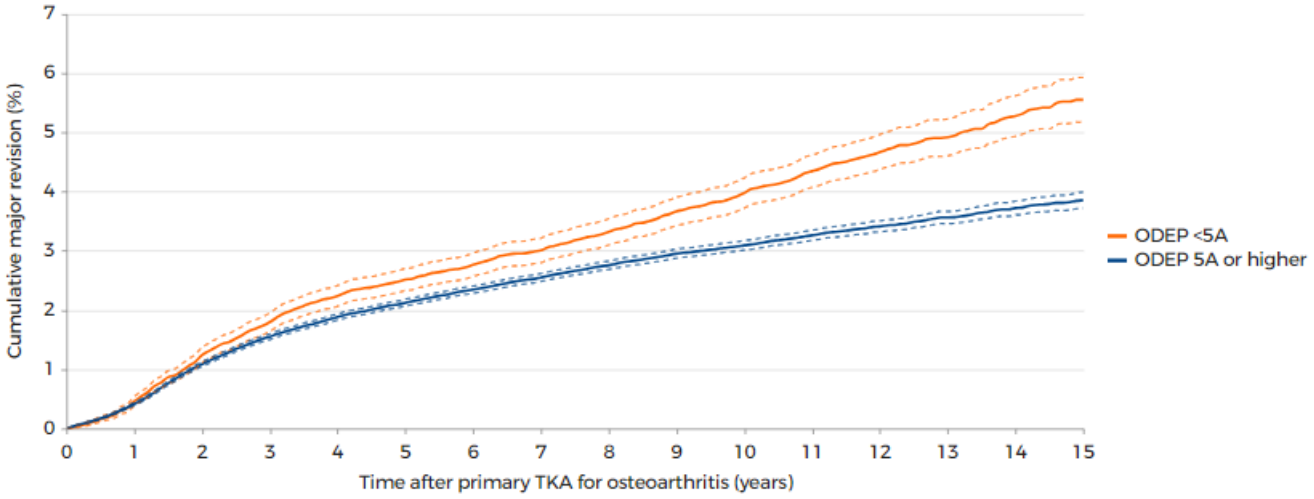
Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

TKA: total knee arthroplasty

© LROI 2024 | K078B

TKA by ODEP 5A or higher

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties for osteoarthritis by ODEP classification 5A or higher in the Netherlands in 2007-2023 (n= 327,470)



© LROI 2024 | K079A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
ODEP <5A	30,023	0.35 (0.28-0.41)	1.73 (1.58-1.89)	2.48 (2.30-2.67)	2.99 (2.78-3.20)	3.92 (3.67-4.17)	5.55 (5.17-5.92)
ODEP 5A or higher	297,748	0.36 (0.33-0.38)	1.51 (1.47-1.56)	2.09 (2.04-2.15)	2.52 (2.46-2.59)	3.07 (2.99-3.15)	3.84 (3.71-3.97)

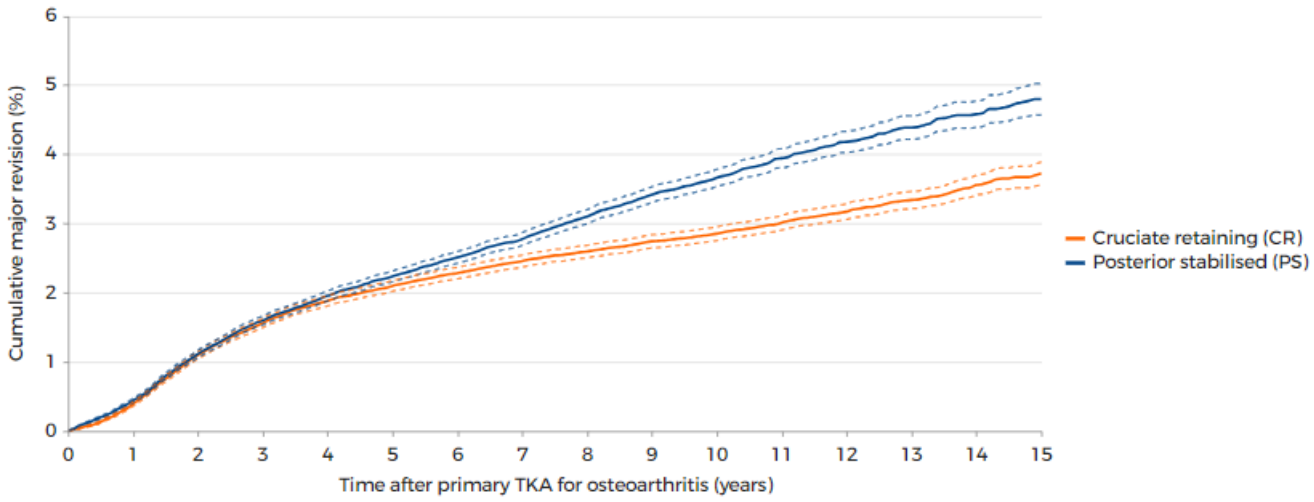
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first

© LROI 2024 | K079B

TKA by type of femur

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties for osteoarthritis by prosthesis design in the Netherlands in 2007-2023 (n=326,093)



© LROI 2024 | K080A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Cruciate retaining (CR)	150,009	0.32 (0.29-0.35)	1.52 (1.45-1.58)	2.07 (1.99-2.15)	2.44 (2.35-2.52)	2.84 (2.74-2.93)	3.70 (3.54-3.86)
Posterior stabilised (PS)	176,376	0.38 (0.35-0.41)	1.57 (1.50-1.63)	2.21 (2.13-2.28)	2.74 (2.65-2.83)	3.62 (3.50-3.75)	4.80 (4.57-5.02)

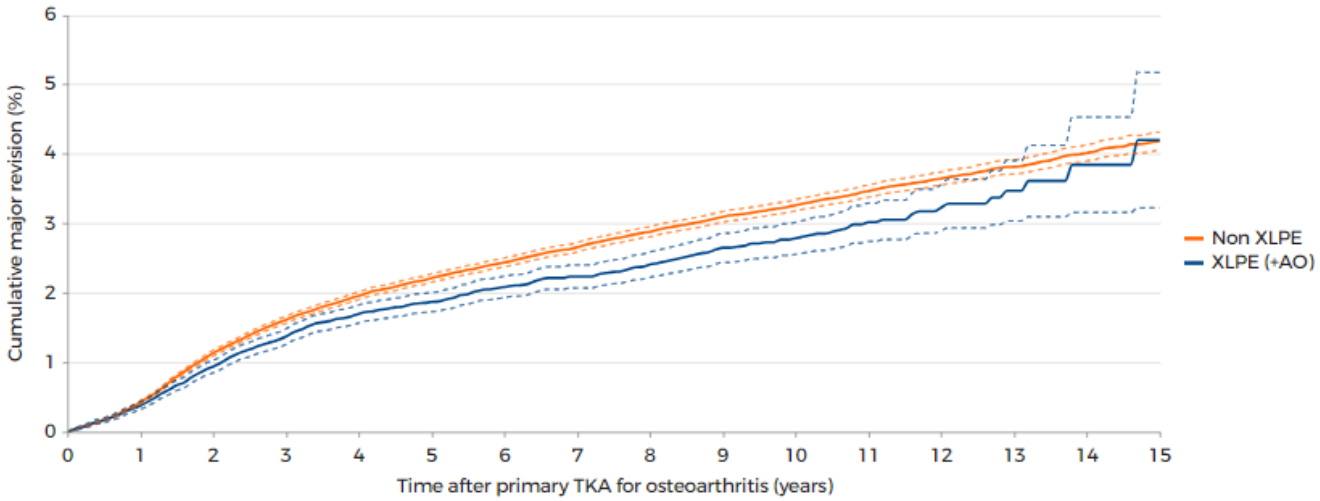
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first

© LROI 2024 | K080B

TKA by PE type

FIGURE Cumulative major revision percentages (Kaplan-Meier; 95% CI) of total knee arthroplasties for osteoarthritis by inlay material in the Netherlands in 2007-2023 (n=332,342)



© LROI 2024 | K081A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Non XLPE	277,707	0.36 (0.34-0.38)	1.58 (1.53-1.62)	2.18 (2.12-2.24)	2.63 (2.56-2.70)	3.24 (3.16-3.32)	4.17 (4.04-4.30)
XLPE (+AO)	54,945	0.33 (0.28-0.38)	1.32 (1.21-1.43)	1.85 (1.72-1.99)	2.24 (2.07-2.40)	2.77 (2.54-2.99)	4.20 (3.22-5.17)

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

Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first

© LROI 2024 | K081B

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 2007-2023 (n=312,778)

					Type of revision (n)						Cumulative revision percentage (95% CI)					
Femur component	Tibia component	Primary TKAs (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Patella addition	Only femur	Only tibia	Only insert/patella	Unknown	1yr	3yr	5yr	7yr	10yr	14yr
All cemented TKAs for osteoarthritis		**312,778**	**69 (63 - 76)**	**13,640**	**4,817**	**2,510**	**525**	**1,168**	**4,298**	**322**	**0.94 (0.91-0.97)**	**3.20 (3.13-3.27)**	**4.15 (4.07-4.23)**	**4.80 (4.71-4.88)**	**5.68 (5.58-5.78)**	**7.10 (6.93-7.27)**
Genesis II	Genesis II	68,889	69 (63 - 76)	3,417	810	737	247	255	1,295	73	1.18 (1.10-1.26)	3.86 (3.70-4.01)	4.90 (4.72-5.07)	5.51 (5.32-5.71)	6.30 (6.07-6.52)	7.68 (7.29-8.07)
NexGen	NexGen	63,875	69 (63 - 75)	2,813	1,190	294	75	330	853	71	0.84 (0.77-0.91)	2.71 (2.58-2.84)	3.73 (3.57-3.89)	4.59 (4.40-4.77)	5.83 (5.60-6.06)	7.39 (7.02-7.76)
VANGUARD COMPLETE KNEE	VANGUARD COMPLETE KNEE	51,335	69 (63 - 75)	2,006	709	364	49	144	695	45	0.96 (0.87-1.04)	3.00 (2.85-3.16)	3.75 (3.57-3.92)	4.28 (4.09-4.48)	4.97 (4.74-5.20)	6.10 (5.69-6.52)
PFC / SIGMA	PFC / SIGMA	33,530	70 (63 - 76)	1,292	403	280	31	92	455	31	0.89 (0.79-0.99)	2.93 (2.74-3.12)	3.65 (3.44-3.87)	4.00 (3.77-4.22)	4.58 (4.32-4.84)	5.09 (4.76-5.42)
LCS	LCS	17,253	70 (63 - 76)	822	437	86	34	145	108	12	0.61 (0.49-0.73)	3.11 (2.85-3.37)	4.14 (3.83-4.44)	4.74 (4.41-5.07)	5.26 (4.89-5.62)	5.91 (5.41-6.41)
TRIATHLON	TRIATHLON	12,256	70 (64 - 76)	441	117	72	17	41	188	6	1.39 (1.18-1.61)	3.55 (3.19-3.92)	4.34 (3.92-4.77)	4.85 (4.37-5.33)	5.41 (4.83-6.00)	n.a.
Persona	Persona	9,354	69 (62 - 74)	147	28	17	1	9	90	2	0.83 (0.64-1.03)	2.75 (2.22-3.29)	4.19 (3.05-5.34)	4.60 (3.21-6.00)	n.a.	n.a.
ATTUNE	ATTUNE	8,636	70 (63 - 76)	126	30	32	4	11	48	1	0.62 (0.44-0.80)	2.41 (1.94-2.88)	2.90 (2.33-3.48)	3.17 (2.49-3.85)	n.a.	n.a.
balanSys	balanSys	4,557	69 (62 - 76)	227	74	83	6	13	46	5	0.96 (0.67-1.25)	4.13 (3.50-4.76)	5.25 (4.51-5.98)	6.11 (5.28-6.93)	6.94 (5.97-7.92)	8.35 (6.81-9.89)
AGC V2	AGC V2	4,420*	71 (65 - 77)	190	110	59	1	2	12	6	0.30 (0.14-0.46)	2.02 (1.61-2.44)	2.60 (2.12-3.07)	3.18 (2.65-3.71)	3.87 (3.28-4.46)	5.39 (4.58-6.21)
TC Plus	TC Plus	3,867	70 (63 - 76)	137	72	33	2	5	20	5	0.65 (0.40-0.91)	2.37 (1.87-2.86)	3.11 (2.52-3.69)	3.49 (2.86-4.13)	4.32 (3.54-5.09)	6.61 (4.48-8.75)
Optetrak	Optetrak	3,073*	70 (62 - 76)	433	277	90	3	33	23	7	1.05 (0.69-1.41)	5.33 (4.53-6.13)	7.16 (6.23-8.08)	9.19 (8.14-10.24)	12.79 (11.52-14.05)	21.42 (18.88-23.96)
ACS	ACS	2,690	67 (60 - 73)	143	36	23	9	12	55	8	0.67 (0.36-0.98)	3.76 (3.04-4.49)	4.73 (3.92-5.54)	5.07 (4.23-5.91)	5.45 (4.58-6.33)	n.a.
SCORPIO NRG	SCORPIO	2,631*	70 (63 - 76)	143	52	47	10	4	29	1	0.84 (0.49-1.19)	3.16 (2.49-3.83)	4.48 (3.68-5.28)	5.12 (4.26-5.98)	5.67 (4.75-6.58)	n.a.
SCORPIO	SCORPIO	2,240*	71 (63 - 76)	122	66	23	3	6	20	4	0.31 (0.08-0.55)	2.35 (1.72-2.98)	3.19 (2.46-3.93)	3.74 (2.94-4.54)	4.71 (3.80-5.61)	6.37 (5.23-7.51)
Journey II BCS	Journey BCS	2,186	68 (62 - 74)	107	19	36	0	0	49	3	0.91 (0.50-1.31)	4.27 (3.29-5.24)	5.64 (4.49-6.79)	6.52 (5.23-7.82)	n.a.	n.a.
MRK	MRK	1,872	70 (63 - 76)	42	20	11	0	0	9	2	0.23 (0.00-0.46)	1.54 (0.88-2.20)	2.97 (1.96-3.99)	3.95 (2.67-5.22)	4.93 (3.01-6.85)	n.a.
NexGen GSF	NexGen	1,300	68 (61 - 74)	35	21	5	0	1	7	1	0.47 (0.09-0.84)	1.47 (0.79-2.14)	2.38 (1.51-3.25)	2.60 (1.67-3.52)	3.29 (2.19-4.39)	n.a.
PFC / SIGMA	LCS	1,212*	66 (58 - 75)	57	29	11	3	1	11	2	0.33 (0.01-0.65)	1.93 (1.15-2.71)	2.88 (1.93-3.84)	3.91 (2.79-5.03)	4.57 (3.33-5.80)	5.75 (4.18-7.33)
Innex	Innex	1,126*	70 (62 - 77)	40	14	11	0	4	11	0	0.98 (0.40-1.55)	2.15 (1.30-2.99)	2.79 (1.82-3.76)	3.18 (2.14-4.22)	3.39 (2.32-4.47)	3.89 (2.67-5.10)
Evolution MP	Evolution MP	1,044	69 (63 - 74)	30	8	10	1	0	10	1	0.79 (0.24-1.34)	2.36 (1.36-3.37)	3.40 (2.10-4.70)	4.27 (2.65-5.88)	n.a.	n.a.
Journey BCS	Journey BCS	890*	66 (59 - 72)	129	17	61	1	3	45	2	1.13 (0.43-1.82)	6.84 (5.17-8.51)	8.36 (6.52-10.20)	10.22 (8.19-12.25)	12.34 (10.11-14.56)	18.25 (15.07-21.44)
Profix	Profix	772*	68 (61 - 76)	61	42	7	2	2	7	1	0.52 (0.01-1.03)	3.68 (2.34-5.02)	5.58 (3.94-7.21)	6.55 (4.77-8.32)	7.72 (5.79-9.65)	8.67 (6.51-10.83)
Genesis II	Profix / Genesis MB baseplate	622*	67 (60 - 75)	66	27	30	0	1	7	1	0.97 (0.20-1.75)	6.92 (4.90-8.94)	8.98 (6.69-11.27)	10.25 (7.81-12.70)	11.24 (8.68-13.81)	11.24 (8.68-13.81)
Rotaglide	Rotaglide	428*	72 (65 - 78)	44	29	4	2	0	9	0	0.94 (0.02-1.85)	4.49 (2.52-6.47)	5.94 (3.68-8.20)	7.18 (4.71-9.66)	10.13 (7.18-13.08)	n.a.
Advance MP	Advance	314*	71 (65 - 78)	33	7	7	1	5	10	3	1.92 (0.40-3.44)	7.67 (4.72-10.62)	8.96 (5.80-12.13)	9.30 (6.08-12.53)	9.65 (6.36-12.93)	n.a.
MAXIM	VANGUARD COMPLETE KNEE	272*	70 (63 - 77)	14	3	3	1	2	5	0	1.47 (0.04-2.90)	2.94 (0.93-4.95)	3.31 (1.18-5.44)	4.06 (1.71-6.41)	4.81 (2.26-7.37)	5.19 (2.54-7.84)

* Denotes prosthesis combinations with no reported use in primary TKAs in 2023.

Please note: n.a. if <50 cases were at risk; TKA: total knee 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.

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 2007-2023 (n=16,847)

					Type of revision (n)						Cumulative revision percentage (95% CI)					
Femur component	Tibia component	Primary TKAs (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Patella addition	Only femur	Only tibia	Only insert/patella	Unknown	1yr	3yr	5yr	7yr	10yr	14yr
All uncemented TKAs for osteoarthritis		**16,847**	**69 (62 - 75)**	**730**	**266**	**107**	**14**	**125**	**210**	**8**	**0.99 (0.84-1.15)**	**3.53 (3.23-3.83)**	**4.37 (4.03-4.71)**	**4.90 (4.53-5.27)**	**5.53 (5.11-5.95)**	**6.45 (5.88-7.02)**
LCS	LCS	8,907	70 (63 - 76)	402	120	47	9	96	126	4	0.92 (0.72-1.12)	3.45 (3.06-3.84)	4.13 (3.70-4.55)	4.45 (4.00-4.90)	4.92 (4.43-5.41)	5.52 (4.90-6.13)
TRIATHLON	TRIATHLON	2,782	68 (62 - 74)	56	20	6	0	4	26	0	0.78 (0.44-1.12)	1.80 (1.23-2.37)	2.49 (1.73-3.25)	3.02 (2.10-3.94)	3.55 (2.38-4.72)	n.a.
ACS	ACS	788	69 (61 - 75)	34	11	7	2	5	9	0	1.74 (0.80-2.68)	4.00 (2.51-5.50)	4.89 (3.18-6.61)	5.16 (3.37-6.95)	5.80 (3.82-7.79)	n.a.
ATTUNE	ATTUNE	725	66 (60 - 72)	18	4	6	0	0	8	0	0.90 (0.18-1.63)	5.54 (2.82-8.26)	5.54 (2.82-8.26)	n.a.	n.a.	n.a.
TRIATHLON	TRIATHLON TRITANIUM	701	68 (62 - 73)	3	2	0	0	0	1	0	0.52 (0.00-1.12)	n.a.	n.a.	n.a.	n.a.	n.a.
DURACON	DURACON	282*	69 (61 - 77)	11	6	1	0	0	4	0	0.35 (0.00-1.05)	0.71 (0.00-1.69)	1.44 (0.04-2.85)	1.44 (0.04-2.85)	3.05 (0.96-5.13)	4.17 (1.57-6.77)
Rotaglide	Rotaglide	265*	69 (61 - 76)	64	43	11	1	1	7	1	1.51 (0.04-2.99)	10.34 (6.65-14.04)	16.32 (11.80-20.85)	19.75 (14.83-24.67)	23.23 (17.88-28.57)	n.a.
NexGen	NexGen	239	69 (63 - 77)	20	10	1	1	3	5	0	1.69 (0.05-3.34)	5.66 (2.67-8.65)	7.16 (3.77-10.55)	8.83 (4.78-12.88)	9.78 (5.37-14.19)	n.a.
ACS LD	ACS LD	234*	70 (61 - 76)	15	6	3	0	2	4	0	1.30 (0.00-2.75)	5.69 (2.68-8.69)	6.17 (3.04-9.30)	6.70 (3.42-9.98)	n.a.	n.a.
Genesis II	Genesis II	228	69 (63 - 76)	11	5	3	0	1	1	1	0.88 (0.00-2.11)	4.65 (1.83-7.47)	4.65 (1.83-7.47)	5.25 (2.21-8.28)	5.25 (2.21-8.28)	n.a.
VANGUARD COMPLETE KNEE	VANGUARD COMPLETE KNEE	163	68 (61 - 74)	14	7	2	0	4	1	0	2.46 (0.08-4.84)	5.63 (2.06-9.21)	5.63 (2.06-9.21)	7.31 (3.11-11.52)	9.51 (4.41-14.62)	n.a.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2023.

Please note: n.a. if <50 cases were at risk; TKA: total knee 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.

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 2007-2023 (n=312,778)

Femur component	Tibia component	Primary TKAs (n)	Median (IQR) age (yr)	Major revisions (n)	Cumulative revision percentage (95% CI)					
					1yr	3yr	5yr	7yr	10yr	14yr
All cemented TKAs for osteoarthritis		**312,778**	**69 (63 - 76)**	**7,289**	**0.34 (0.32-0.36)**	**1.51 (1.46-1.55)**	**2.10 (2.05-2.16)**	**2.55 (2.49-2.61)**	**3.17 (3.09-3.25)**	**4.16 (4.02-4.30)**
Genesis II	Genesis II	68,889	69 (63 - 76)	1,507	0.39 (0.34-0.44)	1.61 (1.51-1.71)	2.14 (2.02-2.26)	2.49 (2.36-2.62)	2.90 (2.75-3.06)	3.38 (3.15-3.62)
NexGen	NexGen	63,875	69 (63 - 75)	1,749	0.29 (0.25-0.34)	1.39 (1.30-1.49)	2.09 (1.96-2.21)	2.79 (2.65-2.94)	3.86 (3.66-4.06)	5.08 (4.76-5.41)
VANGUARD COMPLETE KNEE	VANGUARD COMPLETE KNEE	51,335	69 (63 - 75)	1,034	0.38 (0.33-0.44)	1.45 (1.34-1.56)	1.89 (1.77-2.02)	2.21 (2.06-2.35)	2.62 (2.45-2.80)	3.44 (3.09-3.78)
PFC / SIGMA	PFC / SIGMA	33,530	70 (63 - 76)	594	0.28 (0.22-0.33)	1.18 (1.06-1.30)	1.63 (1.49-1.78)	1.83 (1.67-1.98)	2.15 (1.97-2.34)	2.49 (2.24-2.74)
LCS	LCS	17,253	70 (63 - 76)	653	0.38 (0.29-0.47)	2.29 (2.07-2.52)	3.17 (2.90-3.43)	3.78 (3.47-4.08)	4.27 (3.93-4.61)	4.77 (4.33-5.21)
TRIATHLON	TRIATHLON	12,256	70 (64 - 76)	200	0.43 (0.31-0.55)	1.51 (1.26-1.75)	2.09 (1.78-2.40)	2.37 (2.02-2.73)	2.64 (2.23-3.06)	n.a.
Persona	Persona	9,354	69 (62 - 74)	44	0.20 (0.10-0.30)	0.87 (0.55-1.19)	1.75 (0.84-2.65)	2.19 (0.94-3.44)	n.a.	n.a.
ATTUNE	ATTUNE	8,636	70 (63 - 76)	49	0.22 (0.11-0.33)	0.89 (0.61-1.18)	1.27 (0.86-1.69)	1.40 (0.91-1.89)	n.a.	n.a.
balanSys	balanSys	4,557	69 (62 - 76)	101	0.32 (0.15-0.49)	1.56 (1.16-1.95)	2.32 (1.82-2.83)	2.92 (2.32-3.52)	3.29 (2.61-3.97)	3.66 (2.81-4.51)
AGC V2	AGC V2	4,420*	71 (65 - 77)	120	0.14 (0.03-0.25)	1.08 (0.77-1.39)	1.49 (1.13-1.85)	1.94 (1.53-2.36)	2.40 (1.93-2.87)	3.54 (2.85-4.23)

* Denotes prosthesis combinations with no reported use in primary TKAs in 2023.

Please note: n.a. if <50 cases were at risk.

Majore revision: Revision of at least the femur or tibia component

TKA: total knee arthroplasty; CI: confidence interval; IQR: interquartile range.

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 2007-2023 (n=16,847)

					Cumulative revision percentage (95% CI)					
Femur component	**Tibia component**	**Primary TKAs (n)**	**Median (IQR) age (yr)**	**Major revisions (n)**	**1yr**	**3yr**	**5yr**	**7yr**	**10yr**	**14yr**
All uncemented TKAs for osteoarthritis		**16,847**	**69 (62 - 75)**	**451**	**0.59 (0.47-0.71)**	**2.07 (1.83-2.30)**	**2.68 (2.41-2.95)**	**3.02 (2.73-3.32)**	**3.46 (3.12-3.80)**	**4.12 (3.64-4.60)**
LCS	LCS	8,907	70 (63 - 76)	245	0.58 (0.42-0.74)	2.13 (1.82-2.44)	2.62 (2.27-2.96)	2.74 (2.39-3.10)	2.98 (2.60-3.36)	3.41 (2.90-3.92)
TRIATHLON	TRIATHLON	2,782	68 (62 - 74)	29	0.36 (0.12-0.59)	0.76 (0.38-1.14)	1.25 (0.68-1.82)	1.66 (0.92-2.39)	2.46 (1.30-3.62)	n.a.
ACS	ACS	788	69 (61 - 75)	21	1.22 (0.43-2.01)	2.50 (1.32-3.68)	3.15 (1.76-4.53)	3.42 (1.94-4.89)	3.42 (1.94-4.89)	n.a.
ATTUNE	ATTUNE	725	66 (60 - 72)	6	0.15 (0.00-0.44)	1.60 (0.13-3.08)	2.68 (0.13-5.23)	n.a.	n.a.	n.a.
TRIATHLON	TRIATHLON TRITANIUM	701	68 (62 - 73)	2	0.37 (0.00-0.89)	n.a.	n.a.	n.a.	n.a.	n.a.
DURACON	DURACON	282*	69 (61 - 77)	6	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.37 (0.00-1.08)	0.37 (0.00-1.08)	1.56 (0.04-3.08)	2.24 (0.23-4.25)
Rotaglide	Rotaglide	265*	69 (61 - 76)	52	0.38 (0.00-1.12)	6.54 (3.53-9.54)	11.33 (7.45-15.22)	15.18 (10.72-19.64)	18.62 (13.67-23.58)	n.a.
NexGen	NexGen	239	69 (63 - 77)	15	1.27 (0.00-2.70)	4.37 (1.72-7.02)	5.32 (2.39-8.25)	6.99 (3.31-10.68)	6.99 (3.31-10.68)	n.a.
ACS LD	ACS LD	234*	70 (61 - 76)	9	1.30 (0.00-2.76)	3.50 (1.12-5.89)	3.98 (1.43-6.53)	3.98 (1.43-6.53)	n.a.	n.a.
Genesis II	Genesis II	228	69 (63 - 76)	6	0.44 (0.00-1.31)	2.81 (0.59-5.02)	2.81 (0.59-5.02)	2.81 (0.59-5.02)	2.81 (0.59-5.02)	n.a.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2023.

Please note: n.a. if <50 cases were at risk.

Majore revision: Revision of at least the femur or tibia component

TKA: total knee arthroplasty; CI: confidence interval; IQR: interquartile range.

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 2007-2023

Bone cement	Primary TKAs (n)	Median (IQR) age (yr)	Revisions (n)	Cumulative revision percentage (95% CI)					
				1yr	3yr	5yr	7yr	10yr	14yr
Separately packed	**183,676**	**69 (63 - 76)**	**9,162**	**0.89 (0.85-0.93)**	**3.24 (3.15-3.32)**	**4.21 (4.12-4.31)**	**4.89 (4.78-4.99)**	**5.76 (5.64-5.89)**	**7.23 (7.02-7.44)**
PALACOS R+G	137,562	69 (63 - 76)	6,788	0.91 (0.86-0.97)	3.25 (3.16-3.35)	4.22 (4.11-4.33)	4.88 (4.76-5.00)	5.75 (5.60-5.89)	7.34 (7.07-7.61)
Refobacin Bone Cement R	13,368	69 (63 - 76)	690	0.80 (0.65-0.96)	3.08 (2.77-3.38)	3.99 (3.63-4.34)	4.91 (4.51-5.32)	6.45 (5.94-6.96)	7.99 (7.30-8.69)
PALACOS MV+G	8,211	70 (64 - 76)	382	0.80 (0.61-1.00)	3.04 (2.66-3.42)	4.03 (3.59-4.47)	4.78 (4.30-5.27)	5.28 (4.75-5.81)	n.a.
Simplex ABC EC	5,077*	69 (62 - 76)	349	0.93 (0.66-1.19)	3.70 (3.18-4.22)	4.98 (4.38-5.59)	5.97 (5.31-6.64)	7.07 (6.33-7.80)	8.93 (7.16-10.70)
Simplex ABC TOBRA	4,864	66 (60 - 73)	221	0.78 (0.53-1.03)	2.24 (1.83-2.66)	3.01 (2.53-3.50)	3.56 (3.04-4.09)	4.48 (3.87-5.09)	6.35 (5.17-7.53)
Refobacin Plus Bone Cement	3,054*	68 (60 - 75)	195	1.02 (0.66-1.37)	4.28 (3.56-5.00)	5.36 (4.56-6.17)	5.78 (4.95-6.62)	6.33 (5.44-7.21)	6.77 (5.84-7.70)
Subiton G	1,843	69 (61 - 75)	79	1.58 (0.99-2.17)	5.42 (4.18-6.65)	6.66 (4.81-8.52)	n.a.	n.a.	n.a.
PALACOS R	1,673*	69 (62 - 76)	75	0.54 (0.19-0.89)	2.60 (1.84-3.37)	3.23 (2.37-4.08)	3.75 (2.82-4.67)	4.49 (3.47-5.52)	4.99 (3.85-6.12)
Biomet Plus Bone Cement	1,446	68 (61 - 75)	66	1.05 (0.52-1.58)	3.47 (2.51-4.42)	4.40 (3.32-5.49)	4.60 (3.48-5.71)	4.88 (3.70-6.06)	n.a.
PALAMED G	1,345*	70 (63 - 76)	60	0.22 (0.00-0.48)	2.25 (1.46-3.05)	3.18 (2.24-4.13)	3.50 (2.51-4.50)	4.01 (2.94-5.08)	4.87 (3.65-6.08)
Biomet Bone Cement R	1,104	69 (62 - 74)	34	0.91 (0.32-1.50)	3.39 (2.02-4.75)	5.63 (3.40-7.86)	6.58 (3.70-9.46)	6.58 (3.70-9.46)	n.a.
VERSABOND	631*	71 (63 - 78)	54	0.63 (0.01-1.25)	5.43 (3.65-7.20)	6.42 (4.50-8.35)	6.93 (4.93-8.93)	7.48 (5.40-9.56)	n.a.
cemSys 1G	547*	64 (58 - 69)	38	1.10 (0.22-1.97)	3.31 (1.80-4.81)	5.73 (3.77-7.69)	6.90 (4.75-9.05)	n.a.	n.a.
Simplex P	398*	70 (62 - 77)	22	0.00 (0.00-0.00)	2.83 (1.18-4.48)	3.90 (1.96-5.84)	4.48 (2.40-6.57)	5.41 (3.10-7.73)	6.21 (3.66-8.76)
Simplex HV	376	66 (61 - 73)	7	0.27 (0.00-0.79)	1.61 (0.33-2.89)	2.24 (0.47-4.01)	n.a.	n.a.	n.a.
Synicem1G	334*	71 (65 - 77)	12	0.60 (0.00-1.43)	3.68 (1.63-5.72)	3.68 (1.63-5.72)	n.a.	n.a.	n.a.
Pre-packed in a vacuum mixing system	**108,935**	**70 (63 - 76)**	**3,654**	**1.03 (0.97-1.09)**	**3.23 (3.11-3.35)**	**4.05 (3.91-4.19)**	**4.65 (4.49-4.82)**	**5.47 (5.25-5.69)**	**7.30 (6.33-8.27)**
Refobacin Bone Cement R	47,649	70 (64 - 76)	1,637	1.06 (0.97-1.16)	3.16 (2.98-3.34)	4.05 (3.84-4.26)	4.75 (4.50-5.00)	5.57 (5.24-5.89)	n.a.
PALACOS R+G	43,015	71 (64 - 76)	1,187	1.12 (1.01-1.22)	3.27 (3.07-3.47)	3.98 (3.74-4.22)	4.45 (4.16-4.74)	4.67 (4.21-5.12)	n.a.
Refobacin Plus Bone Cement	16,501	68 (62 - 74)	713	0.71 (0.58-0.84)	3.12 (2.84-3.40)	3.96 (3.64-4.28)	4.47 (4.13-4.82)	5.27 (4.87-5.68)	6.76 (5.93-7.59)
Cemex Genta	1,355	71 (65 - 77)	100	1.04 (0.50-1.58)	4.92 (3.76-6.07)	5.68 (4.44-6.92)	6.32 (5.01-7.63)	7.52 (6.04-8.99)	n.a.

* Denotes types of bone cement with no reported use in primary TKAs in 2023.

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

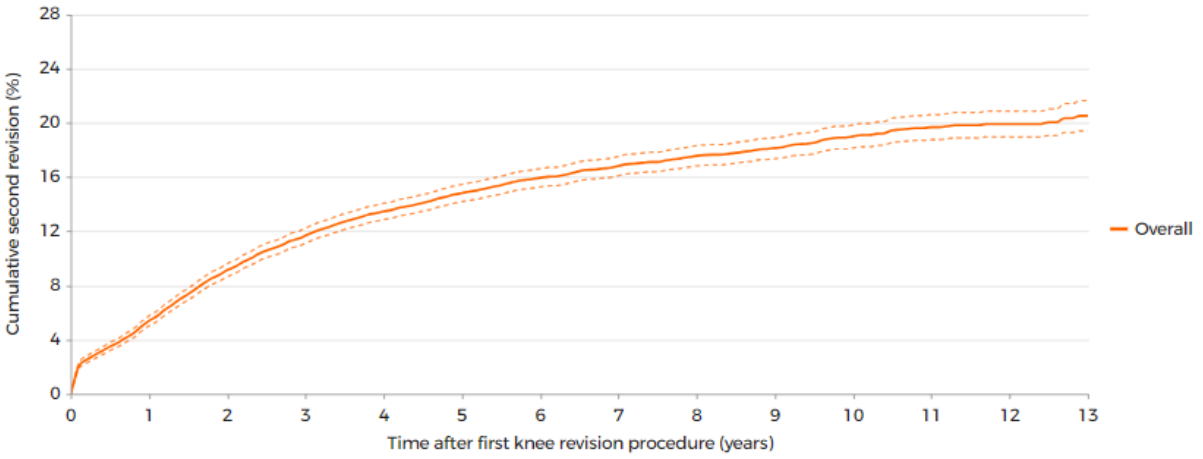
Only types of bone cement with over 250 procedures have been listed.

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 of the prosthesis may have influenced the cumulative revision percentages.

Rerevision

Overall second revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties after a one-stage first revision in the Netherlands in 2007-2023 (n=14,991)



© LROI 2024 | K087A

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

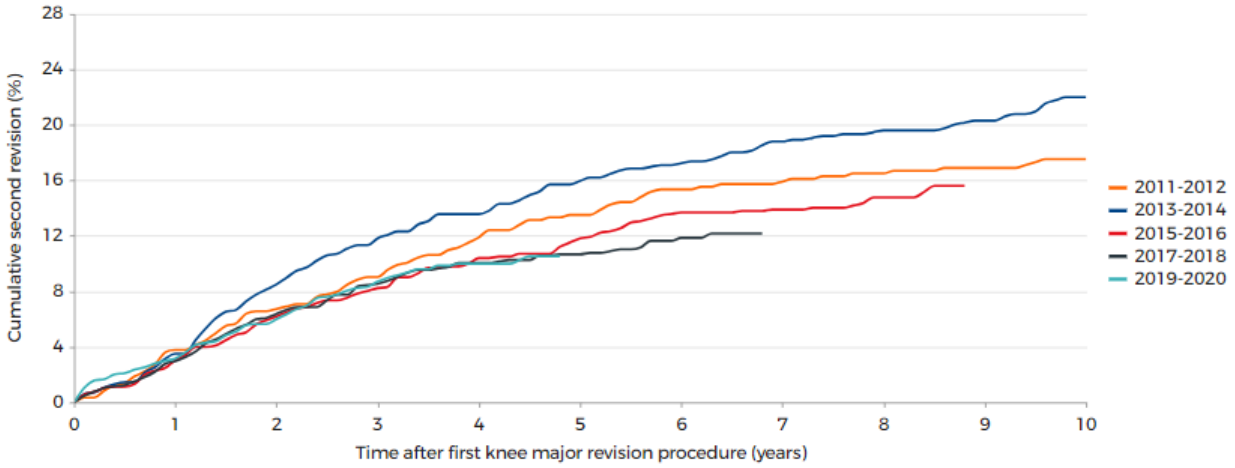
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).

CI: confidence interval.

© LROI 2024 | K087B

By procedure year of first major revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties after a one-stage first revision by procedure year of first major revision in the Netherlands in 2012-2023 (n=4,662)



© LROI 2024 | K088A

	Number (n)	1yr	3yr	5yr	7yr	10yr
2011-2012	587	3.61 (2.09-5.12)	9.02 (6.68-11.36)	13.50 (10.69-16.30)	15.71 (12.71-18.72)	17.51 (14.35-20.67)
2013-2014	834	3.14 (1.95-4.32)	11.32 (9.15-13.49)	15.69 (13.19-18.18)	18.78 (16.09-21.48)	21.99 (19.04-24.93)
2015-2016	1,052	2.47 (1.53-3.41)	8.03 (6.38-9.67)	11.50 (9.56-13.45)	13.88 (11.76-16.01)	n.a.
2017-2018	1,046	2.78 (1.78-3.78)	8.44 (6.74-10.14)	10.66 (8.77-12.56)	n.a.	n.a.
2019-2020	1,143	2.98 (1.99-3.97)	8.33 (6.72-9.94)	n.a.	n.a.	n.a.

Please note: n.a. if <50 cases were at risk.

One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

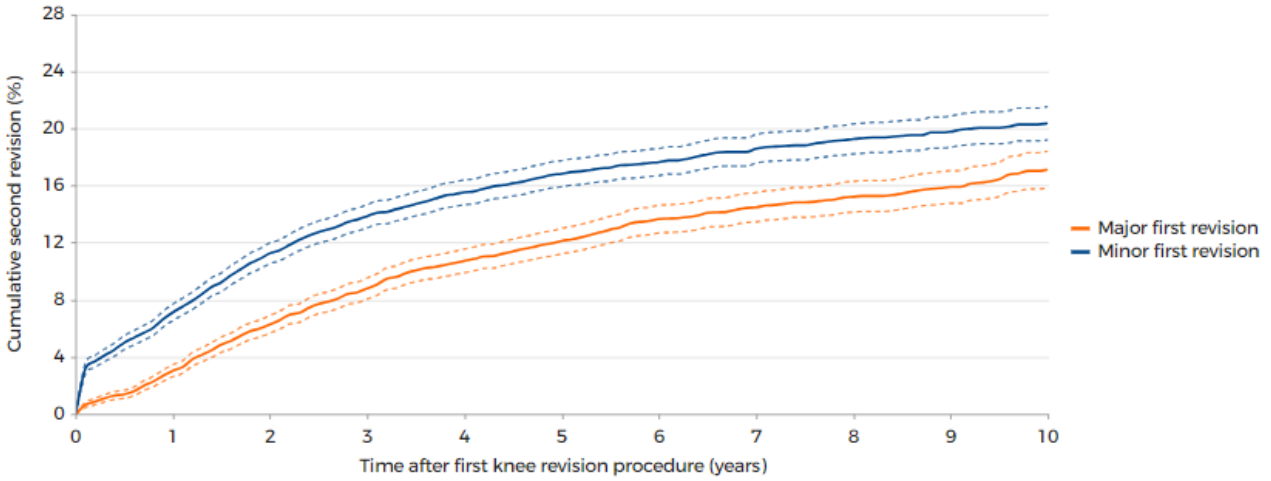
Major revision: revision of at least the femur or tibia component.

CI: confidence interval.

© LROI 2024 | K088B

By type of first revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties after a one-stage first revision by type of first revision in the Netherlands in 2007-2023 (n=14,991)

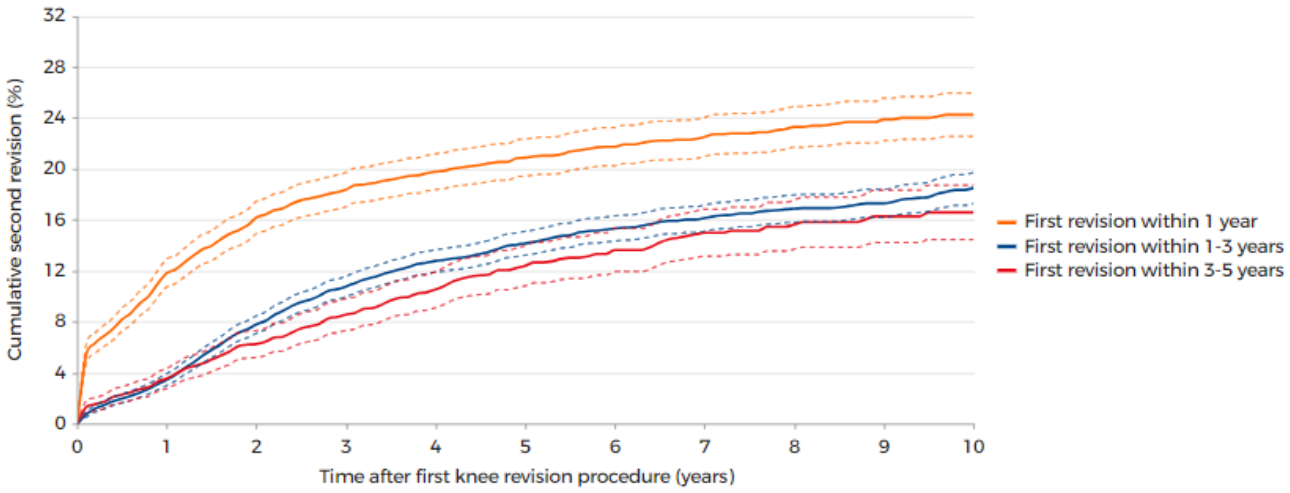


	Number (n)	1yr	3yr	5yr	7yr	10yr
Major first revision	6,687	2.67 (2.28-3.07)	8.51 (7.79-9.24)	11.94 (11.06-12.82)	14.42 (13.40-15.44)	17.02 (15.75-18.29)
Minor first revision	8,010	6.63 (6.07-7.19)	13.61 (12.80-14.41)	16.74 (15.83-17.65)	18.34 (17.35-19.32)	20.27 (19.12-21.41)

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

By time to first revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total knee arthroplasties after a one-stage first revision by time to first revision in the Netherlands in 2007-2023 (n=12,074)



	Number (n)	1yr	3yr	5yr	7yr	10yr
First revision within 1 year	3,536	10.97 (9.92-12.02)	18.17 (16.83-19.51)	20.82 (19.37-22.27)	22.35 (20.81-23.88)	24.23 (22.53-25.93)
First revision within 1-3 years	6,348	3.09 (2.66-3.52)	10.54 (9.75-11.34)	14.03 (13.10-14.96)	16.01 (15.00-17.03)	18.33 (17.13-19.54)
First revision within 3-5 years	2,190	3.29 (2.54-4.05)	8.37 (7.13-9.61)	12.21 (10.66-13.77)	14.85 (13.02-16.67)	16.57 (14.44-18.70)

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

Reasons for seconds revision by type of first revision

TABLE Reasons for second revision within eight 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 2007-2023

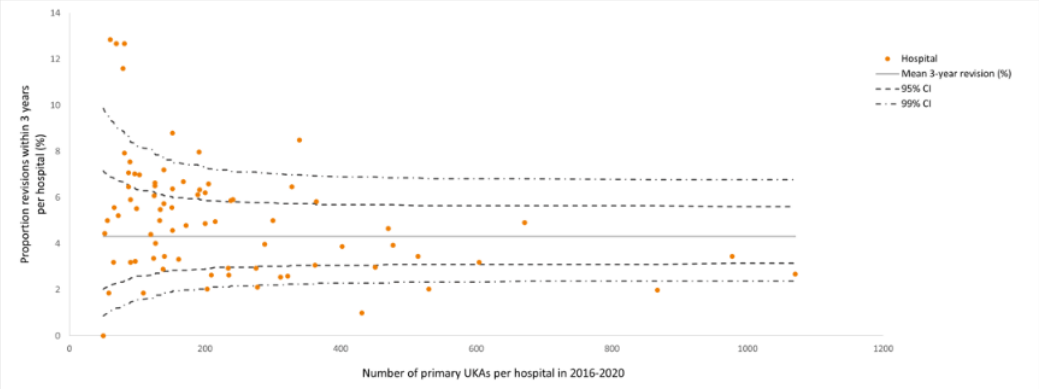
	Major revision (n=739)	Minor revision (n=858)	Any type of revision (n=1,673)
Reasons for second revision	**Proportion (%)**	**Proportion (%)**	**Proportion (%)**
Infection	24.56	49.65	38.43
Instability	30.80	25.29	27.62
Loosening of tibia component	20.08	12.70	16.02
Patellar pain	17.77	8.86	13.21
Malalignment	10.31	9.67	10.10
Loosening of femur component	11.26	4.08	7.53
Arthrofibrosis	8.01	4.43	6.10
Patellar dislocation	3.93	3.73	3.71
Insert wear	2.31	2.21	2.39
Loosening of patella component	2.31	1.40	1.91
Peri-prosthetic fracture	0.95	0.58	0.72
Progression of osteoarthritis	0.00	0.35	0.18
Other	8.14	5.71	6.93

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

Survival unicondylar knee arthroplasty

Overall revision per hospital

FIGURE Funnel plot of proportion of knee revision arthroplasties within three years after a unicondylar knee arthroplasty per hospital in the Netherlands in 2016-2020 (n=18,078)

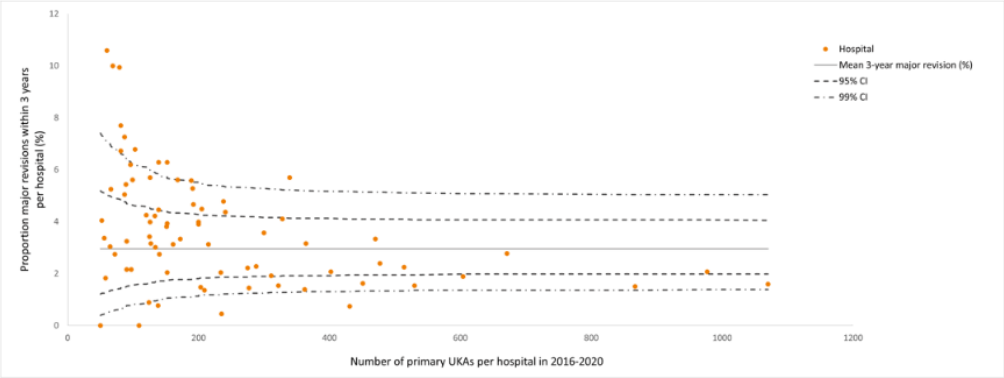


Please note: The proportion of revisions within 3 years per hospital were adjusted for casemix factors age, gender, ASA score and diagnosis (osteoarthritis versus other).
UKA: unicondylar knee arthroplasty; CL: control limits.

The mean 3-years revision percentage is 4.31 in the Netherlands in 2016-2020.
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 unicondylar knee arthroplasty per hospital in the Netherlands in 2016-2020 (n=18,078)

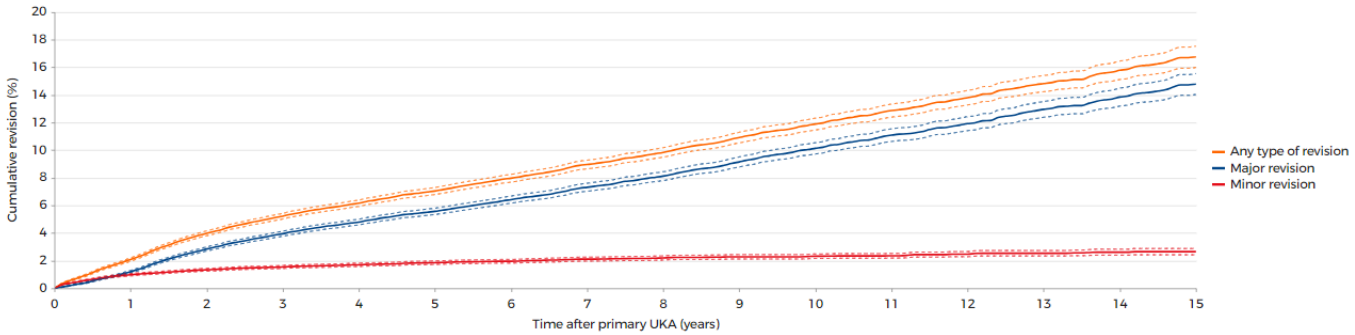


Please note: The proportion of revisions within 3 years per hospital were adjusted for casemix factors age, gender, ASA score and diagnosis (osteoarthritis versus other).
UKA: unicondylar knee arthroplasty; CL: control limits.

The mean 3-years major revision percentage is 2.95 in the Netherlands in 2016-2020.
Control limits indicate the plausible range of outcome if all hospitals perform equally well.

UKA by type pf revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of unicondylar knee arthroplasties by type of revision in the Netherlands in 2007-2023 (n=55,945)



© LROI 2024 | K092A

	1yr	3yr	5yr	7yr	10yr	15yr
Any type of revision	1.88 (1.77-2.00)	5.11 (4.91-5.31)	6.96 (6.71-7.21)	8.89 (8.58-9.20)	11.78 (11.36-12.20)	16.69 (15.92-17.45)
Major revision	1.04 (0.96-1.13)	3.85 (3.67-4.03)	5.50 (5.28-5.73)	7.24 (6.95-7.52)	10.04 (9.63-10.44)	14.71 (13.96-15.46)
Minor revision	0.93 (0.84-1.01)	1.52 (1.41-1.63)	1.84 (1.71-1.97)	2.10 (1.96-2.25)	2.30 (2.14-2.46)	2.65 (2.42-2.88)

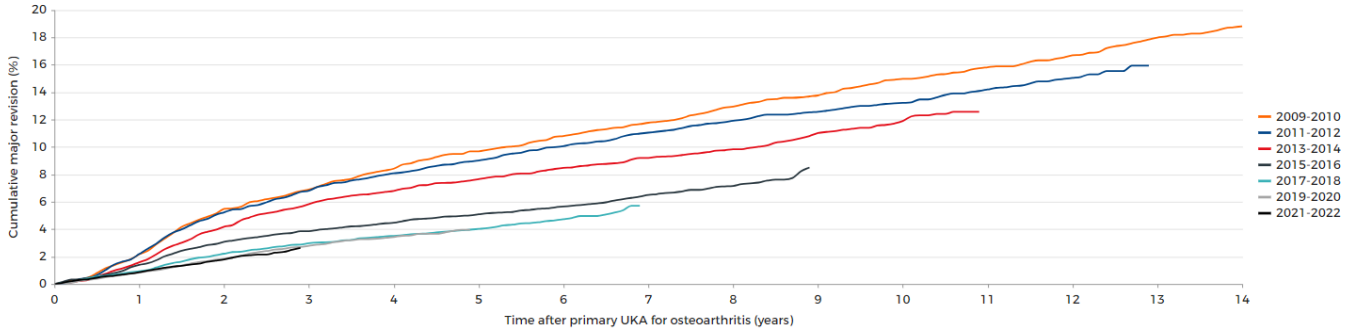
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.
Major revision: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
Minor revision: only insert and/or patella exchange (including patella addition).
UKA: unicondylar knee arthroplasty; CI: confidence interval.

© LROI 2024 | K092B

In 2007-2023, 2,650 (4.7%) primary UKAs were implanted in patients who died within fifteen years after the primary diagnosis

UKA by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of unicondylar knee arthroplasties for osteoarthritis by procedure year of primary UKA in the Netherlands in 2009-2023 (n=45,126)



© LROI 2024 | K093A

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2010	3,248	1.81 (1.35-2.28)	6.77 (5.89-7.64)	9.68 (8.64-10.72)	11.66 (10.53-12.79)	14.89 (13.63-16.15)	18.72 (17.31-20.14)
2011-2012	3,160	1.80 (1.33-2.27)	6.71 (5.82-7.60)	8.94 (7.92-9.95)	10.97 (9.86-12.08)	13.17 (11.96-14.38)	n.a.
2013-2014	4,150	1.34 (0.99-1.70)	5.63 (4.92-6.35)	7.55 (6.73-8.37)	9.20 (8.30-10.10)	11.71 (10.69-12.73)	n.a.
2015-2016	5,616	1.22 (0.93-1.51)	3.85 (3.34-4.36)	5.01 (4.43-5.59)	6.38 (5.73-7.03)	n.a.	n.a.
2017-2018	7,685	0.86 (0.65-1.07)	2.88 (2.50-3.26)	3.96 (3.52-4.40)	5.71 (4.98-6.44)	n.a.	n.a.
2019-2020	9,554	0.78 (0.60-0.96)	2.70 (2.37-3.02)	3.96 (3.47-4.45)	n.a.	n.a.	n.a.
2021-2022	12,642	0.76 (0.61-0.91)	2.64 (2.13-3.14)	n.a.	n.a.	n.a.	n.a.

Please note: n.a. if <50 cases were at risk.

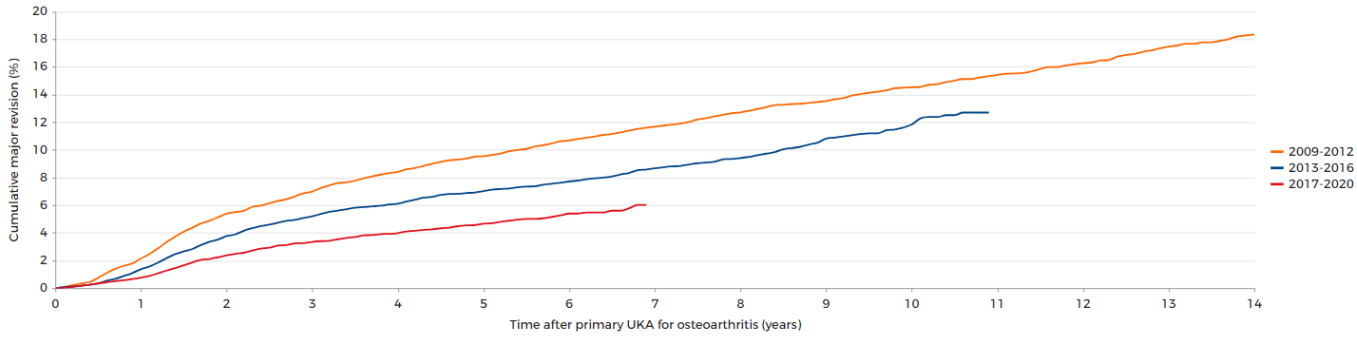
Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

UKA: unicondylar knee arthroplasty

© LROI 2024 | K093B

UKA cemented by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of cemented unicondylar knee arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2023 (n=18,726)



© LROI 2024 | K094A

	Number (n)	1yr	3yr	5yr	7yr	10yr	14yr
2009-2012	5,806	1.79 (1.45-2.14)	6.86 (6.19-7.52)	9.51 (8.74-10.28)	11.59 (10.75-12.43)	14.48 (13.55-15.41)	18.25 (17.14-19.37)
2013-2016	6,108	1.09 (0.83-1.36)	5.07 (4.51-5.63)	6.91 (6.26-7.55)	8.57 (7.86-9.29)	11.60 (10.67-12.52)	n.a.
2017-2020	7,266	0.66 (0.47-0.85)	3.25 (2.84-3.67)	4.56 (4.05-5.08)	6.01 (5.10-6.92)	n.a.	n.a.

Please note: n.a. if <50 cases were at risk.

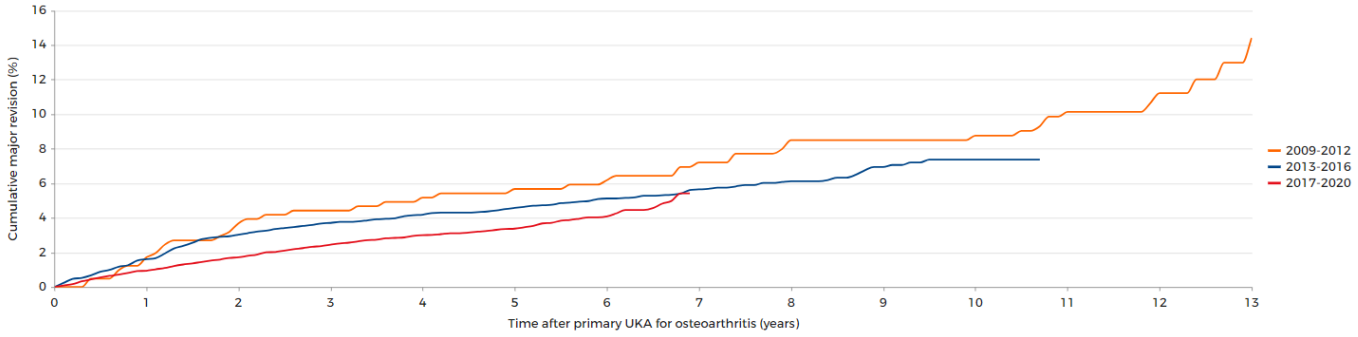
Major revision precentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.

UKA: unicondylar knee arthroplasty

© LROI 2024 | K094B

UKA uncemented by procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of uncemented unicondylar knee arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2009-2023 (n=13,289)



	Number (n)	1yr	3yr	5yr	7yr	10yr	13yr
2009-2012	421	1.22 (0.16-2.29)	4.42 (2.42-6.42)	5.42 (3.22-7.62)	6.95 (4.46-9.43)	8.49 (5.76-11.22)	12.97 (8.93-17.02)
2013-2016	3.476	1.53 (1.11-1.94)	3.68 (3.04-4.31)	4.52 (3.82-5.22)	5.62 (4.84-6.39)	7.37 (6.30-8.45)	n.a.
2017-2020	9.581	0.92 (0.73-1.11)	2.37 (2.06-2.68)	3.35 (2.97-3.74)	5.42 (4.44-6.39)	n.a.	n.a.

Please note: n.a. if <50 cases were at risk.

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.

UKA: unicondylar knee arthroplasty

UKA by component

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 2007-2023 (n=54,834)

					Type of revision (n)						Cumulative revision percentage (95% CI)					
Femur component	Tibia component	Primary UKAs (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Patella addition	Only femur	Only tibia	Only insert/patella	Unknown	1yr	3yr	5yr	7yr	10yr	14yr
All UKAs for osteoarthritis		**54,834**	**64 (58 - 71)**	**3,875**	**2,848**	**9**	**16**	**77**	**889**	**36**	**1.88 (1.76-2.00)**	**5.08 (4.87-5.28)**	**6.94 (6.68-7.19)**	**8.87 (8.56-9.18)**	**11.80 (11.37-12.23)**	**16.82 (16.04-17.61)**
OXFORD PKR Uncemented	OXFORD PKR Uncemented	24,743	65 (59 - 71)	1,057	562	2	3	24	458	8	2.01 (1.83-2.20)	4.24 (3.95-4.53)	5.43 (5.07-5.79)	6.99 (6.49-7.49)	9.05 (8.20-9.90)	n.a.
OXFORD PKR Cemented	OXFORD PKR Cemented	16,012	63 (57 - 70)	1,804	1,450	5	10	31	286	22	1.80 (1.59-2.00)	5.82 (5.45-6.20)	8.08 (7.63-8.53)	10.05 (9.54-10.57)	13.16 (12.53-13.79)	18.23 (17.25-19.22)
Physica ZUK	Physica ZUK	5,717	64 (58 - 70)	195	163	0	0	1	31	0	0.77 (0.54-1.01)	3.11 (2.58-3.63)	4.03 (3.37-4.70)	5.53 (4.56-6.50)	7.95 (6.46-9.45)	11.11 (8.41-13.81)
Genesis Uni	Genesis Uni	1,278*	62 (56 - 68)	236	224	1	0	2	6	3	2.74 (1.85-3.64)	8.89 (7.32-10.45)	12.42 (10.60-14.24)	14.91 (12.94-16.88)	17.56 (15.41-19.72)	22.69 (19.58-25.79)
balanSys UNI	balanSys UNI	747	62 (56 - 69)	75	59	1	0	6	9	0	2.75 (1.53-3.97)	9.01 (6.64-11.38)	10.29 (7.70-12.88)	11.83 (8.95-14.70)	15.59 (12.00-19.17)	n.a.
Journey Uni	Journey Uni	672	62 (57 - 69)	37	33	0	2	1	0	1	1.14 (0.30-1.98)	4.80 (2.90-6.70)	7.46 (4.94-9.98)	9.20 (6.02-12.39)	n.a.	n.a.
OXFORD PKR Uncemented	OXFORD PKR Cemented	634	66 (58 - 74)	43	27	0	0	0	16	0	3.09 (1.68-4.50)	5.53 (3.55-7.52)	7.40 (4.95-9.85)	11.13 (7.50-14.76)	n.a.	n.a.
Restoris MCK	Restoris MCK	302	69 (62 - 75)	4	2	0	0	0	2	0	1.37 (0.03-2.70)	n.a.	n.a.	n.a.	n.a.	n.a.
OXFORD PKR Cemented	OXFORD PKR Uncemented	264	66 (59 - 73)	26	13	0	1	0	12	0	4.36 (1.84-6.88)	8.62 (4.99-12.26)	9.84 (5.88-13.80)	n.a.	n.a.	n.a.
TRIATHLON	TRIATHLON	197*	60 (54 - 65)	26	25	0	0	0	1	0	1.52 (0.00-3.23)	7.11 (3.52-10.71)	9.41 (5.26-13.56)	11.27 (6.47-16.07)	15.03 (8.82-21.25)	n.a.
HLS uni	HLS Uni	171*	58 (52 - 65)	37	36	0	0	0	1	0	2.34 (0.07-4.60)	8.79 (4.54-13.04)	16.45 (10.88-22.02)	19.42 (13.47-25.37)	20.64 (14.54-26.74)	n.a.
Allegretto	Allegretto	108*	57 (51 - 65)	22	19	0	0	3	0	0	6.48 (1.84-11.12)	12.04 (5.90-18.17)	17.67 (10.46-24.88)	19.90 (12.25-27.56)	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary UKAs in 2023.

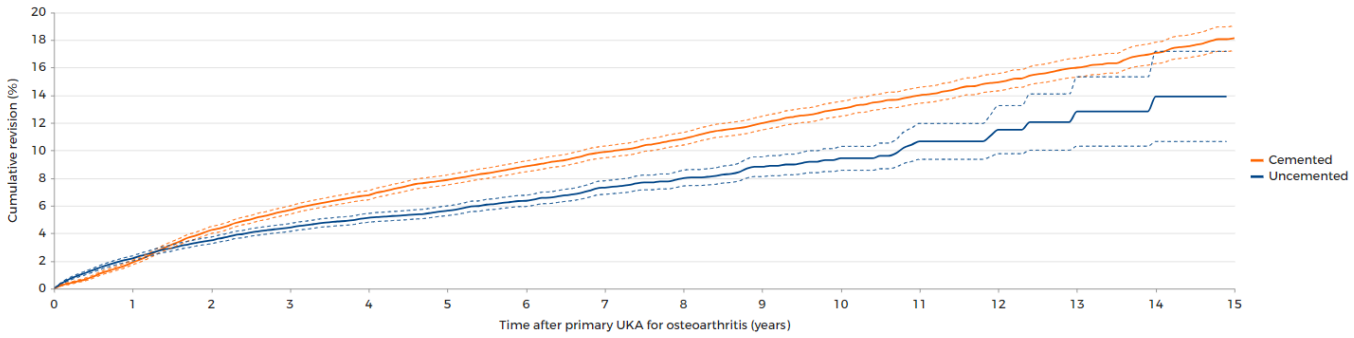
Please note: n.a. if <50 cases were at risk; UKA: unicondylar knee arthroplasty; CI: confidence interval; IQR: interquartile range.

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.

UKA by fixation

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of unicondylar knee arthroplasties for osteoarthritis by fixation of revision in the Netherlands in 2007-2023 (n=53,143)



© LROI 2024 | K097A

	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Cemented	26.586	1.66 (1.50-1.81)	5.56 (5.27-5.86)	7.78 (7.42-8.14)	9.81 (9.39-10.24)	12.92 (12.39-13.45)	18.05 (17.16-18.93)
Uncemented	26.557	2.06 (1.88-2.24)	4.35 (4.07-4.63)	5.57 (5.22-5.92)	7.26 (6.77-7.74)	9.30 (8.47-10.13)	13.90 (10.64-17.16)

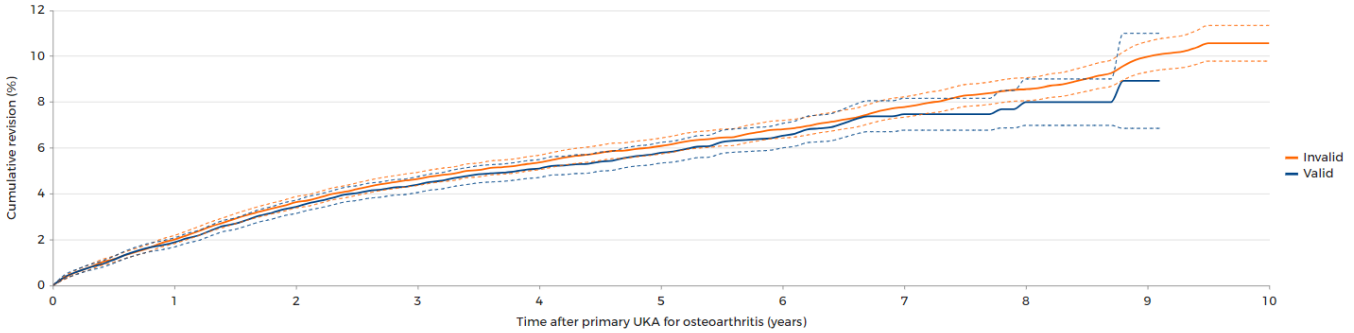
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

UKA: unicondylar knee arthroplasty

© LROI 2024 | K097B

UKA by pre-PROM

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of unicondylar knee arthroplasties by valid pre-operative PROM of patients who underwent a UKA for osteoarthritis in the Netherlands in 2014-2023 (n=44,949)



© LROI 2024 | K098A

	Number (n)	1yr	3yr	5yr	7yr	10yr
Valid	19.607	1.75 (1.56-1.95)	4.30 (3.96-4.64)	5.69 (5.25-6.13)	7.37 (6.70-8.05)	n.a.
Invalid	25.342	1.86 (1.69-2.03)	4.57 (4.29-4.86)	6.00 (5.66-6.35)	7.71 (7.27-8.15)	10.55 (9.77-11.33)

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

Valid: pre-operative PROM reported; Invalid: non-responders to pre-operative PROM; PROM: patient reported outcome measure.

UKA: unicondylar knee arthroplasty

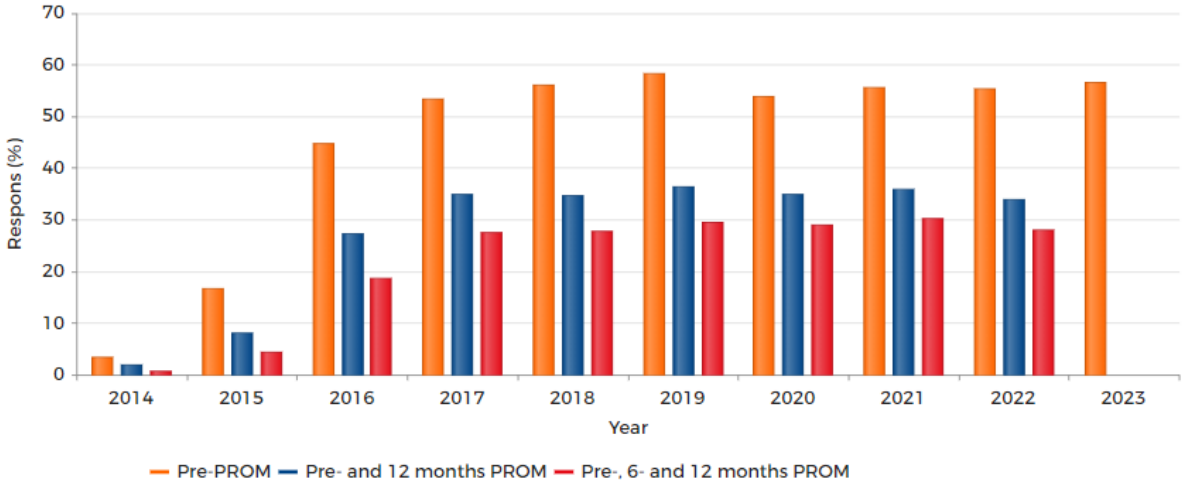
© LROI 2024 | K098B

PROMs

Response

Response TKA osteoarthritis

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2023



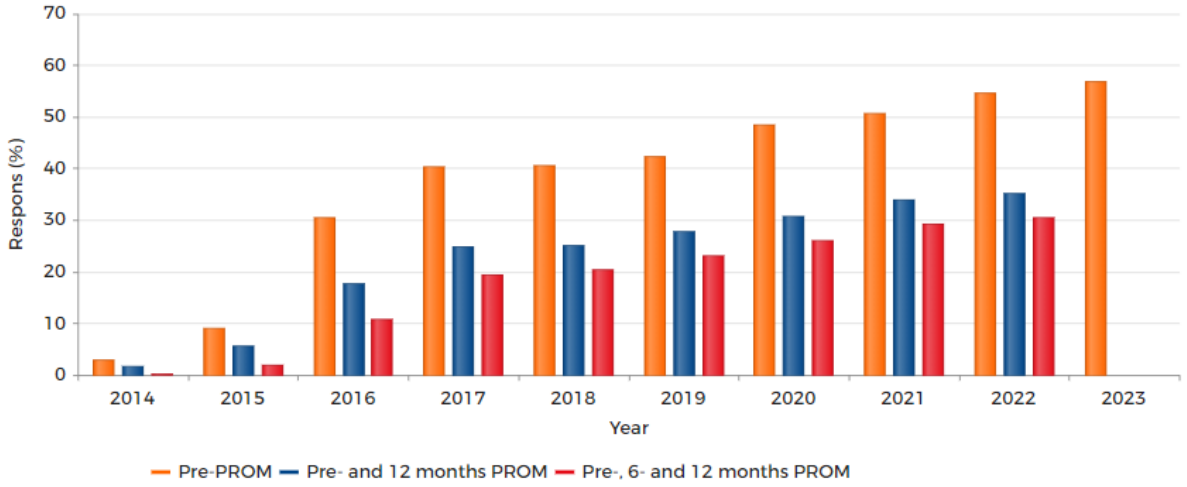
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Pre-PROM	3.45	16.81	44.66	53.39	56.11	58.40	53.99	55.65	55.44	56.67
Pre- and 12 months PROM	1.99	8.15	27.37	34.84	34.57	36.38	35.05	36.02	33.89	n.a.
Pre-, 6- and 12 months PROM	0.74	4.46	18.64	27.53	27.86	29.47	29.14	30.30	28.11	n.a.
Total TKAs for osteoarthritis (n)	**22,829**	**22,931**	**23,657**	**24,421**	**24,784**	**24,819**	**18,742**	**20,395**	**25,607**	**27,036**

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2023.

TKA: total knee arthroplasty; PROM: patient reported outcome measure.

Response UKA osteoarthritis

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a UKA for osteoarthritis in the Netherlands in 2014-2023

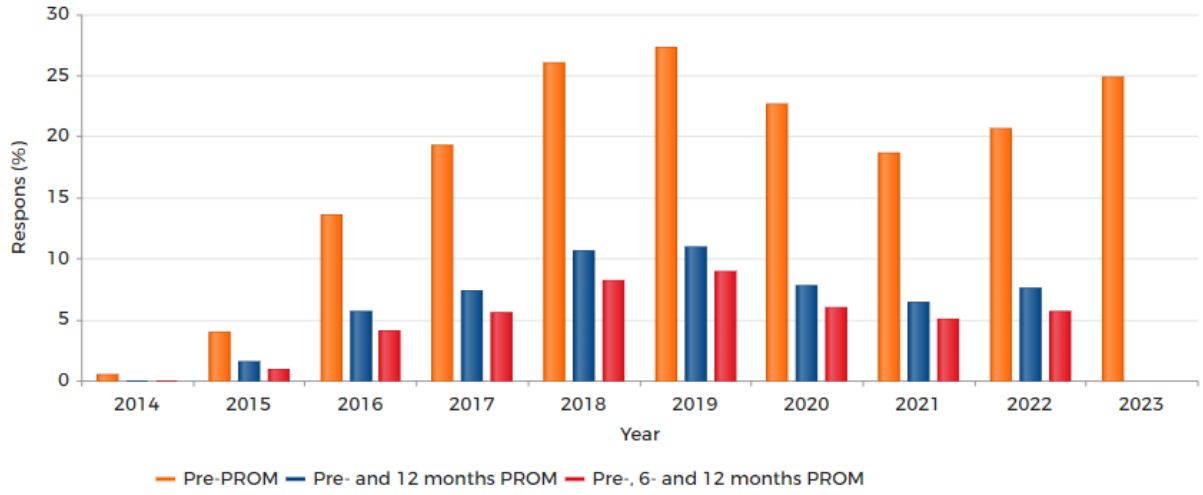


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Pre-PROM	2.87	9.18	30.45	40.33	40.59	42.31	48.43	50.76	54.69	56.88
Pre- and 12 months PROM	1.77	5.55	17.63	24.95	25.13	27.78	30.78	34.04	35.25	n.a.
Pre-, 6- and 12 months PROM	0.31	1.93	10.94	19.42	20.47	23.02	26.09	29.16	30.47	n.a.
Total UKAs for osteoarthritis (n)	**2,265**	**2,593**	**2,870**	**3,595**	**3,991**	**4,788**	**4,623**	**5,435**	**6,752**	**7,563**

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2023.
UKA: unicondylar knee arthroplasty; PROM: patient reported outcome measure.

Response knee revision

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a knee revision arthroplasty in the Netherlands in 2014-2024

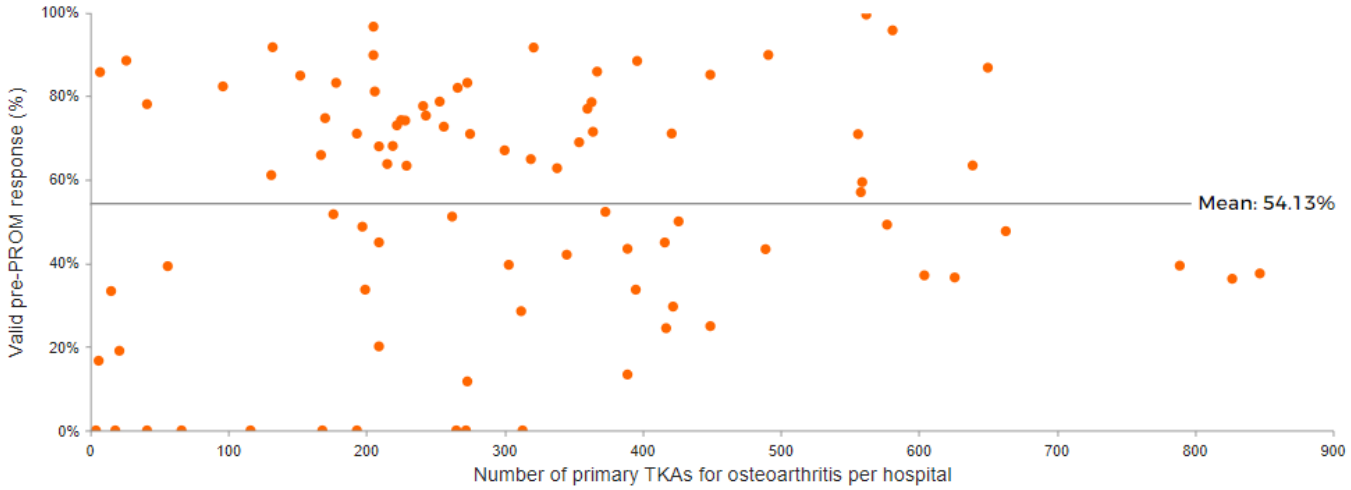


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Pre-PROM	0.53	4.03	13.62	19.28	26.09	27.35	22.65	18.69	20.68	24.91
Pre- and 12 months PROM	0.04	1.54	5.67	7.43	10.62	10.99	7.85	6.45	7.57	n.a.
Pre-, 6- and 12 months PROM	0.04	1.00	4.10	5.61	8.22	9.01	5.96	5.06	5.68	n.a.
Total knee revision arthroplasties (n)	**2,459**	**2,605**	**2,804**	**2,853**	**2,833**	**2,984**	**2,433**	**2,510**	**2,921**	**3,215**

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2023.
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 in the Netherlands in 2023



TKA: total knee arthroplasty; PROM: patient reported outcome measure.

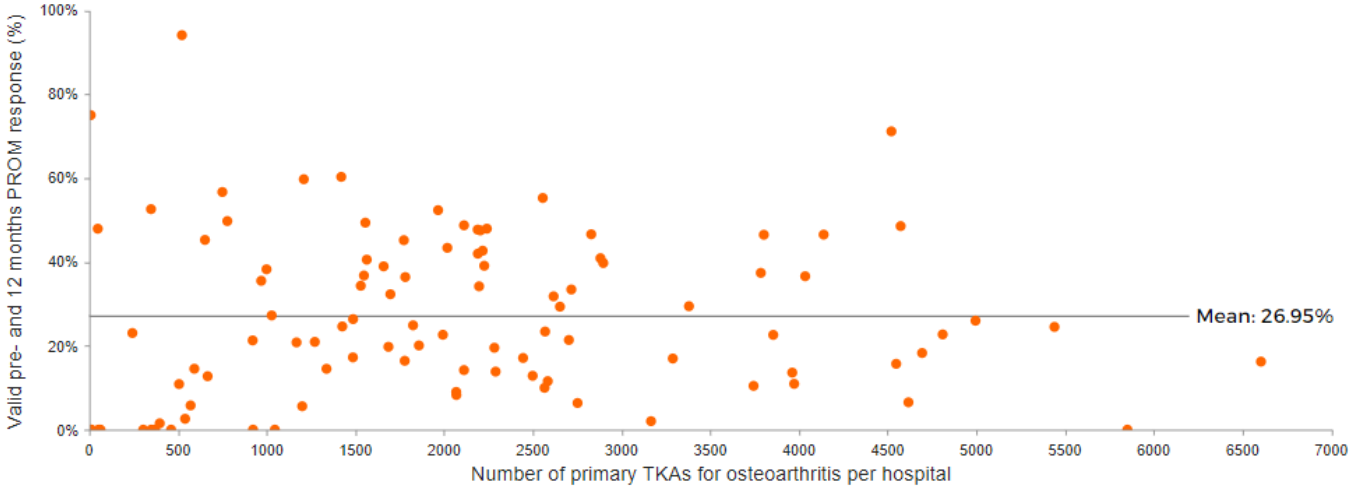
© LROI 2024 | K102

The mean pre-operative response rate is 54.1% in the Netherlands in 2023.

48 out of 89 (54%) 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 TKA for osteoarthritis per hospital in the Netherlands in 2014-2022



Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2023.

TKA: total knee arthroplasty; PROM: patient reported outcome measure.

© LROI 2024 | K103

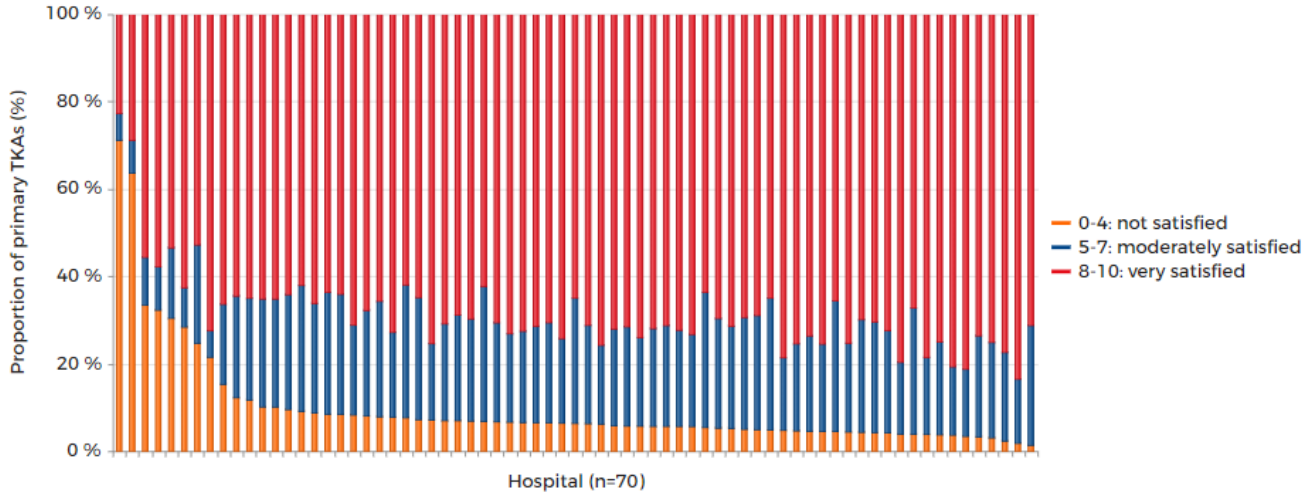
The mean PROM trajectory response rate was 26.9% in the Netherlands between 2014-2022.

44 out of 100 (44%) hospitals scored above the national mean.

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

NRS satisfaction per hospital

FIGURE Distribution of NRS satisfaction score after primary total knee arthroplasties for osteoarthritis per hospital in the Netherlands in 2019-2023 (n=35,942)

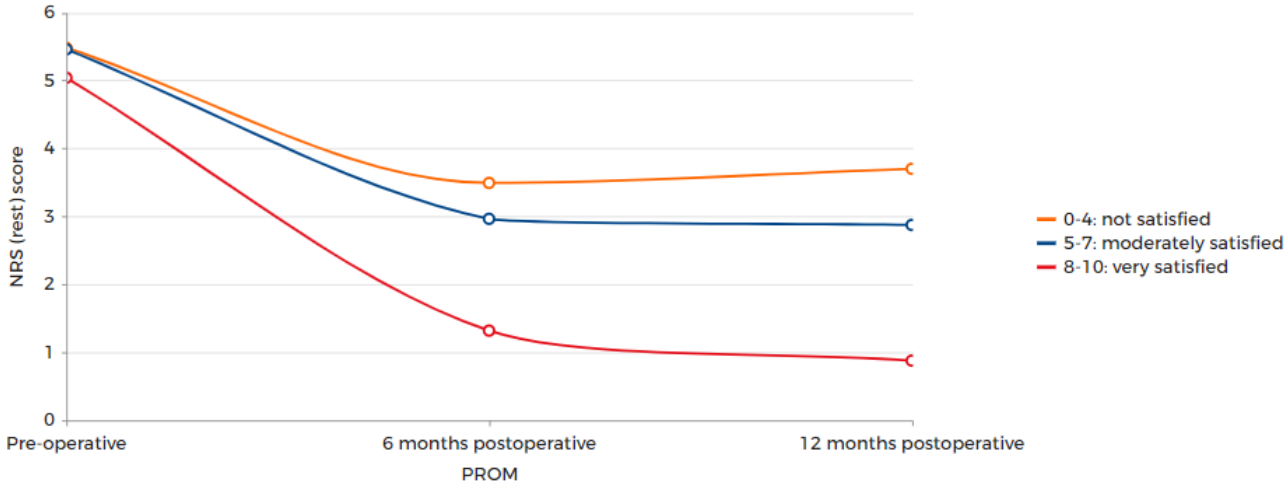


Please note: Hospitals with fewer than 50 procedures with a registered NRS satisfaction score are not shown.
The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.

© LROI 2024 | K104

NRS (rest)

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative NRS (rest) scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction in the Netherlands in 2014-2022



© LROI 2024 | K106A

NRS (rest) score		Pre-operative	6 months postoperative	12 months postoperative
NRS satisfaction	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
0-4: not satisfied	2,703	5.48 (5.38-5.58)	3.49 (3.39-3.60)	3.70 (3.59-3.81)
5-7: moderately satisfied	9,071	5.46 (5.41-5.51)	2.96 (2.92-3.01)	2.87 (2.83-2.92)
8-10: very satisfied	29,283	5.04 (5.01-5.07)	1.32 (1.30-1.34)	0.88 (0.86-0.90)
Total	45,389	5.18 (5.15-5.20)	1.84 (1.82-1.86)	1.51 (1.49-1.53)

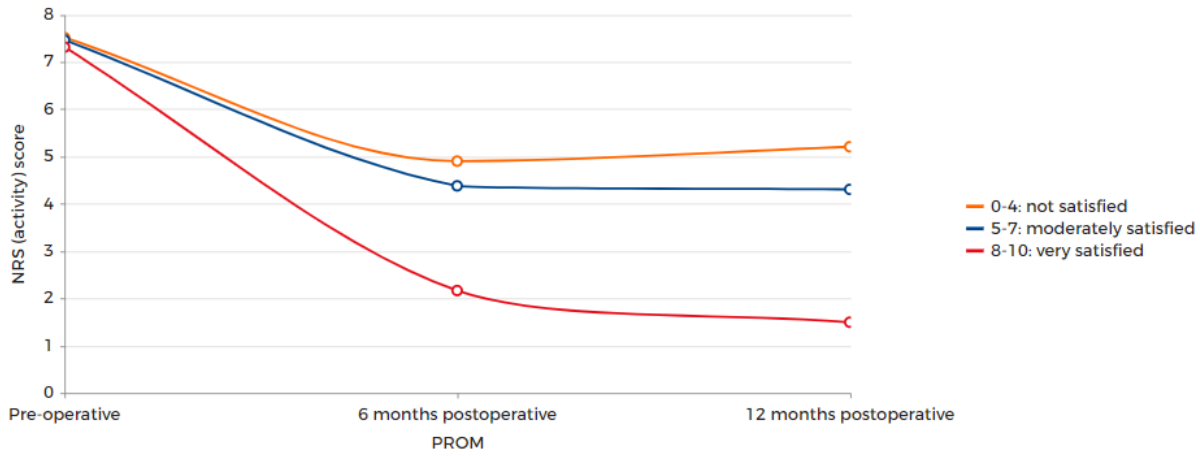
The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K106B

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 (95% CI) pre-operative, 6 months and 12 months postoperative NRS (activity) scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction in the Netherlands in 2014-2022



© LROI 2024 | K107A

NRS (activity) score		Pre-operative	6 months postoperative	12 months postoperative
NRS satisfaction	**n**	**Mean (95% CI)**	**Mean (95% CI)**	**Mean (95% CI)**
0-4: not satisfied	2,703	7.51 (7.44-7.58)	4.90 (4.79-5.01)	5.21 (5.09-5.32)
5-7: moderately satisfied	9,071	7.46 (7.42-7.50)	4.38 (4.33-4.43)	4.30 (4.26-4.35)
8-10: very satisfied	29,283	7.31 (7.29-7.33)	2.17 (2.14-2.19)	1.49 (1.47-1.52)
Total	45,389	7.35 (7.33-7.36)	2.83 (2.81-2.85)	2.35 (2.33-2.38)

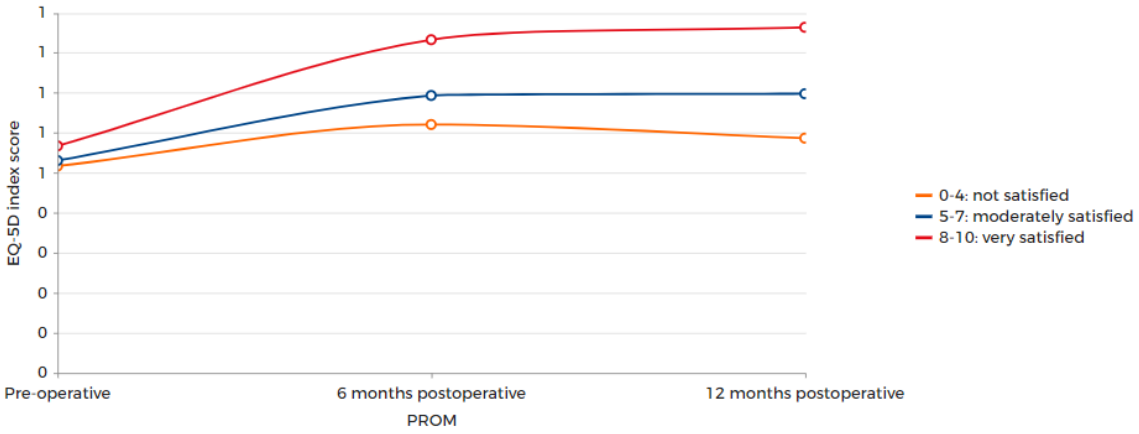
The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K107B

The NRS (activity) 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.

EQ5D index score

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D index scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction in the Netherlands in 2014-2022



© LROI 2024 | K108A

EQ-5D index score		Pre-operative	6 months postoperative	12 months postoperative
NRS satisfaction	**n**	**Mean (95% CI)**	**Mean (95% CI)**	**Mean (95% CI)**
0-4: not satisfied	2,703	0.52 (0.51-0.53)	0.62 (0.61-0.63)	0.59 (0.58-0.60)
5-7: moderately satisfied	9,071	0.53 (0.53-0.54)	0.69 (0.69-0.70)	0.70 (0.69-0.70)
8-10: very satisfied	29,283	0.57 (0.57-0.57)	0.83 (0.83-0.83)	0.86 (0.86-0.87)
Total	45,389	0.56 (0.56-0.56)	0.79 (0.79-0.79)	0.81 (0.81-0.81)

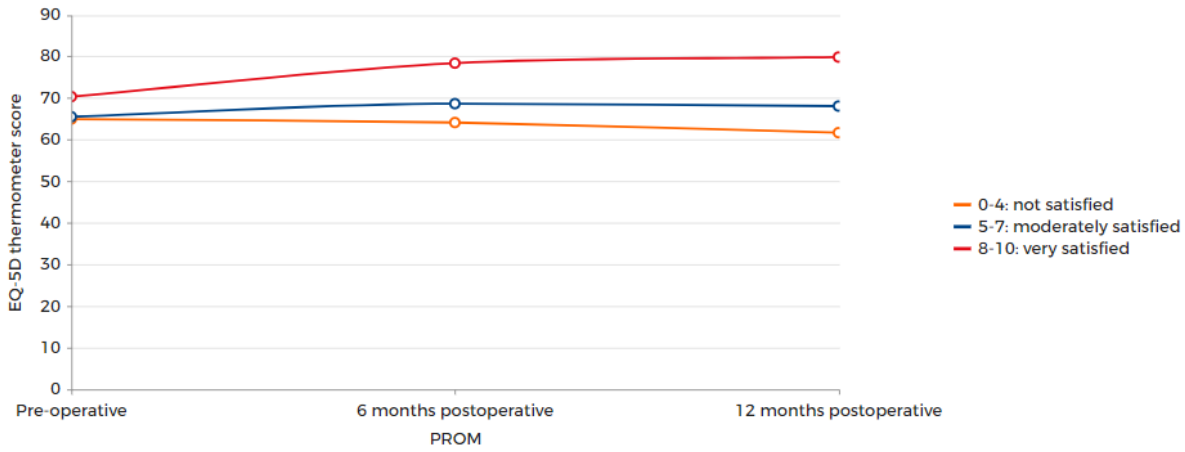
The NRS (satisfaction) score measures patients' satisfaction with the outcome of after joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.
TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K108B

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 (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction in the Netherlands in 2014-2022



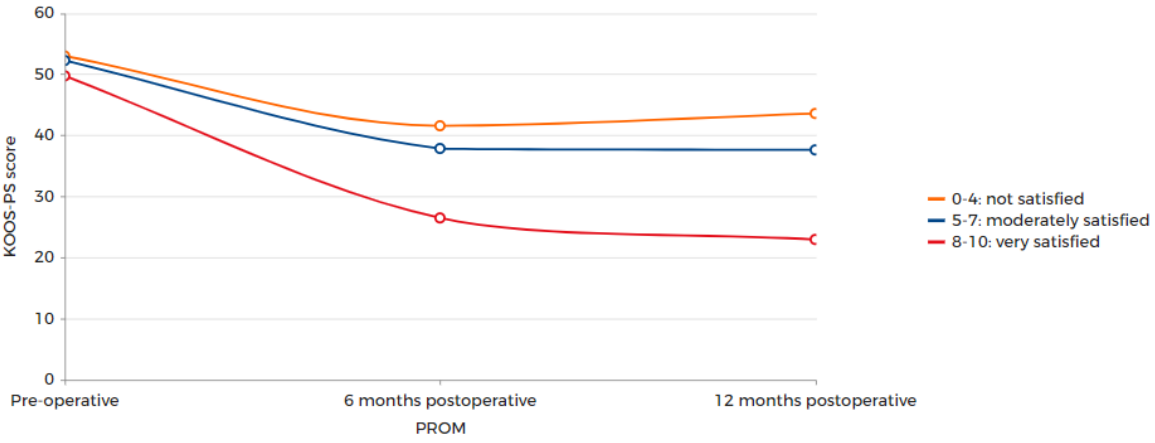
EQ-5D thermometer score		Pre-operative	6 months postoperative	12 months postoperative
NRS satisfaction	**n**	**Mean (95% CI)**	**Mean (95% CI)**	**Mean (95% CI)**
0-4: not satisfied	2,703	64.97 (64.19-65.74)	64.13 (63.29-64.96)	61.69 (60.82-62.56)
5-7: moderately satisfied	9,071	65.52 (65.12-65.92)	68.66 (68.28-69.03)	68.07 (67.72-68.43)
8-10: very satisfied	29,283	70.35 (70.13-70.56)	78.40 (78.19-78.60)	79.85 (79.65-80.05)
Total	45,389	68.75 (68.57-68.93)	75.15 (74.97-75.33)	75.68 (75.49-75.86)

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 (95% CI) pre-operative, 6 months and 12 months postoperative KOOS-PS scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction in the Netherlands in 2014-2022



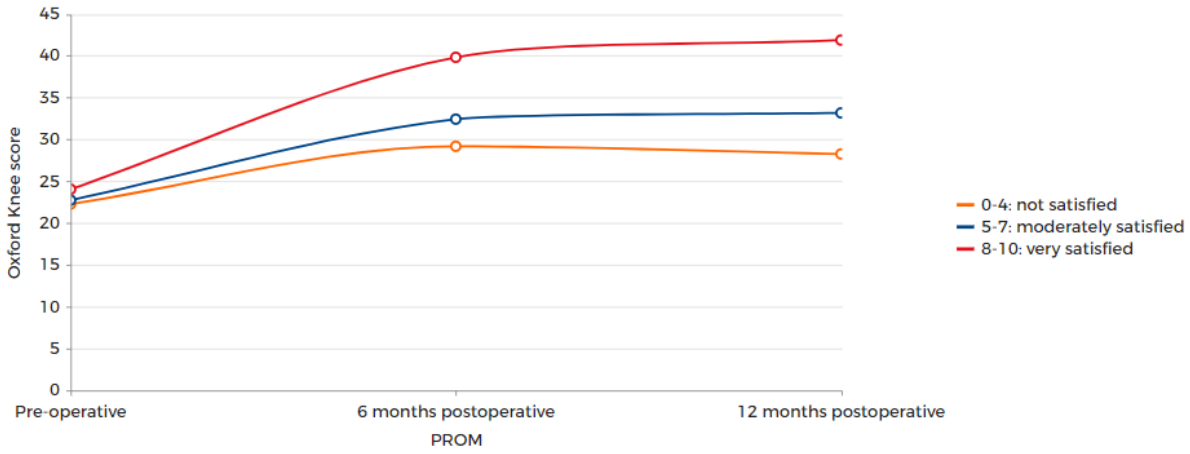
KOOS-PS score		Pre-operative	6 months postoperative	12 months postoperative
NRS satisfaction	**n**	**Mean (95% CI)**	**Mean (95% CI)**	**Mean (95% CI)**
0-4: not satisfied	2,703	52.97 (52.39-53.55)	41.56 (40.93-42.19)	43.57 (42.87-44.27)
5-7: moderately satisfied	9,071	52.24 (51.94-52.53)	37.84 (37.59-38.10)	37.61 (37.36-37.86)
8-10: very satisfied	29,283	49.72 (49.55-49.89)	26.48 (26.33-26.63)	22.96 (22.81-23.11)
Total	45,389	50.47 (50.33-50.61)	30.05 (29.92-30.19)	27.60 (27.46-27.75)

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 (95% CI) pre-operative, 6 months and 12 months postoperative Oxford Knee scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction in the Netherlands in 2014-2022



© LROI 2024 | K111A

Oxford Knee score		Pre-operative	6 months postoperative	12 months postoperative
NRS satisfaction	**n**	**Mean (95% CI)**	**Mean (95% CI)**	**Mean (95% CI)**
0-4: not satisfied	2,703	22.28 (21.99-22.57)	29.19 (28.81-29.56)	28.27 (27.87-28.67)
5-7: moderately satisfied	9,071	22.75 (22.59-22.90)	32.43 (32.27-32.59)	33.18 (33.03-33.33)
8-10: very satisfied	29,283	24.05 (23.97-24.14)	39.82 (39.75-39.90)	41.88 (41.82-41.95)
Total	45,389	23.66 (23.59-23.73)	37.51 (37.43-37.58)	39.09 (39.02-39.17)

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.

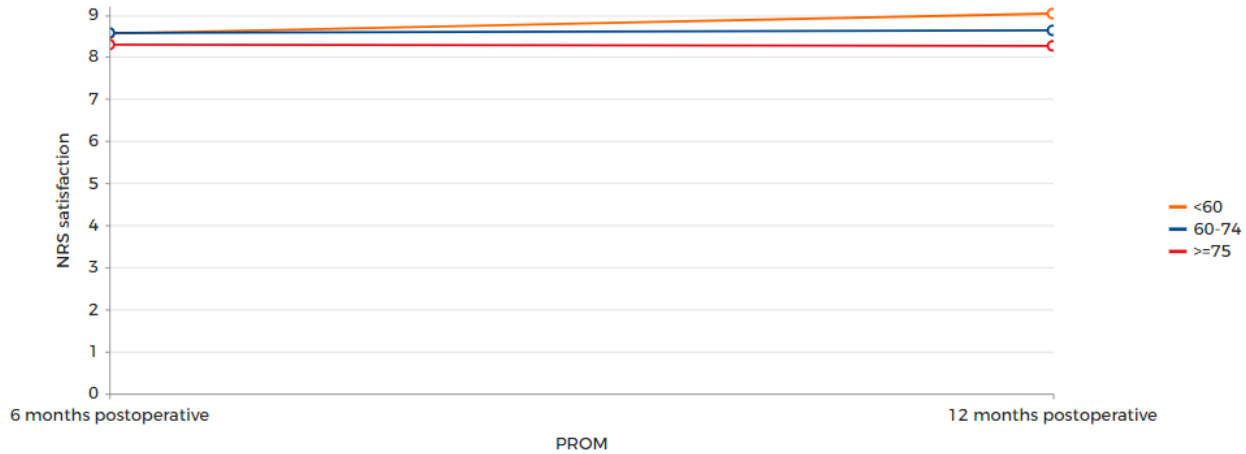
TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K111B

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 (95% CI) 6 months and 12 months postoperative NRS (satisfaction) scores of patients who underwent a TKA for osteoarthritis by age category in the Netherlands in 2014-2022



© LROI 2024 | K112A

NRS satisfaction		6 months postoperative	12 months postoperative
Age category	**n**	**Mean (95% CI)**	**Mean (95% CI)**
<60	6,558	8.56 (8.36-8.76)	9.03 (8.79-9.27)
60-74	27,362	8.57 (8.48-8.67)	8.63 (8.54-8.73)
>=75	11,465	8.30 (8.18-8.41)	8.27 (8.16-8.37)
Total	45,389	8.50 (8.43-8.57)	8.60 (8.53-8.67)

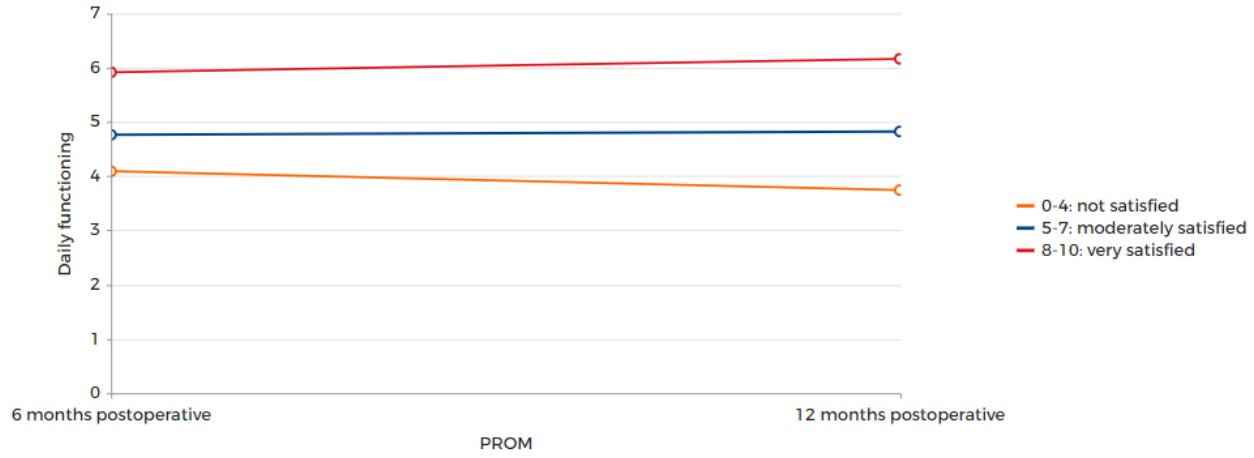
TKA: total knee arthroplasty; CI: confidence interval.

© LROI 2024 | K112B

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: daily functioning and pain

FIGURE Mean (95% CI) 6 months and 12 months postoperative change in daily functioning of patients who underwent a TKA for osteoarthritis by NRS satisfaction in the Netherlands in 2014-2022



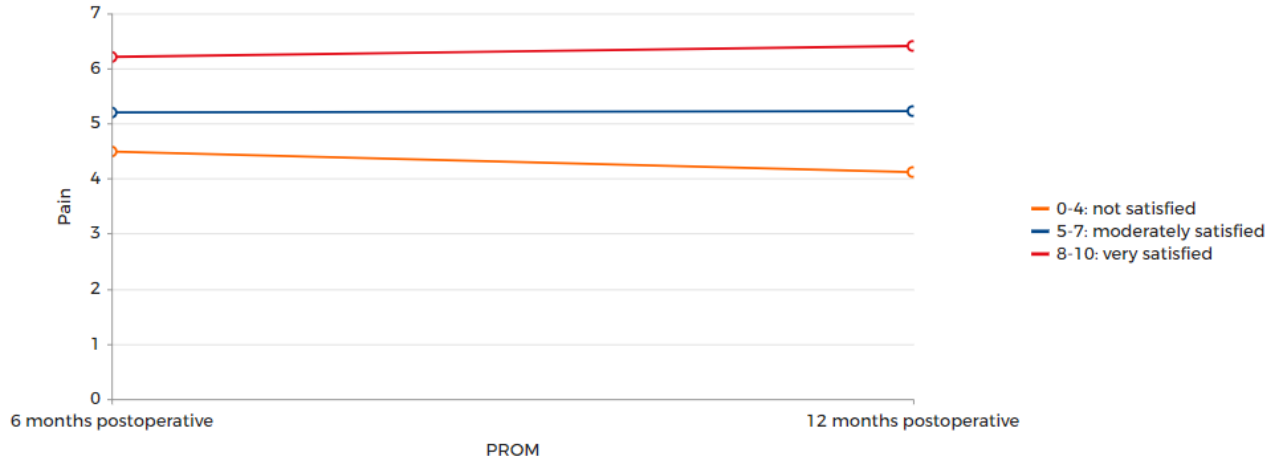
Anchor question score: Daily functioning		6 months postoperative	12 months postoperative
NRS satisfaction	n	Mean (95% CI)	Mean (95% CI)
0-4: not satisfied	2,703	4.09 (4.02-4.15)	3.74 (3.67-3.81)
5-7: moderately satisfied	9,071	4.76 (4.73-4.79)	4.82 (4.79-4.85)
8-10: very satisfied	29,283	5.91 (5.90-5.92)	6.16 (6.15-6.17)
Total	45,389	5.52 (5.51-5.54)	5.70 (5.68-5.71)

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 anchor question daily functioning measures change in daily functioning after joint replacement.

FIGURE Mean (95% CI) 6 months and 12 months postoperative change in pain of patients who underwent a TKA for osteoarthritis by NRS satisfaction in the Netherlands in 2014-2022



Anchor question score: Pain		6 months postoperative	12 months postoperative
NRS satisfaction	n	Mean (95% CI)	Mean (95% CI)
0-4: not satisfied	2,703	4.49 (4.42-4.55)	4.11 (4.04-4.18)
5-7: moderately satisfied	9,071	5.19 (5.17-5.22)	5.22 (5.20-5.24)
8-10: very satisfied	29,283	6.20 (6.19-6.21)	6.40 (6.39-6.41)
Total	45,389	5.87 (5.86-5.88)	5.99 (5.98-6.01)

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 anchor question pain measures change in pain degree after joint replacement.

Ankle arthroplasty

Numbers

Registered procedures

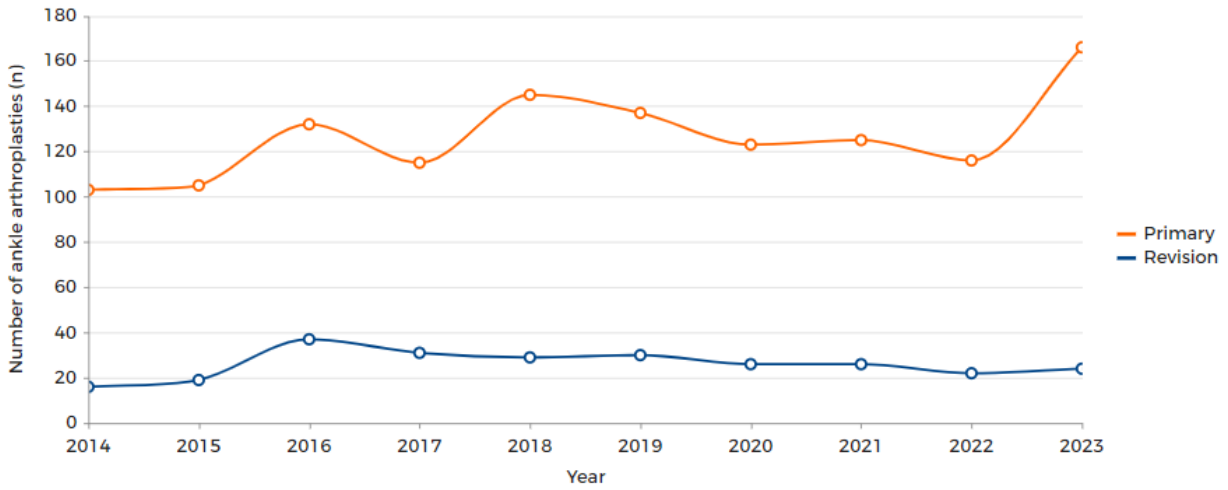
TABLE Number of registered ankle arthroplasties per year of surgery (2014-2023) in the LROI in April 2024

Year of surgery	Total ankle arthroplasty	Other	Unknown/ missing	Revision arthroplasty	Total
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	22	**138**
2023	165	1	0	24	**190**
Total (n)	**1,247**	**14**	**6**	**260**	**1,527**

© LROI 2024 | A001

Type of procedures

FIGURE Number of primary ankle arthroplasties and ankle revision arthroplasties registered in the LROI in the Netherlands in 2014-2023

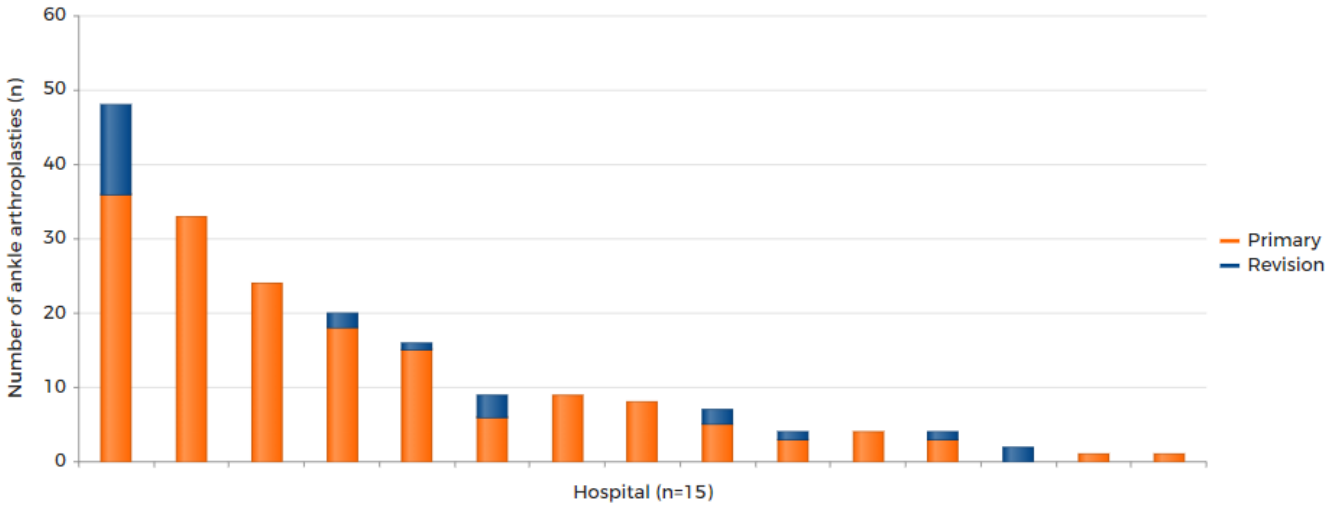


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Primary	103	105	132	115	145	137	123	125	116	166	**1,267**
Revision	16	19	37	31	29	30	26	26	22	24	**260**
Total (n)	**119**	**124**	**169**	**146**	**174**	**167**	**149**	**151**	**138**	**190**	**1,527**

© LROI 2024 | A002

Type of procedure per hospital

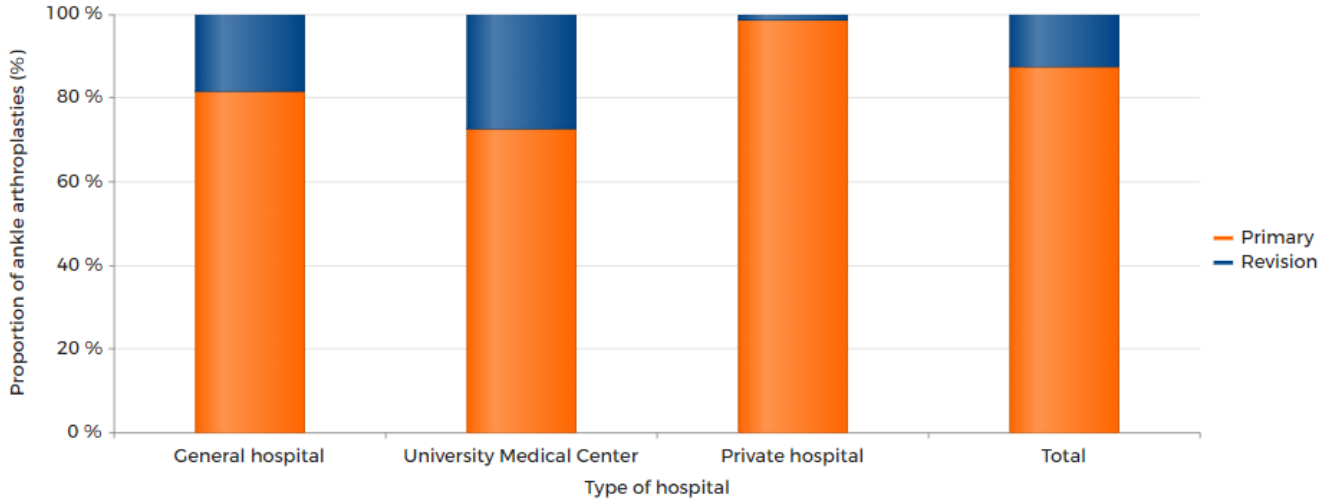
FIGURE Number of primary ankle arthroplasties and ankle revision arthroplasties per hospital in the Netherlands in 2023 (n=190)



© LROI 2024 | A003

Type of hospital

FIGURE Primary ankle arthroplasties and ankle revision arthroplasties (proportion [%] per category) by type of hospital in the Netherlands in 2023



	General hospital	University Medical Center	Private hospital	Total
Primary	81.65	72.73	98.57	87.37
Revision	18.35	27.27	1.43	12.63
Total (n)	**109**	**11**	**70**	**190**

Please note: In 2023, 8 general hospitals, 2 UMCs and 5 private hospitals performed ankle arthroplasties.
General: general hospital; UMC: university medical centre; Private: private hospital.

© LROI 2024 | A004

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 2023

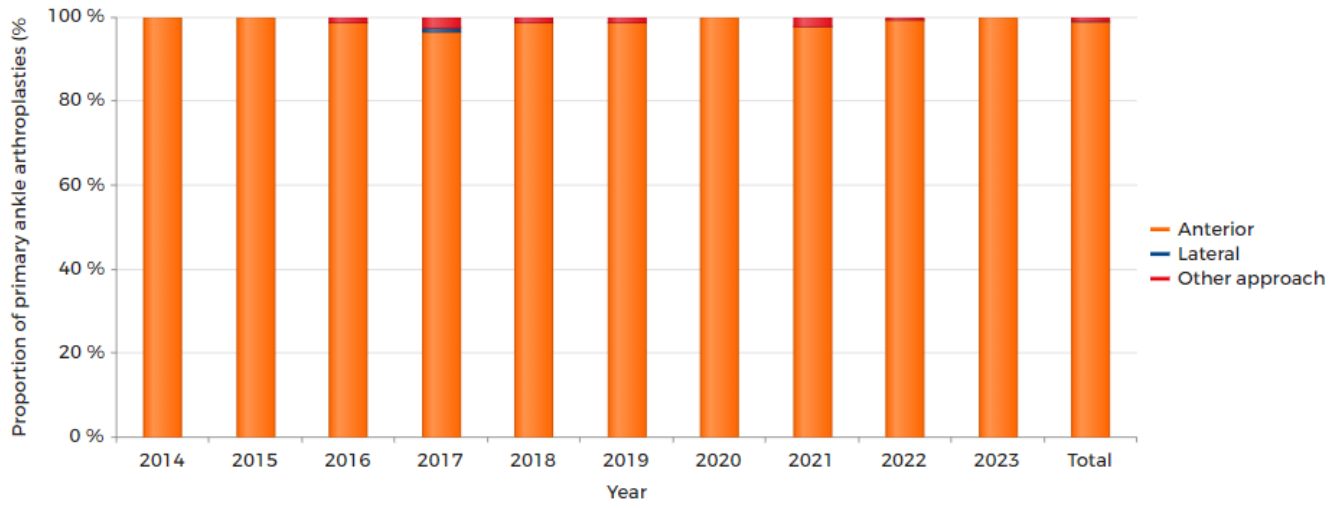
	Osteoarthritis	No osteoarthritis	Total
N(%)	**132 (80)**	**33 (20)**	**166**
Mean age (years) (SD)	69.2 (6.8)	66 (10.6)	68.6 (7.8)
Age (years) (%)			
<50	0	6	1
50-59	8	21	10
60-69	42	27	39
70-79	41	36	40
>80	10	9	10
Gender (%)			
Men	56	52	55
Women	44	48	45
ASA score (%)			
ASA I	9	15	10
ASA II	73	73	73
ASA III-IV	18	12	17
Type of hospital (%)			
General	49	73	54
UMC	5	6	5
Private	46	21	42
Charnley-score (%)			
A One ankle joint affected	64	52	61
B1 Both ankle joints affected	17	15	17
B2 Contralateral ankle with TAP	6	0	5
C Multiple joints affected	13	33	17
Mean BMI (kg/m) (SD)	28.1 (3.9)	28.3 (4.6)	28.2 (4)
Body Mass Index (kg/m) (%)			
Underweight (<=18.5)	0	0	
Normal weight (>18.5-25)	22	24	23
Overweight (>25-30)	51	42	52
Obesity (>30-40)	23	27	25
Morbid obesity (>40)	0	0	
Smoking (%)			
No	96	97	96
Yes	4	3	4

No osteoarthritis: another diagnosis than osteoarthritis registered as primary diagnosis, specifically post-traumatic (n=21) and rheumatoid arthritis (n=11).General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation

Surgery and prosthesis

Surgical approach

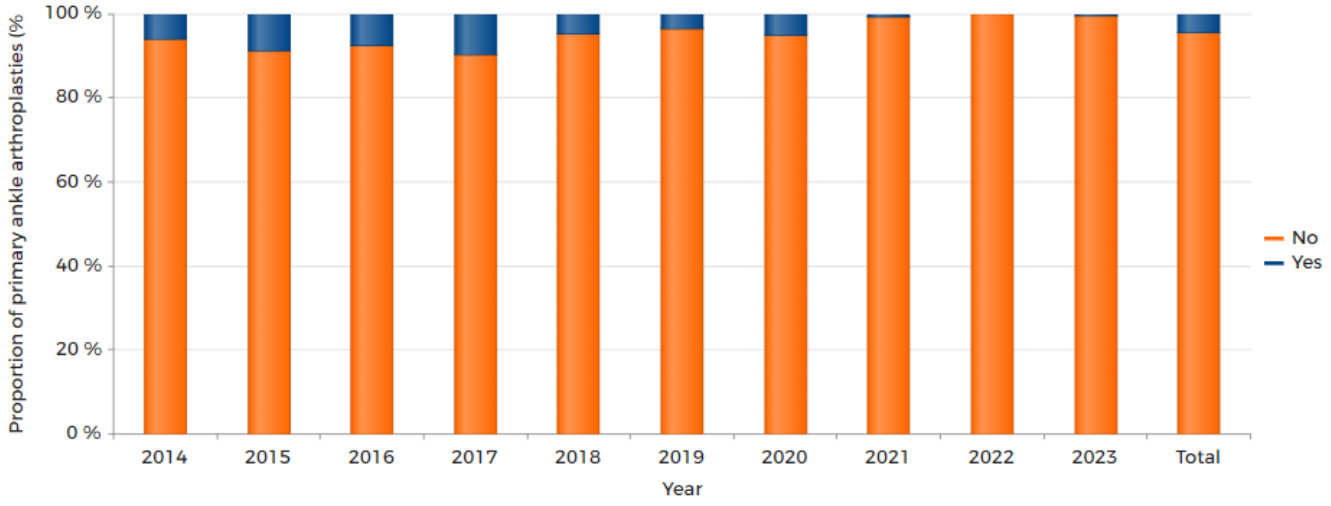
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary ankle arthroplasty in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Anterior	100	100	98.46	96.43	98.60	98.51	100	97.60	99.14	100	98.88
Lateral	0	0	0	0.89	0	0	0	0	0	0	0.08
Other approach	0	0	1.54	2.68	1.40	1.49	0	2.40	0.86	0	1.04
Total (n)	**101**	**101**	**130**	**112**	**143**	**134**	**120**	**125**	**116**	**166**	**1,248**

Medial malleolus osteotomy

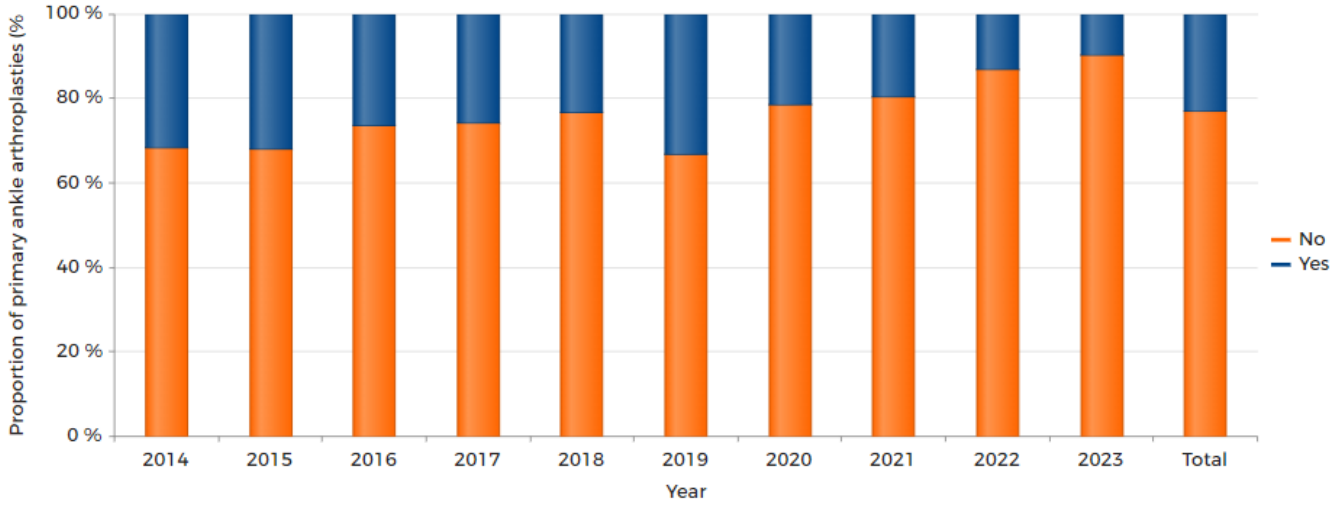
FIGURE Trend (proportion [%] per year) in medial malleolus osteostomy in primary ankle arthroplasty in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
No	94.12	91.26	92.31	90.18	95.07	96.32	95.04	99.19	100	99.40	95.51
Yes	5.88	8.74	7.69	9.82	4.93	3.68	4.96	0.81	0	0.60	4.49
Total (n)	**102**	**103**	**130**	**112**	**142**	**136**	**121**	**124**	**112**	**166**	**1,248**

Extension heel cord

FIGURE Trend (proportion [%] per year) in heel cord extension in primary ankle arthroplasty in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
No	68.32	67.96	73.64	74.11	76.76	66.91	78.51	80.49	86.84	90.30	76.97
Yes	31.68	32.04	26.36	25.89	23.24	33.09	21.49	19.51	13.16	9.70	23.03
Total (n)	**101**	**103**	**129**	**112**	**142**	**136**	**121**	**123**	**114**	**165**	**1,246**

Most frequently registered ankle prostheses

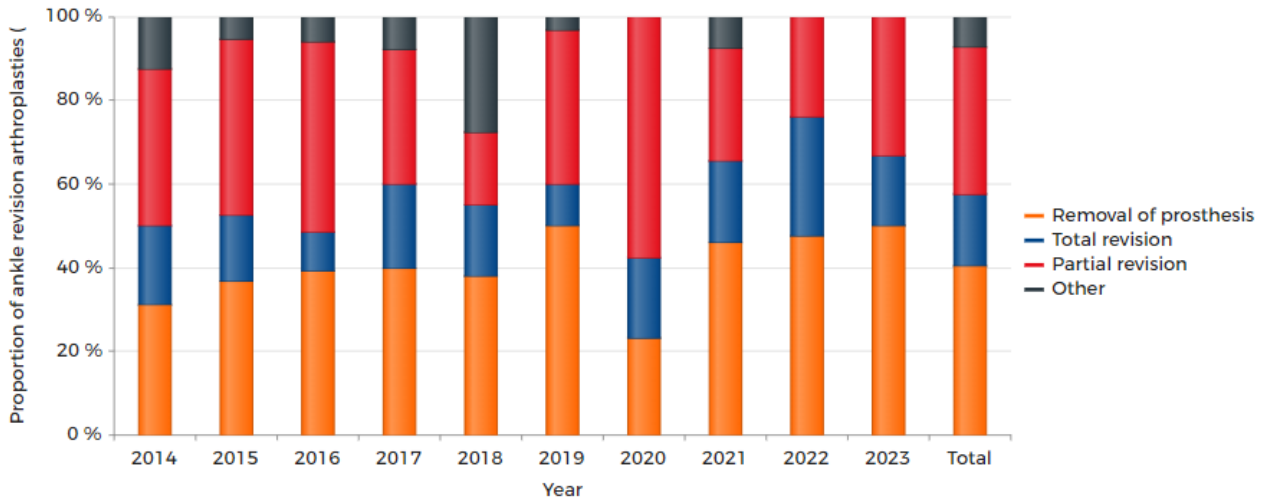
TABLE The most frequently registered primary ankle arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Total ankle arthroplasties (n)	**124**	**115**	**114**	**110**	**98**
Name; Proportion (%)					
INFINITY	32.26	36.52	33.33	54.55	65.31
Salto	44.35	51.30	59.65	39.09	29.59
Taric	0.00	0.00	0.00	0.00	4.08
INBONE	3.23	1.74	1.75	0.00	1.02

Ankle revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision arthroplasty of ankle revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Removal of prosthesis	31.25	36.84	39.39	40	37.93	50	23.08	46.15	47.62	50	40.56
Total revision	18.75	15.79	9.09	20	17.24	10	19.23	19.23	28.57	16.67	16.87
Partial revision	37.50	42.11	45.45	32	17.24	36.67	57.69	26.92	23.81	33.33	35.34
Other	12.50	5.26	6.06	8	27.59	3.33	0	7.69	0	0	7.23
Total (n)	**16**	**19**	**33**	**25**	**29**	**30**	**26**	**26**	**21**	**24**	**249**

Please note in 11 ankle revision arthroplasties, the type of revision was not registered.

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a ankle revision arthroplasty in the Netherlands in 2016-2023

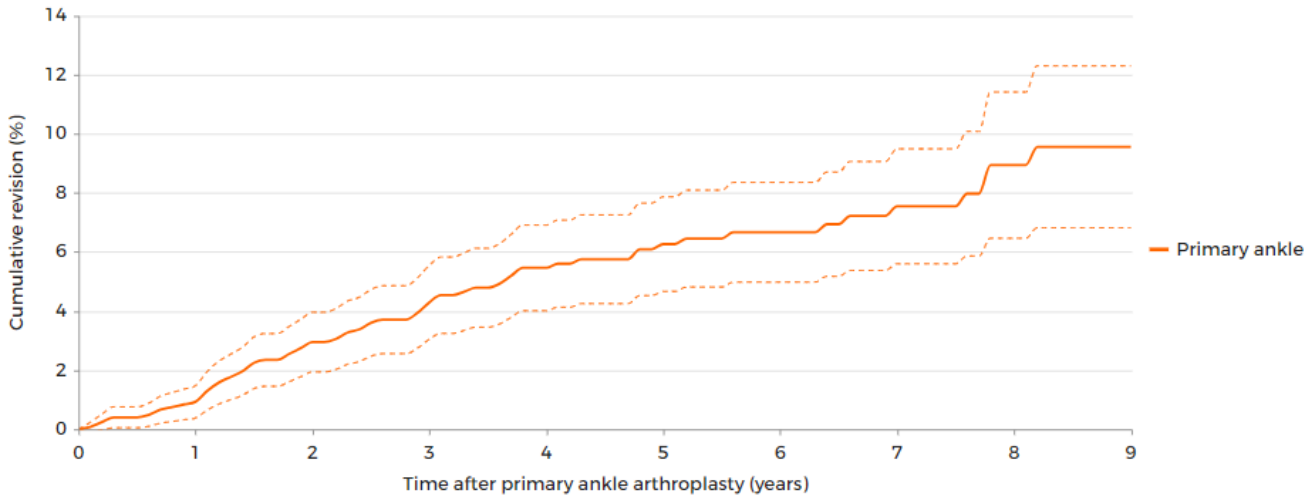
Year	2016	2017	2018	2019	2020	2021	2022	2023	Total
Ankle revision arthroplasty (n)	**37**	**31**	**29**	**30**	**26**	**26**	**22**	**24**	**225**
Reasons for revision; Proportion (%)									
Cyst formation	21.62	41.94	41.38	53.33	23.08	53.85	31.82	45.83	38.67
Inlay wear	35.14	45.16	31.03	40.00	30.77	30.77	22.73	37.50	34.67
Loosening of talus component	29.73	38.71	37.93	40.00	11.54	30.77	31.82	33.33	32.00
Loosening of tibia component	18.92	22.58	34.48	26.67	19.23	23.08	36.36	29.17	25.78
Malalignment	8.11	29.03	24.14	26.67	11.54	15.38	22.73	29.17	20.44
Instability	8.11	25.81	20.69	26.67	19.23	7.69	4.55	16.67	16.44
Infection	13.51	3.23	24.14	10.00	11.54	15.38	4.55	12.50	12.00
Peri-articular arthrofibrosis	5.41	9.68	3.45	6.67	23.08	26.92	4.55	12.50	11.11
Dislocation	5.41	9.68	6.90	10.00	7.69	3.85	0.00	0.00	5.78
Peri-prosthetic fracture	0.00	3.23	3.45	3.33	7.69	0.00	4.55	0.00	2.67
Revision after ankle prosthesis removal	0.00	0.00	0.00	0.00	0.00	7.69	0.00	4.17	1.33
Other	5.41	0.00	10.34	10.00	15.38	3.85	13.64	4.17	7.56

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

Survival

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary ankle arthroplasties in the Netherlands in 2014-2023 (n=1,266)



© LROI 2024 | A012A

	1yr	3yr	5yr	7yr	9yr
Primary ankle	0.84 (0.32-1.36)	3.94 (2.75-5.13)	6.08 (4.52-7.65)	7.21 (5.37-9.06)	9.55 (6.81-12.29)

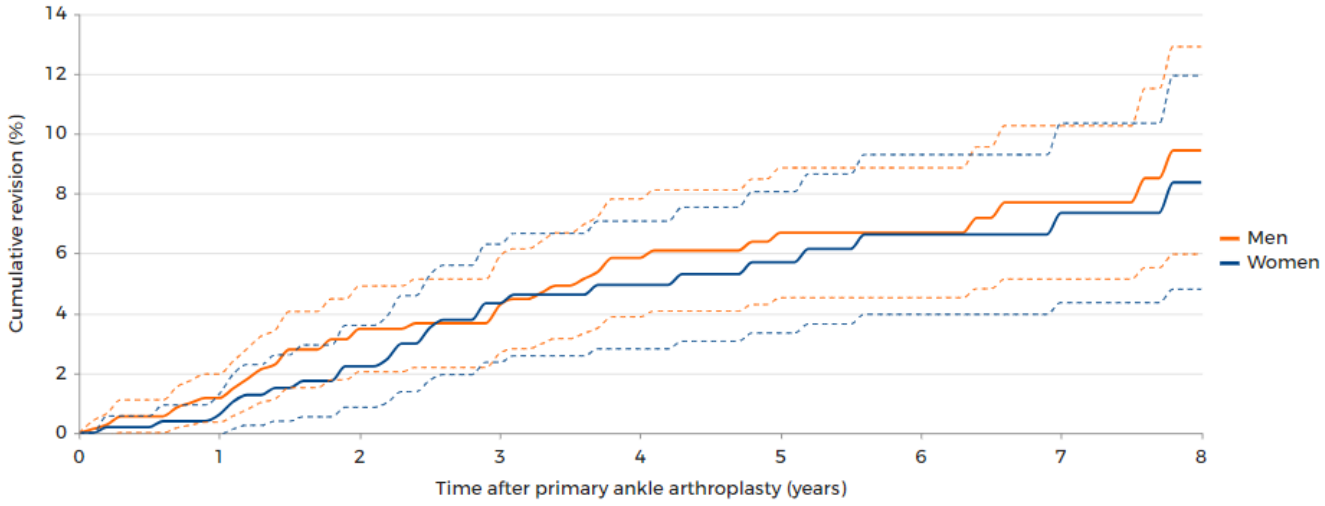
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
Please note: The number of registered ankle revision arthroplasties is not complete.
CI: confidance interval.

© LROI 2024 | A012B

In 2014-2023, 67 (5.3%) primary ankle arthroplasties were implanted in patients who died within nine years after the primary procedure.

By gender

FIGURE Cumulative revision percentages (Kaplan-Meier; 95% CI) of primary ankle arthroplasties by gender in the Netherlands in 2014-2023 (n=1,264)



© LROI 2024 | A013A

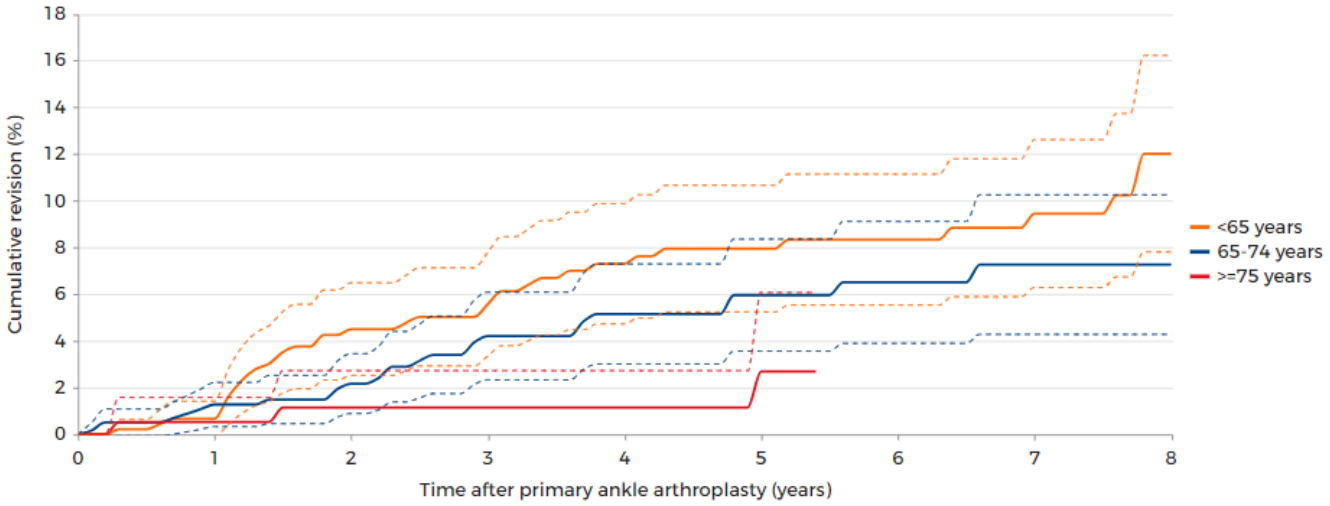
	Number (n)	1yr	3yr	5yr	7yr	8yr
Men	730	1.17 (0.36-1.97)	3.66 (2.19-5.14)	6.38 (4.29-8.48)	7.70 (5.14-10.26)	9.43 (5.97-12.90)
Women	534	0.39 (-0.15-0.94)	4.33 (2.36-6.30)	5.70 (3.34-8.06)	6.63 (3.96-9.29)	8.37 (4.80-11.93)

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: confidance interval.

© LROI 2024 | A013B

By age category

FIGURE Cumulative revision percentages (Kaplan-Meier; 95% CI) of primary ankle arthroplasties by age category in the Netherlands in 2014-2023 (n=1,266)



© LROI 2024 | A014A

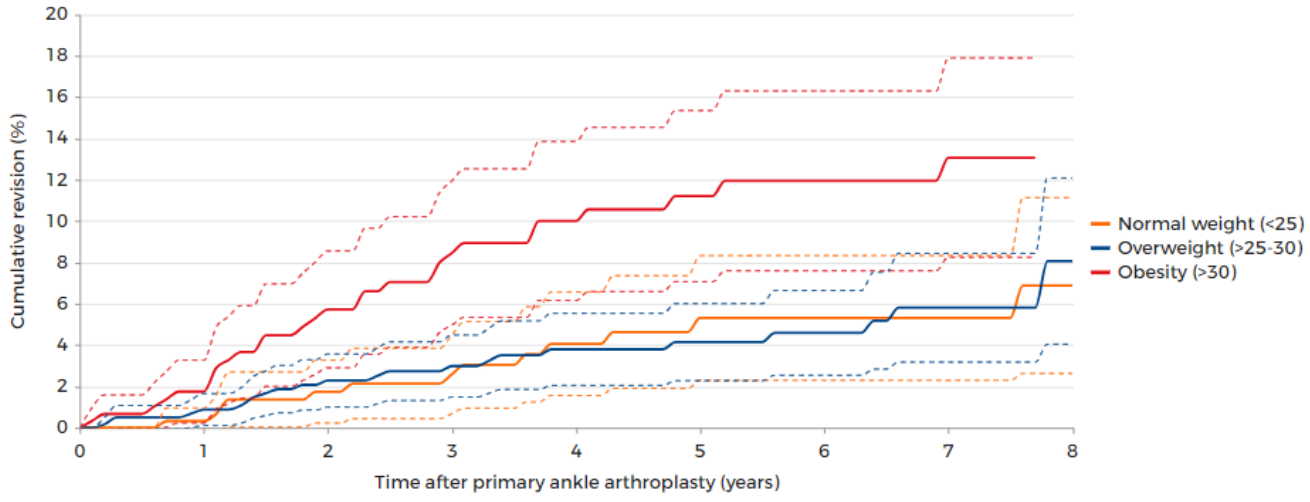
	Number (n)	1yr	3yr	5yr	7yr	8yr
<65 years	473	0.67 (-0.09-1.42)	5.03 (2.93-7.13)	7.95 (5.24-10.66)	8.84 (5.89-11.80)	12.02 (7.81-16.22)
65-74 years	597	1.08 (0.22-1.94)	3.94 (2.13-5.75)	5.96 (3.56-8.36)	7.27 (4.28-10.25)	7.27 (4.28-10.25)
>=75 years	196	0.54 (-0.51-1.58)	1.15 (-0.44-2.73)	1.15 (-0.44-2.73)	n.a.	n.a.

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

© LROI 2024 | A014B

By BMI

FIGURE Cumulative revision percentages (Kaplan-Meier; 95% CI) of primary ankle arthroplasties by BMI in the Netherlands in 2014-2023 (n=1,248)



© LROI 2024 | A015A

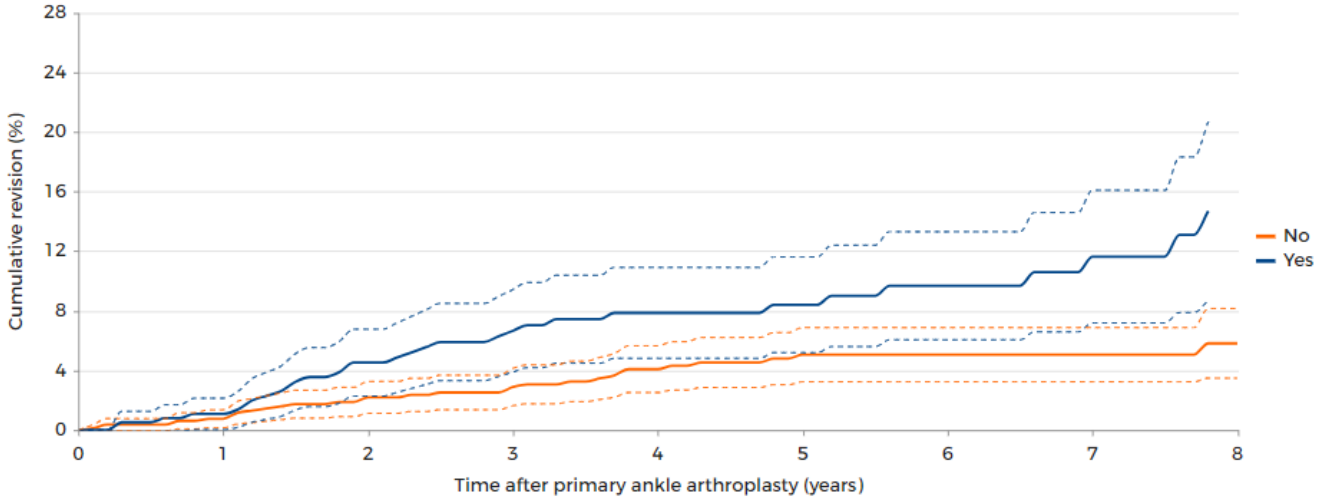
	Number (n)	1yr	3yr	5yr	7yr	8yr
Normal weight (<25)	334	0.32 (-0.31-0.96)	2.14 (0.44-3.84)	4.63 (1.90-7.35)	5.31 (2.30-8.33)	6.88 (2.63-11.13)
Overweight (>25-30)	609	0.69 (0.02-1.37)	2.74 (1.32-4.16)	4.14 (2.28-6.01)	5.80 (3.17-8.43)	8.06 (4.04-12.08)
Obesity (>30)	305	1.75 (0.23-3.27)	7.99 (4.60-11.37)	11.20 (7.06-15.34)	11.94 (7.59-16.29)	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.
CI: confidance interval.

© LROI 2024 | A015B

By previous surgery

FIGURE Cumulative revision percentages (Kaplan-Meier; 95% CI) of primary ankle arthroplasties by previous surgery in the Netherlands in 2014-2023 (n=1,239)



© LROI 2024 | A016A

	Number (n)	1yr	3yr	5yr	7yr	8yr
No	846	0.75 (0.15-1.36)	2.52 (1.37-3.68)	4.79 (3.04-6.53)	5.06 (3.24-6.87)	5.81 (3.48-8.15)
Yes	393	1.08 (0.03-2.13)	6.28 (3.60-8.96)	8.40 (5.19-11.60)	10.58 (6.58-14.58)	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.

CI: confidance interval.

© LROI 2024 | A016B

Shoulder arthroplasty

Numbers

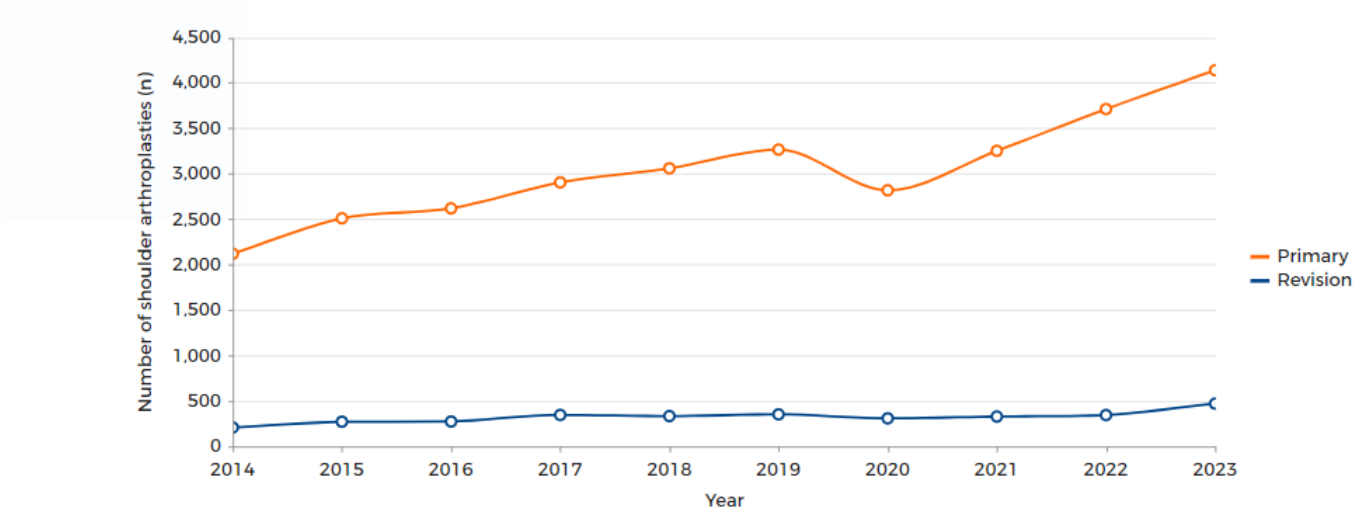
Registered procedures

TABLE Number of registered shoulder arthroplasties per year of surgery (2014-2023) in the LROI in April 2024

Year of surgery	Reversed shoulder arthroplasty	Total anatomical shoulder arthroplasty	Hemi shoulder arthroplasty	Resurfacing shoulder arthroplasty	Other	Unknown/ missing	Revision arthroplasty	Total
2014	1,246	398	374	89	0	13	208	**2,328**
2015	1,578	501	354	70	0	7	272	**2,782**
2016	1,748	519	299	39	0	14	274	**2,893**
2017	1,988	560	305	38	0	14	346	**3,251**
2018	2,140	629	250	35	0	6	334	**3,394**
2019	2,429	601	211	22	0	3	353	**3,619**
2020	2,159	478	161	16	0	4	309	**3,127**
2021	2,451	586	168	10	0	37	329	**3,581**
2022	2,881	620	194	14	2	1	345	**4,057**
2023	3,282	671	165	13	4	4	471	**4,610**
Total (n)	**21,902**	**5,563**	**2,481**	**346**	**6**	**103**	**3,241**	**33,642**

Procedures

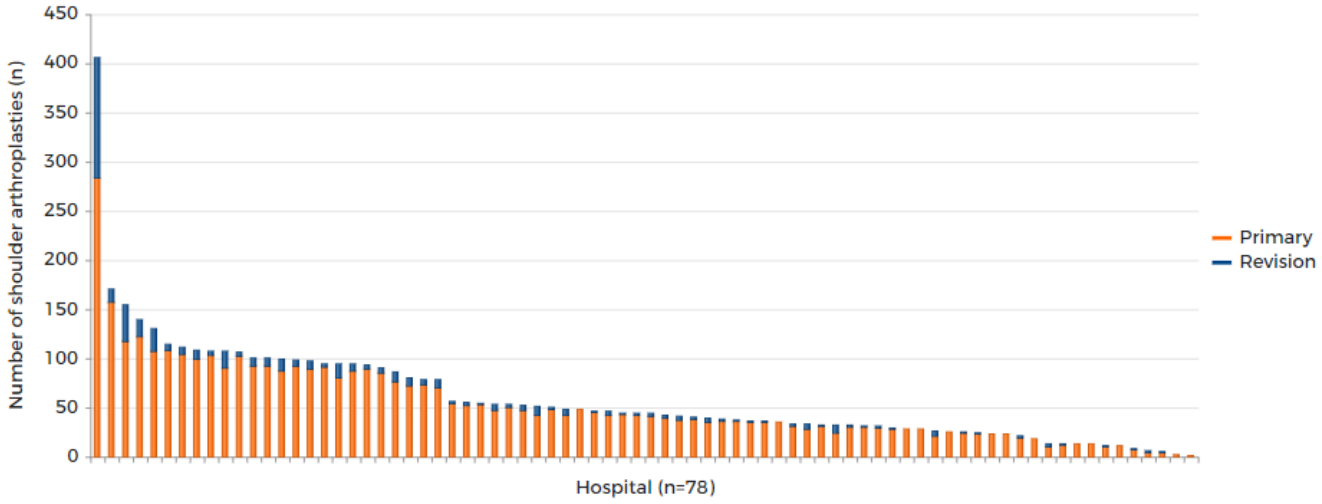
FIGURE Number of primary shoulder arthroplasties and shoulder revision arthroplasties registered in the LROI in the Netherlands 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Primary	2,120	2,510	2,619	2,905	3,060	3,266	2,818	3,252	3,712	4,139	**30,401**
Revision	208	272	274	346	334	353	309	329	345	471	**3,241**
Total (n)	**2,328**	**2,782**	**2,893**	**3,251**	**3,394**	**3,619**	**3,127**	**3,581**	**4,057**	**4,610**	**33,642**

Type of procedure per hospital

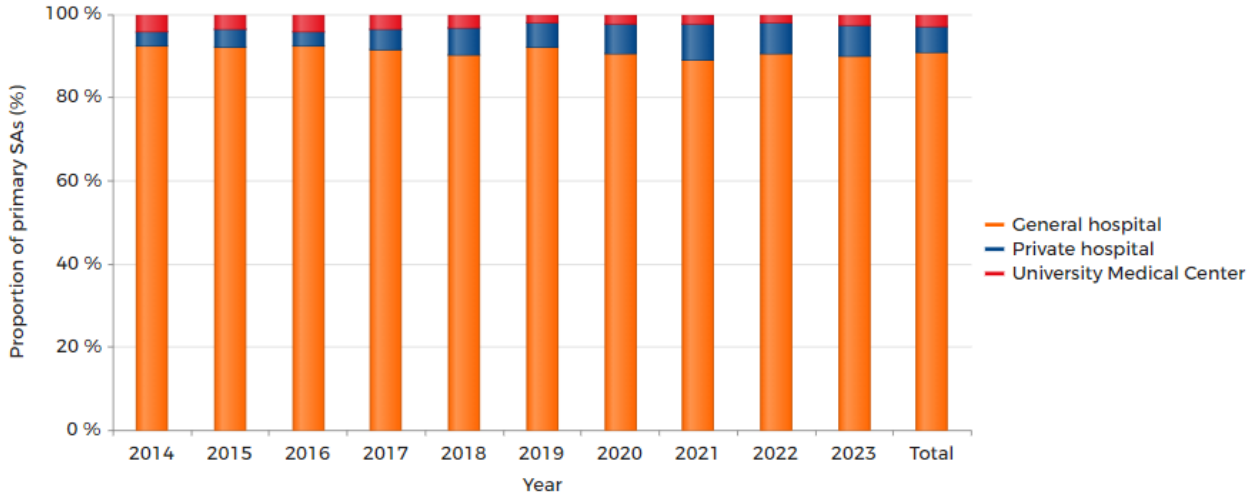
FIGURE Number of primary shoulder arthroplasties and shoulder revision arthroplasties per hospital in the Netherlands in 2023 (n=4,610)



© LROI 2024 | S003

Type of hospital

FIGURE Trend (proportion [%] per year) in type of hospital performing primary and revision shoulder arthroplasties in the Netherlands in 2014-2023



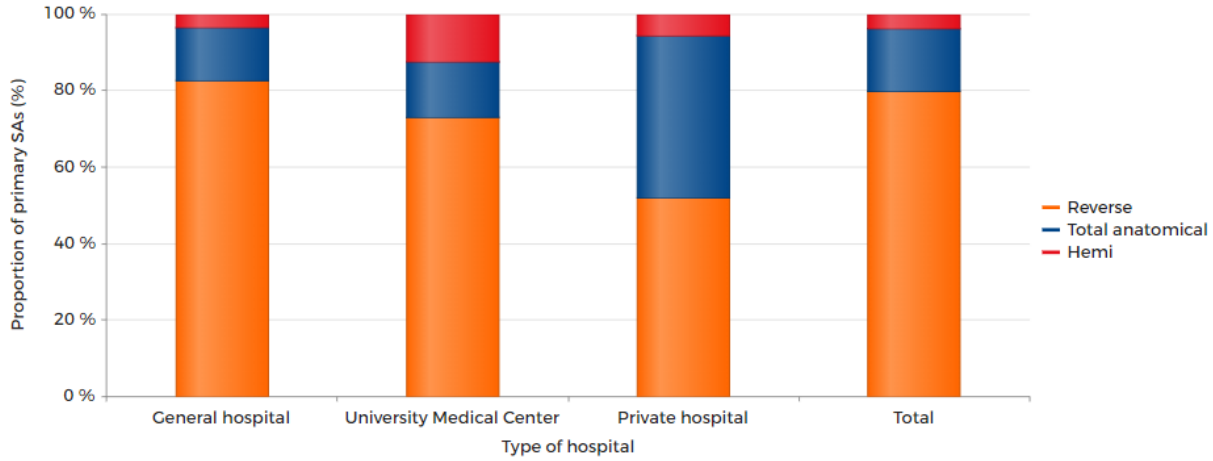
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
General hospital	92.35	92.06	92.46	91.45	90.37	92.15	90.44	89.00	90.46	89.80	90.92
Private hospital	3.48	4.28	3.46	5.14	6.45	5.78	7.39	8.80	7.52	7.68	6.24
University Medical Center	4.17	3.67	4.08	3.41	3.18	2.07	2.17	2.21	2.02	2.52	2.84
Total (n)	**2,328**	**2,782**	**2,893**	**3,251**	**3,394**	**3,619**	**3,127**	**3,581**	**4,057**	**4,609**	**33,641**

Please note: in 2023, 69 general hospitals, 7 UMCs and 17 private hospitals performed shoulder artroplasties.

© LROI 2024 | S004

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 2023

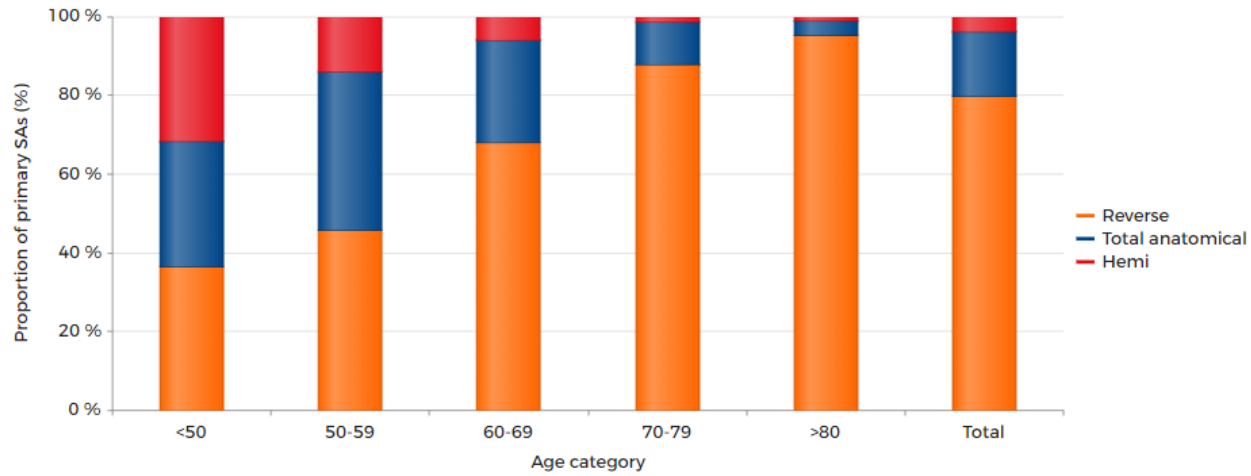


	General hospital	University Medical Center	Private hospital	Total
Reverse	82.42	72.92	51.93	79.70
Total anatomical	13.95	14.58	42.43	16.29
Hemi	3.64	12.50	5.64	4.01
Total (n)	**3,685**	**96**	**337**	**4,118**

Please note: in 4 (0%) primary shoulder arthroplasties the type of primary shoulder arthroplasties was not registered in 2023. 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 2023



	<50	50-59	60-69	70-79	>80	Total
Reverse	36.51	45.87	67.94	87.78	95.15	79.70
Total anatomical	31.75	40.06	26.12	10.85	3.68	16.29
Hemi	31.75	14.07	5.95	1.37	1.18	4.01
Total (n)	**63**	**327**	**1,076**	**1,972**	**680**	**4,118**

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 2023

	Reverse	Total anatomical	Hemi	Total
N(%)	**3282 (79.6)**	**671 (16.2)**	**165 (4)**	**4139**
Mean age (years) (SD)	73.2 (7.8)	65.6 (8.5)	61 (13)	71.4 (9)
Age (years) (%)				
<50	1	3	12	2
50-59	5	20	28	8
60-69	22	42	39	26
70-79	53	32	16	48
>80	20	4	5	16
Gender (%)				
Men	25	35	43	28
Women	75	65	57	72
ASA score (%)				
ASA I	5	10	12	6
ASA II	54	67	62	56
ASA III-IV	42	23	26	38
Type of hospital (%)				
General	93	77	81	89
UMC	2	2	7	2
Private	5	21	11	8
Specialism (%)				
Orthopaedic surgeon	99	100	98	99
Trauma surgeon	1	0	2	1
Diagnosis (%)				
Osteoarthritis	33	89	55	43
Fracture	19	1	22	16
Cuff arthropathy	24	1	0	19
Post-traumatic	11	3	7	9
Cuff rupture	6	0	0	5
Rheumatoid arthritis	1	1	0	1
Osteonecrosis	1	2	12	2
Chronic (sub)dislocation	1	0	1	1
Inflammatory arthritis	0	0	0	0
Tumour	0	0	1	0
Other	3	0	2	2
Walch-score (%)				
A1	43	30	39	41
A2	28	38	23	31
B1	12	19	11	14
B2	8	8	10	8
B3	4	2	8	4
C	2	1	3	2
Mean BMI (kg/m2) (SD)	27.9 (5.2)	28.4 (5)	28 (5.2)	28 (5.2)
Body Mass Index (kg/m2) (%)				
Underweight (<=18.5)	1	0	1	1
Normal weight (>18.5-25)	31	25	32	30
Overweight (>25-30)	39	40	35	39
Obesity (>30-40)	26	28	28	27
Morbid obesity (>40)	3	2	2	3
Smoking (%)				
No	90	87	88	90
Yes	9	12	10	10

Total includes resurfacing shoulder arthroplasties (13; 0.3%), other (4; 0.1%) and primary shoulder arthroplasties of which the type of prosthesis had not been registered (4; 0.1%)

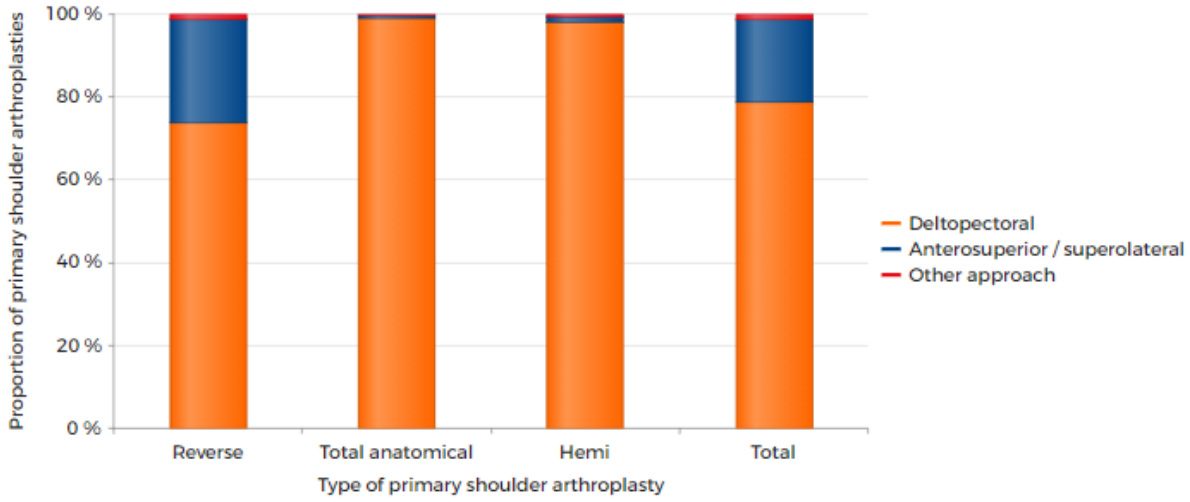
Reverse: reverse total shoulder arthroplasty; Total anatomical: anatomic total shoulder arthroplasty; Hemi: shoulder hemiarthroplasty; General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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 2023



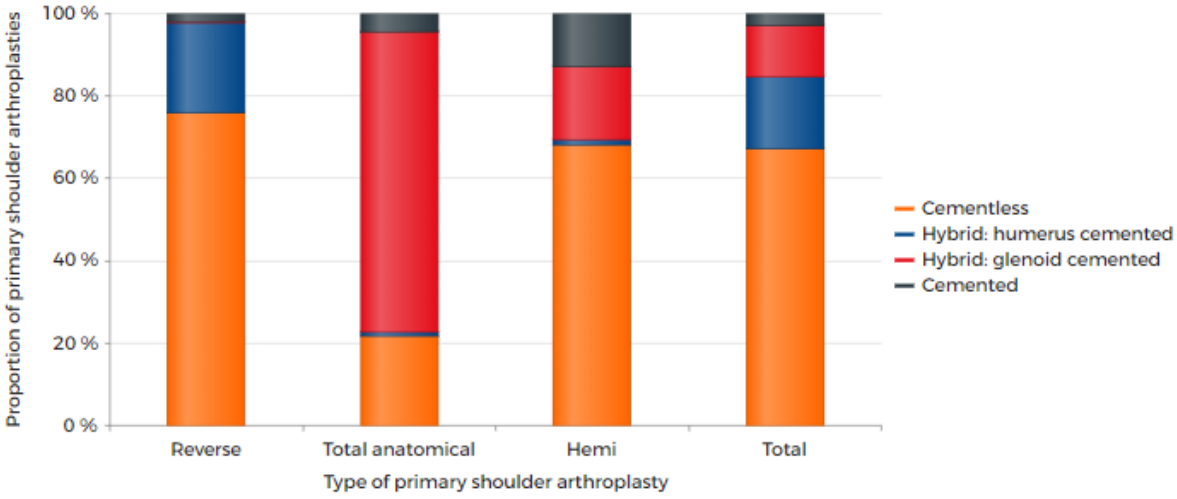
	Reverse	Total anatomical	Hemi	Total
Deltopectoral	73.87	99.09	98.17	78.95
Anterosuperior / superolateral	24.77	0.61	1.22	19.90
Other approach	1.36	0.30	0.61	1.16
Total (n)	**3,242**	**660**	**164**	**4,066**

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

© LROI 2024 | S008

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 2023



	Reverse	Total anatomical	Hemi	Total
Cementless	76.16	21.67	68.10	67.17
Hybrid: humerus cemented	21.59	0.93	1.23	17.49
Hybrid: glenoid cemented	0.25	73.07	17.79	12.54
Cemented	2.00	4.33	12.88	2.81
Total (n)	**3,251**	**646**	**163**	**4,060**

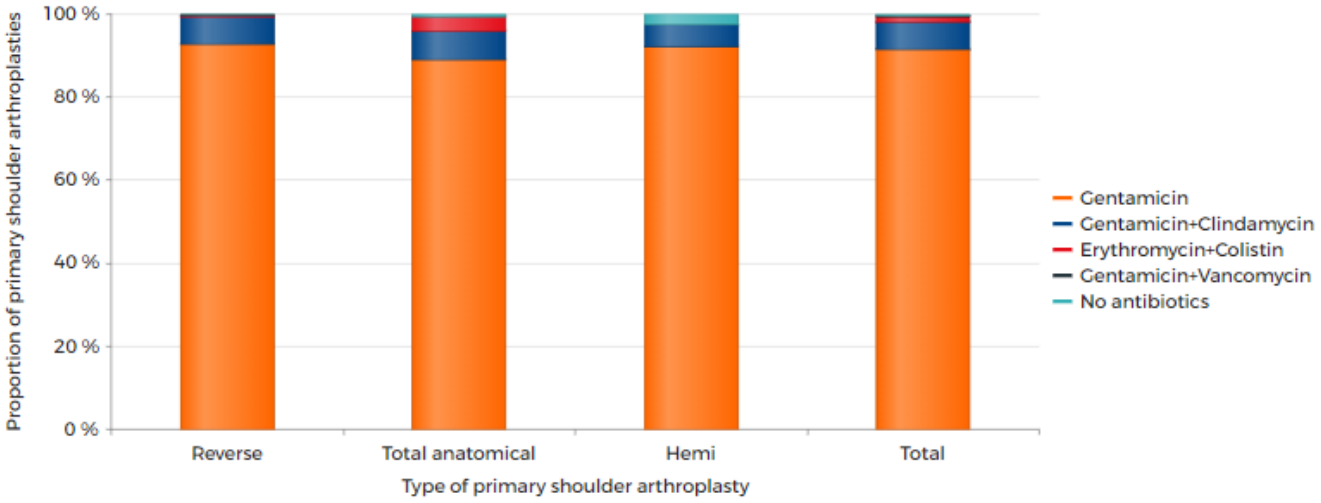
Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

© LROI 2024 | S009

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 2023

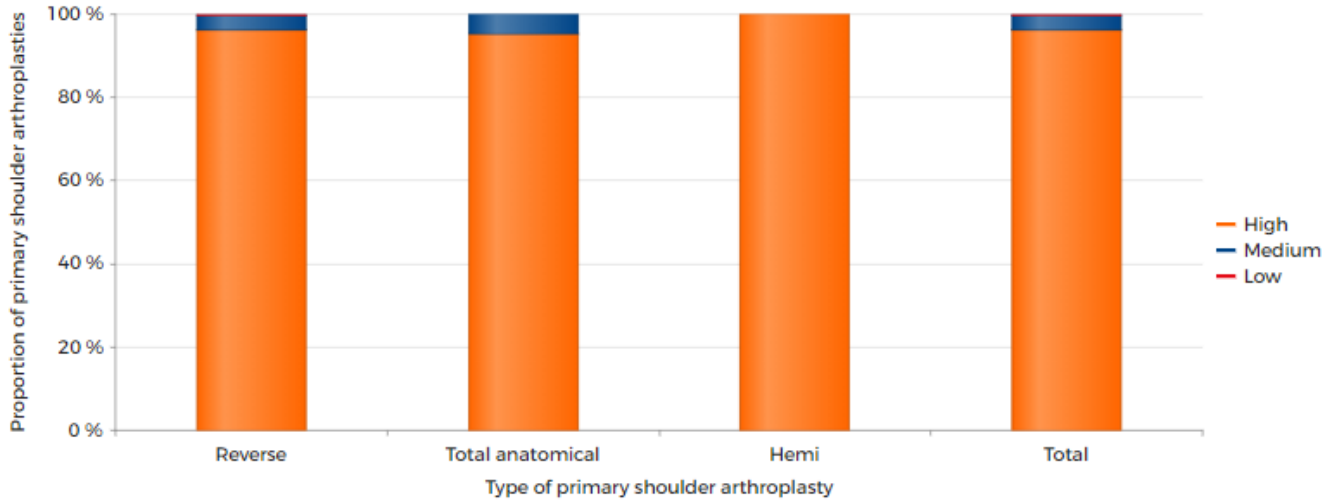


	Reverse	Total anatomical	Hemi	Total
Gentamicin	92.96	89.23	92.11	91.53
Gentamicin+Clindamycin	6.44	6.79	5.26	6.53
Erythromycin+Colistin	0.30	3.28	0	1.41
Gentamicin+Vancomycin	0.15	0	0	0.09
No antibiotics	0.15	0.70	2.63	0.44
Total (n)	**668**	**427**	**38**	**1,133**

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 2023



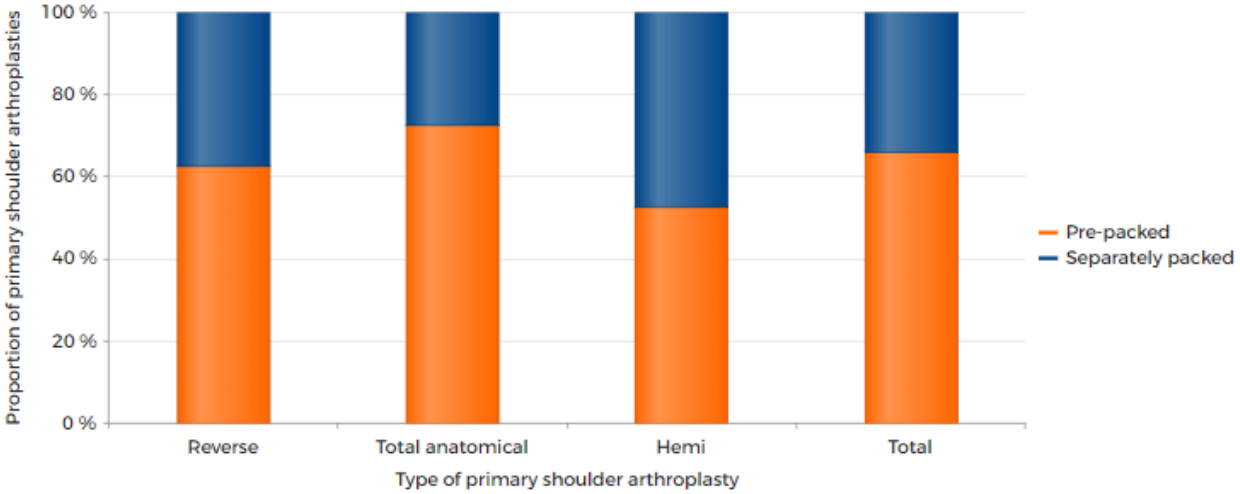
	Reverse	Total anatomical	Hemi	Total
High	96.41	95.32	100	96.12
Medium	3.29	4.68	0	3.71
Low	0.30	0	0	0.18
Total (n)	**668**	**427**	**38**	**1,133**

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

© LROI 2024 | S011

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 2023



	Reverse	Total anatomical	Hemi	Total
Pre-packed	62.72	72.60	52.63	66.11
Separately packed	37.28	27.40	47.37	33.89
Total (n)	**668**	**427**	**38**	**1,133**

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

© LROI 2024 | S012

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 2019-2023

Year	2019	2020	2021	2022	2023
Humeral stem (n)	**2,245**	**1,930**	**2,340**	**2,660**	**3,016**
Name; Proportion (%)					
Delta X-tend	33.94	30.83	27.48	30.38	28.98
Aequalis Ascend Flex	13.36	14.09	16.07	13.65	17.57
COMPREHENSIVE MINI	8.42	8.91	7.74	9.92	10.58
Aequalis Reversed Fractuur	5.08	7.15	7.05	6.69	6.47
Global Unite	4.50	3.42	4.27	5.56	5.94
SMR stem Cementless	4.05	3.73	4.66	3.27	5.67
Equinoxe	5.57	3.94	4.53	5.26	5.37
Aequalis Reversed II	9.80	7.05	5.85	5.30	3.91
Affinis Inverse	3.16	3.63	3.55	4.96	3.78
COMPREHENSIVE FRACTURE	2.90	3.32	3.25	3.31	3.12
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Humeral liner (n)	**2,086**	**1,899**	**2,272**	**2,533**	**2,924**
Name; Proportion (%)					
Delta X-tend	35.91	34.28	31.91	37.27	35.94
Aequalis Ascend Flex	14.86	15.38	20.25	15.79	19.80
COMPREHENSIVE	11.94	13.27	12.10	14.96	15.01
Aequalis Reversed Fractuur	5.32	6.48	6.60	6.28	5.68
Equinoxe	6.42	5.00	5.11	5.53	5.54
SMR reversed liner	3.93	4.00	5.33	3.24	5.44
Aequalis Reversed II	10.35	7.32	6.07	5.37	4.00
Affinis Inverse	3.36	3.26	3.21	4.38	3.11
UNIVERS REVERS	0.58	2.16	1.63	2.33	2.63
TM Reverse shoulder	2.30	3.05	2.11	2.49	0.99

Year	2019	2020	2021	2022	2023
Glenosphere (n)	**2,216**	**1,840**	**2,245**	**2,660**	**3,045**
Name; Proportion (%)					
Delta X-tend	36.78	28.75	27.71	35.41	34.09
Aequalis Reversed II	24.46	26.90	26.19	20.71	23.12
COMPREHENSIVE	11.64	13.53	12.43	14.70	14.15
Perform Reversed	5.87	5.11	9.58	7.07	8.67
SMR reversed head	2.71	4.40	5.61	4.32	6.73
Equinoxe	6.05	5.38	5.17	5.26	5.35
Affinis Inverse	3.11	2.12	2.49	2.71	3.05
TM Reverse Glenoid Heads	6.41	8.37	6.77	3.68	1.84
Affinis Inverse Vitamys	0.86	2.39	1.78	3.72	1.81
UNIVERS REVERS	0.54	2.34	1.69	2.07	0.95
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Metaphysis (n)	**1,829**	**1,487**	**1,782**	**2,048**	**2,416**
Name; Proportion (%)					
Delta X-tend	37.45	29.32	28.28	34.52	31.66
Aequalis Ascend Flex	17.22	19.10	24.35	18.26	23.14
COMPREHENSIVE	13.12	16.27	14.42	17.92	17.43
SMR reversed body	5.19	5.72	6.68	4.25	6.95
Equinoxe	7.22	6.86	6.51	6.79	6.71
Aequalis Reversed II	12.08	9.15	7.58	6.79	4.76
Global Unite Fracture	1.48	3.16	3.93	4.88	4.10
UNIVERS REVERS	0.60	2.69	1.52	2.44	3.15
Anatomical inverse Humeral Cups	4.98	6.32	6.17	2.05	1.08
Affinis Fracture Inverse	0.60	1.34	0.45	1.76	0.87

Year	2019	2020	2021	2022	2023
Glenoid baseplate (n)	**2,197**	**1,933**	**2,258**	**2,594**	**2,919**
Name; Proportion (%)					
Delta X-tend	38.87	33.63	29.76	36.51	35.42
Aequalis Reversed II	24.76	25.56	26.13	21.63	24.46
COMPREHENSIVE	11.65	12.73	12.36	15.15	15.01
Perform Reversed	5.69	4.66	9.39	7.25	8.08
Equinoxe	5.42	3.93	4.87	5.17	5.41
SMR uncemented glenoid	2.82	4.09	5.36	3.12	5.10
Affinis Inverse	3.82	4.86	3.10	2.47	1.95
Trabecular Metal Baseplate	6.01	8.02	6.64	3.86	1.92
Affinis Fracture Inverse	0.00	0.00	0.58	2.74	1.37
Universal Glenoid	0.59	2.28	1.68	2.08	0.99

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 2019-2023

Year	2019	2020	2021	2022	2023
Humeral stem (n)	**519**	**380**	**515**	**553**	**596**
Name; Proportion (%)					
Aequalis Ascend Flex	26.20	33.95	36.89	33.82	34.90
GLOBAL ICON	6.17	7.11	6.60	12.66	13.59
Affinis Short	10.60	8.68	7.77	9.95	13.59
SMR Stemless	6.94	7.63	5.05	9.58	10.74
COMPREHENSIVE NANO	7.71	7.37	10.49	11.03	9.73
Global Unite	12.52	11.58	8.35	7.96	7.38
Simpliciti Shoulder System	4.43	3.68	1.36	2.35	2.52
COMPREHENSIVE MINI	2.31	3.16	4.27	2.71	2.35
SMR stem Cementless	2.70	2.37	4.08	0.72	1.68
Equinoxe	1.35	0.79	3.50	2.35	1.34
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Humeral liner (n)	**529**	**393**	**530**	**562**	**593**
Name; Proportion (%)					
Aequalis Ascend Flex	27.41	35.37	36.98	34.34	35.24
GLOBAL ICON	5.67	6.62	6.60	12.99	13.49
Affinis Short	10.40	7.89	7.36	9.07	13.32
COMPREHENSIVE	9.64	10.43	14.53	13.35	12.48
SMR head	9.83	8.40	7.55	9.25	10.79
Global Unite/ Global AP	17.20	16.03	12.64	11.03	8.26
Simpliciti Shoulder System	5.86	4.58	2.45	2.67	3.37
Equinoxe	1.89	1.78	3.40	2.31	1.35
ECLIPSE	3.78	3.31	2.83	1.96	0.67
Sidus Heads	3.40	4.33	5.09	2.67	0.67
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Glenosphere (n)	**552**	**389**	**540**	**562**	**601**
Name; Proportion (%)					
Aequalis Perform Keeled	18.66	27.76	27.78	26.51	27.62
Global APG+	26.81	23.65	17.96	25.27	21.96
COMPREHENSIVE	9.78	11.31	15.00	14.06	13.31
Aequalis Perform Pegged	9.78	9.51	10.56	9.96	11.31
SMR TT hybrid glenoid	0.18	2.57	5.00	5.87	7.99
Affinis Vitamys	4.53	2.83	5.19	4.80	6.66
Affinis	5.62	5.91	2.41	4.45	5.32
SMR uncemented glenoid	7.25	4.37	4.44	1.42	2.00
Affinis Vitamys uncemented	0.00	0.00	0.00	0.53	1.50
Equinoxe Cage	1.81	1.80	3.33	2.31	1.33

Shoulder hemiarthroplasty

TABLE The most frequently registered humeral stems and humeral heads in primary shoulder hemiarthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Humeral stem (n)	**166**	**140**	**157**	**167**	**154**
Name; Proportion (%)					
Aequalis Ascend Flex	21.08	27.14	23.57	22.16	29.87
SMR Stemless	3.01	5.00	3.82	5.39	11.69
Aequalis Flex Revive	0.00	2.86	3.18	3.59	11.04
Affinis Short	10.84	2.86	2.55	8.98	5.19
Equinoxe	1.81	0.71	3.82	1.80	4.55
Sidus Baseplate	2.41	4.29	7.01	7.19	4.55
COMPREHENSIVE MINI	7.23	3.57	0.64	3.59	4.55
Aequalis Fractuur hemi	9.64	14.29	10.19	5.39	4.55
Global Unite	5.42	3.57	6.37	7.78	3.90
COMPREHENSIVE FRACTURE	5.42	7.86	12.74	7.19	3.90
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Humeral liner (n)	**176**	**142**	**150**	**158**	**146**
Name; Proportion (%)					
Aequalis pyrocarbon humeral head	17.61	25.35	16.67	13.92	24.66
Aequalis Ascend Flex	4.55	5.63	10.67	13.92	16.44
SMR head	5.68	10.56	12.00	11.39	13.70
COMPREHENSIVE	23.86	11.27	19.33	12.03	8.90
Affinis Short	10.23	2.82	2.67	7.59	5.48
Global Unite/ Global AP	4.55	4.23	6.67	8.23	4.79
Aequalis humerus kop	9.66	14.08	10.00	6.33	4.79
Equinoxe	1.14	0.70	2.00	1.27	4.79
ECLIPSE	9.66	4.93	0.67	8.23	4.79
Sidus Heads	4.55	4.23	7.33	7.59	4.79

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 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**294**	**306**	**385**	**427**	**419**
Cement name; Proportion (%)					
PALACOS R+G	47.28	57.52	58.96	48.01	68.50
Refobacin Bone Cement R	44.22	32.03	34.29	45.67	29.36
Refobacin Plus Bone Cement	8.50	10.46	6.75	6.32	2.15
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Separately packed bone cement components (n)	**239**	**218**	**183**	**242**	**249**
Cement name; Proportion (%)					
PALACOS R+G	68.62	59.17	80.87	69.01	63.05
COPAL G+C	1.67	3.21	2.73	12.81	16.87
Refobacin Bone Cement R	9.62	14.68	3.28	3.31	9.24
PALACOS MV+G	3.77	7.80	4.37	5.79	8.03
Simplex ABC EC	3.77	5.05	0.55	0.00	0.80
PALACOS LV+G	5.86	2.75	4.92	4.13	0.80
COPAL G+V	0.00	0.00	0.00	0.41	0.40
Biomet Bone Cement R	0.00	0.92	2.19	2.48	0.40
Refobacin Revision	0.42	0.00	0.55	0.41	0.40

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 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**238**	**182**	**284**	**325**	**308**
Cement name; Proportion (%)					
PALACOS R+G	47.06	53.85	44.01	40.31	48.05
Refobacin Bone Cement R	47.06	36.81	49.30	49.85	45.78
Refobacin Plus Bone Cement	5.88	9.34	6.69	9.85	6.17
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Separately packed bone cement components (n)	**185**	**134**	**129**	**116**	**117**
Cement name; Proportion (%)					
PALACOS R+G	71.89	61.94	78.29	43.97	39.32
COPAL G+C	0.00	0.00	0.00	25.86	24.79
Refobacin Bone Cement R	5.95	19.40	5.43	4.31	16.24
Simplex ABC EC	19.46	12.69	6.98	14.66	11.97
Subiton G	0.00	2.24	2.33	3.45	5.13
Biomet Bone Cement R	0.00	2.24	3.88	3.45	2.56

Shoulder hemiarthroplasty

TABLE The most frequently registered types of bone cement used during primary shoulder hemiarthroplasties in the Netherlands in 2019-2023

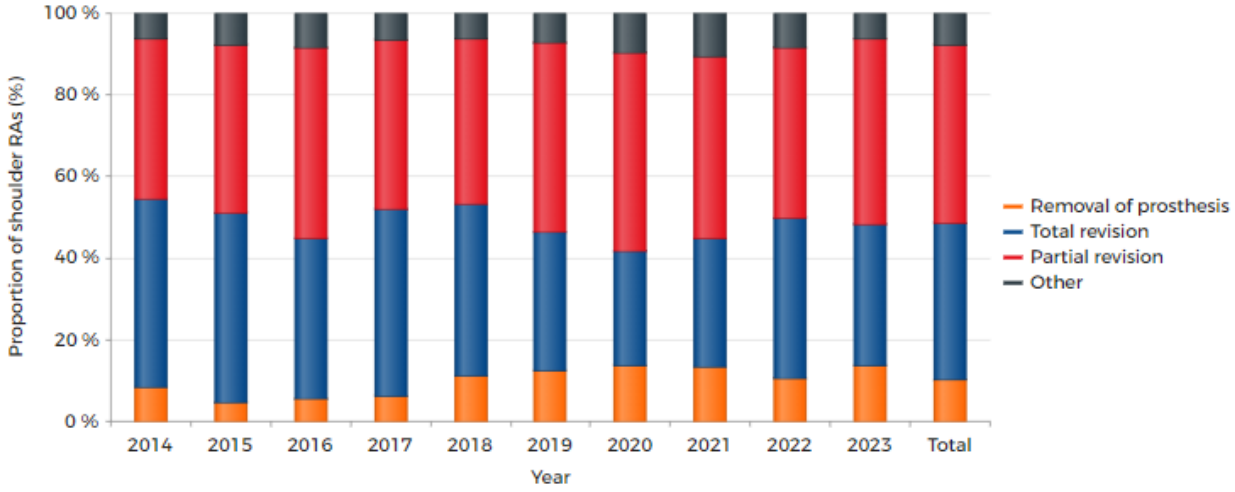
Year	2019	2020	2021	2022	2023
Bone cement pre-packed in a vacuum mixing system (n)	**46**	**29**	**52**	**34**	**20**
Cement name; Proportion (%)					
PALACOS R+G	34.78	27.59	46.15	20.59	60.00
Refobacin Bone Cement R	52.17	31.03	38.46	50.00	35.00
Refobacin Plus Bone Cement	13.04	41.38	15.38	29.41	5.00
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Separately packed bone cement components (n)	**34**	**28**	**12**	**33**	**18**
Cement name; Proportion (%)					
PALACOS R+G	47.06	67.86	83.33	51.52	55.56
Refobacin Bone Cement R	5.88	7.14	0.00	9.09	27.78
COPAL G+C	0.00	0.00	0.00	6.06	11.11
Biomet Bone Cement R	0.00	0.00	0.00	3.03	5.56

© LROI 2024 | S018

Shoulder revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in shoulder revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Removal of prosthesis	8.33	4.62	5.70	6.33	11.21	12.36	13.77	13.41	10.53	13.62	10.40
Total revision	46.08	46.54	39.16	45.78	42.06	33.91	27.87	31.40	39.18	34.68	38.07
Partial revision	39.22	41.15	46.77	41.27	40.50	46.55	48.85	44.51	41.81	45.53	43.84
Other	6.37	7.69	8.37	6.63	6.23	7.18	9.51	10.67	8.48	6.17	7.69
Total (n)	**204**	**260**	**263**	**332**	**321**	**348**	**305**	**328**	**342**	**470**	**3,173**

RA: revision arthroplasty

© LROI 2024 | S019

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a shoulder revision arthroplasty in the Netherlands in 2014-2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Shoulder revision arthroplasty (n)	**208**	**272**	**274**	**346**	**334**	**353**	**309**	**329**	**345**	**471**	**3241**
Reasons for revision; Proportion (%)											
Infection	19.23	16.54	22.26	21.39	24.85	28.05	28.80	32.22	30.72	27.81	25.73
Instability	12.50	15.44	23.36	26.30	22.16	22.66	23.95	19.76	20.58	21.23	21.20
Progression of osteoarthritis	24.04	24.63	16.79	16.76	14.97	12.18	10.36	11.25	11.01	8.70	14.25
Loosening of glenoid component	12.50	13.24	10.58	13.01	11.08	11.33	10.36	14.59	18.26	17.20	13.48
Cuff rupture	13.94	15.07	10.95	14.45	11.98	11.33	10.03	10.94	10.72	9.55	11.69
Cuff arthropathy	12.50	13.24	13.50	11.85	9.58	11.61	9.71	7.60	4.35	7.86	9.87
Other	12.02	12.87	8.39	8.38	5.99	6.23	9.39	5.78	9.86	9.77	8.70
Loosening of humeral component	7.69	7.72	10.95	4.62	7.19	5.38	8.74	7.90	8.70	8.92	7.74
Peri-prosthetic fracture	2.88	5.88	5.11	4.62	6.59	6.23	5.83	8.81	7.83	6.58	6.20
Revision after shoulder removal								3.04	4.93	5.94	
Other	10.58	11.76	12.04	9.25	12.57	11.90	17.48	12.77	11.88	14.01	12.53

Please note: Removal after shoulder revision was not registered before 2022.

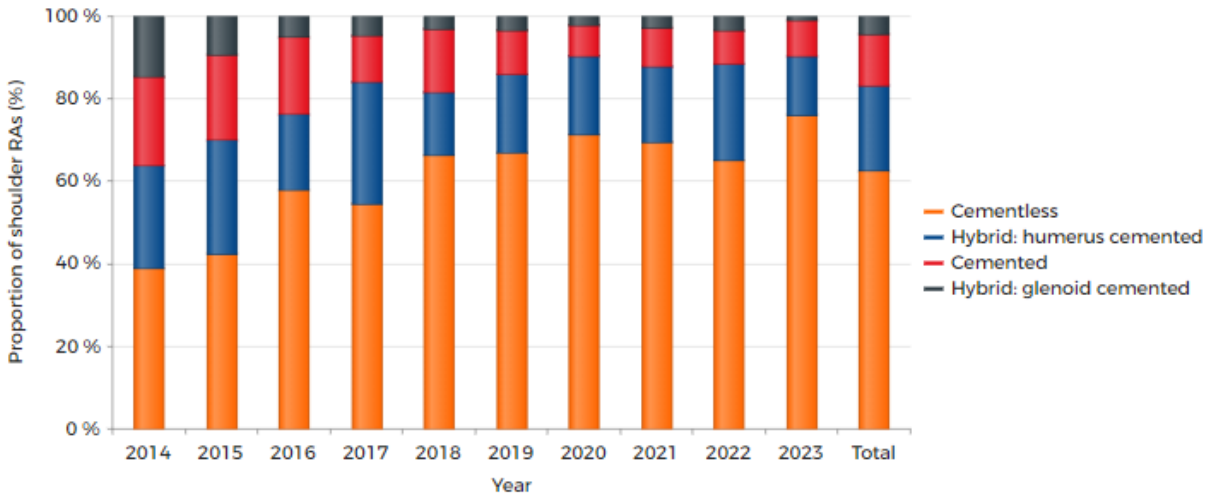
One patient may have more than one reason for revision. As such, the total proportion is over 100%.

© LROI 2024 | S020

Surgical techniques

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in shoulder revision arthroplasties in the Netherlands in 2014-2023



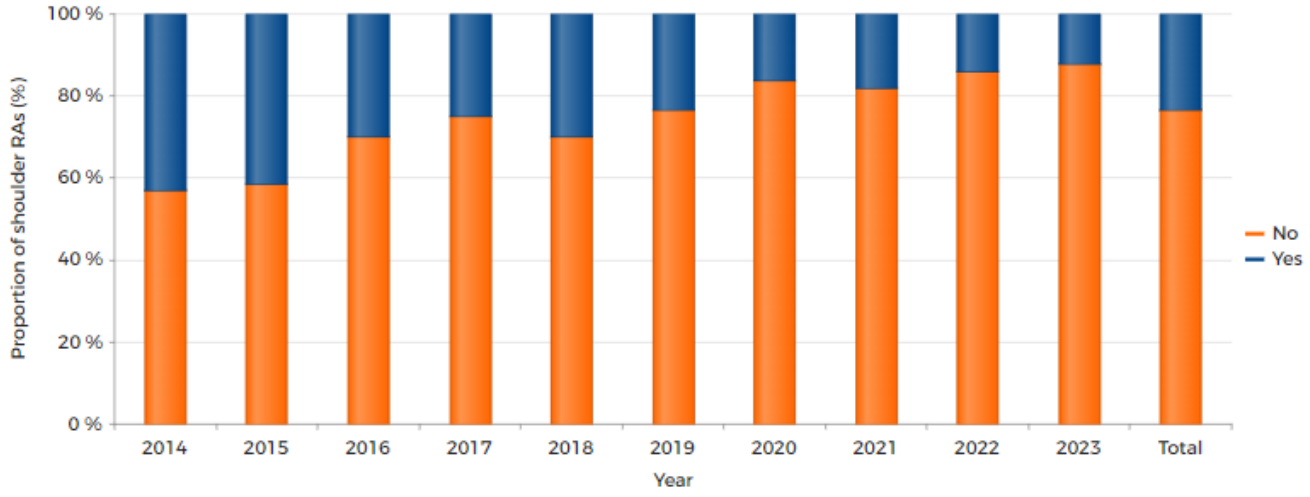
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cementless	38.98	42.51	57.96	54.55	66.28	66.89	71.32	69.42	65	75.88	62.47
Hybrid: humerus cemented	24.86	27.53	18.37	29.55	15.33	19.21	18.99	18.35	23.33	14.32	20.66
Cemented	21.47	20.65	18.78	11.36	15.33	10.60	7.36	9.35	8.33	8.79	12.51
Hybrid: glenoid cemented	14.69	9.31	4.90	4.55	3.07	3.31	2.33	2.88	3.33	1.01	4.36
Total (n)	**177**	**247**	**245**	**308**	**261**	**302**	**258**	**278**	**300**	**398**	**2,774**

RA: revision arthroplasty

© LROI 2024 | S021

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 2014-2023

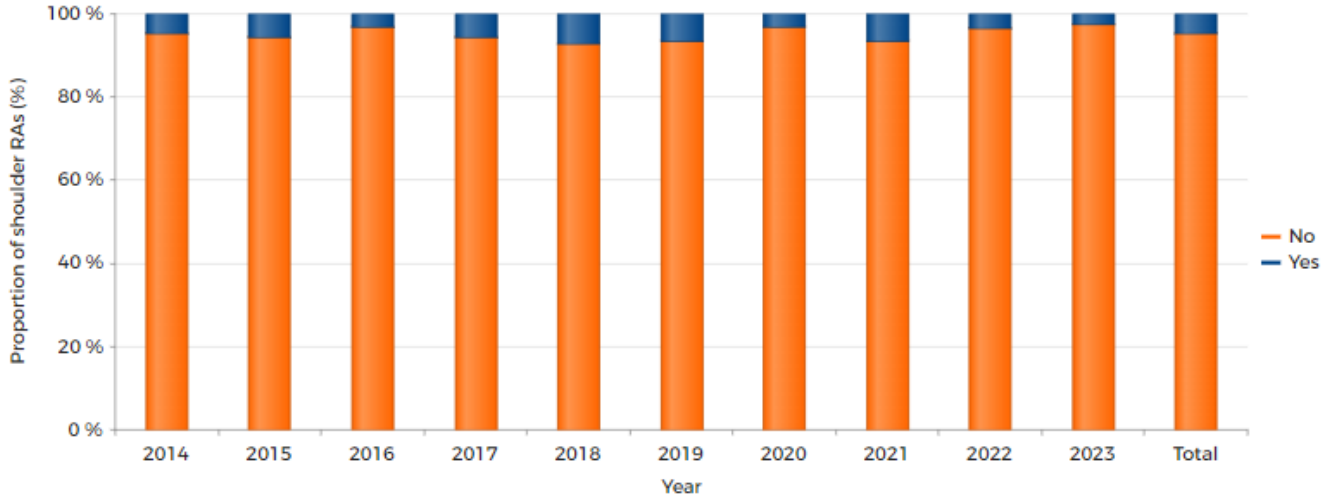


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
No	57.14	58.68	70.24	75.23	70.13	76.67	83.89	82.05	86.01	87.82	76.75
Yes	42.86	41.32	29.76	24.77	29.87	23.33	16.11	17.95	13.99	12.18	23.25
Total (n)	**182**	**242**	**252**	**323**	**298**	**330**	**298**	**312**	**336**	**468**	**3,041**

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 2014-2023

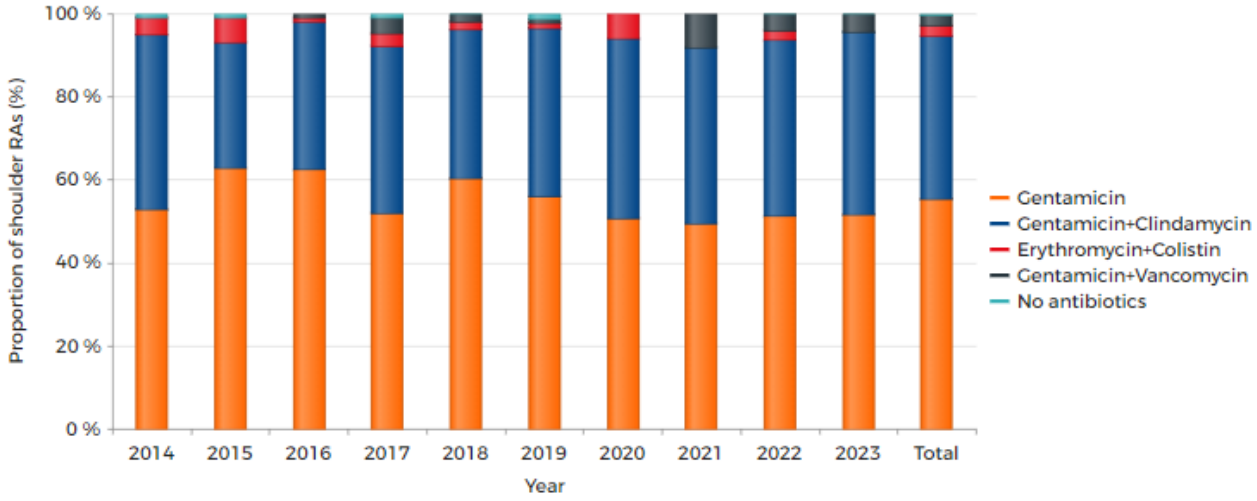


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
No	95.40	94.44	96.76	94.29	92.81	93.58	96.94	93.55	96.71	97.42	95.29
Yes	4.60	5.56	3.24	5.71	7.19	6.42	3.06	6.45	3.29	2.58	4.71
Total (n)	**174**	**234**	**247**	**315**	**292**	**327**	**294**	**310**	**334**	**466**	**2,993**

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 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Gentamicin	52.94	62.93	62.63	51.92	60.58	56.18	50.75	49.43	51.55	51.61	55.43
Gentamicin+Clindamycin	42.16	30.17	35.35	40.38	35.58	40.45	43.28	42.53	42.27	44.09	39.25
Erythromycin+Colistin	3.92	6.03	1.01	2.88	1.92	1.12	5.97	0	2.06	0	2.51
Gentamicin+Vancomycin	0	0	1.01	3.85	1.92	1.12	0	8.05	4.12	4.30	2.40
No antibiotics	0.98	0.86	0	0.96	0	1.12	0	0	0	0	0.42
Total (n)	**102**	**116**	**99**	**104**	**104**	**89**	**67**	**87**	**97**	**93**	**958**

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 2019-2023

Year	2019	2020	2021	2022	2023
Humeral stem (n)	**139**	**105**	**128**	**145**	**176**
Name; Proportion (%)					
Delta X-tend	36.69	41.90	36.72	42.07	37.50
Aequalis Flex Revive	0.00	4.76	10.16	5.52	15.34
Aequalis Ascend Flex	7.91	8.57	7.03	13.79	10.80
Aequalis Ascend Flex Cemented	4.32	0.00	3.91	8.97	7.95
COMPREHENSIVE MINI	6.47	8.57	4.69	4.14	4.55
SMR stem Cementless	2.88	1.90	4.69	0.00	4.55
Global Unite	6.47	0.95	7.81	7.59	4.55
Aequalis Reversed Fractuur	5.04	6.67	1.56	3.45	2.27
Equinoxe	5.04	4.76	2.34	2.07	1.70
SMR stem Revision	0.00	0.00	0.78	0.00	1.70
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Humeral head (n)	**32**	**26**	**33**	**31**	**35**
Name; Proportion (%)					
Global AP	21.88	15.38	18.18	19.35	25.71
Aequalis Ascend Flex	18.75	26.92	27.27	41.94	22.86
SMR CTA head	6.25	0.00	3.03	6.45	8.57
COMPREHENSIVE	6.25	3.85	0.00	6.45	8.57
Aequalis pyrocarbon humeral head	3.13	0.00	0.00	0.00	5.71
Affinis Short	0.00	3.85	0.00	0.00	5.71
Aequalis humerus kop	9.38	15.38	6.06	0.00	5.71
Global Unite/ Global AP	12.50	7.69	6.06	6.45	5.71
GLOBAL ICON	3.13	0.00	0.00	0.00	2.86
Simpliciti Shoulder System	6.25	0.00	3.03	3.23	2.86
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Humeral liner (n)	**219**	**189**	**198**	**225**	**286**
Name; Proportion (%)					
Delta X-tend	37.90	37.57	51.52	53.78	44.06
Aequalis Ascend Flex	14.61	12.70	16.67	20.00	24.13
COMPREHENSIVE	9.13	11.11	9.09	8.44	7.69
SMR reversed liner	3.20	5.82	2.53	0.89	5.59
Aequalis Reversed Fractuur	5.48	5.82	3.03	3.11	3.85
Equinoxe	5.94	6.35	3.03	3.56	3.50
UNIVERS REVERS	0.46	1.59	2.02	0.89	2.80
TM Reverse shoulder	1.83	1.59	1.52	0.00	2.10
Aequalis Reversed II	9.13	5.82	5.05	4.44	2.10
Anatomical Inverse Humeral Poly Inlays	5.94	5.82	3.03	2.22	1.75
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Glenosphere (n)	**218**	**141**	**165**	**178**	**257**
Name; Proportion (%)					
Delta X-tend	37.16	26.95	38.79	44.38	38.13
Perform Reversed	9.17	6.38	10.30	12.92	17.90
Aequalis Reversed II	18.35	17.02	13.33	19.10	15.56
COMPREHENSIVE	7.80	11.35	9.70	7.30	9.34
SMR reversed head	4.13	11.35	3.64	2.81	6.23
Equinoxe	4.13	6.38	2.42	2.25	2.72
UNIVERS REVERS	0.46	2.13	3.64	1.12	2.33
TM Reverse Glenoid Heads	6.42	7.80	5.45	1.12	2.33
Affinis Inverse	5.05	3.55	3.64	1.12	1.17
Aequalis Perform Keeled	2.75	1.42	1.21	1.69	1.17

Year	2019	2020	2021	2022	2023
Metaphysis (n)	**128**	**99**	**115**	**126**	**162**
Name; Proportion (%)					
Aequalis Ascend Flex	20.31	16.16	27.83	31.75	37.04
Delta X-tend	21.88	17.17	25.22	27.78	24.07
COMPREHENSIVE	17.19	19.19	17.39	15.08	14.81
SMR reversed body	4.69	9.09	5.22	2.38	8.02
UNIVERS REVERS	0.78	2.02	1.74	1.59	4.94
Equinoxe	5.47	12.12	5.22	3.17	3.70
Anatomical inverse Humeral Cups	10.16	10.10	5.22	3.97	3.09
SMR reversed body extender	0.00	1.01	0.00	0.00	1.85
Affinis Fracture	0.00	0.00	1.74	0.79	0.62
SMR reversed body adaptor	0.78	0.00	0.87	0.79	0.62
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Glenoid baseplate (n)	**128**	**93**	**117**	**125**	**158**
Name; Proportion (%)					
Delta X-tend	47.66	43.01	45.30	52.00	41.77
Perform Reversed	4.69	3.23	9.40	9.60	20.25
Aequalis Reversed II	21.09	15.05	13.68	18.40	15.19
COMPREHENSIVE	9.38	15.05	11.97	8.80	13.29
Equinoxe	3.91	2.15	1.71	2.40	2.53
Trabecular Metal Baseplate	6.25	6.45	4.27	0.80	1.90
SMR uncemented glenoid	0.78	5.38	5.13	1.60	1.90
SMR Axioma baseplate	0.78	0.00	0.00	0.00	1.27
Universal Glenoid	0.00	3.23	2.56	0.80	1.27
Affinis Inverse	3.91	6.45	4.27	2.40	0.63

Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during shoulder revision arthroplasties in the Netherlands in 2019-2023

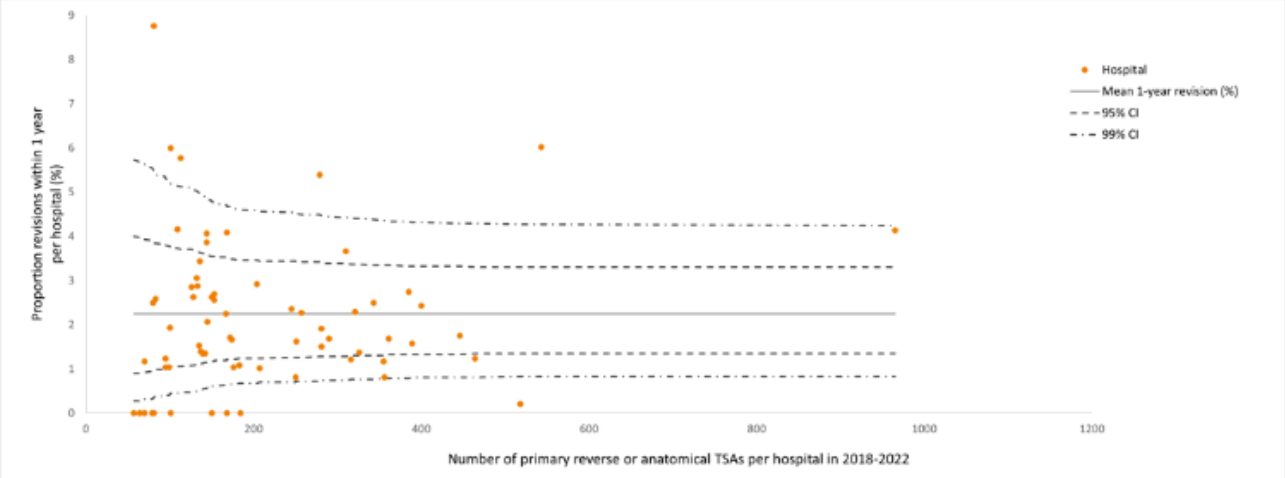
Year	2019	2020	2021	2022	2023
Bone cement used (n)	**84**	**60**	**76**	**91**	**85**
Cement name; Proportion (%)					
COPAL G+C	34.52	38.33	43.42	39.56	44.71
PALACOS R+G	35.71	28.33	32.89	27.47	30.59
Refobacin Bone Cement R	14.29	11.67	15.79	14.29	15.29
COPAL G+V	1.19	0.00	2.63	3.30	4.71
Refobacin Revision	4.76	10.00	3.95	4.40	2.35
PALACOS MV+G	1.19	0.00	0.00	3.30	1.18
Refobacin Plus Bone Cement	3.57	1.67	0.00	5.49	1.18

Survival overall

Revision within 1 and 3 years

Overall revision per hospital

FIGURE Funnel plot of proportion of shoulder revision arthroplasties within one year after a total (reverse or anatomical) shoulder arthroplasty per hospital in the Netherlands in 2018-2022 (n=14,918)



Please note: The proportions of revisions within 1 year per hospital were adjusted for casemix factor diagnosis (fracture versus other). TSA: total shoulder arthroplasty; CL: control limits.

The mean 1-year revision percentage is 2.25 in the Netherlands in 2018-2022.
Control limits indicate the plausible range of outcome if all hospitals perform equally well.

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 2018-2022

	Cumulative 1-year revision percentage - Kaplan Meier (95% CI)	
	Reverse (n=12,017)	Anatomical (n=2,901)
Any type of revision	2.38 (2.10-2.65)	0.93 (0.58-1.28)
Major revision	1.08 (0.90-1.27)	0.83 (0.50-1.16)
Only humeral stem	0.23 (0.14-0.31)	0.21 (0.04-0.37)
Only glenoid baseplate (reverse) or glenoid (anatomical)	0.38 (0.27-0.49)	0.24 (0.06-0.42)
Humeral stem and glenoid baseplate (reverse) or glenoid (anatomical)	0.34 (0.23-0.44)	0.28 (0.09-0.47)
Minor revision	1.26 (1.06-1.46)	0.10 (-0.01-0.22)
DAIR	0.33 (0.23-0.44)	0.00 (0.00-0.00)
No DAIR	0.93 (0.76-1.10)	0.10 (-0.01-0.22)

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

In 2018-2022, 235 (2.0%) primary reverse total shoulder arthroplasties and 23 (0.8%) 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 2016-2020 (n=10,429)

Time after primary reverse TSA	Percentage revisions (%)
Day 0-29	0.60
Day 30-182	1.38
Day 183-364	0.61
Day 365-730 (second year)	0.91
Day 731-1095 (third year)	0.53

TSA: total shoulder arthroplasty

© LROI 2024 | S028

Time after primary anatomical TSA

TABLE Time after primary anatomical total shoulder arthroplasty until short-term revision in the Netherlands in 2016-2020 (n=2,774)

Time after primary anatomical TSA	Percentage revisions (%)
Day 0-29	0.11
Day 30-182	0.58
Day 183-364	0.83
Day 365-730 (second year)	1.87
Day 731-1095 (third year)	0.97

TSA: total shoulder arthroplasty

© LROI 2024 | S029

Time after primary hemi

TABLE Time after primary shoulder hemiarthroplasty until short-term revision in the Netherlands in 2016-2020 (n=1,216)

Time after primary hemi	Percentage revisions (%)
Day 0-29	0.41
Day 30-182	0.90
Day 183-364	1.81
Day 365-730 (second year)	2.88
Day 731-1095 (third year)	1.81

© LROI 2024 | S030

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 2018-2022

	Reverse (n=537)	Total anatomical (n=55)	Hemi (n=50)
Reasons for revision	Proportion (%)	Proportion (%)	Proportion (%)
Instability	41.25	18.75	22.58
Infection	29.70	0.00	19.35
Cuff rupture	n.a.	43.75	32.26
Malalignment	5.28	12.50	19.35
Cuff arthropathy	n.a.	9.38	19.35
Loosening of glenoid component	11.22	18.75	0.00
Loosening of humeral component	4.62	6.25	6.45
Peri-prosthetic fracture	7.92	9.38	0.00
Progression of osteoarthritis	1.32	0.00	12.90
Other	12.21	12.50	19.35

Please note: After a reverse total shoulder arthroplasty, the rotater cuff is no longer present.

Please note: One patient may have more than one reason of revision.

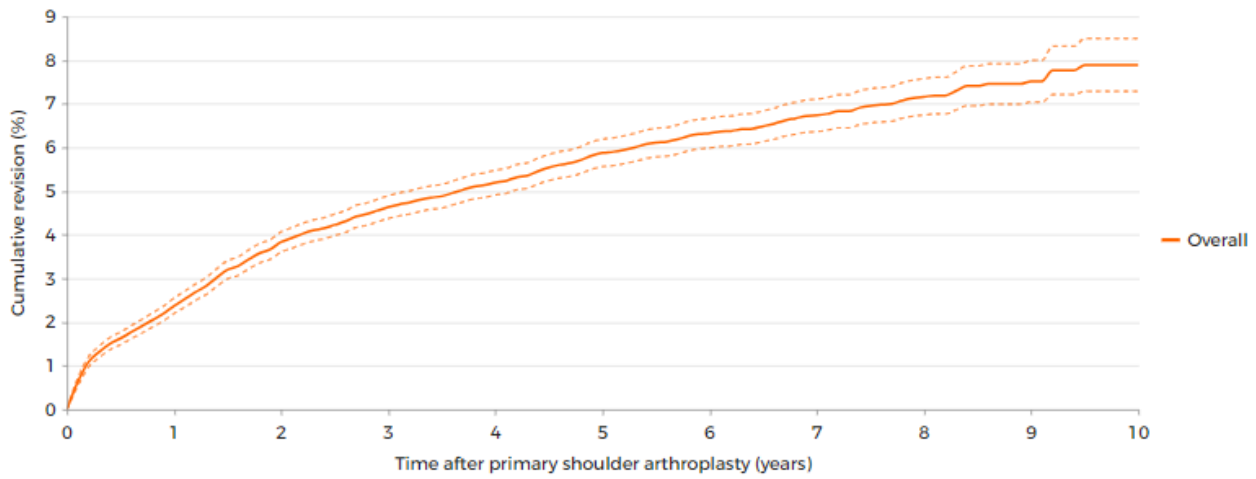
Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

© LROI 2024 | S031

Revision within 10 years

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary shoulder arthroplasties in the Netherlands in 2014-2023 (n=30,282)



© LROI 2024 | S032A

	1yr	3yr	5yr	7yr	10yr
Overall	2.19 (2.03-2.36)	4.56 (4.30-4.81)	5.82 (5.50-6.13)	6.72 (6.35-7.09)	7.89 (7.29-8.50)

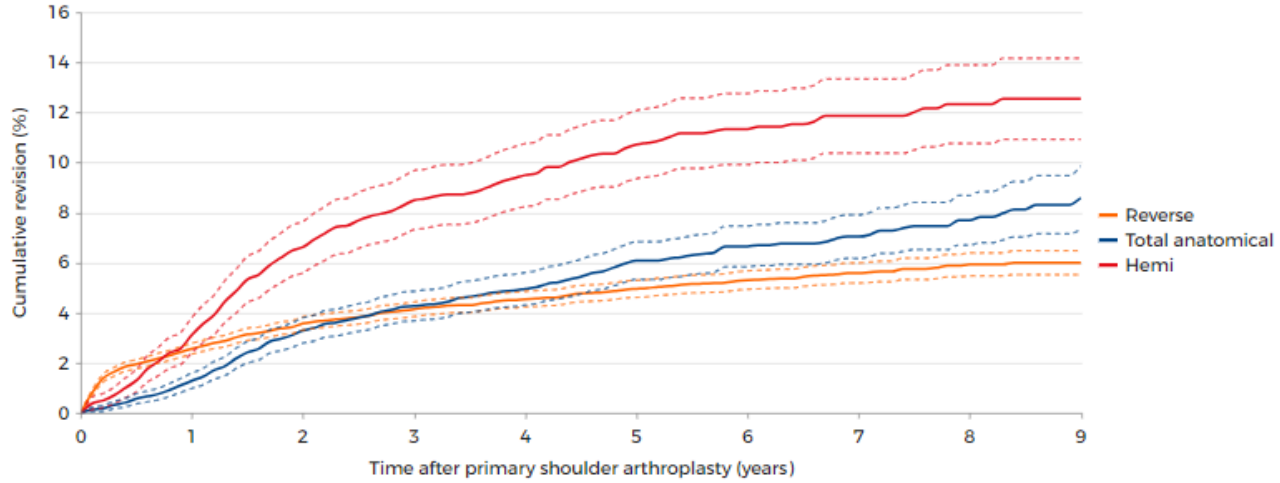
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

© LROI 2024 | S032B

In 2014-2023, 3,685 (12.2%) primary shoulder arthroplasties were implanted in patients who died within ten years after the primary procedure.

By type of shoulder arthroplasty

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary shoulder arthroplasties by type of shoulder arthroplasty in the Netherlands in 2014-2023 (n=29,838)



© LROI 2024 | S033A

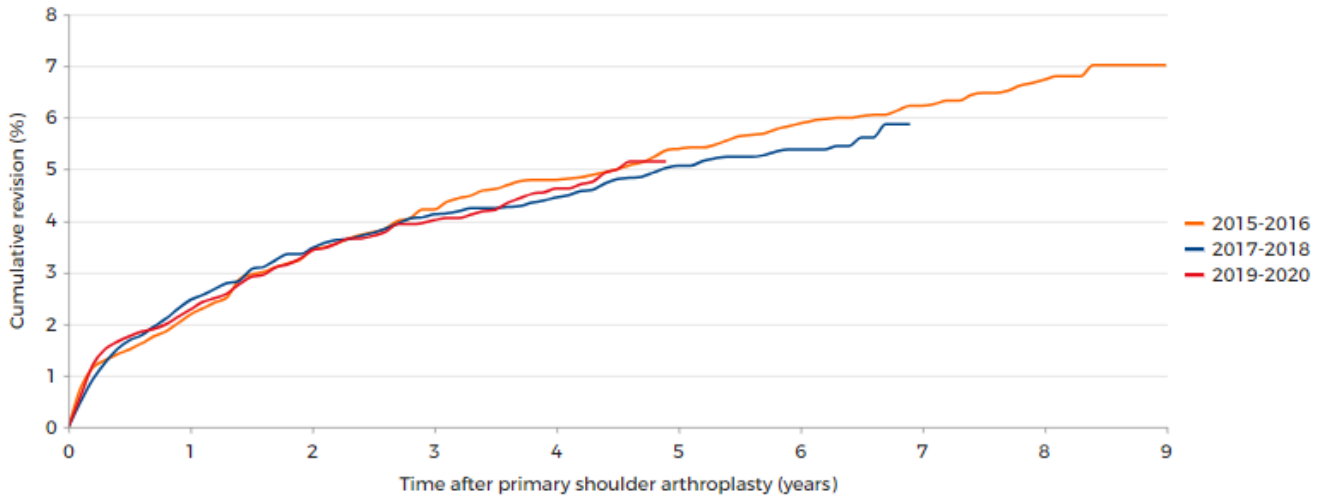
	Number (n)	1yr	3yr	5yr	7yr	9yr
Reverse	21,825	2.43 (2.22-2.64)	4.08 (3.79-4.37)	4.93 (4.59-5.26)	5.59 (5.18-5.99)	6.00 (5.52-6.48)
Total anatomical	5,546	1.10 (0.81-1.38)	4.24 (3.65-4.82)	5.96 (5.22-6.70)	7.04 (6.17-7.91)	8.31 (7.15-9.48)
Hemi	2,467	2.57 (1.94-3.21)	8.27 (7.11-9.44)	10.57 (9.22-11.91)	11.86 (10.37-13.34)	12.54 (10.92-14.16)

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 hemiarthroplast; CI: confidence interval.

© LROI 2024 | S033B

By procedure year

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total (anatomical or reverse) shoulder arthroplasties by procedure year of primary shoulder arthroplasty in the Netherlands in 2015-2023 (n=15,271)



© LROI 2024 | S034A

	Number (n)	1yr	3yr	5yr	7yr	9yr
2015-2016	4,329	2.02 (1.60-2.44)	4.22 (3.61-4.82)	5.37 (4.68-6.05)	6.23 (5.49-6.97)	7.02 (6.16-7.88)
2017-2018	5,302	2.29 (1.89-2.70)	4.07 (3.53-4.60)	5.02 (4.43-5.62)	5.87 (5.11-6.64)	n.a.
2019-2020	5,640	2.14 (1.76-2.52)	3.96 (3.44-4.47)	5.15 (4.48-5.82)	n.a.	n.a.

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

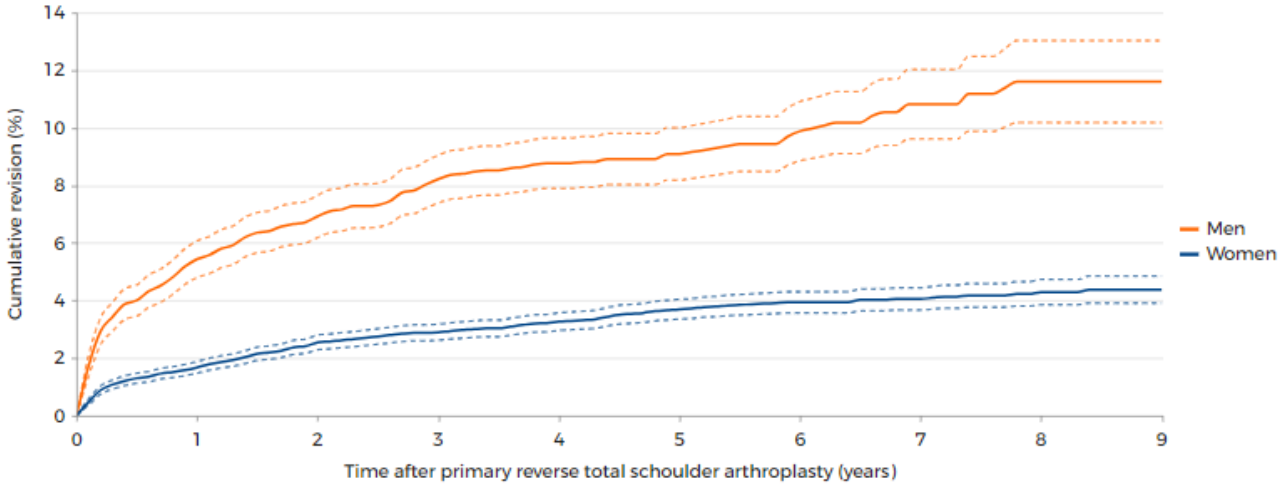
© LROI 2024 | S034B

Survival reverse total shoulder arthroplasty

Revision by patient characteristics

Reverse TSA by gender

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties by gender in the Netherlands in 2014-2023 (n=21,808)



© LROI 2024 | S035A

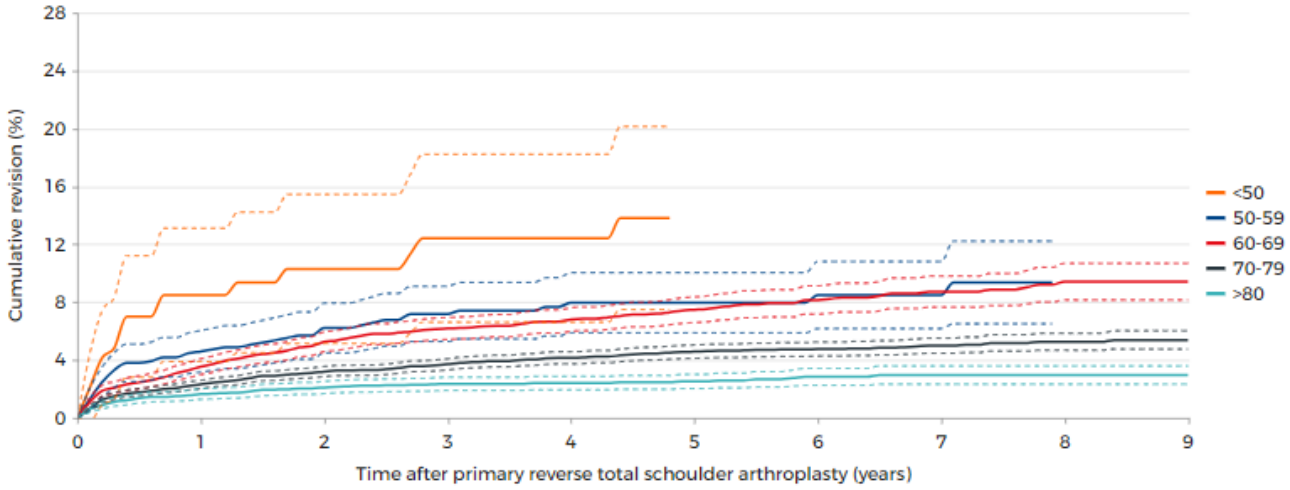
	Number (n)	1yr	3yr	5yr	7yr	9yr
Men	5,179	5.18 (4.56-5.80)	8.03 (7.22-8.85)	9.09 (8.18-10.00)	10.82 (9.61-12.02)	11.60 (10.18-13.03)
Women	16,629	1.58 (1.39-1.78)	2.88 (2.60-3.16)	3.67 (3.33-4.01)	4.05 (3.67-4.44)	4.38 (3.91-4.85)

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

© LROI 2024 | S035B

Reverse TSA by age category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties by age category in the Netherlands in 2014-2023 (n=21,809)



© LROI 2024 | S036A

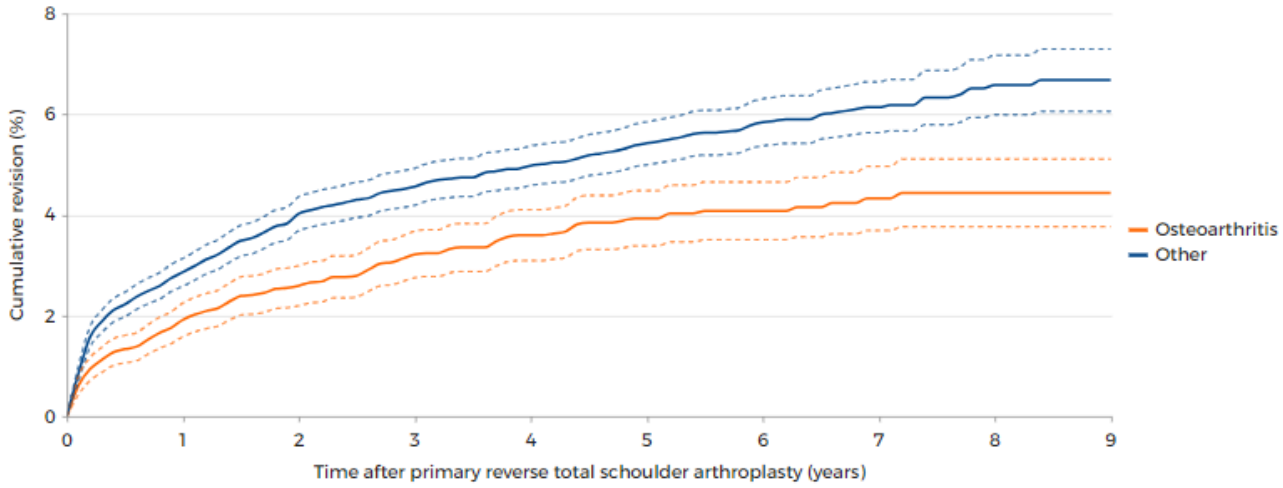
	Number (n)	1yr	3yr	5yr	7yr	9yr
<50	145	8.50 (3.90-13.11)	12.42 (6.62-18.22)	n.a.	n.a.	n.a.
50-59	865	4.47 (3.06-5.88)	7.19 (5.29-9.10)	7.96 (5.88-10.05)	8.49 (6.18-10.81)	n.a.
60-69	4,725	3.29 (2.77-3.82)	6.15 (5.39-6.90)	7.42 (6.54-8.30)	8.73 (7.66-9.81)	9.42 (8.16-10.68)
70-79	11,137	2.22 (1.94-2.50)	3.63 (3.25-4.01)	4.56 (4.10-5.02)	5.00 (4.47-5.52)	5.39 (4.76-6.03)
>80	4,937	1.56 (1.21-1.91)	2.33 (1.88-2.78)	2.52 (2.03-3.01)	2.97 (2.34-3.59)	2.97 (2.34-3.59)

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

© LROI 2024 | S036B

Reverse TSA by diagnosis

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties by diagnosis in the Netherlands in 2014-2023 (n=21,730)



© LROI 2024 | S037A

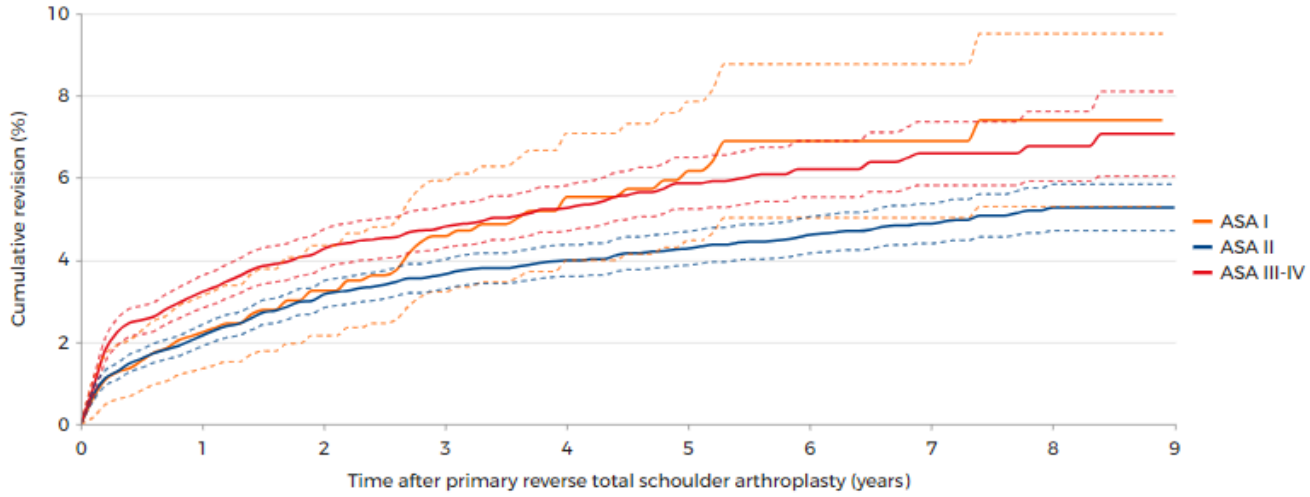
	Number (n)	1yr	3yr	5yr	7yr	9yr
Osteoarthritis	6,930	1.76 (1.44-2.08)	3.14 (2.68-3.59)	3.93 (3.38-4.48)	4.33 (3.69-4.96)	4.44 (3.77-5.11)
Other	14,800	2.75 (2.48-3.02)	4.51 (4.15-4.88)	5.38 (4.96-5.81)	6.14 (5.63-6.64)	6.68 (6.06-7.29)

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

© LROI 2024 | S037B

Reverse TSA by ASA score

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties by ASA score in the Netherlands in 2014-2023 (n=21,649)



© LROI 2024 | S038A

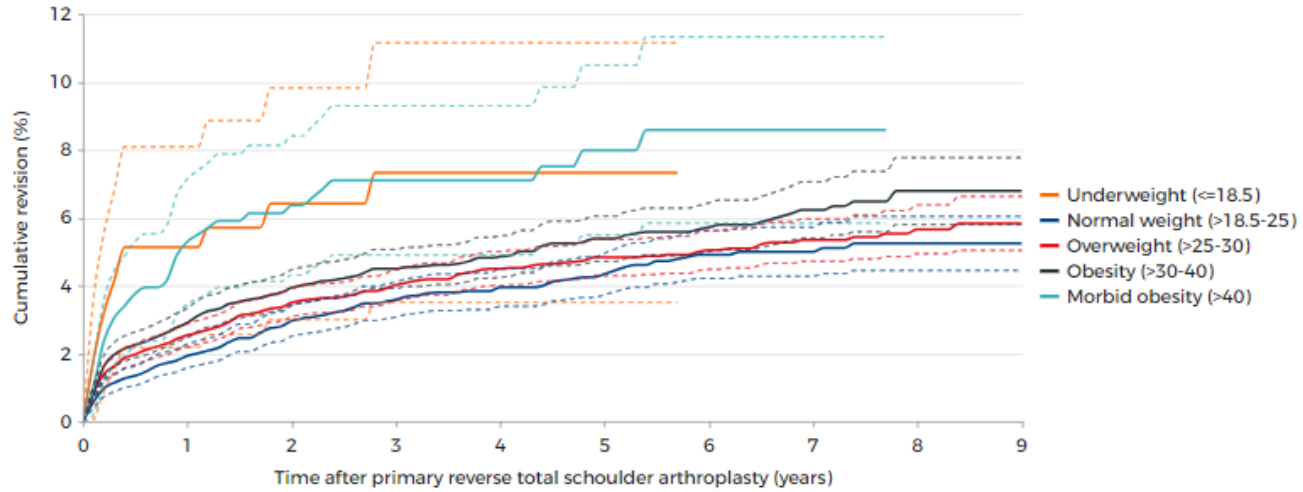
	Number (n)	1yr	3yr	5yr	7yr	9yr
ASA I	1,124	2.13 (1.27-3.00)	4.57 (3.22-5.93)	5.94 (4.30-7.58)	6.90 (5.03-8.77)	7.40 (5.30-9.51)
ASA II	12,350	2.03 (1.77-2.28)	3.60 (3.25-3.96)	4.26 (3.85-4.67)	4.88 (4.40-5.37)	5.28 (4.71-5.84)
ASA III-IV	8,175	3.09 (2.70-3.47)	4.74 (4.23-5.25)	5.87 (5.24-6.50)	6.59 (5.82-7.37)	7.07 (6.04-8.10)

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

© LROI 2024 | S038B

Reverse TSA by BMI category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties by BMI category in the Netherlands in 2014-2023 (n=21,476)



© LROI 2024 | S039A

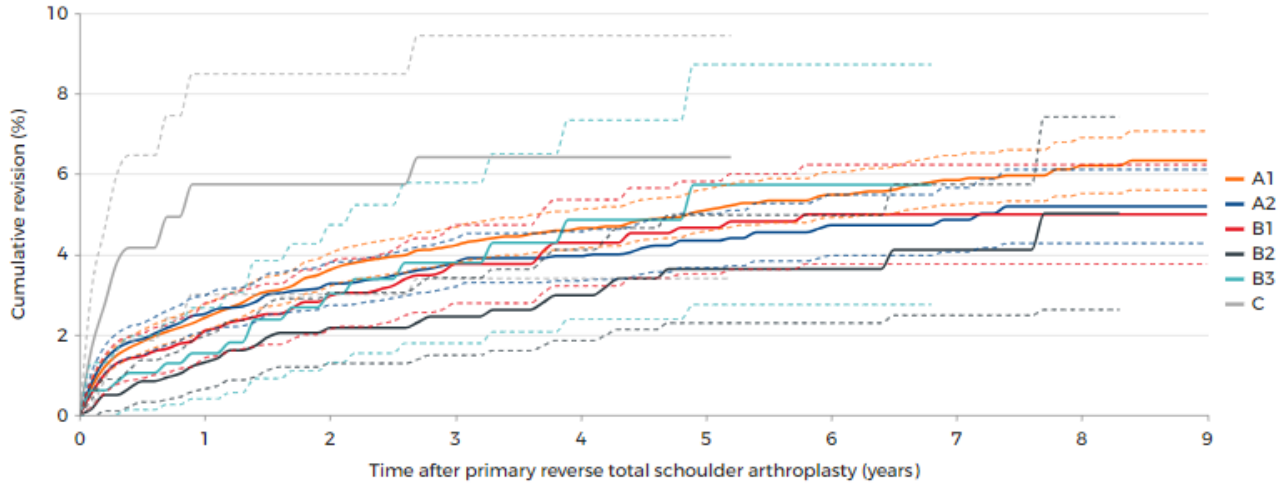
	Number (n)	1yr	3yr	5yr	7yr	9yr
Underweight (<=18.5)	222	5.13 (2.18-8.09)	7.33 (3.51-11.15)	7.33 (3.51-11.15)	n.a.	n.a.
Normal weight (>18.5-25)	6,290	1.79 (1.46-2.13)	3.53 (3.02-4.04)	4.25 (3.65-4.84)	5.00 (4.28-5.72)	5.24 (4.45-6.04)
Overweight (>25-30)	8,392	2.43 (2.09-2.77)	3.91 (3.46-4.36)	4.83 (4.29-5.37)	5.34 (4.72-5.96)	5.83 (5.04-6.63)
Obesity (>30-40)	5,969	2.77 (2.34-3.19)	4.49 (3.92-5.06)	5.38 (4.71-6.05)	6.23 (5.41-7.06)	6.79 (5.80-7.77)
Morbid obesity (>40)	603	4.91 (3.13-6.68)	7.10 (4.90-9.30)	7.99 (5.49-10.50)	8.58 (5.84-11.33)	n.a.

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

© LROI 2024 | S039B

Reverse TSA by Walch score

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties by walch score in the Netherlands in 2014-2023 (n=17,424)



© LROI 2024 | S040A

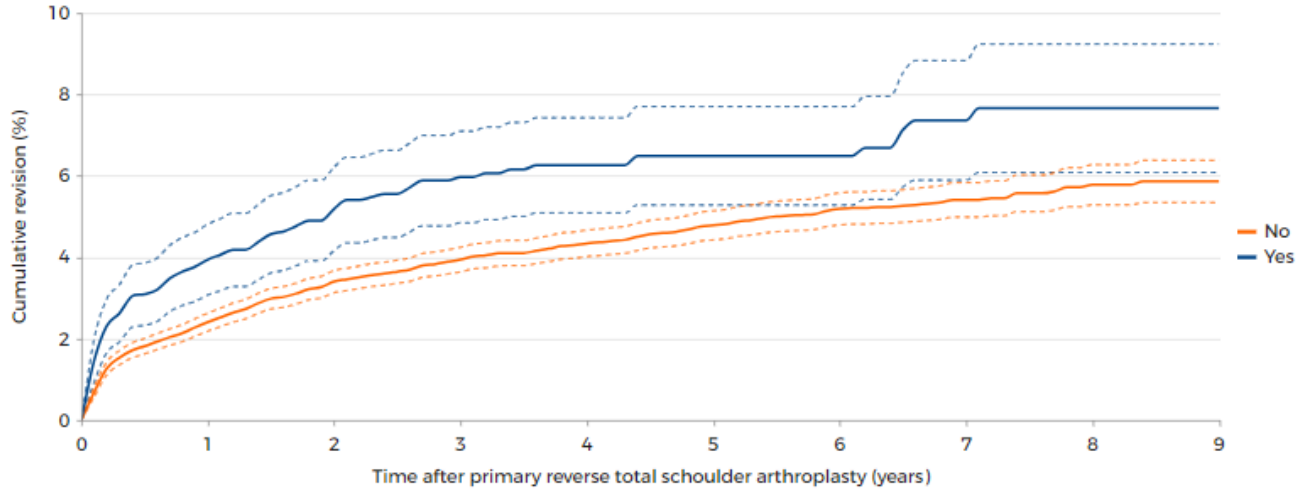
	Number (n)	1yr	3yr	5yr	7yr	9yr
A1	8,889	2.28 (1.96-2.59)	4.17 (3.72-4.62)	5.04 (4.52-5.56)	5.84 (5.23-6.46)	6.33 (5.60-7.07)
A2	4,682	2.46 (2.01-2.92)	3.72 (3.13-4.31)	4.34 (3.66-5.01)	4.86 (4.06-5.66)	5.19 (4.27-6.11)
B1	1,827	1.84 (1.21-2.47)	3.57 (2.63-4.51)	4.66 (3.51-5.81)	4.99 (3.76-6.23)	4.99 (3.76-6.23)
B2	1,234	1.21 (0.58-1.84)	2.45 (1.49-3.42)	3.63 (2.29-4.98)	4.11 (2.48-5.74)	n.a.
B3	496	1.54 (0.40-2.67)	3.79 (1.79-5.78)	5.74 (2.75-8.72)	n.a.	n.a.
C	296	5.75 (3.00-8.49)	6.42 (3.40-9.44)	6.42 (3.40-9.44)	n.a.	n.a.

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

© LROI 2024 | S040B

Reverse TSA by smoking

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties by smoking in the Netherlands in 2014-2023 (n=21,451)



© LROI 2024 | S041A

	Number (n)	1yr	3yr	5yr	7yr	9yr
No	19,428	2.28 (2.06-2.49)	3.89 (3.59-4.19)	4.75 (4.40-5.11)	5.41 (4.99-5.83)	5.86 (5.34-6.38)
Yes	2,023	3.77 (2.92-4.62)	5.88 (4.77-7.00)	6.49 (5.28-7.70)	7.36 (5.89-8.83)	7.66 (6.08-9.24)

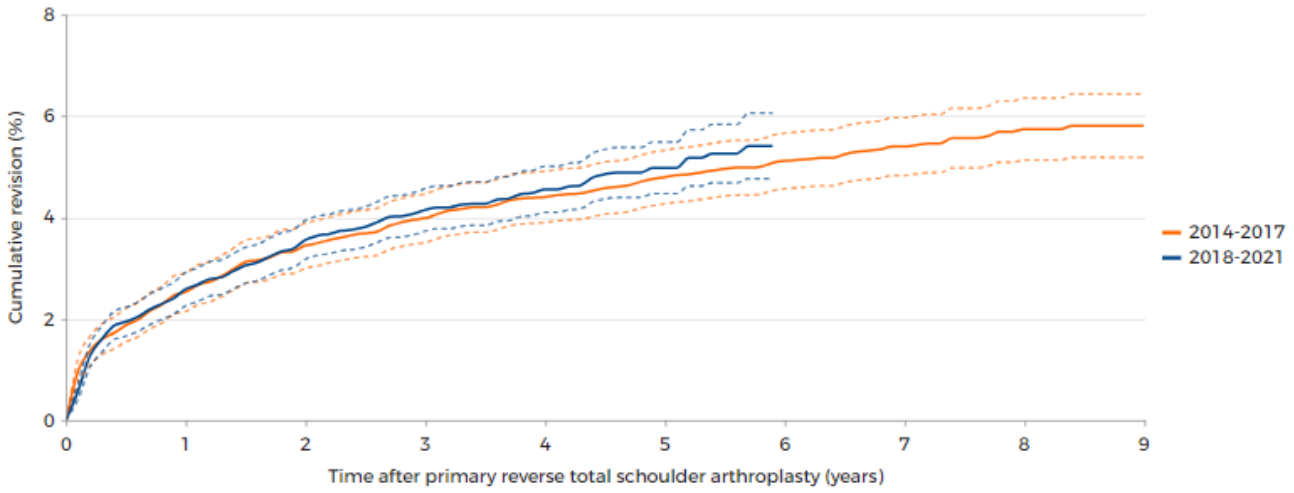
Please note: Dotted lines represent the upper and lower limits of the 95% confidence intervall; n.a. if <50 cases were at risk.
CI: confidence interval.

© LROI 2024 | S041B

Revision by procedure characteristics

Reverse TSA by procedure year

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary reverse total shoulder arthroplasties by procedure year of primary arthroplasty in the Netherlands in 2014-2023 (n=15,678)



© LROI 2024 | S042A

	Number (n)	1yr	3yr	5yr	7yr	9yr
2014-2017	6,532	2.47 (2.09-2.84)	3.95 (3.47-4.43)	4.76 (4.23-5.29)	5.40 (4.83-5.97)	5.81 (5.18-6.43)
2018-2021	9,146	2.41 (2.09-2.72)	4.07 (3.66-4.48)	4.98 (4.47-5.49)	n.a.	n.a.

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

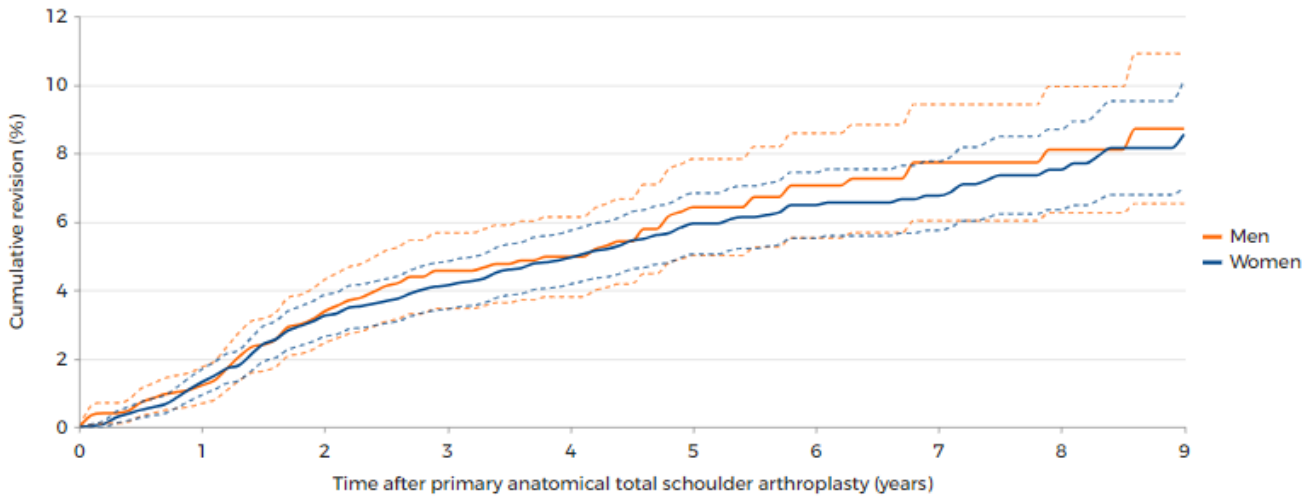
© LROI 2024 | S042B

Survival total anatomical shoulder arthroplasty

Revision by patient characteristics

Anatomical TSA by gender

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of anatomical total shoulder arthroplasties by gender in the Netherlands in 2014-2023 (n=5,544)



© LROI 2024 | S043A

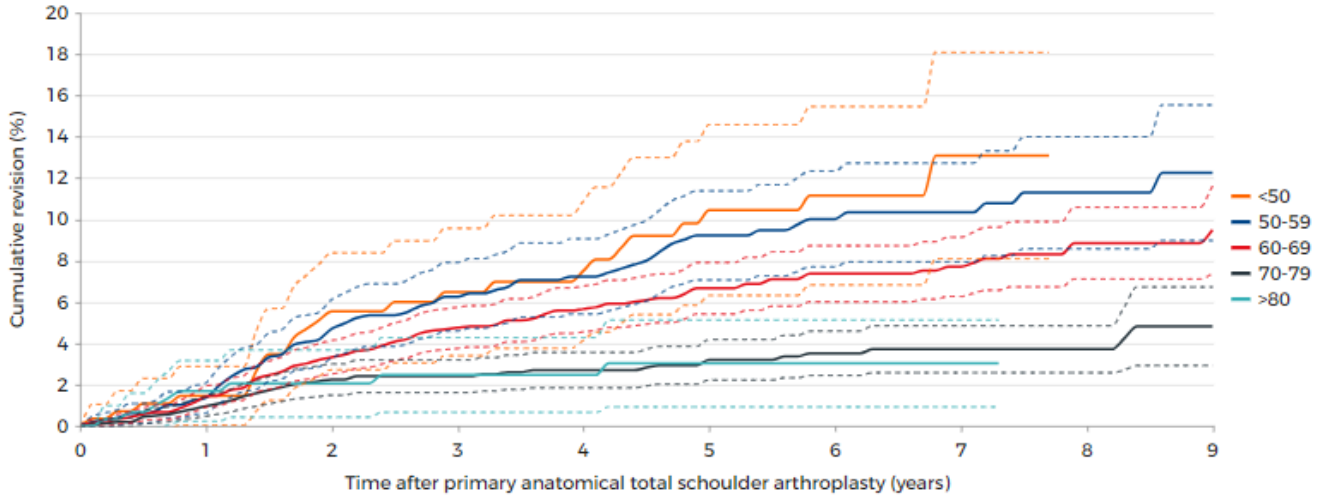
	Number (n)	1yr	3yr	5yr	7yr	9yr
Men	1,750	1.08 (0.59-1.58)	4.56 (3.46-5.67)	6.28 (4.90-7.67)	7.72 (6.02-9.42)	8.71 (6.52-10.91)
Women	3,794	1.10 (0.76-1.44)	4.10 (3.40-4.79)	5.82 (4.95-6.70)	6.75 (5.74-7.76)	8.15 (6.78-9.52)

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

© LROI 2024 | S043B

Anatomical TSA by age category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of anatomical total shoulder arthroplasties by age category in the Netherlands in 2014-2023 (n=5,544)

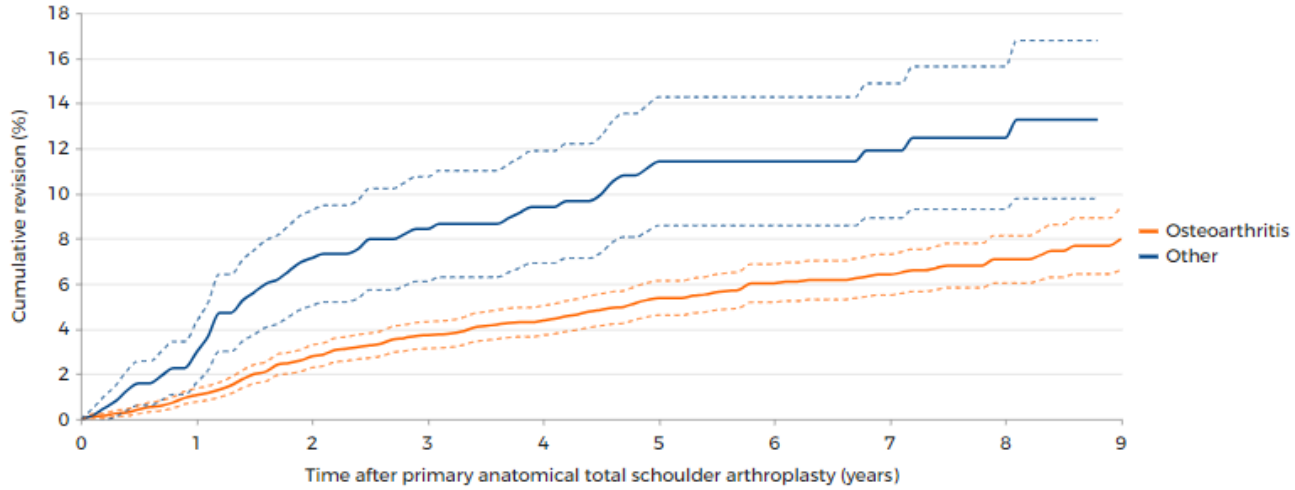


	Number (n)	1yr	3yr	5yr	7yr	9yr
<50	284	1.46 (0.04-2.87)	6.48 (3.40-9.57)	9.81 (5.84-13.78)	13.09 (8.09-18.08)	n.a.
50-59	1,028	1.24 (0.54-1.94)	6.25 (4.59-7.91)	9.22 (7.06-11.38)	10.33 (7.94-12.72)	12.26 (8.98-15.54)
60-69	2,218	1.11 (0.66-1.56)	4.68 (3.69-5.66)	6.66 (5.42-7.91)	7.70 (6.27-9.13)	8.85 (7.11-10.59)
70-79	1,707	0.82 (0.37-1.26)	2.40 (1.61-3.19)	2.94 (2.02-3.85)	3.71 (2.58-4.85)	4.82 (2.92-6.72)
>80	307	1.69 (0.22-3.16)	2.46 (0.66-4.27)	3.02 (0.92-5.13)	3.02 (0.92-5.13)	n.a.

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

Anatomical TSA by diagnosis

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of anatomical total shoulder arthroplasties by diagnosis in the Netherlands in 2014-2023 (n=5,510)

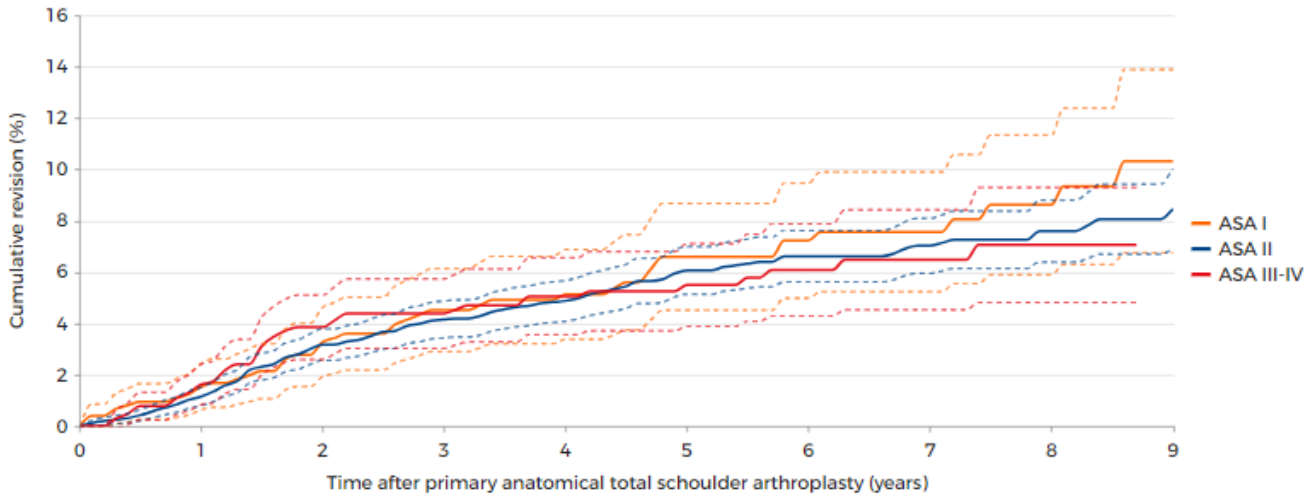


	Number (n)	1yr	3yr	5yr	7yr	9yr
Osteoarthritis	4,869	0.95 (0.66-1.23)	3.69 (3.10-4.28)	5.28 (4.53-6.03)	6.40 (5.50-7.30)	7.68 (6.43-8.92)
Other	641	2.26 (1.09-3.44)	8.42 (6.10-10.74)	11.12 (8.32-13.91)	11.90 (8.92-14.88)	n.a.

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

Anatomical TSA by ASA score

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of anatomical total shoulder arthroplasties by ASA score in the Netherlands in 2014-2023 (n=5,503)



© LROI 2024 | S046A

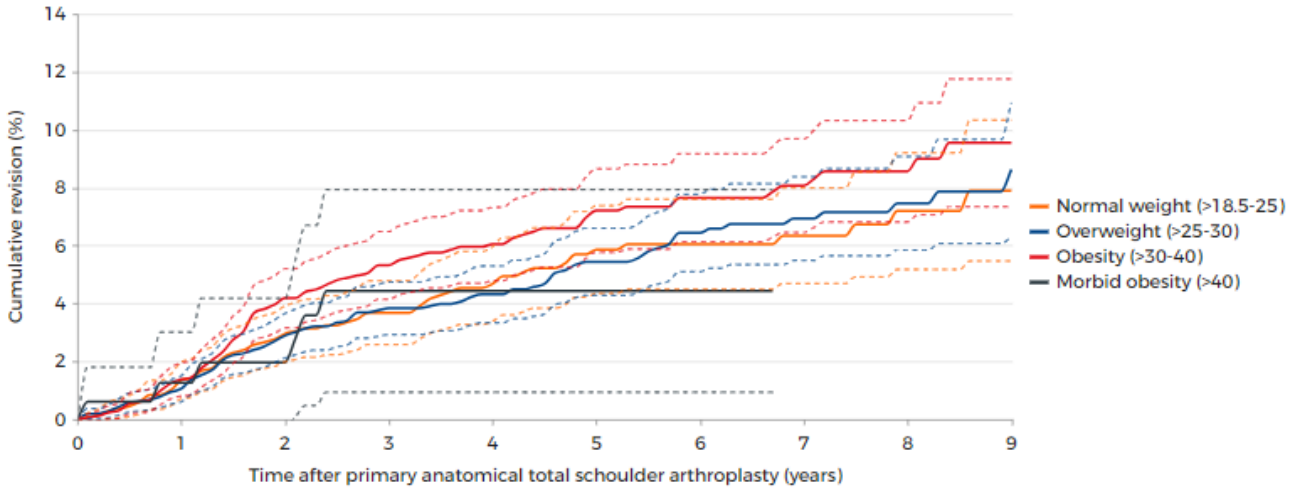
	Number (n)	1yr	3yr	5yr	7yr	9yr
ASA I	751	1.24 (0.43-2.04)	4.52 (2.90-6.14)	6.59 (4.51-8.67)	7.57 (5.24-9.90)	10.32 (6.75-13.89)
ASA II	3,661	1.02 (0.68-1.36)	4.11 (3.40-4.82)	5.94 (5.03-6.86)	7.02 (5.95-8.09)	8.06 (6.70-9.42)
ASA III-IV	1,091	1.30 (0.60-2.00)	4.38 (3.03-5.73)	5.26 (3.71-6.80)	6.48 (4.53-8.42)	n.a.

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

© LROI 2024 | S046B

Anatomical TSA by BMI category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of anatomical total shoulder arthroplasties by BMI category in the Netherlands in 2014-2023 (n=5,428)



© LROI 2024 | S047A

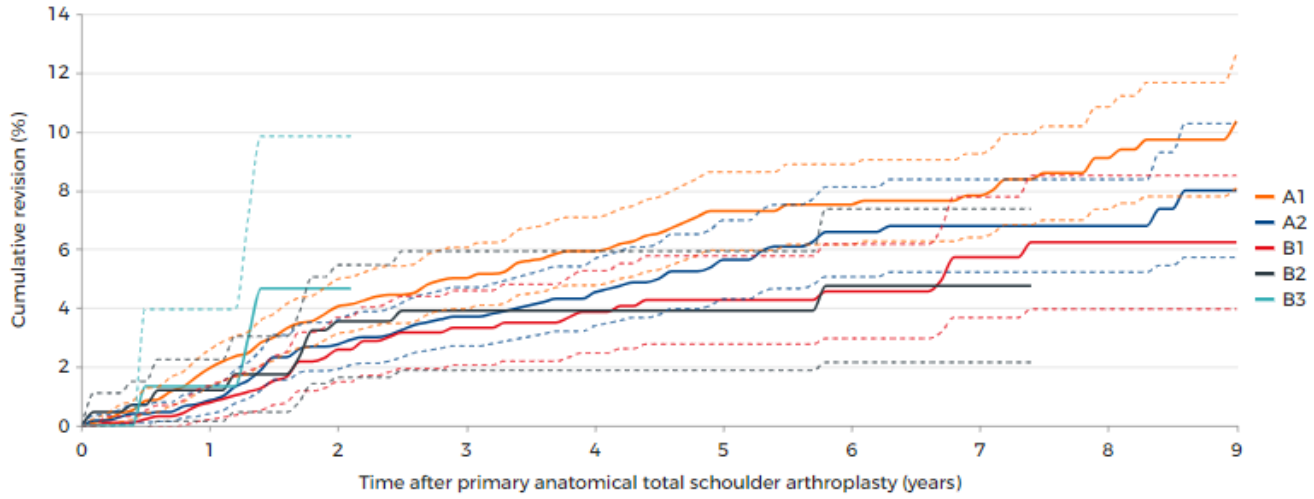
	Number (n)	1yr	3yr	5yr	7yr	9yr
Underweight (<=18.5)	31	n.a.	n.a.	n.a.	n.a.	n.a.
Normal weight (>18.5-25)	1,374	1.01 (0.46-1.56)	3.68 (2.58-4.78)	5.70 (4.22-7.18)	6.34 (4.69-7.99)	7.90 (5.47-10.33)
Overweight (>25-30)	2,141	0.94 (0.52-1.36)	3.76 (2.86-4.66)	5.44 (4.28-6.60)	6.93 (5.49-8.38)	7.87 (6.07-9.67)
Obesity (>30-40)	1,717	1.24 (0.70-1.79)	5.31 (4.14-6.48)	6.96 (5.56-8.37)	8.07 (6.45-9.69)	9.55 (7.34-11.75)
Morbid obesity (>40)	165	1.27 (-0.48-3.01)	4.43 (0.94-7.93)	4.43 (0.94-7.93)	n.a.	n.a.

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

© LROI 2024 | S047B

Anatomical TSA by Walch score

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of anatomical total shoulder arthroplasties by walch score in the Netherlands in 2014-2023 (n=5,251)



© LROI 2024 | S048A

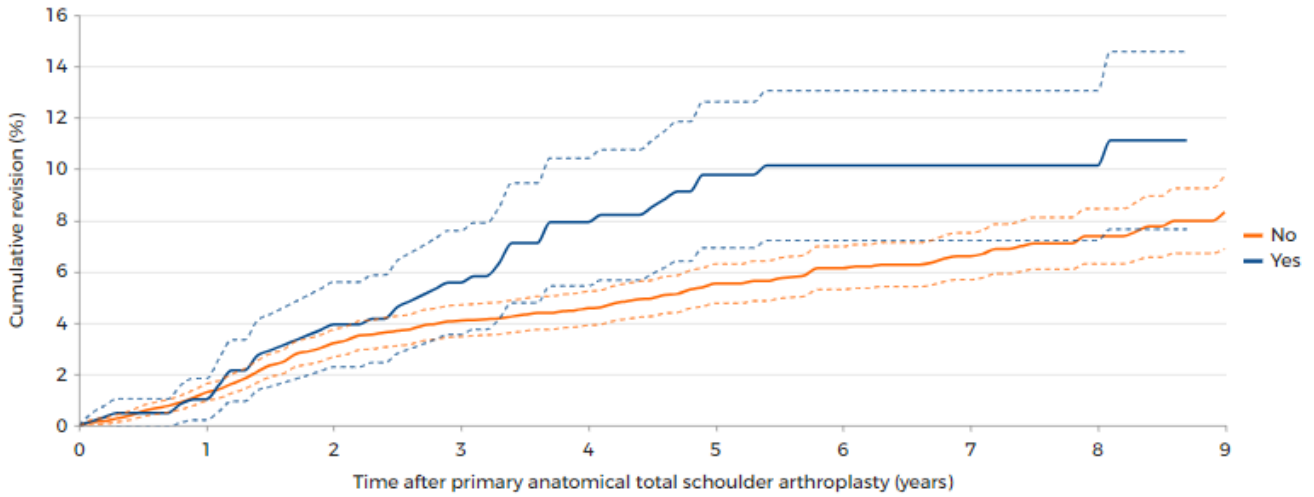
	Number (n)	1yr	3yr	5yr	7yr	9yr
A1	1,968	1.67 (1.09-2.25)	5.01 (3.97-6.06)	7.30 (5.97-8.63)	7.82 (6.40-9.24)	9.73 (7.79-11.66)
A2	1,765	0.73 (0.32-1.14)	3.71 (2.71-4.70)	5.37 (4.08-6.66)	6.79 (5.22-8.37)	8.00 (5.72-10.27)
B1	968	0.67 (0.14-1.20)	3.33 (2.06-4.59)	4.27 (2.77-5.77)	5.73 (3.68-7.78)	6.24 (3.97-8.51)
B2	431	1.20 (0.15-2.25)	3.91 (1.88-5.93)	3.91 (1.88-5.93)	4.76 (2.15-7.37)	n.a.
B3	79	1.34 (-1.27-3.96)	n.a.	n.a.	n.a.	n.a.
C	40	n.a.	n.a.	n.a.	n.a.	n.a.

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

© LROI 2024 | S048B

Anatomical TSA by smoking

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of anatomical total shoulder arthroplasties by smoking in the Netherlands in 2014-2023 (n=5,484)



© LROI 2024 | S049A

	Number (n)	1yr	3yr	5yr	7yr	9yr
No	4,851	1.08 (0.78-1.38)	4.05 (3.44-4.66)	5.39 (4.64-6.14)	6.59 (5.68-7.51)	7.98 (6.71-9.24)
Yes	633	1.02 (0.21-1.83)	5.57 (3.55-7.59)	9.77 (6.92-12.62)	10.13 (7.21-13.05)	n.a.

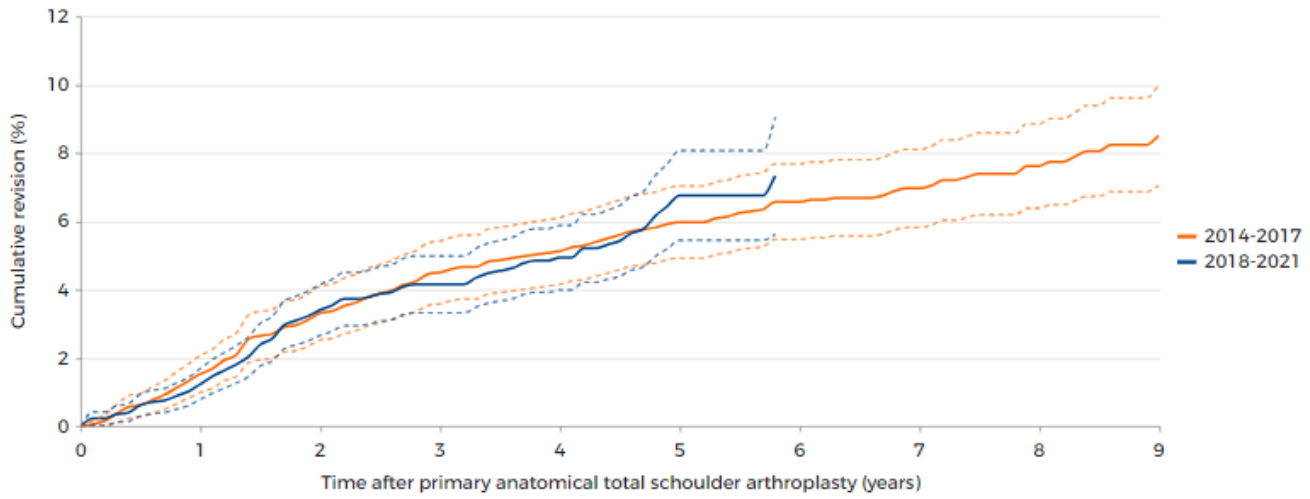
Please note: Dotted lines represent the upper and lower limits of the 95% confidence intervall; n.a. if <50 cases were at risk.
CI: confidence interval.

© LROI 2024 | S049B

Revision by procedure characteristics

Anatomical TSA by procedure year

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary anatomical total shoulder arthroplasties by procedure year of primary arthroplasty in the Netherlands in 2014-2023 (n=4,256)



© LROI 2024 | S050A

	Number (n)	1yr	3yr	5yr	7yr	9yr
2014-2017	1,974	1.32 (0.82-1.82)	4.45 (3.53-5.36)	5.92 (4.87-6.97)	6.96 (5.82-8.10)	8.24 (6.86-9.61)
2018-2021	2,282	1.01 (0.60-1.42)	4.15 (3.31-4.98)	6.44 (5.20-7.69)	n.a.	n.a.

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

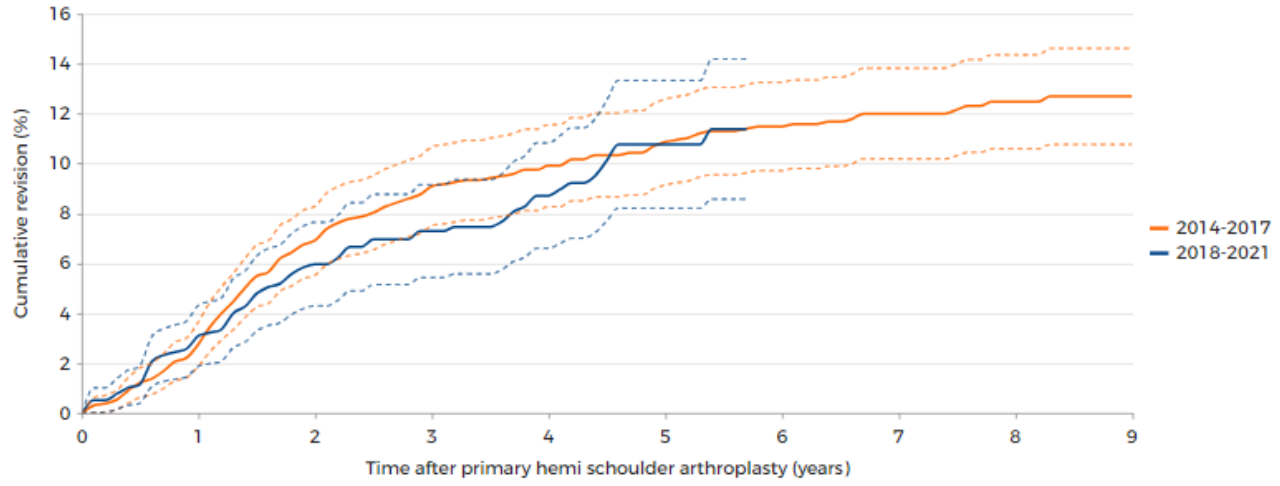
© LROI 2024 | S050B

Survival hemi

Revision by procedure characteristics

Hemi by procedure year

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary shoulder hemiarthroplasties by procedure year of primary arthroplasty in the Netherlands in 2014-2023 (n=2,107)



© LROI 2024 | S051A

	Number (n)	1yr	3yr	5yr	7yr	9yr
2014-2017	1,323	2.22 (1.42-3.02)	8.76 (7.21-10.31)	10.69 (8.98-12.40)	12.00 (10.19-13.82)	12.69 (10.76-14.62)
2018-2021	784	2.58 (1.46-3.69)	7.29 (5.43-9.15)	10.77 (8.21-13.33)	n.a.	n.a.

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

© LROI 2024 | S051B

Survival by component name

Primary reverse TSA - osteoarthritis

TABLE Cumulative revision percentages of primary reverse total shoulder arthroplasties by prosthesis component combination of patients who underwent a RTSA for osteoarthritis in the Netherlands in 2014-2023 (n=6,930)

					Type of revision (n)				Cumulative revision percentage (95% CI)			
Humeral stem component	Glenosphere component	Primary RTSAs (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Partial major	Partial minor	Other	1yr	3yr	5yr	7yr
All RTSAs for osteoarthritis		**6,930**	**76 (71 - 80)**	**216**	**60**	**68**	**74**	**11**	**1.76 (1.44-2.08)**	**3.14 (2.68-3.59)**	**3.93 (3.38-4.48)**	**4.33 (3.69-4.96)**
Delta X-tend	Delta X-tend	1,986	76 (71 - 80)	37	10	11	13	3	0.80 (0.39-1.20)	1.79 (1.15-2.43)	2.26 (1.50-3.01)	2.51 (1.60-3.43)
Aequalis Reversed II	Aequalis Reversed II	807	76 (72 - 80)	31	9	8	13	1	2.38 (1.32-3.44)	3.67 (2.33-5.01)	4.02 (2.60-5.43)	4.27 (2.77-5.76)
Aequalis Ascend Flex	Aequalis Reversed II	793	76 (71 - 80)	34	14	9	10	1	2.86 (1.65-4.07)	3.81 (2.35-5.28)	6.21 (3.93-8.48)	7.18 (4.24-10.13)
COMPREHENSIVE MINI	COMPREHENSIVE	656	76 (71 - 80)	11	2	6	3	0	0.81 (0.10-1.51)	1.95 (0.72-3.17)	2.46 (0.88-4.03)	2.46 (0.88-4.03)
Equinoxe	Equinoxe	379	76 (71 - 80)	16	3	6	7	0	1.18 (0.03-2.34)	4.31 (1.89-6.73)	6.05 (2.97-9.13)	n.a.
Aequalis Ascend Flex	Perform Reversed	326	76 (71 - 81)	16	1	8	6	1	4.86 (2.45-7.26)	4.86 (2.45-7.26)	n.a.	n.a.
Anatomical Shoulder Stems	TM Reverse Glenoid Heads	239	75 (71 - 80)	13	4	3	6	0	2.56 (0.54-4.57)	4.57 (1.79-7.36)	6.19 (2.65-9.72)	n.a.
SMR stem Cementless	SMR reversed head	218	77 (73 - 80)	5	3	0	0	1	1.06 (0.00-2.53)	2.70 (0.00-5.44)	n.a.	n.a.
Affinis Inverse	Affinis Inverse	170	76 (72 - 79)	4	1	2	1	0	1.25 (0.00-2.97)	2.96 (0.06-5.87)	2.96 (0.06-5.87)	n.a.
TM Reverse Stem	TM Reverse Glenoid Heads	159	75 (71 - 80)	4	0	0	2	1	0.63 (0.00-1.87)	3.18 (0.08-6.27)	n.a.	n.a.
Global Unite	Delta X-tend	158	75 (70 - 79)	2	1	0	1	0	0.68 (0.00-2.00)	2.38 (0.00-5.92)	n.a.	n.a.
Affinis Inverse	Affinis Inverse Vitamys	120	75 (71 - 80)	2	0	1	1	0	0.96 (0.00-2.84)	n.a.	n.a.	n.a.
UNIVERS REVERS	UNIVERS REVERS	66	75 (69 - 81)	2	0	0	2	0	3.04 (0.00-7.19)	3.04 (0.00-7.19)	n.a.	n.a.

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

Only combinations with over 50 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.

Primary reverse TSA - fracture

TABLE Cumulative revision percentages of primary reverse total shoulder arthroplasties by prosthesis component combination of patients who underwent a RTSA for fracture in the Netherlands in 2014-2023 (n=3,966)

					Type of revision (n)				Cumulative revision percentage (95% CI)			
Humeral stem component	**Glenosphere component**	**Primary RTSAs (n)**	**Median (IQR) age (yr)**	**Revisions (n)**	**Total revision**	**Partial major**	**Partial minor**	**Other**	**1yr**	**3yr**	**5yr**	**7yr**
All RTSAs for fracture		**3,966**	**74 (69 - 79)**	**154**	**30**	**41**	**69**	**10**	**2.89 (2.36-3.43)**	**4.02 (3.36-4.68)**	**4.63 (3.86-5.41)**	**5.36 (4.35-6.37)**
Aequalis Reversed Fractuur	Aequalis Reversed II	930	75 (69 - 79)	15	2	2	9	2	1.59 (0.76-2.42)	1.73 (0.86-2.60)	1.73 (0.86-2.60)	1.73 (0.86-2.60)
Delta X-tend	Delta X-tend	859	74 (69 - 80)	43	9	7	22	3	3.85 (2.54-5.15)	5.26 (3.68-6.84)	5.49 (3.85-7.13)	5.99 (4.08-7.90)
COMPREHENSIVE FRACTURE	COMPREHENSIVE	442	75 (70 - 80)	11	2	3	4	1	1.63 (0.43-2.83)	2.68 (1.00-4.36)	3.40 (1.22-5.59)	n.a.
Global Unite	Delta X-tend	257	74 (69 - 80)	7	1	1	3	2	1.63 (0.05-3.22)	2.41 (0.22-4.60)	n.a.	n.a.
Equinoxe	Equinoxe	198	73 (69 - 79)	9	2	3	4	0	2.64 (0.36-4.92)	4.14 (1.09-7.19)	n.a.	n.a.
Aequalis Flex Revive	Perform Reversed	153	73 (67 - 77)	10	3	2	5	0	6.17 (2.01-10.34)	n.a.	n.a.	n.a.
Anatomical Shoulder Stems	TM Reverse Glenoid Heads	117	73 (67 - 77)	12	0	9	3	0	8.61 (3.51-13.71)	9.70 (4.23-15.17)	n.a.	n.a.
SMR stem Cementless	SMR reversed head	94	73 (67 - 78)	3	0	0	3	0	2.89 (0.00-6.87)	n.a.	n.a.	n.a.
COMPREHENSIVE MINI	COMPREHENSIVE	69	74 (68 - 78)	4	1	3	0	0	4.65 (0.00-9.80)	n.a.	n.a.	n.a.
TM Reverse Stem	TM Reverse Glenoid Heads	58	74 (69 - 77)	2	0	0	2	0	n.a.	n.a.	n.a.	n.a.
Affinis Fracture	Affinis Inverse	55*	77 (73 - 82)	1	0	0	1	0	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary RTSAs in 2023.

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

Only combinations with over 50 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.

Primary reverse TSA - cuff arthrophaty

TABLE Cumulative revision percentages of primary reverse total shoulder arthroplasties by prosthesis component combination of patients who underwent a RTSA for cuff arthropathy in the Netherlands in 2014-2023 (n=5,694)

					Type of revision (n)				Cumulative revision percentage (95% CI)			
Humeral stem component	Glenosphere component	Primary RTSAs (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Partial major	Partial minor	Other	1yr	3yr	5yr	7yr
All RTSAs for cuff arthropathy		**5,694**	**75 (70 - 79)**	**235**	**56**	**69**	**90**	**17**	**2.08 (1.70-2.46)**	**3.78 (3.24-4.31)**	**4.66 (4.03-5.29)**	**5.53 (4.77-6.29)**
Delta X-tend	Delta X-tend	1,687	74 (69 - 78)	60	13	9	33	4	2.00 (1.31-2.69)	3.17 (2.27-4.07)	3.79 (2.76-4.81)	4.44 (3.24-5.65)
Aequalis Reversed II	Aequalis Reversed II	857	75 (71 - 79)	38	8	11	14	4	2.14 (1.16-3.12)	3.50 (2.22-4.77)	4.29 (2.85-5.74)	5.53 (3.74-7.33)
COMPREHENSIVE MINI	COMPREHENSIVE	659	75 (71 - 79)	14	5	5	4	0	0.78 (0.10-1.47)	2.17 (0.94-3.39)	2.78 (1.30-4.27)	2.78 (1.30-4.27)
Aequalis Ascend Flex	Aequalis Reversed II	577	74 (69 - 78)	24	4	13	6	1	2.00 (0.83-3.17)	3.19 (1.63-4.74)	4.66 (2.40-6.93)	7.42 (3.95-10.89)
Aequalis Ascend Flex	Perform Reversed	226	75 (70 - 79)	17	3	7	3	4	6.88 (3.39-10.38)	8.87 (4.78-12.95)	n.a.	n.a.
Affinis Inverse	Affinis Inverse	178	75 (71 - 79)	10	3	2	5	0	2.31 (0.07-4.55)	4.29 (1.17-7.41)	6.08 (2.15-10.00)	n.a.
Equinoxe	Equinoxe	176	76 (71 - 80)	11	2	5	4	0	1.19 (0.00-2.83)	3.22 (0.43-6.01)	7.07 (2.49-11.64)	n.a.
Anatomical Shoulder Stems	TM Reverse Glenoid Heads	161	76 (71 - 80)	10	5	2	3	0	1.89 (0.00-4.02)	5.19 (1.69-8.70)	7.04 (2.76-11.31)	n.a.
SMR stem Cementless	SMR reversed head	127	75 (69 - 80)	2	0	1	1	0	0.83 (0.00-2.44)	1.92 (0.00-4.59)	1.92 (0.00-4.59)	n.a.
UNIVERS REVERS	UNIVERS REVERS	107	75 (71 - 79)	7	0	2	2	2	4.70 (0.68-8.72)	4.70 (0.68-8.72)	n.a.	n.a.
TM Reverse Stem	TM Reverse Glenoid Heads	100	76 (70 - 80)	3	0	1	2	0	1.01 (0.00-2.96)	2.08 (0.00-4.92)	3.28 (0.00-6.95)	n.a.
Global Unite	Delta X-tend	89	74 (69 - 80)	1	0	1	0	0	0.00 (0.00-0.00)	n.a.	n.a.	n.a.
Affinis Inverse	Affinis Inverse Vitamys	61	75 (68 - 80)	3	1	1	1	0	n.a.	n.a.	n.a.	n.a.

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

Only combinations with over 50 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.

Primary anatomical TSA – osteoarthritis

TABLE Cumulative revision percentages of primary anatomical total shoulder arthroplasties by prosthesis component combination of patients who underwent a ATSA for osteoarthritis in the Netherlands in 2014-2023 (n=4,869)

					Type of revision (n)				Cumulative revision percentage (95% CI)			
Humeral stem component	Glenosphere component	Primary ATSAs (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Partial major	Partial minor	Other	1yr	3yr	5yr	7yr
All ATSAs for osteoarthritis		**4,869**	**67 (61 - 72)**	**219**	**125**	**64**	**10**	**18**	**0.95 (0.66-1.23)**	**3.69 (3.10-4.28)**	**5.28 (4.53-6.03)**	**6.40 (5.50-7.30)**
Aequalis Ascend Flex	Aequalis Perform Keeled	719	69 (62 - 74)	10	7	2	1	0	0.45 (0.00-0.95)	1.63 (0.56-2.69)	1.63 (0.56-2.69)	n.a.
Global Unite	Global APC+	413	67 (61 - 73)	18	8	7	2	1	1.54 (0.32-2.76)	4.11 (2.07-6.16)	4.94 (2.61-7.27)	4.94 (2.61-7.27)
COMPREHENSIVE NANO	COMPREHENSIVE	406	66 (61 - 72)	16	11	3	0	2	1.05 (0.03-2.08)	3.03 (1.17-4.89)	5.73 (2.93-8.52)	5.73 (2.93-8.52)
Global AP	Global APC+	381	66 (60 - 71)	20	16	1	1	1	1.05 (0.03-2.08)	3.26 (1.44-5.08)	5.13 (2.81-7.44)	6.00 (3.40-8.60)
Aequalis Ascend Flex	Aequalis Perform Pegged	296	68 (62 - 73)	13	6	4	2	1	0.74 (0.00-1.77)	5.11 (2.12-8.09)	5.11 (2.12-8.09)	n.a.
GLOBAL ICON	Global APC+	246	65 (59 - 71)	7	6	0	0	0	0.00 (0.00-0.00)	4.55 (0.95-8.14)	n.a.	n.a.
Affinis Short	Affinis	200	70 (65 - 75)	1	1	0	0	0	0.00 (0.00-0.00)	0.73 (0.00-2.15)	0.73 (0.00-2.15)	n.a.
Aequalis Ascend Flex	Aequalis Spherical Glenoid	170*	67 (60 - 73)	16	5	8	1	2	0.00 (0.00-0.00)	4.17 (1.15-7.20)	7.33 (3.33-11.32)	9.52 (4.91-14.13)
Affinis Short	Affinis Vitamys	125	61 (56 - 67)	2	1	0	1	0	2.07 (0.00-4.92)	n.a.	n.a.	n.a.
COMPREHENSIVE MINI	COMPREHENSIVE	117	65 (61 - 72)	4	0	2	1	1	1.77 (0.00-4.19)	3.71 (0.14-7.28)	3.71 (0.14-7.28)	n.a.
Aequalis Primair	Aequalis Spherical Glenoid	113*	69 (63 - 75)	5	4	1	0	0	1.77 (0.00-4.20)	3.56 (0.13-6.98)	3.56 (0.13-6.98)	3.56 (0.13-6.98)
Aequalis Press-fit	Aequalis Spherical Glenoid	111*	70 (65 - 76)	4	3	1	0	0	0.90 (0.00-2.66)	2.73 (0.00-5.78)	3.78 (0.14-7.43)	3.78 (0.14-7.43)
Sidus Baseplate	Anatomical Shoulder Glenoids	99	62 (55 - 68)	9	7	1	1	0	1.02 (0.00-3.01)	6.92 (1.55-12.30)	n.a.	n.a.
ECLIPSE	Arthrex Glenoid Keeled	85*	68 (62 - 72)	4	3	1	0	0	0.00 (0.00-0.00)	0.00 (0.00-0.00)	2.41 (0.00-5.71)	n.a.
SMR Stemless	SMR TT hybrid glenoid	84	65 (60 - 73)	0	0	0	0	0	n.a.	n.a.	n.a.	n.a.
SMR Stemless	SMR uncemented glenoid	81	61 (56 - 67)	11	1	8	0	2	3.73 (0.00-7.88)	12.06 (4.65-19.47)	n.a.	n.a.
Equinoxe	Equinoxe Cage	57	66 (58 - 71)	3	0	3	0	0	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary RTSAs in 2023.

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

Only combinations with over 50 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.

Primary hemi SA - osteoarthritis

TABLE Cumulative revision percentages of primary shoulder hemiarthroplasties by prosthesis component of patients who underwent a hemi SA for osteoarthritis in the Netherlands in 2014-2023 (n=1,063)

				Type of revision (n)				Cumulative revision percentage (95% CI)		
Humeral stem component	Primary hemi (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Partial major	Partial minor	Other	1yr	3yr	5yr
All hemi SAs for osteoarthritis	**1,063**	**66 (59 - 73)**	**90**	**57**	**5**	**24**	**1**	**1.95 (1.10-2.80)**	**6.44 (4.85-8.02)**	**9.19 (7.23-11.16)**
Aequalis Ascend Flex	218	63 (55 - 69)	13	4	1	7	0	2.89 (0.61-5.17)	5.85 (2.47-9.24)	7.02 (2.98-11.05)
Sidus Baseplate	117	66 (58 - 75)	19	16	2	1	0	3.45 (0.13-6.76)	12.71 (6.19-19.22)	13.98 (7.10-20.86)
Affinis Short	103	70 (60 - 75)	3	2	1	0	0	0.00 (0.00-0.00)	1.05 (0.00-3.10)	2.67 (0.00-6.42)
COMPREHENSIVE NANO	100	67 (61 - 72)	8	4	0	3	1	2.06 (0.00-4.89)	6.24 (1.40-11.08)	8.56 (2.88-14.25)
ECLIPSE	63	70 (64 - 75)	7	6	0	1	0	0.00 (0.00-0.00)	n.a.	n.a.

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

Only combinations with over 50 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.

Primary hemi SA - fracture

TABLE Cumulative revision percentages of primary shoulder hemiarthroplasties by prosthesis component of patients who underwent a hemi SA for fracture in the Netherlands in 2014-2023 (n=733)

				Type of revision (n)				Cumulative revision percentage (95% CI)		
Humeral stem component	Primary hemi (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Partial major	Partial minor	Other	1yr	3yr	5yr
All hemi SAs for fracture	**733**	**65 (59 - 73)**	**71**	**29**	**4**	**29**	**8**	**3.29 (1.97-4.61)**	**9.58 (7.32-11.84)**	**10.81 (8.38-13.24)**
Aequalis Fractuur hemi	241	68 (61 - 75)	13	10	2	0	0	1.31 (0.00-2.78)	5.07 (2.14-7.99)	6.33 (2.96-9.69)
COMPREHENSIVE FRACTURE	128	66 (60 - 73)	10	3	0	5	2	4.10 (0.58-7.62)	6.81 (2.24-11.38)	7.99 (2.93-13.05)
Global Unite	94	62 (54 - 67)	12	3	1	6	2	3.30 (0.00-6.97)	11.33 (4.71-17.95)	14.34 (6.74-21.95)
Anatomical Shoulder Stems	57	67 (57 - 73)	9	4	0	5	0	1.79 (0.00-5.25)	n.a.	n.a.

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

Only combinations with over 50 procedures have been listed.

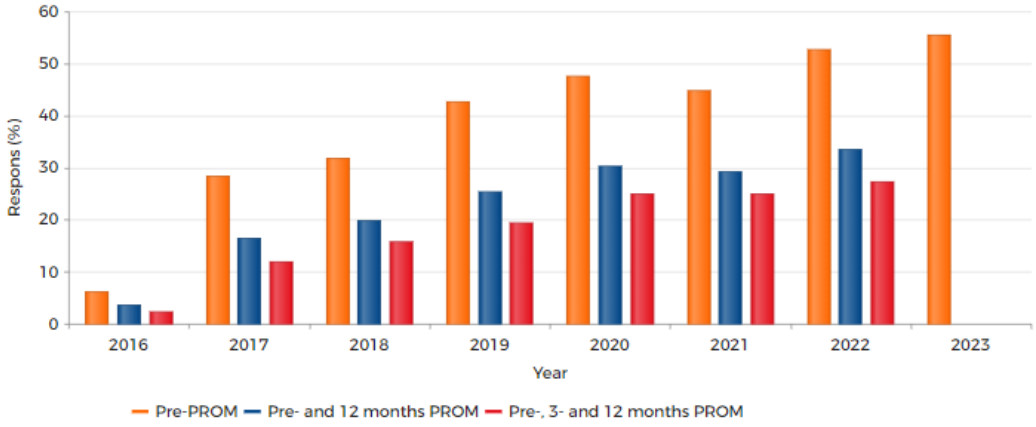
Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure of the prosthesis may have influenced the cumulative revision percentages.

PROMs

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 for osteoarthritis in the Netherlands in 2014-2023

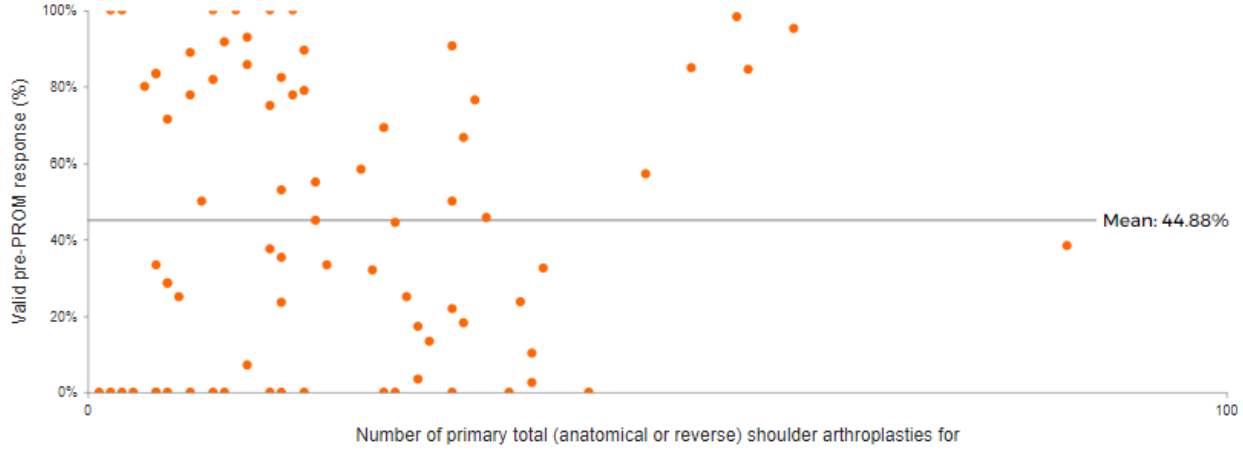


	2016	2017	2018	2019	2020	2021	2022	2023
Pre-PROM	6.09	28.33	31.78	42.75	47.55	44.89	52.75	55.48
Pre- and 12 months PROM	3.68	16.46	19.79	25.31	30.24	29.26	33.57	n.a.
Pre-, 3- and 12 months PROM	2.41	11.98	15.79	19.50	25.03	24.98	27.28	n.a.
Total shoulder arthroplasty for osteoarthritis (n)	788	893	1,051	1,118	959	1,145	1,272	1,368

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2023.
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 in the Netherlands in 2023



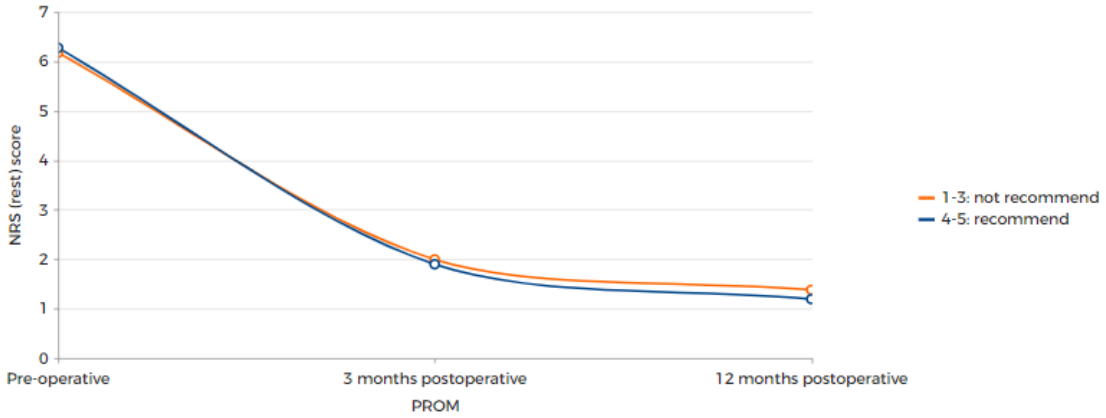
TKA: total knee arthroplasty; PROM: patient reported outcome measure.

The mean pre-operative response rate is 44.9% in the Netherlands in 2023.
37 out of 77 (48%) hospitals scored above the national mean.

Mean scores (pre-operative, 3 months and 12 months)

NRS (rest)

FIGURE Mean (95% CI) 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 2014-2022



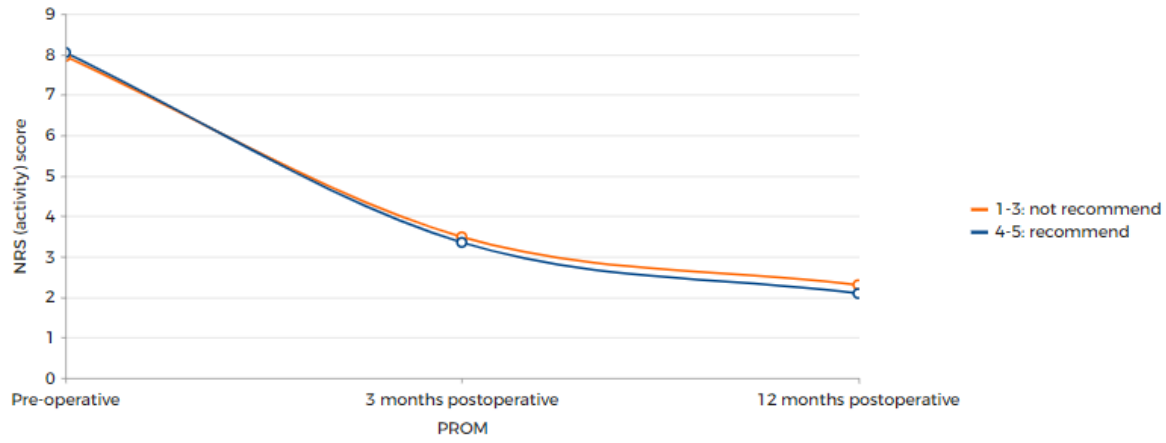
NRS (rest) score		Pre-operative	3 months postoperative	12 months postoperative
Recommendation score	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
1-3: not recommend	941	6.18 (6.04-6.32)	2.00 (1.85-2.14)	1.38 (1.24-1.52)
4-5: recommend	369	6.27 (6.03-6.51)	1.90 (1.68-2.12)	1.20 (0.99-1.40)
Total	1,387	6.20 (6.08-6.31)	1.98 (1.86-2.10)	1.34 (1.23-1.45)

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 (95% CI) 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 2014-2022



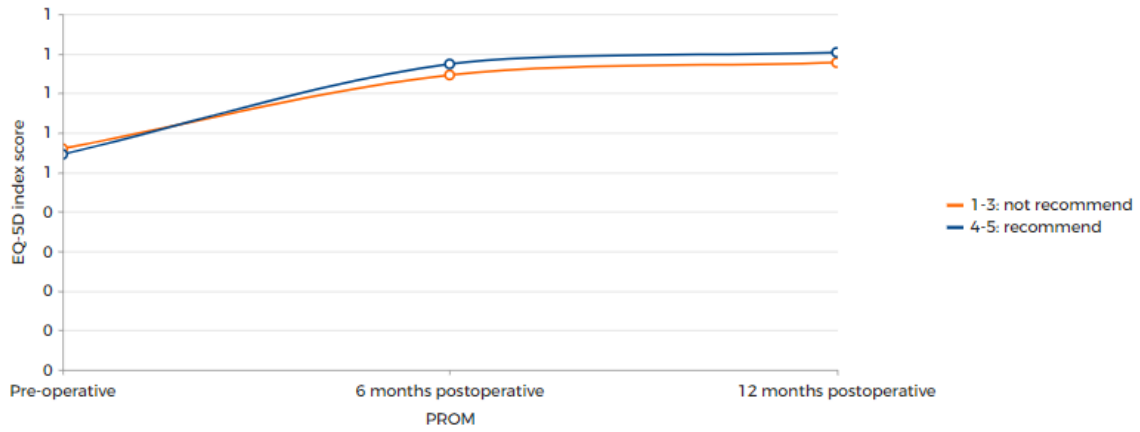
NRS (activity) score		Pre-operative	3 months postoperative	12 months postoperative
Recommendation score	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
1-3: not recommend	941	7.95 (7.84-8.06)	3.49 (3.32-3.65)	2.30 (2.14-2.47)
4-5: recommend	369	8.04 (7.88-8.21)	3.35 (3.10-3.60)	2.09 (1.84-2.34)
Total	1,387	7.95 (7.86-8.04)	3.45 (3.32-3.59)	2.24 (2.11-2.38)

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 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.

EQ5D index score

FIGURE Mean (95% CI) 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 2014-2022



© LROI 2024 | S062A

EQ-5D index score		Pre-operative	6 months postoperative	12 months postoperative
Recommendation score	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
1-3: not recommend	941	0.56 (0.55-0.57)	0.75 (0.73-0.76)	0.78 (0.76-0.79)
4-5: recommend	369	0.55 (0.52-0.57)	0.77 (0.76-0.79)	0.80 (0.78-0.82)
Total	1,387	0.56 (0.54-0.57)	0.75 (0.74-0.76)	0.78 (0.77-0.79)

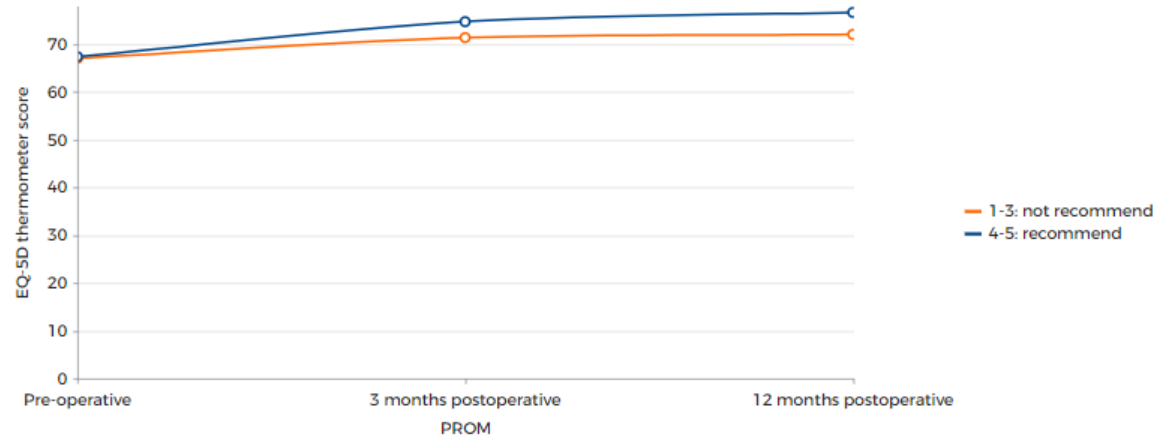
The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.
CI: confidence interval.

© LROI 2024 | S062B

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 (95% CI) 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 2014-2022



© LROI 2024 | S063A

EQ-5D thermometer score		Pre-operative	6 months postoperative	12 months postoperative
Recommendation score	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
1-3: not recommend	941	67.07 (65.83-68.30)	71.41 (70.05-72.77)	72.08 (70.67-73.48)
4-5: recommend	369	67.40 (65.44-69.36)	74.74 (72.83-76.66)	76.69 (74.92-78.46)
Total	1,387	66.84 (65.81-67.87)	72.45 (71.37-73.54)	73.36 (72.25-74.47)

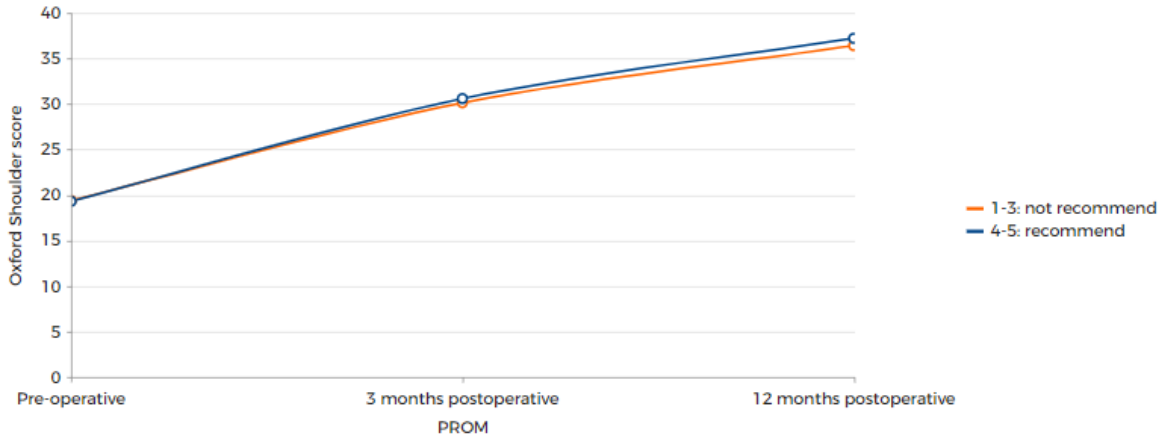
The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.
CI: confidence interval.

© LROI 2024 | S063B

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 (95% CI) 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 2014-2022



© LROI 2024 | S064A

Oxford Shoulder Score		Pre-operative	3 months postoperative	12 months postoperative
Recommendation score	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
1-3: not recommend	941	19.39 (18.91-19.87)	30.13 (29.44-30.83)	36.41 (35.72-37.10)
4-5: recommend	369	19.32 (18.52-20.12)	30.59 (29.54-31.64)	37.21 (36.14-38.29)
Total	1,387	19.43 (19.03-19.84)	30.26 (29.69-30.82)	36.73 (36.17-37.30)

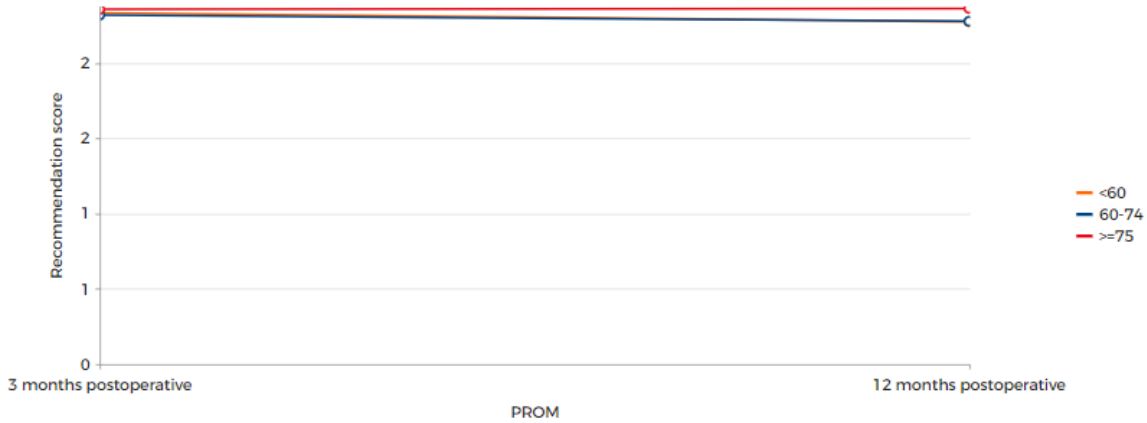
The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.
CI: confidence interval.

© LROI 2024 | S064B

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 (95% CI) 3 months and 12 months postoperative recommendation scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by age category in the Netherlands in 2014-2022



© LROI 2024 | S065A

Recommendation score		3 months postoperative	12 months postoperative
Age category	n	Mean (95% CI)	Mean (95% CI)
<60	189	2.34 (2.12-2.55)	2.28 (2.04-2.51)
60-74	887	2.32 (2.21-2.42)	2.28 (2.17-2.39)
>=75	526	2.36 (2.22-2.49)	2.36 (2.23-2.50)
Total	1,387	2.36 (2.28-2.44)	2.33 (2.25-2.42)

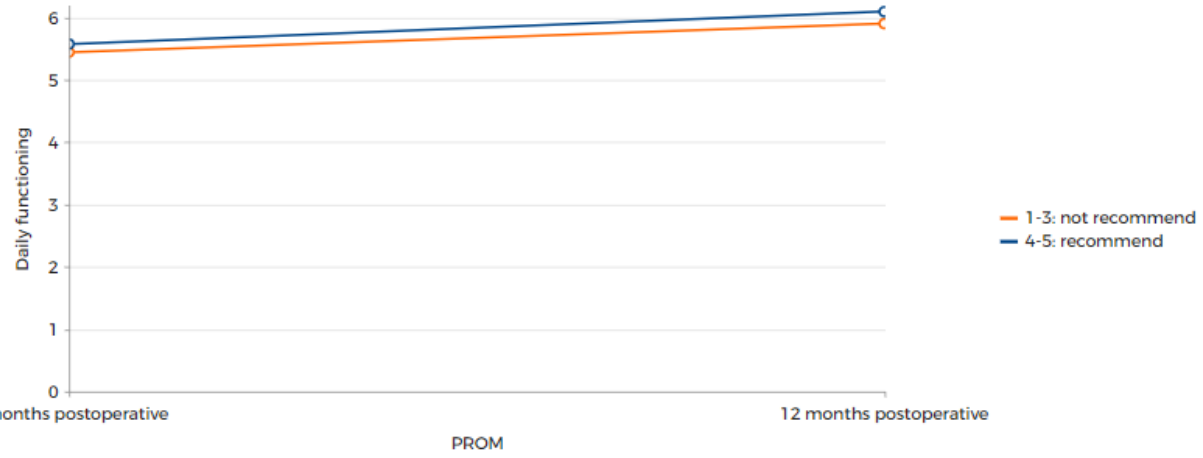
CI: confidence interval.

© LROI 2024 | S065B

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 Daily functioning and Change in pain

FIGURE Mean (95% CI) 3 months and 12 months postoperative change in daily functioning of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2014-2022



© LROI 2024 | S066A

Anchor question score: Daily functioning		3 months postoperative	12 months postoperative
Recommendation score	n	Mean (95% CI)	Mean (95% CI)
1-3: not recommend	1,069	5.45 (5.36-5.53)	5.91 (5.83-5.98)
4-5: recommend	403	5.58 (5.44-5.71)	6.10 (5.98-6.21)
Total	1,602	5.40 (5.33-5.48)	5.89 (5.82-5.96)

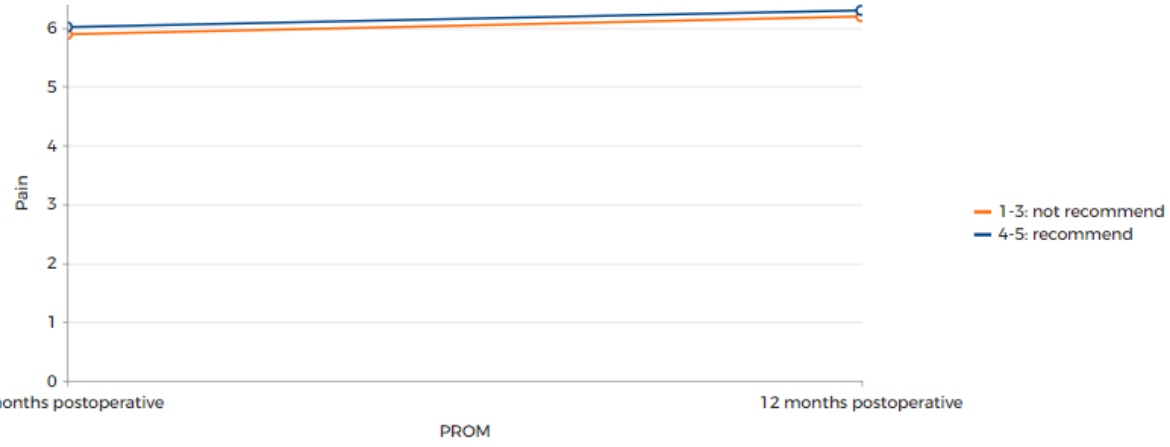
The recommendation score measures to what extend the patient would recommend joint replacement to a friend or relative. The score has a range of 1.0 to 5.0, with 1.0 representing totally disagreement and 5.0 representing totally agreement.

CI: confidence interval.

© LROI 2024 | S066B

The anchor question daily functioning measures change in daily functioning after joint replacement.

FIGURE Mean (95% CI) 3 months and 12 months postoperative change in pain of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2014-2022



© LROI 2024 | S067A

Anchor question score: Pain		3 months postoperative	12 months postoperative
Recommendation score	n	Mean (95% CI)	Mean (95% CI)
1-3: not recommend	941	5.89 (5.81-5.97)	6.19 (6.12-6.26)
4-5: recommend	369	6.01 (5.89-6.14)	6.30 (6.19-6.40)
Total	1,387	5.92 (5.86-5.98)	6.22 (6.16-6.27)

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.

© LROI 2024 | S067B

The anchor question pain measures change in pain degree after joint replacement.

Elbow arthroplasty

Numbers

Registered procedures

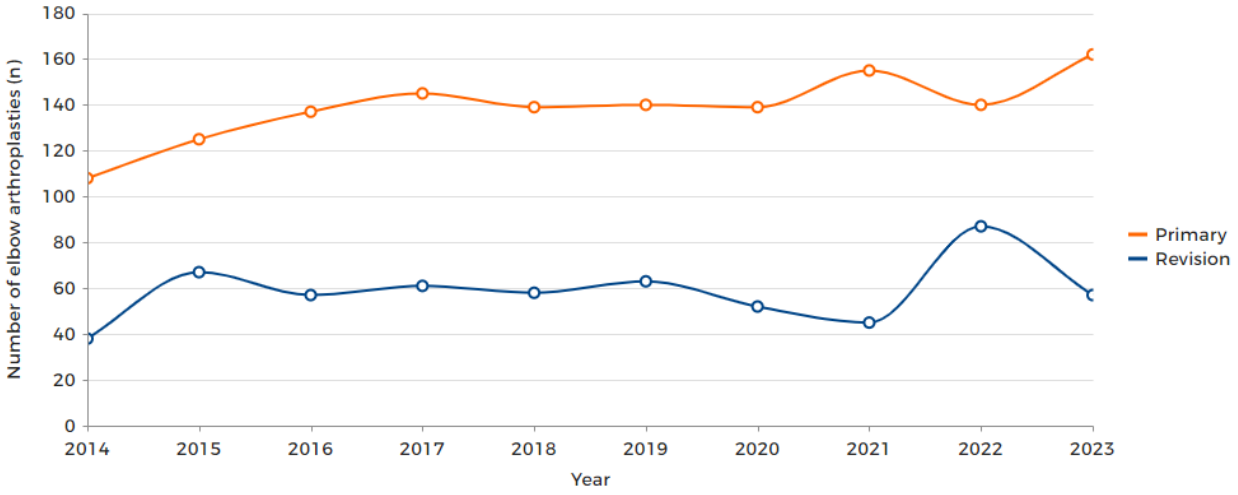
TABLE Number of registered elbow arthroplasties per year of surgery (2014-2023) in the LROI in April 2024

Year of surgery	Total elbow arthroplasty	Distal hemihumeral arthroplasty	Radial head arthroplasty	Radiocapitellar arthroplasty	Other	Unknown/ missing	Revision arthroplasty	Total
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	2	1	52	**191**
2021	74	7	74	0	0	0	45	**200**
2022	74	2	63	1	0	0	87	**227**
2023	85	8	67	0	2	0	57	**219**
Total (n)	**747**	**39**	**520**	**30**	**8**	**46**	**585**	**1,975**

© LROI 2024 | E001

Type of procedures

FIGURE Number of primary elbow arthroplasties and elbow revision arthroplasties registered in the LROI in the Netherlands in 2014-2023

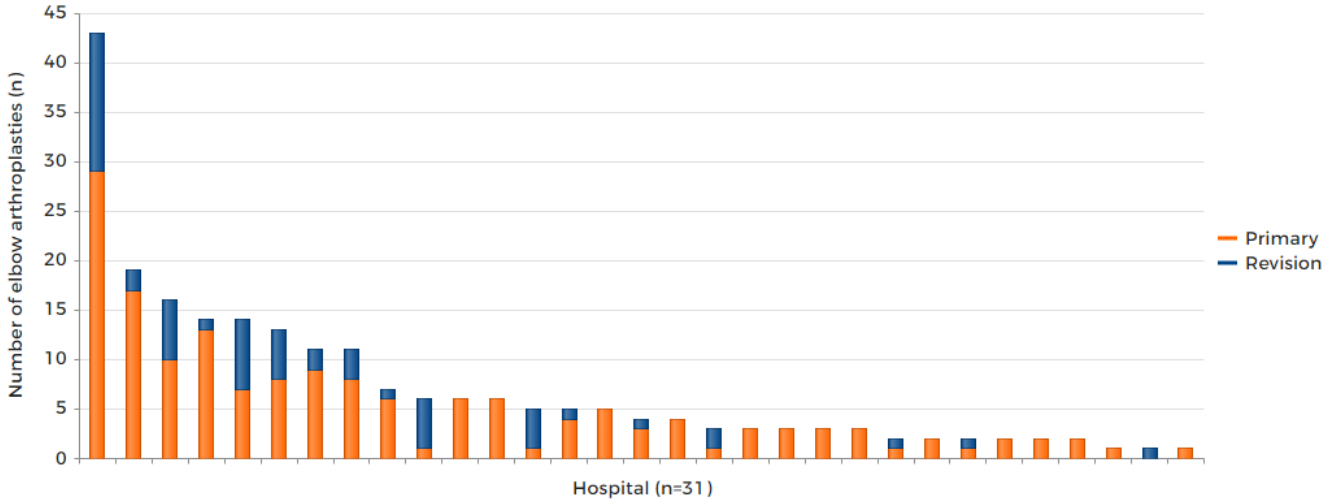


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Primary	108	125	137	145	139	140	139	155	140	162	**1,390**
Revision	38	67	57	61	58	63	52	45	87	57	**585**
Total (n)	**146**	**192**	**194**	**206**	**197**	**203**	**191**	**200**	**227**	**219**	**1,975**

© LROI 2024 | E002

Type of procedure per hospital

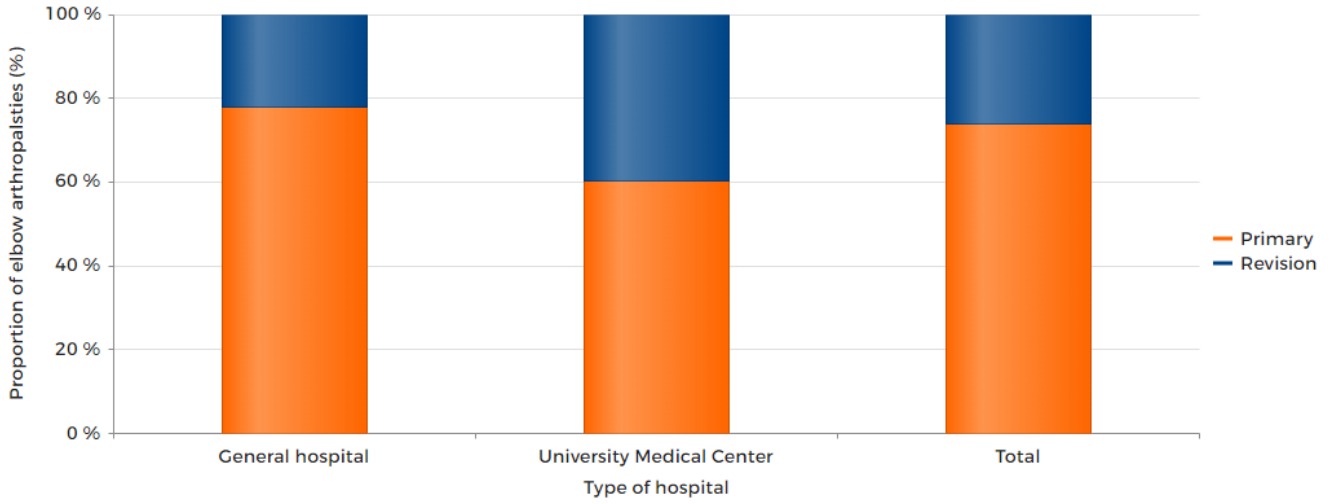
FIGURE Number of primary elbow arthroplasties and elbow revision arthroplasties per hospital in the Netherlands in 2023 (n=219)



© LROI 2024 | E003

Type of hospital

FIGURE Primary elbow arthroplasties and elbow revision arthroplasties (proportion [%] per category) by type of hospital in the Netherlands in 2023



	General hospital	University Medical Center	Total
Primary	77.78	60.42	73.97
Revision	22.22	39.58	26.03
Total (n)	**171**	**48**	**219**

Please note: in 2023, 27 general hospitals, 6 UMCs and 0 private hospitals performed elbow arthroplasties.
General: general hospital; UMC: university medical centre.

© LROI 2024 | E004

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 2023

	Total arthroplasty	Radial head arthroplasty	Total
N(%)	**93 (58.2)**	**67 (41.8)**	**162**
Mean age (years) (SD)	68 (10.0)	58.2 (13.7)	63.7 (12.8)
Age (years) (%)			
<50	2	24	12
50-59	19	27	22
60-69	25	30	27
70-79	43	16	31
>80	11	3	7
Gender (%)			
Men	23	33	27
Women	77	67	73
ASA score (%)			
ASA I	5	21	12
ASA II	65	70	67
ASA III-IV	30	9	21
Type of hospital (%)			
General	74	94	82
UMC	26	6	18
Private	0	0	0
Diagnosis (%)			
Fracture	18	66	38
Late posttraumatic	24	30	26
Osteoarthritis	18	4	13
Rheumatoid arthritis	31	0	18
Inflammatory arthritis	1	0	1
Osteonecrosis	0	0	0
Hemophilic arthropathy	1	0	1
Tumour	0	0	0
Other	6	0	4
Mean BMI (kg/m2) (SD)	28 (5.4)	28.5 (6.0)	28.2 (5.6)
Body Mass Index (kg/m2) (%)			
Underweight (<=18.5)	2	0	1
Normal weight (>18.5-25)	33	21	29
Overweight (>25-30)	39	51	44
Obesity (>30-40)	22	27	24
Morbid obesity (>40)	3	1	2
Smoking (%)			
No	92	94	94
Yes	8	4	6

Total arthroplasty includes distal hemihumeral prostheses (n=8).

Two primary elbow arthroplasty were registered as other.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

Diagnosis

FIGURE Diagnosis of all patients with a registered primary elbow arthroplasty in the Netherlands in 2023

Diagnosis	Number (n)	Proportion (%)
Fracture	61	37.65
Late posttraumatic	42	25.93
Reumatoid arthritis	29	17.90
Osteoarthritis	21	12.96
Hemophilic arthropathy	1	0.62
Inflammatory arthritis	1	0.62
Tumour (primary)	1	0.62
Other	6	3.70

© LROI 2024 | E006

Surgical techniques

Surgical approach

FIGURE Surgical approach for performing a primary elbow arthroplasty in the Netherlands in 2023

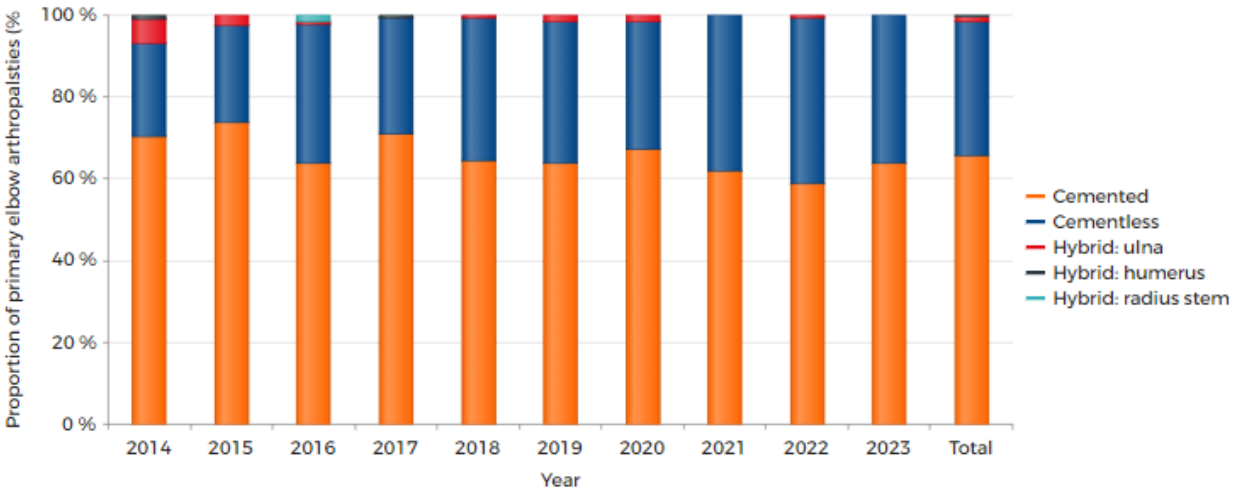
Surgical approach	Number (n)	Proportion (%)
Posterior, Triceps-on	27	16.77
Posterior, Triceps-split	11	6.83
Posterior, Triceps-flap	55	34.16
Posterior, Boyd	2	1.24
Posterolateral (Kocher)	17	10.56
Extensor split (Kaplan)	42	26.09
Other	7	4.35

Please note: In 2022 the registration has been changed. Therefore, no trend can be shown for the surgical approach.

© LROI 2024 | E007

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary elbow arthroplasties in the Netherlands in 2014-2023

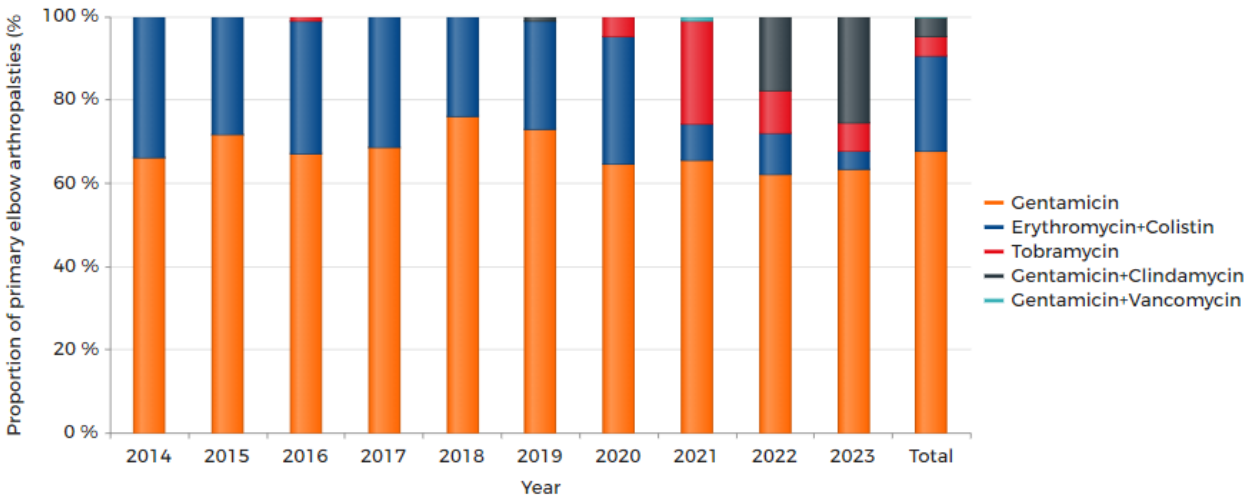


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cemented	70.30	73.77	63.91	70.92	64.44	63.77	67.39	62.09	58.82	63.98	65.68
Cementless	22.77	23.77	33.83	28.37	34.81	34.78	31.16	37.91	40.44	36.02	32.84
Hybrid: ulna	5.94	2.46	0.75	0	0.74	1.45	1.45	0	0.74	0	1.18
Hybrid: humerus	0.99	0	0	0.71	0	0	0	0	0	0	0.15
Hybrid: radius stem	0	0	1.50	0	0	0	0	0	0	0	0.15
Total (n)	**101**	**122**	**133**	**141**	**135**	**138**	**138**	**153**	**136**	**161**	**1,358**

Bone cement

Antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in primary elbow arthroplasties in the Netherlands in 2014-2023

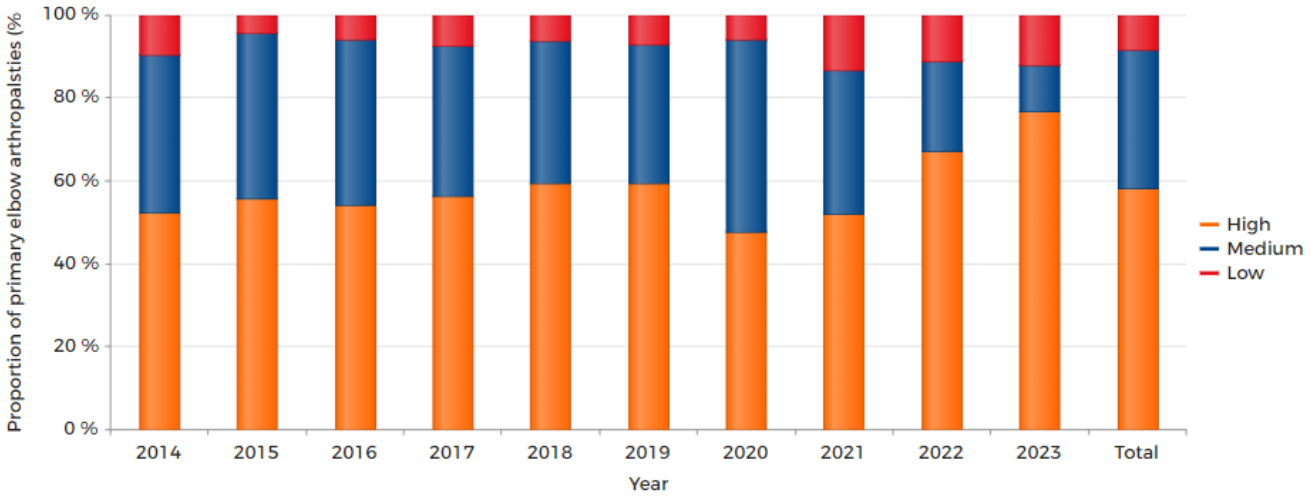


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Gentamicin	66.20	71.59	67.06	68.75	75.95	72.84	64.63	65.43	62.03	63.33	67.77
Erythromycin+Colistin	33.80	28.41	31.76	31.25	24.05	25.93	30.49	8.64	10.13	4.44	22.67
Tobramycin	0	0	1.18	0	0	0	4.88	24.69	10.13	6.67	4.78
Gentamicin+Clindamycin	0	0	0	0	0	1.23	0	0	17.72	25.56	4.66
Gentamicin+Vancomycin	0	0	0	0	0	0	0	1.23	0	0	0.12
Total (n)	**71**	**88**	**85**	**80**	**79**	**81**	**82**	**81**	**79**	**90**	**816**

© LROI 2024 | E009

Viscosity

FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary elbow arthroplasties in the Netherlands in 2014-2023

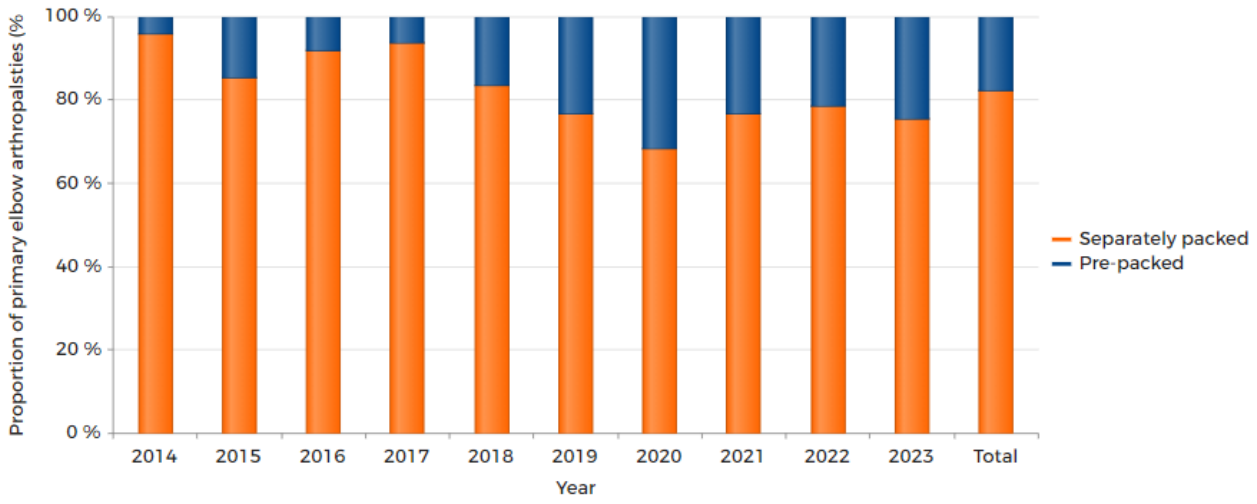


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
High	52.11	55.68	54.12	56.25	59.49	59.26	47.56	51.85	67.09	76.67	58.21
Medium	38.03	39.77	40	36.25	34.18	33.33	46.34	34.57	21.52	11.11	33.33
Low	9.86	4.55	5.88	7.50	6.33	7.41	6.10	13.58	11.39	12.22	8.46
Total (n)	**71**	**88**	**85**	**80**	**79**	**81**	**82**	**81**	**79**	**90**	**816**

© LROI 2024 | E010

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 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Separately packed	95.77	85.23	91.76	93.75	83.54	76.54	68.29	76.54	78.48	75.56	82.35
Pre-packed	4.23	14.77	8.24	6.25	16.46	23.46	31.71	23.46	21.52	24.44	17.65
Total (n)	**71**	**88**	**85**	**80**	**79**	**81**	**82**	**81**	**79**	**90**	**816**

Most frequently registered

Elbow prostheses

TABLE The most frequently registered total elbow arthroplasties in primary elbow arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Total elbow arthroplasty (n)	**65**	**58**	**70**	**67**	**83**
Name; Proportion (%)					
Latitude EV	41.54	51.72	60.00	46.27	62.65
Coonrad/Morrey	38.46	20.69	17.14	23.88	21.69
Latitude	10.77	15.52	12.86	11.94	10.84
DISCOVERY	7.69	8.62	2.86	5.97	3.61
NES	1.54	3.45	7.14	8.96	1.20

TABLE The most frequently registered radial head arthroplasties in primary elbow arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Radial head arthroplasty (n)	**46**	**45**	**60**	**50**	**59**
Name; Proportion (%)					
RHS	56.52	80.00	65.00	40.00	40.68
Anatomic Radial Head	6.52	4.44	5.00	34.00	27.12
EXPLOR	32.61	8.89	18.33	10.00	13.56
Radial Head Replacement System	0.00	0.00	3.33	2.00	8.47
Evolve Radial Head	0.00	2.22	1.67	4.00	6.78
ICARA	2.17	2.22	6.67	10.00	3.39

Types of bone cement

TABLE The registered types of bone cement used during primary elbow arthroplasties in the Netherlands in 2019-2023

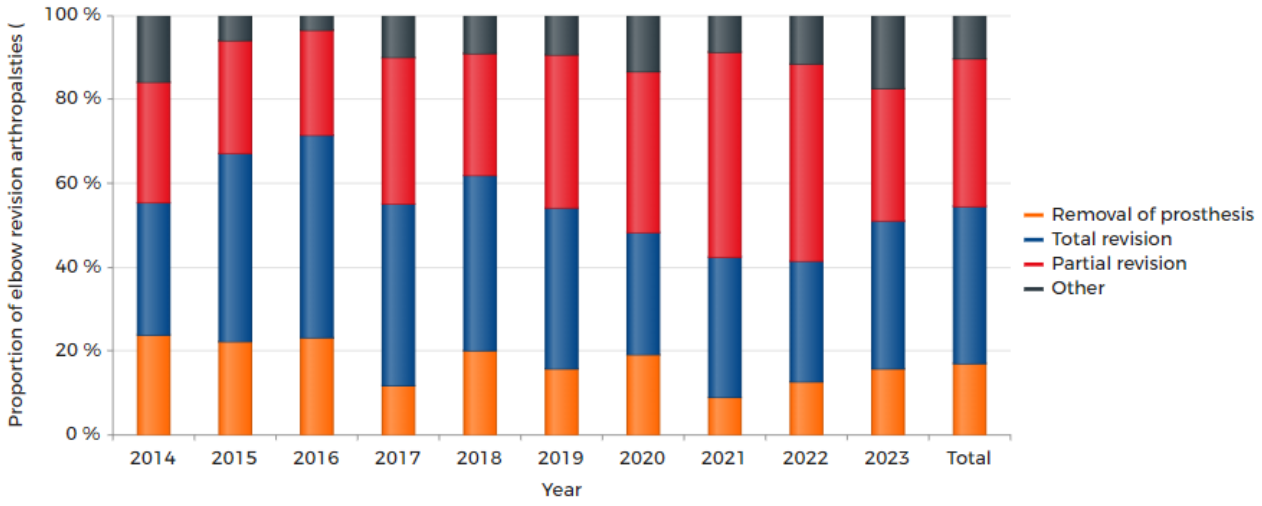
Year	2019	2020	2021	2022	2023
Bone cement used (n)	**83**	**83**	**83**	**79**	**90**
Cement name; Proportion (%)					
PALACOS R+G	35.80	24.39	28.40	36.71	43.33
COPAL G+C	0.00	0.00	0.00	17.72	25.56
PALACOS LV+G	7.41	6.10	13.58	11.39	12.22
Refobacin Bone Cement R	11.11	13.41	19.75	7.59	7.78
Simplex ABC TOBRA	0.00	4.88	24.69	10.13	4.44
Simplex ABC EC	25.93	30.49	8.64	10.13	4.44
Simplex P	0.00	0.00	0.00	0.00	2.22

© LROI 2024 | E014

Elbow revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in elbow revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Removal of prosthesis	23.68	22.39	23.21	11.67	20	15.87	19.23	8.89	12.64	15.79	17.07
Total revision	31.58	44.78	48.21	43.33	41.82	38.10	28.85	33.33	28.74	35.09	37.41
Partial revision	28.95	26.87	25	35	29.09	36.51	38.46	48.89	47.13	31.58	35.17
Other	15.79	5.97	3.57	10	9.09	9.52	13.46	8.89	11.49	17.54	10.34
Total (n)	**38**	**67**	**56**	**60**	**55**	**63**	**52**	**45**	**87**	**57**	**580**

© LROI 2024 | E015

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent an elbow revision arthroplasty in the Netherlands in 2016-2023

Year	2016	2017	2018	2019	2020	2021	2022	2023	Total
Elbow revision arthroplasty (n)	**57**	**61**	**58**	**63**	**52**	**45**	**87**	**57**	**480**
Reasons for revision; Proportion (%)									
Polyethylene wear	28.07	27.87	27.59	22.22	15.38	15.56	18.39	15.79	21.46
Metallosis	22.81	22.95	22.41	23.81	13.46	22.22	12.64	19.30	19.58
instability	21.05	40.98	15.52	20.63	5.77	22.22	11.49	19.30	19.38
Loosening of ulnar component	15.79	18.03	17.24	17.46	23.08	13.33	18.39	15.79	17.50
Infection	14.04	3.28	15.52	15.87	23.08	17.78	24.14	22.81	17.29
Loosening of humeral component	15.79	14.75	15.52	12.70	30.77	20.00	12.64	19.30	17.08
Loosening of radial head component	21.05	18.03	20.69	15.87	15.38	13.33	9.20	15.79	15.83
Peri-prosthetic fracture	3.51	18.03	18.97	19.05	17.31	17.78	9.20	12.28	14.17
Malalignment							9.20	10.53	
Revision after elbow removal							2.30	1.75	
Other	12.28	24.59	10.34	14.29	13.46	15.56	16.09	8.77	14.58

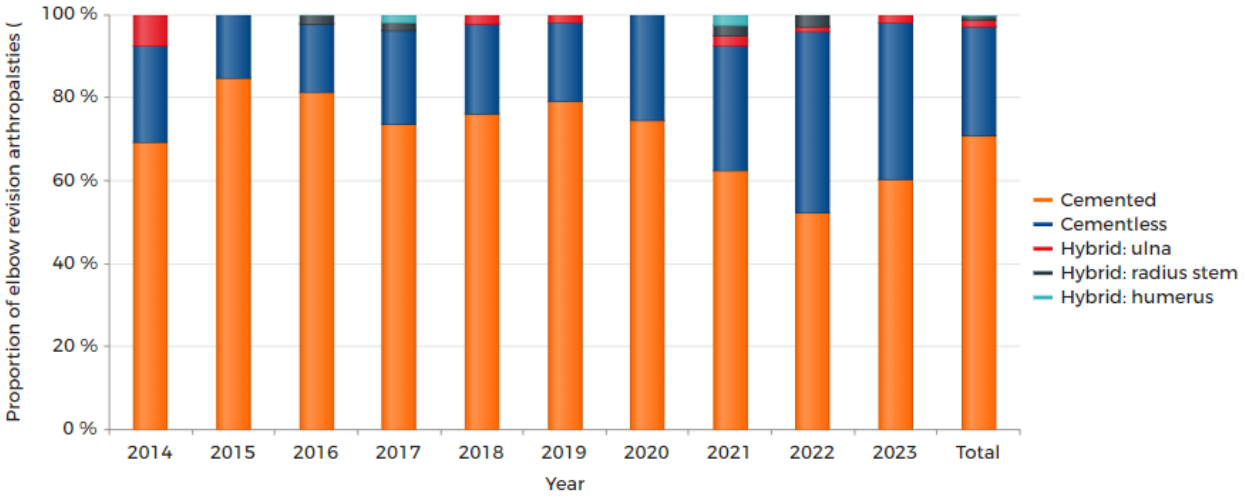
Please note: Malalignment and Removal after elbow revision were not registered before 2022.
One patient may have more than one reason for revision. As such, the total proportion is over 100%.

© LROI 2024 | E016

Surgical techniques

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in elbow revision arthroplasties in the Netherlands in 2014-20223

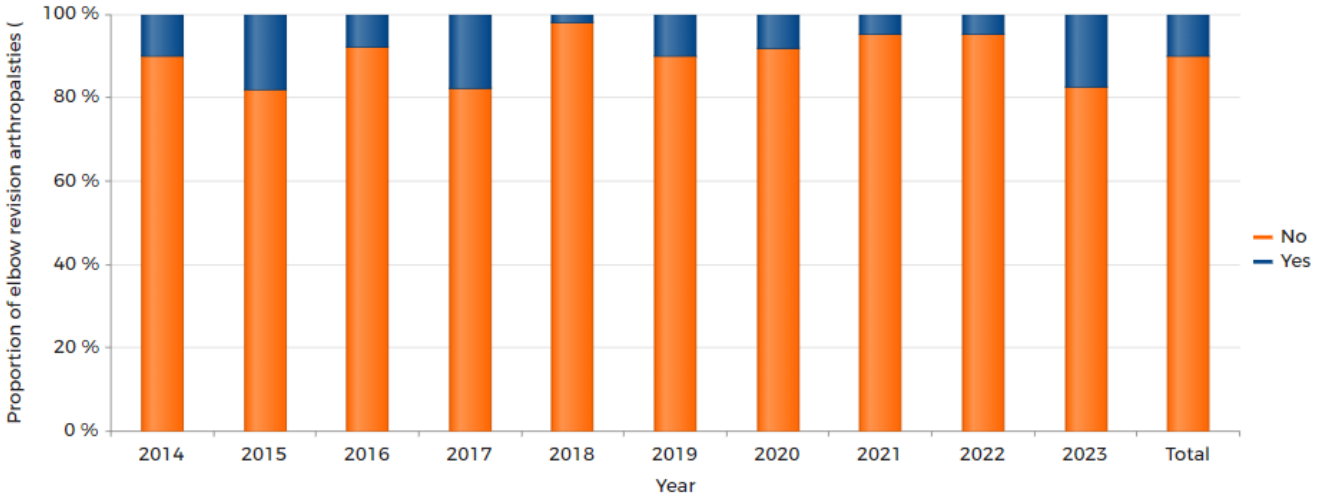


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cemented	69.23	84.62	81.40	73.58	76.09	79.25	74.36	62.50	52.11	60.42	70.70
Cementless	23.08	15.38	16.28	22.64	21.74	18.87	25.64	30	43.66	37.50	26.33
Hybrid: ulna	7.69	0	0	0	2.17	1.89	0	2.50	1.41	2.08	1.49
Hybrid: radius stem	0	0	2.33	1.89	0	0	0	2.50	2.82	0	1.06
Hybrid: humerus	0	0	0	1.89	0	0	0	2.50	0	0	0.42
Total (n)	**26**	**52**	**43**	**53**	**46**	**53**	**39**	**40**	**71**	**48**	**471**

© LROI 2024 | E017

Conversion to TEA

FIGURE Trend (proportion [%] per year) in conversion of a radial head arthroplasty to a total elbow arthroplasy in the Netherlands in 2014-2023

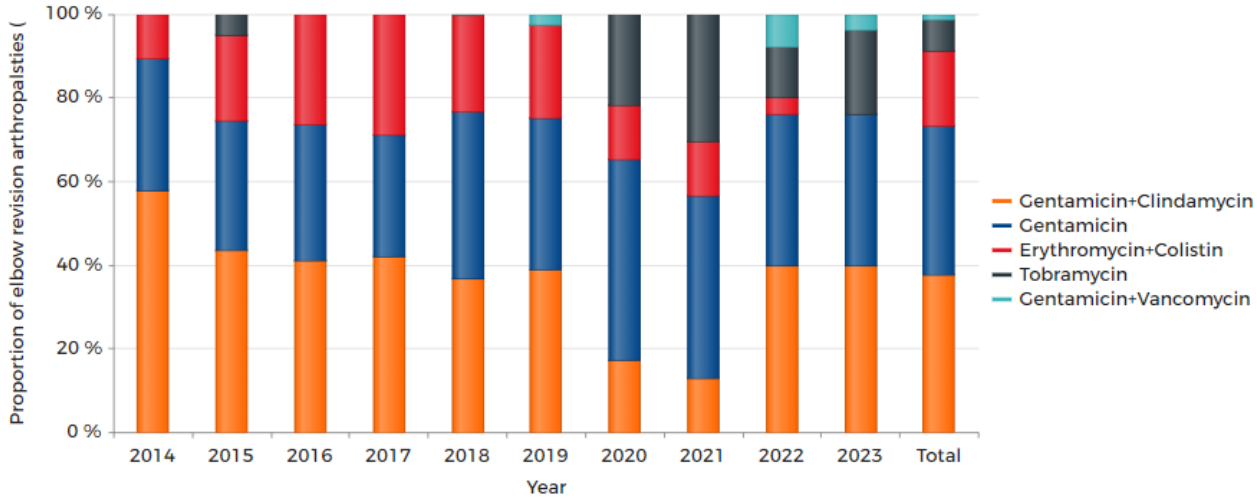


	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
No	90	81.82	92	82.14	97.96	90	91.84	95.35	95.18	82.46	89.85
Yes	10	18.18	8	17.86	2.04	10	8.16	4.65	4.82	17.54	10.15
Total (n)	**30**	**55**	**50**	**56**	**49**	**60**	**49**	**43**	**83**	**57**	**532**

© LROI 2024 | E018

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in elbow revision arthroplasties in the Netherlands in 2014-2023



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Gentamicin+Clindamycin	57.89	43.59	41.18	42.11	36.67	38.89	17.39	13.04	40	40	37.67
Gentamicin	31.58	30.77	32.35	28.95	40	36.11	47.83	43.48	36	36	35.62
Erythromycin+Colistin	10.53	20.51	26.47	28.95	23.33	22.22	13.04	13.04	4	0	17.81
Tobramycin	0	5.13	0	0	0	0	21.74	30.43	12	20	7.53
Gentamicin+Vancomycin	0	0	0	0	0	2.78	0	0	8	4	1.37
Total (n)	**19**	**39**	**34**	**38**	**30**	**36**	**23**	**23**	**25**	**25**	**292**

© LROI 2024 | E019

Most frequently registered components

TABLE The most frequently registered humerus and ulna components in elbow revision arthroplasties in the Netherlands in 2023

Year	2019	2020	2021	2022	2023
Humerus (n)	**25**	**15**	**15**	**24**	**19**
Humerus name; Proportion (%)					
Coonrad/Morrey	24.00	26.67	26.67	25.00	36.84
Latitude EV	56.00	53.33	40.00	33.33	26.32
Latitude	8.00	6.67	0.00	4.17	21.05
NES	4.00	0.00	20.00	25.00	10.53
MUTARS	0.00	0.00	13.33	4.17	5.26
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Ulna (n)	**34**	**18**	**13**	**30**	**21**
Ulna name; Proportion (%)					
Latitude EV	70.59	66.67	46.15	70.00	66.67
Coonrad/Morrey	20.59	22.22	38.46	16.67	28.57
NES	2.94	0.00	0.00	10.00	4.76

Most frequently registered types of bone cement

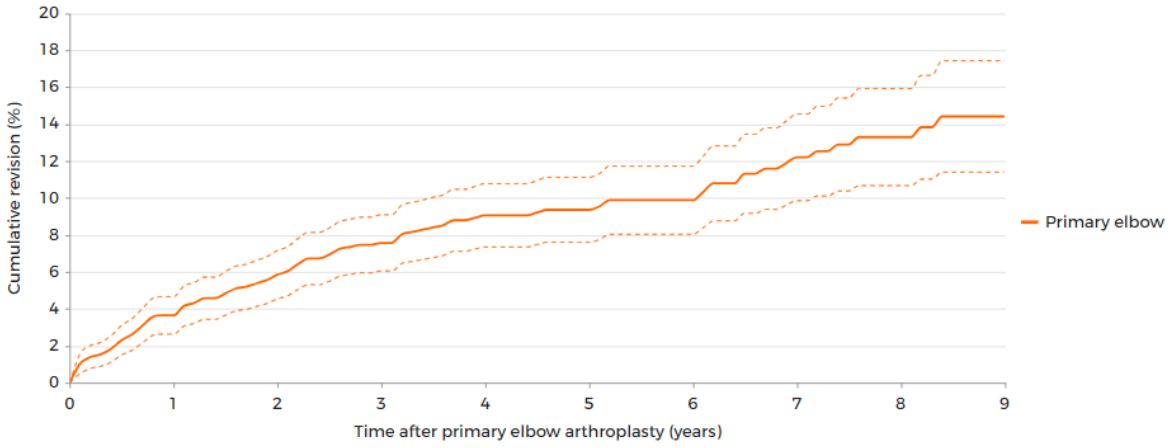
TABLE The registered types of bone cement used during elbow revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Bone cement used (n)	**36**	**23**	**23**	**25**	**25**
Cement name; Proportion (%)					
COPAL G+C	25.00	4.35	0.00	32.00	40.00
PALACOS R+G	13.89	30.43	21.74	12.00	24.00
Simplex ABC TOBRA	0.00	21.74	30.43	12.00	16.00
Refobacin Bone Cement R	11.11	13.04	17.39	20.00	8.00
PALACOS LV+G	5.56	0.00	4.35	4.00	4.00
Simplex P	0.00	0.00	0.00	0.00	4.00
COPAL G+V	2.78	0.00	0.00	8.00	4.00

Survival Overall

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary elbow arthroplasties in the Netherlands in 2014-2023 (n=1,381)



© LROI 2024 | E022A

	1yr	3yr	5yr	7yr	9yr
Primary elbow	3.64 (2.63-4.65)	7.45 (5.95-8.96)	9.36 (7.60-11.12)	11.88 (9.61-14.16)	14.41 (11.39-17.42)

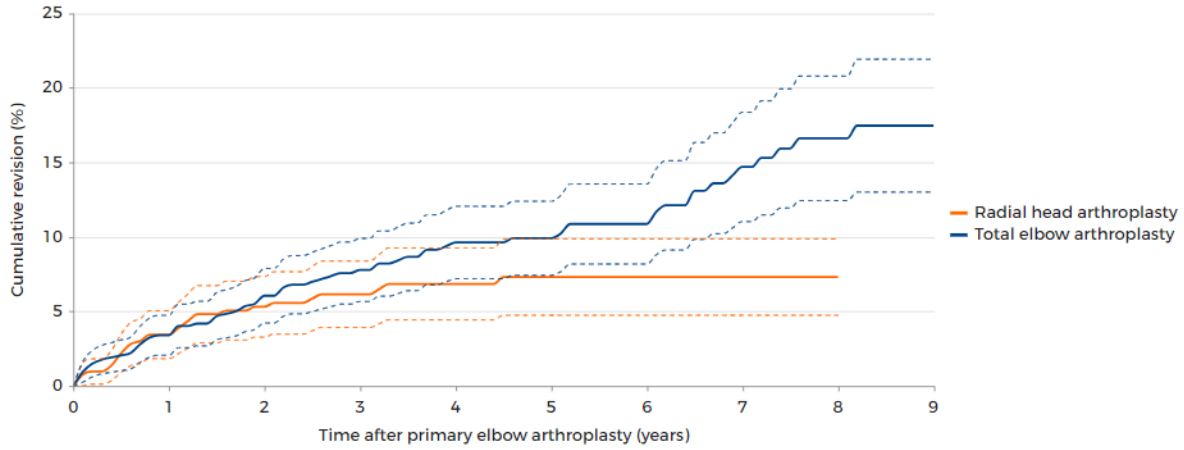
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
CI: confidence interval.

© LROI 2024 | E022B

In 2014-2023, 122 (8.8%) primary elbow arthroplasties were implanted in patients who died within nine years after the primary procedure.

By type of elbow arthroplasty

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary elbow arthroplasties by type of elbow arthroplasty in the Netherlands in 2014-2023 (n=1,260)



© LROI 2024 | E023A

	Number (n)	1yr	3yr	5yr	7yr	9yr
Total elbow arthroplasty	743	3.40 (2.06-4.74)	7.57 (5.49-9.65)	9.90 (7.42-12.38)	14.13 (10.61-17.65)	17.45 (13.00-21.90)
Radial head arthroplasty	517	3.44 (1.83-5.05)	6.15 (3.92-8.37)	7.30 (4.74-9.86)	7.30 (4.74-9.86)	n.a.

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

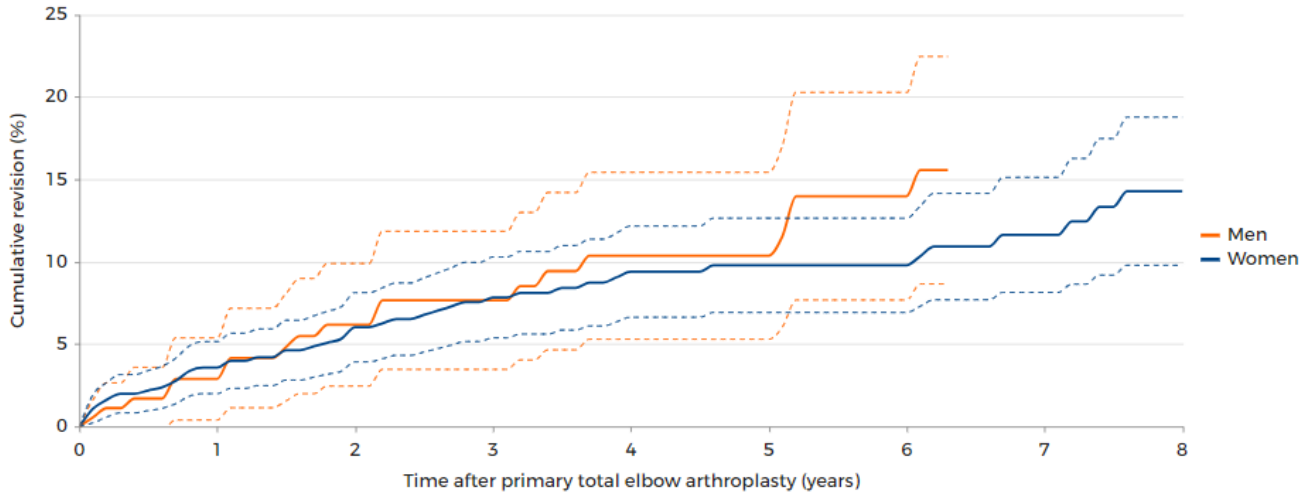
© LROI 2024 | E023B

Survival TEA

Revision by patient characteristics

TEA by gender

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total elbow arthroplasties by gender in the Netherlands in 2014-2023 (n=743)



© LROI 2024 | E024A

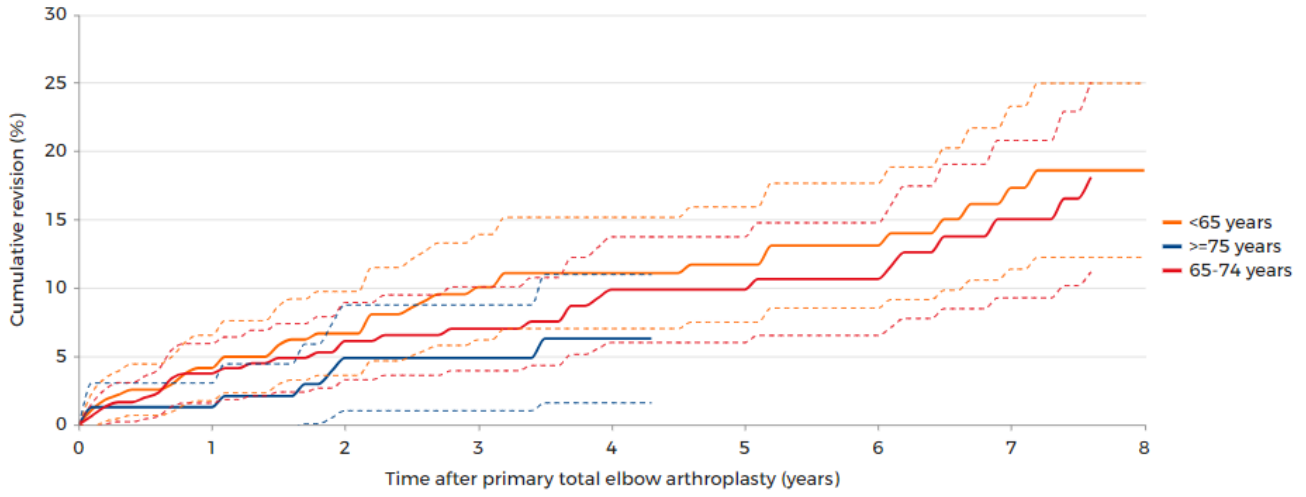
	Number (n)	1yr	3yr	5yr	7yr	8yr
Men	182	2.88 (0.39-5.37)	7.65 (3.46-11.84)	10.35 (5.29-15.41)	n.a.	n.a.
Women	561	3.57 (1.99-5.14)	7.55 (5.15-9.95)	9.77 (6.92-12.63)	11.62 (8.13-15.10)	14.27 (9.77-18.76)

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

© LROI 2024 | E024B

TEA by age category

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total elbow arthroplasties by age category in the Netherlands in 2014-2023 (n=743)



© LROI 2024 | E025A

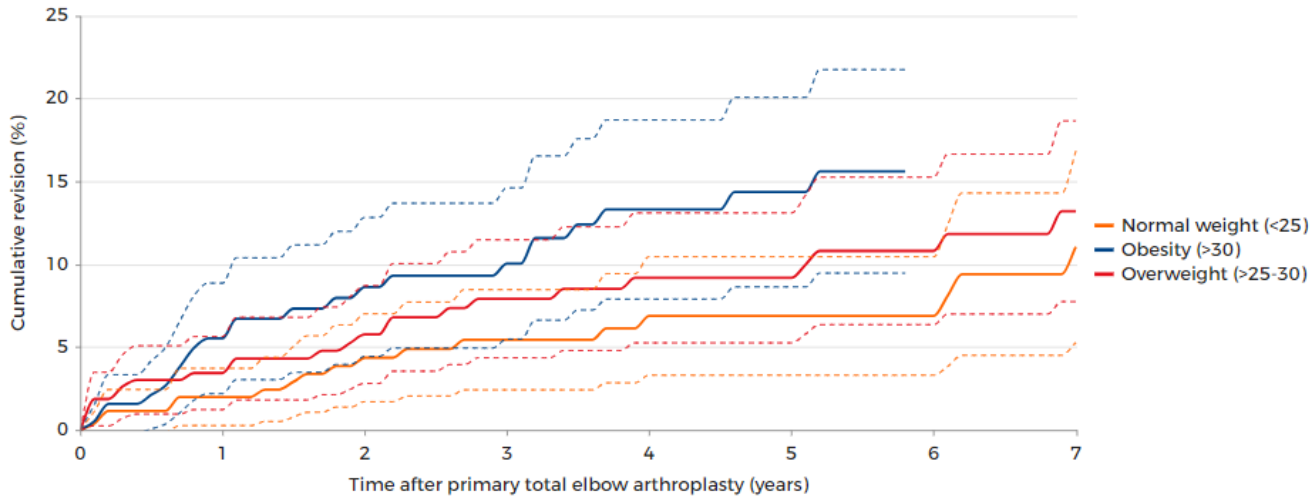
	Number (n)	1yr	3yr	5yr	7yr	8yr
<65 years	277	4.14 (1.74-6.54)	9.54 (5.80-13.28)	11.71 (7.49-15.92)	16.13 (10.57-21.70)	18.60 (12.23-24.96)
65-74 years	308	3.75 (1.57-5.93)	7.01 (3.95-10.08)	9.87 (6.01-13.73)	15.03 (9.27-20.78)	n.a.
>=75 years	158	1.28 (-0.48-3.05)	4.88 (1.01-8.75)	n.a.	n.a.	n.a.

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

© LROI 2024 | E025B

TEA by BMI

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total elbow arthroplasties by BMI category in the Netherlands in 2014-2023 (n=728)



© LROI 2024 | E026A

	Number (n)	1yr	3yr	5yr	7yr
Normal weight (<25)	266	1.99 (0.26-3.71)	5.44 (2.42-8.46)	6.87 (3.30-10.44)	9.39 (4.50-14.28)
Overweight (>25-30)	270	3.43 (1.23-5.63)	7.91 (4.35-11.46)	9.17 (5.25-13.09)	13.19 (7.74-18.64)
Obesity (>30)	192	5.52 (2.19-8.85)	9.30 (4.94-13.67)	14.34 (8.62-20.05)	n.a.

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

© LROI 2024 | E026B

Wrist arthroplasty

Numbers

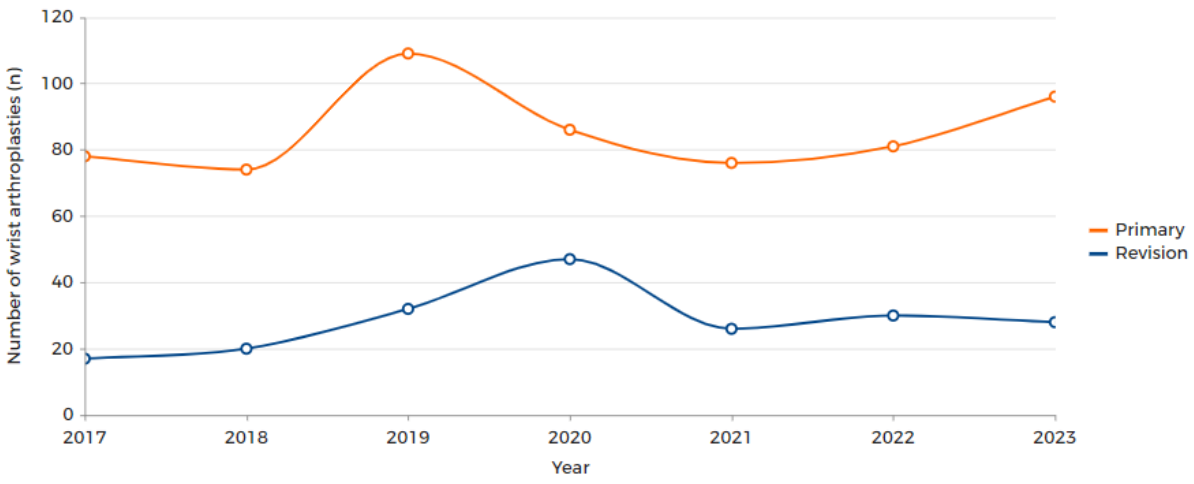
Registered procedures

TABLE Number of registered wrist arthroplasties per year of surgery (2017-2023) in the LROI in April 2024

Year of surgery	Total wrist arthroplasty	Ulnar head arthroplasty	DRU arthroplasty	Hemi arthroplasty	Other	Unknown/ missing	Revision arthroplasty	Total
2016	3	2	10	0	0	2	5	**22**
2017	35	13	10	1	14	5	17	**95**
2018	37	7	18	2	6	4	20	**94**
2019	43	7	30	5	20	4	32	**141**
2020	34	9	16	12	10	5	47	**133**
2021	27	4	16	16	8	5	26	**102**
2022	24	7	17	21	6	6	30	**111**
2023	32	2	26	16	13	7	28	**124**
Total (n)	**235**	**51**	**143**	**73**	**77**	**38**	**205**	**822**

Type of procedure

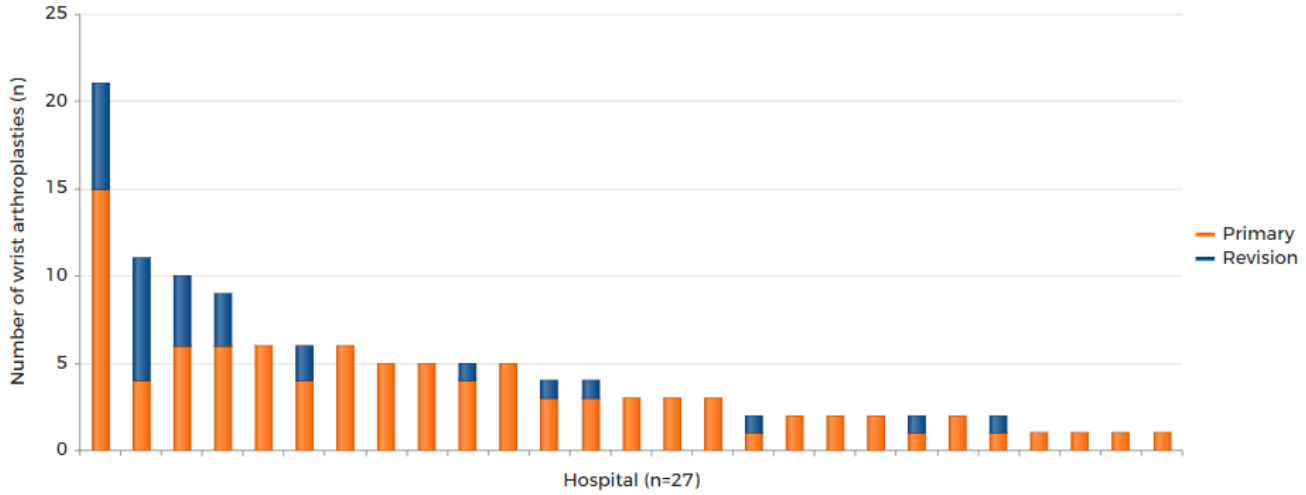
FIGURE Number of primary wrist arthroplasties and wrist revision arthroplasties registered in the LROI in the Netherlands in 2016-2023



	2017	2018	2019	2020	2021	2022	2023	Total
Primary	78	74	109	86	76	81	96	**600**
Revision	17	20	32	47	26	30	28	**200**
Total (n)	**95**	**94**	**141**	**133**	**102**	**111**	**124**	**800**

Type of procedure per hospital

FIGURE Number of primary wrist arthroplasties and wrist revision arthroplasties per hospital in the Netherlands in 2023 (n=124)



© LROI 2024 | W003

Primary wrist arthroplasty

Demographics

Patient characteristics

TABLE Patient characteristics of all patients with a registered primary wrist arthroplasty in the Netherlands in 2023

	Trauma surgery	Plastic surgery	Orthopaedic surgery	Total
N(%)	**6 (6.2)**	**51 (53.2)**	**39 (40.6)**	**96**
Mean age (years) (SD)	55.3 (15.1)	60 (12.7)	59.9 (11.8)	59.7 (12.4)
Age (years) (%)				
<50	17	16	15	16
50-59	33	27	31	29
60-69	50	29	36	33
70-79	0	25	15	20
>80	0	2	3	2
Gender (%)				
Men	33	39	59	47
Women	67	61	41	53
ASA score (%)				
ASA I	0	27	10	20
ASA II	100	55	67	66
ASA III-IV	0	8	23	14
Type of hospital (%)				
General	83	53	95	72
UMC	17	14	5	10
Private	0	33	0	18
Diagnosis (%)				
Osteoarthritis	0	71	46	59
Post-traumatic	83	2	26	18
Rheumatoid arthritis	0	12	21	15
Osteonecrosis	0	2	3	2
Inflammatory arthritis	0	0	0	0
Other	17	4	5	5
Mean BMI (kg/m2) (SD)	28.5 (4.0)	26.7 (4.0)	27.7 (4.3)	27.3 (4.1)
Body Mass Index (kg/m2) (%)				
Underweight (<=18.5)	0	0	0	0
Normal weight (>18.5-25)	17	35	33	36
Overweight (>25-30)	67	33	36	40
Obesity (>30-40)	17	16	31	24
Morbid obesity (>40)	0	0	0	0
Smoking (%)				
No	67	67	87	84
Yes	33	14	13	16

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 and radial stem components in primary wrist arthroplasties in the Netherlands in 2019-2023

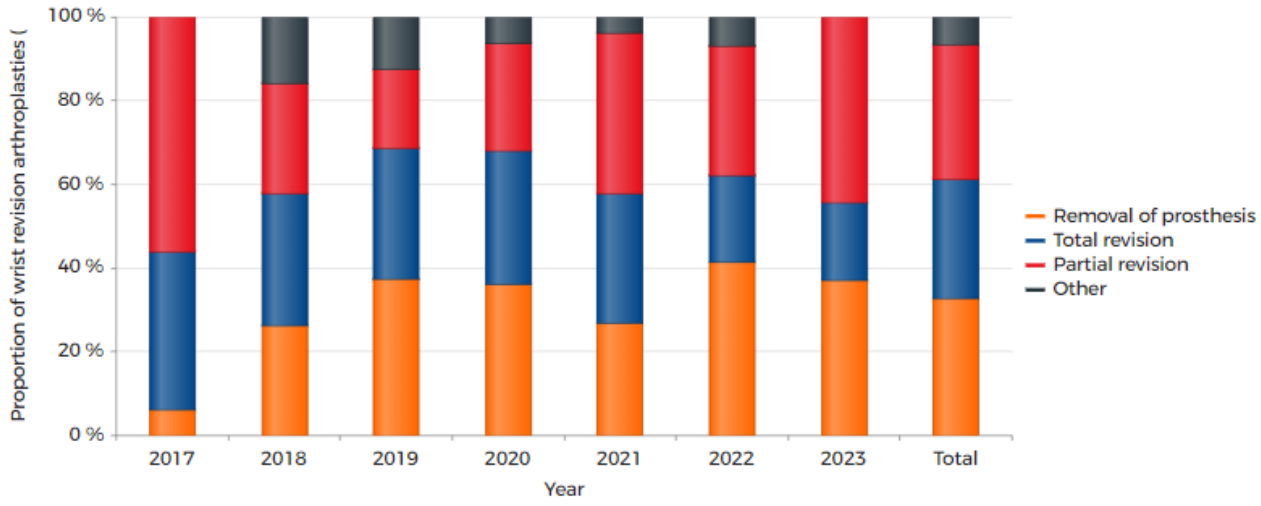
Year	2019	2020	2021	2022	2023
Carpal (n)	**42**	**30**	**23**	**35**	**46**
Carpal name; Proportion (%)					
RCPI	7.14	20.00	26.09	57.14	52.17
REMOTION	0.00	10.00	4.35	8.57	30.43
Motec	4.76	3.33	4.35	8.57	6.52
FREEDOM	83.33	60.00	60.87	25.71	6.52
APSI	2.38	0.00	0.00	0.00	4.35
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Radial stem (n)	**45**	**34**	**30**	**22**	**33**
Radial stem name; Proportion (%)					
Distal radioulnar joint	22.22	23.53	30.00	36.36	48.48
REMOTION	0.00	8.82	6.67	13.64	36.36
FREEDOM	77.78	61.76	60.00	36.36	9.09
Motec	0.00	0.00	3.33	13.64	6.06

© LROI 2024 | W005

Wrist revision arthroplasty

Type of revision

FIGURE Type of revision arthroplasty of wrist revision arthroplasties in the Netherlands in 2017-2023



	2017	2018	2019	2020	2021	2022	2023	Total
Removal of prosthesis	6.25	26.32	37.50	36.17	26.92	41.38	37.04	32.65
Total revision	37.50	31.58	31.25	31.91	30.77	20.69	18.52	28.57
Partial revision	56.25	26.32	18.75	25.53	38.46	31.03	44.44	32.14
Other	0	15.79	12.50	6.38	3.85	6.90	0	6.63
Total (n)	**16**	**19**	**32**	**47**	**26**	**29**	**27**	**196**

© LROI 2024 | W006

Reasons for revision

TABLE Reasons for revision in patients who underwent a wrist revision arthroplasty in the Netherlands in 2017-2023

Year	2017	2018	2019	2020	2021	2022	2023	Total
Wrist revision arthroplasty (n)	**17**	**20**	**32**	**47**	**26**	**30**	**28**	**200**
Reasons for revision; Proportion (%)								
Loosening of carpal component	11.76	25.00	25.00	19.15	34.62	43.33	28.57	27.00
Bone resorption of carpal component						30.00	32.14	
Instability	17.65	25.00	21.88	21.28	23.08	20.00	21.43	21.50
Dislocation	17.65	15.00	9.38	14.89	23.08	16.67	7.14	14.50
Loosening of radial component	5.88	5.00	15.63	17.02	23.08	10.00	10.71	13.50
Bone resorption of radial component						10.00	17.86	
Infection	0.00	5.00	12.50	6.38	0.00	13.33	17.86	9.00
Revision after wrist removal						6.67	10.71	
Implant fracture	17.65	0.00	3.13	6.38	7.69	3.33	10.71	6.50
Peri-prosthetic fracture	5.88	0.00	0.00	0.00	11.54	3.33	3.57	3.00
Loosening of ulnar component	0.00	0.00	0.00	2.13	3.85	6.67	3.57	2.50
Bone resorption of ulnar component							14.29	
Other	29.41	25.00	31.25	27.66	26.92	16.67	7.14	23.50

Please note: One patient may have more than one reason for revision. As such, the total proportion is over 100%.

Please note: Bone resorption of carpal component, bone resorption of radial component, revision after wrist removal and bone resorption of ulnar component were not registered before 2022.

Most frequently registered components

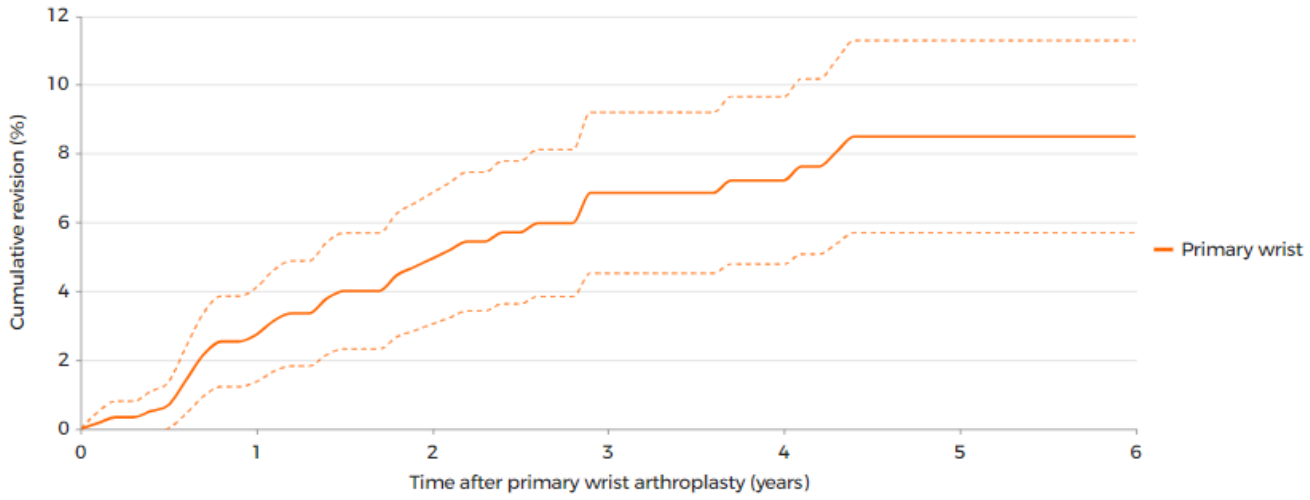
TABLE The most frequently registered carpal and radial stem components in wrist revision arthroplasties in the Netherlands in 2019-2023

Year	2019	2020	2021	2022	2023
Carpal (n)	**7**	**13**	**11**	**7**	**9**
Carpal name; Number (n)					
REMOTION	1	0	1	1	3
FREEDOM	6	10	6	3	3
Motec	0	0	2	1	2
Universal2	0	3	2	2	1
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Radial stem (n)	**7**	**10**	**7**	**3**	**3**
Radial stem name; Number (n)					
REMOTION	1	0	0	0	1
Distal radioulnar joint	2	3	3	1	1
Motec	0	0	1	1	1

Survival

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary wrist arthroplasties in the Netherlands in 2014-2023 (n=600)



© LROI 2024 | W009A

	1yr	3yr	5yr	6yr
Primary wrist	2.54 (1.23-3.86)	6.86 (4.52-9.19)	8.49 (5.70-11.28)	8.49 (5.70-11.28)

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

CI: confidence interval.

© LROI 2024 | W009B

In 2017-2023, 20 (3.3%) primary wrist arthroplasties were implanted in patients who died within six years after the primary procedure.

Finger arthroplasty

Numbers

Registered procedures

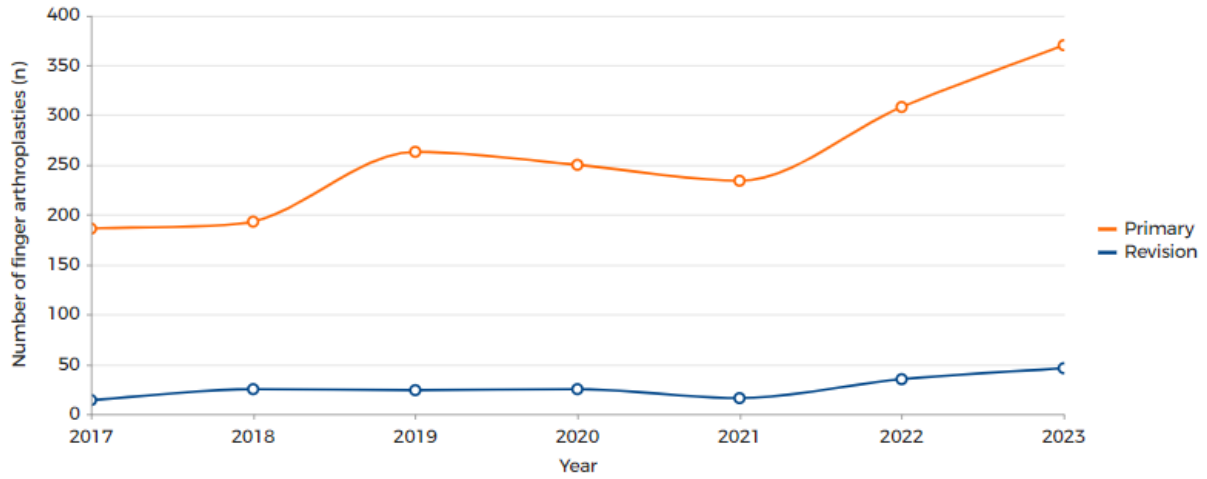
TABLE Number of registered finger arthroplasties per year of surgery (2017-2023) in the LROI in April 2024

Year of surgery	Total finger arthroplasty	Revision arthroplasty	Total
2016	14	0	**14**
2017	186	14	**200**
2018	193	25	**218**
2019	263	24	**287**
2020	250	25	**275**
2021	234	16	**250**
2022	308	35	**343**
2023	370	46	**416**
Total (n)	**1,818**	**185**	**2,003**

© LROI 2024 | F001

Type of procedure

FIGURE Number of primary finger arthroplasties and finger revision arthroplasties registered in the LROI in the Netherlands in 2016-2023

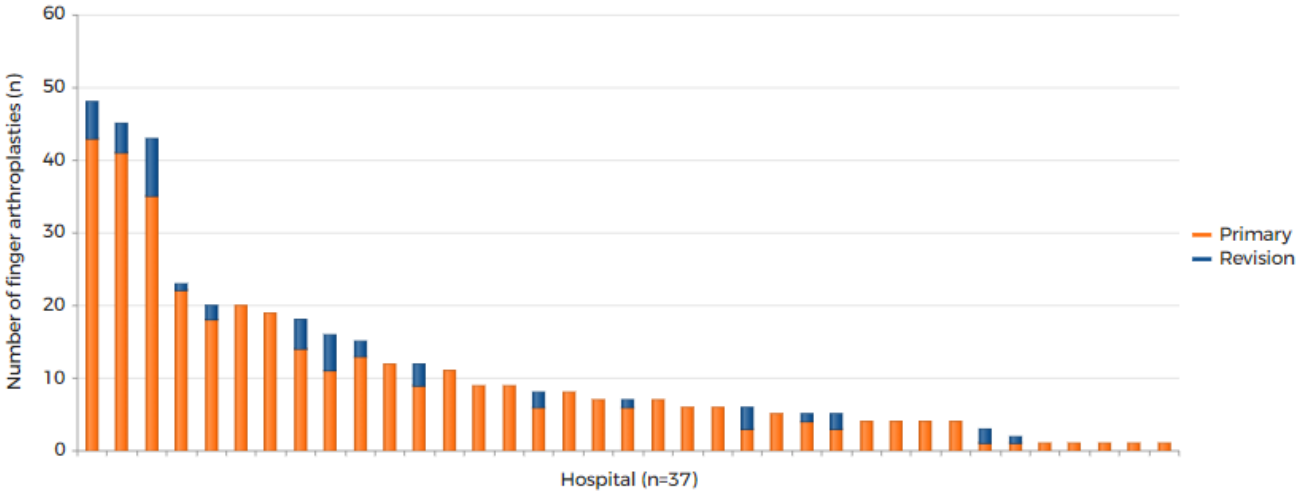


	2017	2018	2019	2020	2021	2022	2023	Total
Primary	186	193	263	250	234	308	370	**1,804**
Revision	14	25	24	25	16	35	46	**185**
Total (n)	**200**	**218**	**287**	**275**	**250**	**343**	**416**	**1,989**

© LROI 2024 | F002

Type of procedure per hospital

FIGURE Number of primary finger arthroplasties and finger revision arthroplasties per hospital in the Netherlands in 2023 (n=416)



© LROI 2024 | F003

Type of primary finger prosthesis

TABLE Type of primary finger prosthesis in primary finger arthroplasties in the Netherlands in 2023 (n=370)

Finger joint	Thumb (n)	Index (n)	Middle (n)	Ring (n)	Small (n)	Total (n)
CMC	37	n.a.	n.a.	n.a.	n.a.	37
MCP	3	39	29	12	11	94
PIP	n.a.	39	83	82	32	236
DIP	0	1	2	0	0	3
Total (n)	**40**	**79**	**114**	**94**	**43**	**370**

© LROI 2024 | F004

Primary finger arthroplasty

Demographics

Patient characteristics by specialism

TABLE Patient characteristics of all patients with a registered primary finger arthroplasty in the Netherlands in 2023

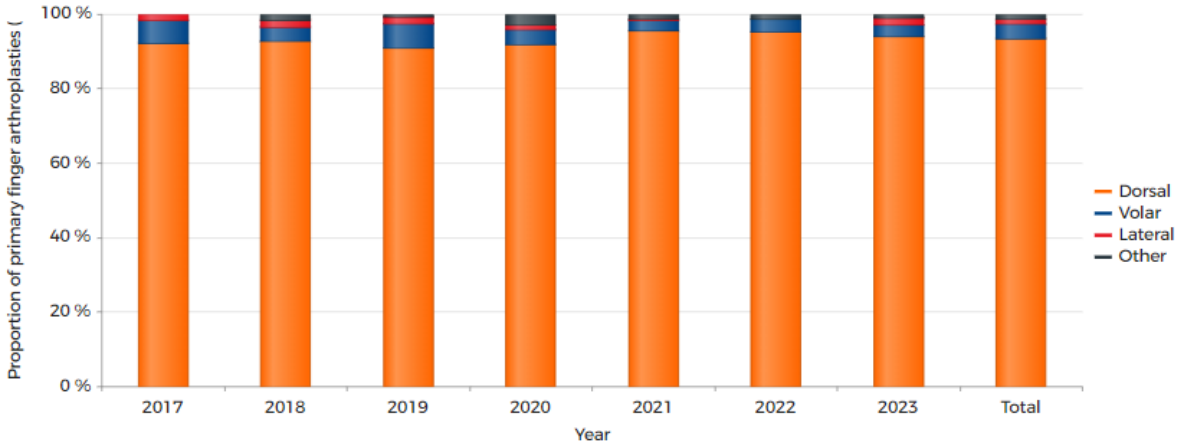
	Plastic surgery	Orthopaedic surgery	Total
N(%)	**265 (72.4)**	**94 (25.6)**	**370**
Mean age (years) (SD)	63 (12.0)	65.6 (9.0)	63.9 (11.3)
Age (years) (%)			
<50	12	2	9
50-59	19	27	21
60-69	37	36	36
70-79	28	31	29
>80	4	4	4
Gender (%)			
Men	29	26	28
Women	71	74	72
ASA score (%)			
ASA I	21	11	18
ASA II	61	67	65
ASA III-IV	14	22	16
Type of hospital (%)			
General	37	94	53
UMC	6	4	6
Private	57	2	41
Diagnosis (%)			
Osteoarthritis	60	69	78
Post-traumatic	2	4	4
Rheumatoid arthritis	9	26	16
Osteonecrosis	0	0	0
Inflammatory arthritis	0	0	0
Other	2	1	2
Mean BMI (kg/m2) (SD)	26.9 (4.7)	26.8 (4.6)	26.8 (4.7)
Body Mass Index (kg/m2) (%)			
Underweight (<=18.5)	1	4	2
Normal weight (>18.5-25)	34	36	38
Overweight (>25-30)	36	32	38
Obesity (>30-40)	17	27	21
Morbid obesity (>40)	1	0	1
Smoking (%)			
No	80	90	89
Yes	11	10	11

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

Surgery and prosthesis

Surgical approach

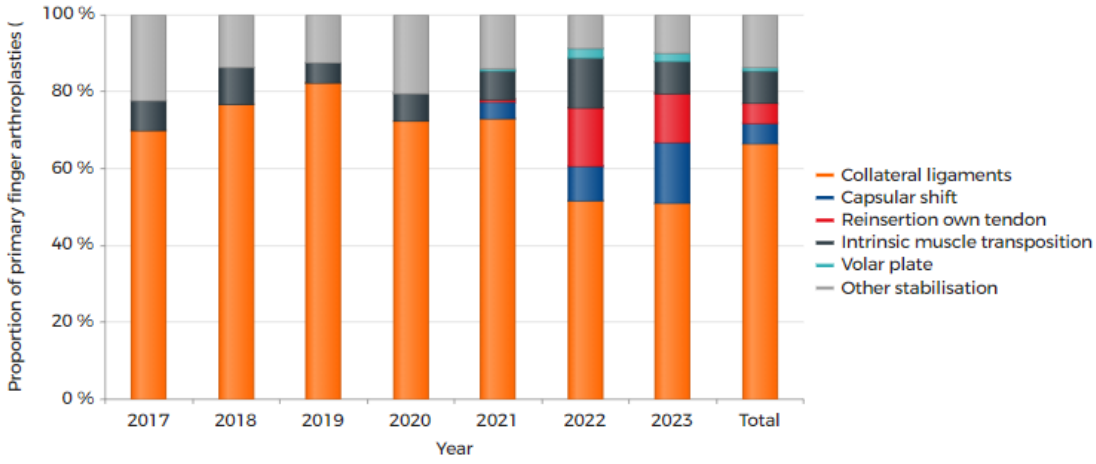
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary finger arthroplasty in the Netherlands in 2017-2023



	2017	2018	2019	2020	2021	2022	2023	Total
Dorsal	92.05	92.67	90.83	91.95	95.63	95.06	93.85	93.25
Volar	6.25	3.66	6.67	3.81	2.62	3.42	3.24	4.14
Lateral	1.70	2.09	1.67	1.27	0.44	0	1.94	1.28
Other	0	1.57	0.83	2.97	1.31	1.52	0.97	1.34
Total (n)	**176**	**191**	**240**	**236**	**229**	**263**	**309**	**1,644**

Soft tissue stabilisation

FIGURE Trend (proportion [%] per year) in type of stabilisation in primary finger arthroplasty in the Netherlands in 2017-2023



	2017	2018	2019	2020	2021	2022	2023	Total
Collateral ligaments	70	76.61	82.16	72.19	72.88	51.72	51.05	66.42
Capsular shift	0	0	0	0	4.52	8.87	15.61	5.26
Reinsertion own tendon	0	0	0	0	0.56	15.27	12.66	5.18
Intrinsic muscle transposition	7.50	9.68	5.41	7.28	7.34	12.81	8.44	8.44
Volar plate	0	0	0	0	0.56	2.46	2.11	0.92
Other stabilisation	22.50	13.71	12.43	20.53	14.12	8.87	10.13	13.78
Total (n)	**120**	**124**	**185**	**151**	**177**	**203**	**237**	**1,197**

Please note: Capsular shift, reinsertion own tendon and volar plate were not registered before 2022.

Most frequently registered components

TABLE The most frequently registered proximal components in primary finger arthroplasties in the Netherlands in 2019-2023

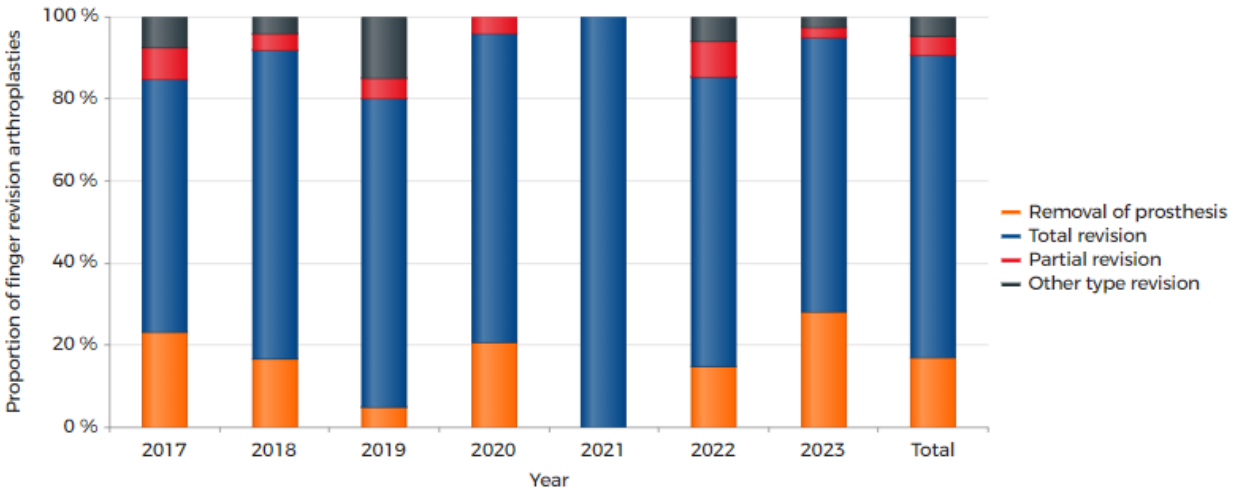
Year	2019	2020	2021	2022	2023
Proximal component (n)	**206**	**168**	**176**	**244**	**297**
Proximal name; Proportion (%)					
Silicone PIP	47.57	52.38	60.80	39.34	29.63
KeriFlex PIP	0.00	0.00	0.00	1.64	17.85
MCP Implant	8.25	14.29	7.39	20.49	16.50
SWANSON	4.85	5.95	7.95	11.48	15.49
KeriFlex MCP	0.00	0.00	0.00	2.87	6.40
KeriMedical TOUCH	0.00	0.00	0.00	1.23	5.05
Cap Flex PIP prothese	2.91	0.60	2.27	1.64	3.37
Pyrocardan	0.97	1.19	1.14	1.23	1.68
Silicone II MCP	0.49	1.19	0.00	2.05	1.68
Thumb CMC implant	0.00	1.79	1.14	1.64	1.01

© LROI 2024 | F008

Finger revision arthroplasty

Type of revision

FIGURE Type of revision arthroplasty of finger revision arthroplasties in the Netherlands in 2017-2023



	2017	2018	2019	2020	2021	2022	2023	Total
Removal of prosthesis	23.08	16.67	5	20.83	0	14.71	28.21	17.06
Total revision	61.54	75	75	75	100	70.59	66.67	73.53
Partial revision	7.69	4.17	5	4.17	0	8.82	2.56	4.71
Other type revision	7.69	4.17	15	0	0	5.88	2.56	4.71
Total (n)	**13**	**24**	**20**	**24**	**16**	**34**	**39**	**170**

© LROI 2024 | F009

Reasons for revision

TABLE Reasons for revision in patients who underwent a finger revision arthroplasty in the Netherlands in 2017-2023

Year	2017	2018	2019	2020	2021	2022	2023	Total
Finger revision arthroplasty (n)	**14**	**25**	**24**	**25**	**16**	**35**	**46**	**185**
Reasons for revision; Proportion (%)								
Implant fracture	0.00	36.00	37.50	28.00	56.25	42.86	36.96	35.68
Instability	0.00	36.00	29.17	20.00	37.50	31.43	6.52	22.16
Dislocation	28.57	20.00	25.00	8.00	31.25	28.57		
Malalignment						20.00	17.39	
Bone resorption of proximal component	14.29	4.00	20.83	0.00	12.50	14.29	0.00	8.11
Bone resorption of distal component	0.00	4.00	20.83	4.00	6.25	14.29	0.00	7.03
Infection	14.29	0.00	25.00	4.00	0.00	2.86		
Loosening of proximal component	28.57	0.00	20.83	4.00	0.00	2.86	2.17	6.49
Loosening of distal component	0.00	0.00	0.00	4.00	0.00	0.00	0.00	6.49
Revision after finger removal						2.86	2.17	
Periprosthetic fracture	7.14	0.00	0.00	0.00	0.00	0.00		
Other	57.14	20.00	33.33	24.00	43.75	8.57	26.09	26.49

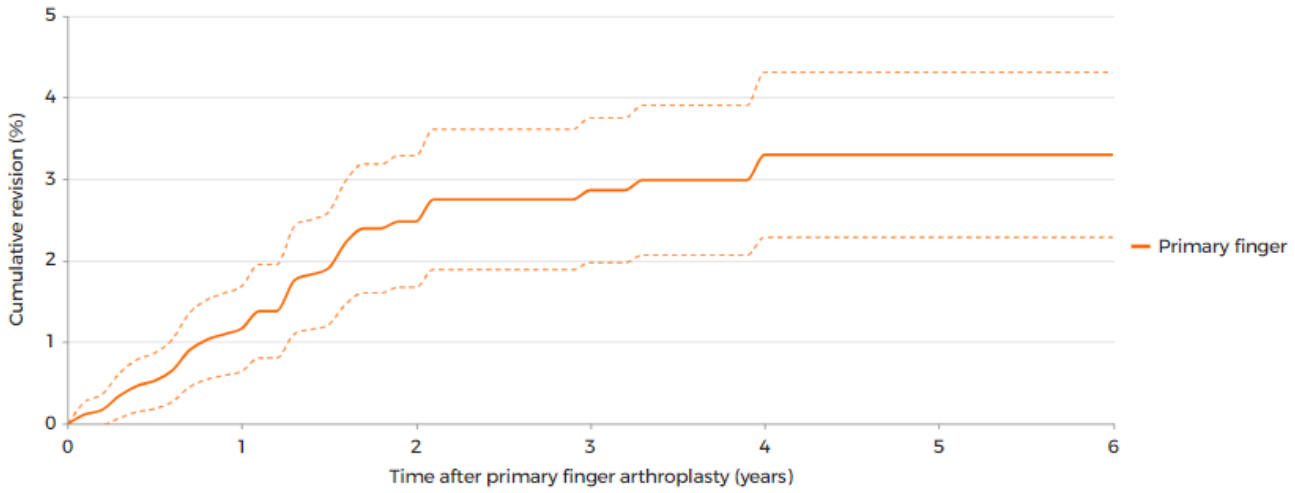
Please note: One patient may have more than one reason for revision. As such, the total proportion is over 100%.

Please note: Malalignment and revision after finger removal were not registered before 2022. Infection, dislocation and periprosthetic fracture were not registered since 2022.

Survival

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary finger arthroplasties in the Netherlands in 2014-2023 (n=1,798)



	1yr	3yr	5yr	6yr
Primary finger	1.10 (0.59-1.60)	2.75 (1.89-3.61)	3.29 (2.28-4.31)	3.29 (2.28-4.31)

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

CI: confidence interval.

In 2017-2023, 57 (3.2%) primary finger arthroplasties were implanted in patients who died within six years after the primary procedure.

Clubfoot

Numbers

Registered treatments

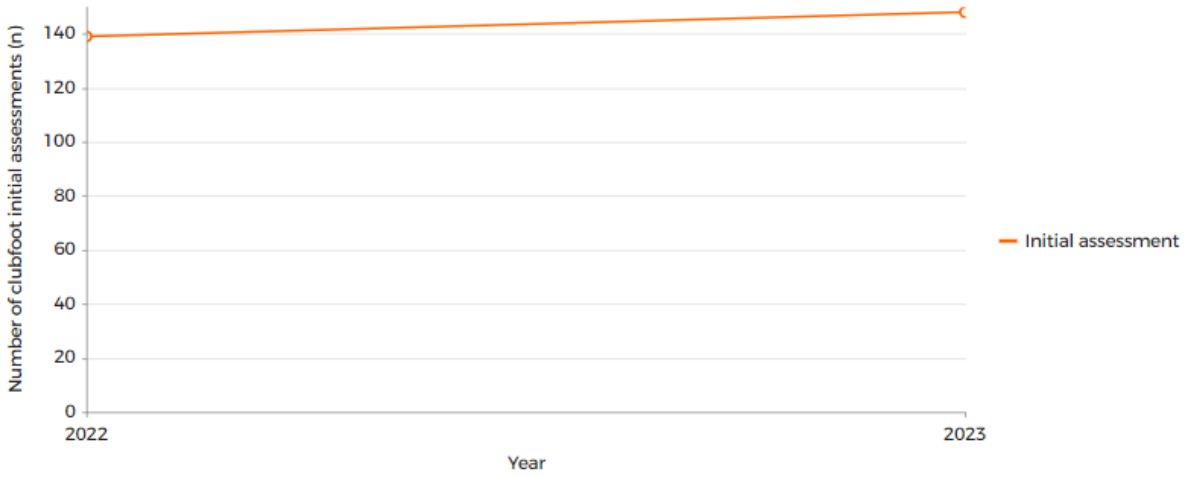
TABLE Number of registered clubfoot treatments per year (2022-2023) in the LROI in Augustus 2024

Year of treatment	Initial assessment	Termination of cast treatment	Relapse	Follow up at 1 year	Total
2022	139	116	4	25	**284**
2023	148	129	14	80	**371**
Total (n)	**287**	**245**	**18**	**105**	**655**

© LROI 2024 | C001

Initial assessments per year

FIGURE Number of patients with initial assessment clubfoot registered in the LROI in the Netherlands in 2022-2023

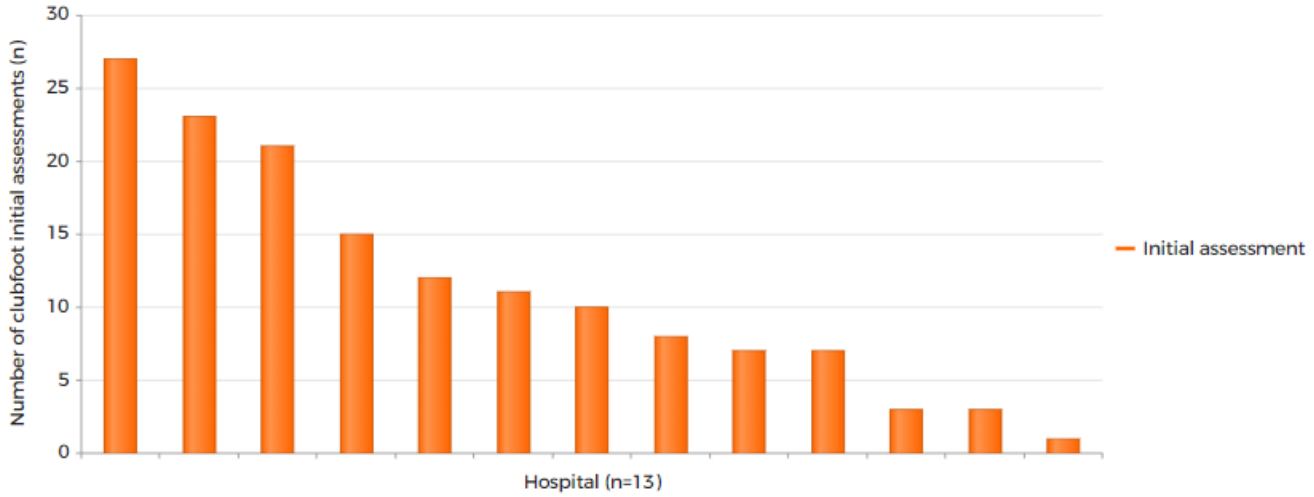


	2022	2023
Initial assessment	139	148
Total (n)	**139**	**148**

© LROI 2024 | C002

Initial assessments per hospital

FIGURE Number of patients with initial assessment clubfoot per hospital in the Netherlands in 2023 (n=148)



© LROI 2024 | C003

Initial assessment

Patient and treatment characteristics

Demographics

TABLE Patient and treatment characteristics of patients with a registered initial assessment clubfoot by treatment year in the Netherlands in 2022-2023

	2022	2023	Total
n	**139**	**148**	**287**
Gender (%)			
Male	72	70	71
Female	28	30	29
Age (days)			
Mean (SD)	11 (14)	12 (13)	12 (13)
Median (IQR)	7 (5-11)	9 (6-13)	8 (5-12)
Treatment started within 1 week (%)	58	35	54
Treatment started within 2 weeks (%)	83	82	83
Bilateral (%)	47	43	45

© LROI 2024 | C004

Gender

FIGURE Gender of patients with a registered initial assesment clubfoot in the Netherlands in 2023

Gender	Number (n)	Proportion (%)
Female	44	29.73
Male	104	70.27

© LROI 2024 | C005

Treatment within 1 week

FIGURE Percentage of patients with a registered initial assesment clubfoot who began treatment within one week in the Netherlands in 2023

Treatment started within 1 week	Number (n)	Proportion (%)
No	96	64.86
Yes	52	35.14

© LROI 2024 | C006

Treatment within 2 weeks

FIGURE Percentage of patients with a registered initial assesment clubfoot who began treatment within two weeks in the Netherlands in 2023

Treatment started within 2 weeks	Number (n)	Proportion (%)
No	27	18.24
Yes	121	81.76

© LROI 2024 | C007

Affected side

FIGURE Affected side of patients with a registered initial assesment clubfoot in the Netherlands in 2023

Affected side	Number (n)	Proportion (%)
Left	42	28.38
Right	43	29.05
Right and left	63	42.57

© LROI 2024 | C008

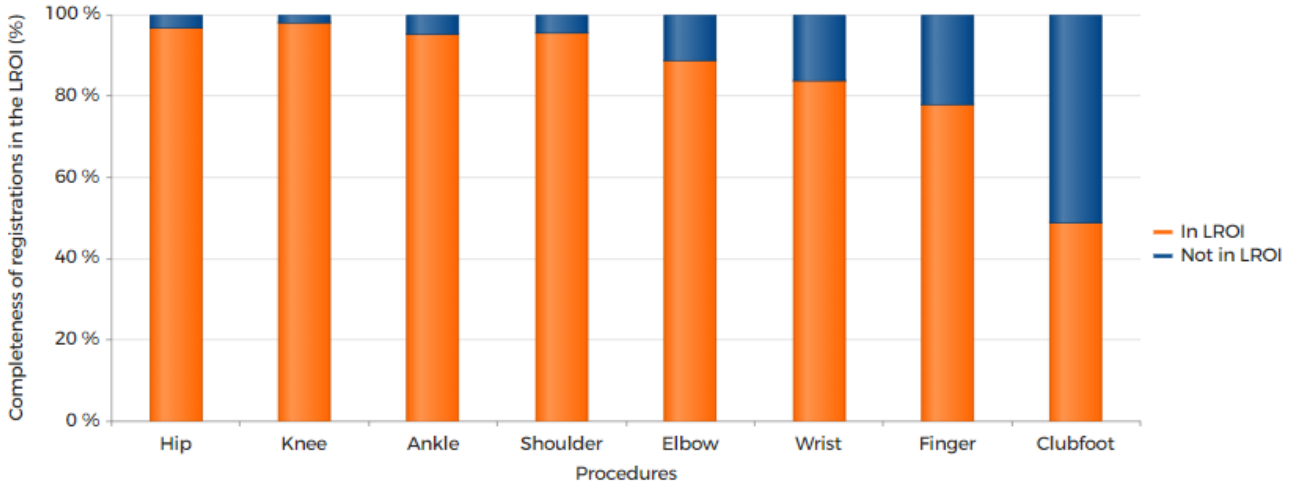
Data quality

Completeness

Coverage and completeness

Overall completeness per arthroplasty

FIGURE Completeness (proportion [%] per procedure) of the registration of procedures in the LROI in 2023



	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger	Clubfoot
In LROI	96.60	97.90	95.10	95.50	88.60	83.90	77.80	48.80
Not in LROI	3.40	2.10	4.90	4.50	11.40	16.10	22.20	51.20
Total (n)	**45,976**	**38,690**	**183**	**4,530**	**219**	**118**	**446**	**303**

Please note: Hip registrations include primary total hip arthroplasties, primary hip hemiarthroplasties and hip revision arthroplasties.

Please note: Completeness refers to the number of registered arthroplasties (orthopaedic, trauma and plastic surgery) in the LROI as of September 2024, compared to the total number of arhtroplasties performed in 2023 (based on the hospital information system). This pertains only to hospitals that submitted data for comparison.

Please note: Five orthopaedic hospitals, three trauma surgery hospitals, and seven plastic surgery hospitals did not provide hospital information system data for comparison.

Completeness per year

TABLE Completeness (proportion [%] per procedure) of the registration of procedures in the LROI in 2023-2023

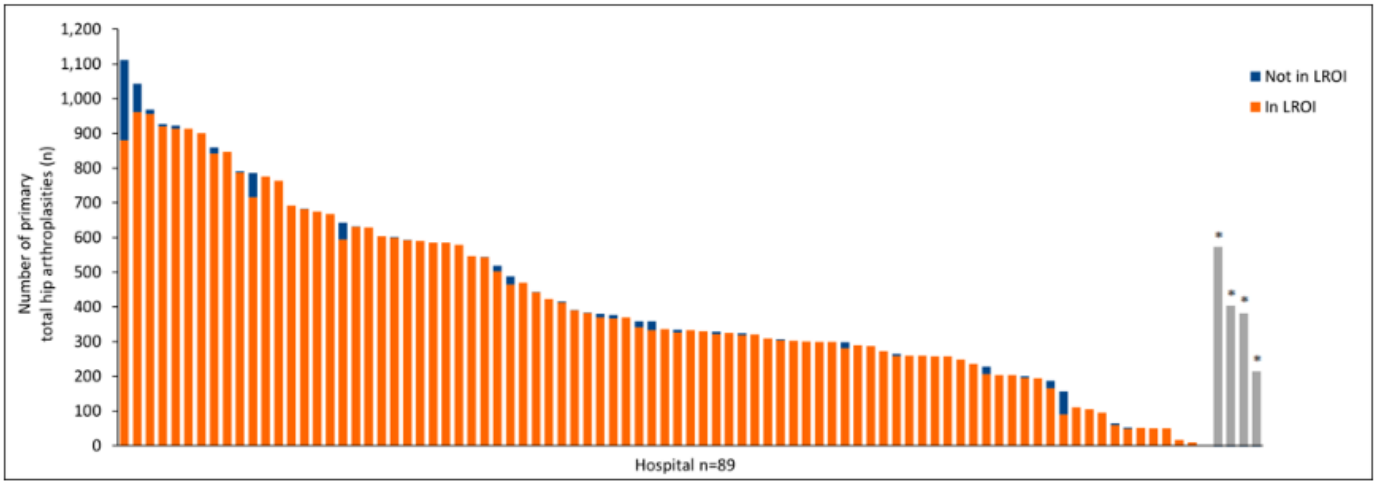
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Hip arthroplasties											
Primary total hip arthroplasties	97	96	98	99	99	99	99	99	99	99	98
Primary hip hemiarthroplasties	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	92	89
Primary hip hemiarthroplasties (orthopaedic surgeon)	71	84	88	95	96	96	94	97	96	n.a.	n.a.
Primary hip hemiarthroplasties (trauma surgeon)	n.a.	n.a.	n.a.	50	64	65	63	68	74	n.a.	n.a.
Hip revision arthroplasties	88	93	97	97	98	97	97	98	98	97	99
Knee arthroplasties											
Primary knee arthroplasties	95	96	98	99	100	99	99	99	97	99	98
Knee revision arthroplasties	90	93	98	98	98	97	97	98	97	98	98
Ankle arthroplasties											
Primary ankle arthroplasties	n.a.	80	91	92	100	98	98	95	95	96	95
Ankle revision arthroplasties	n.a.	55	67	94	87	83	55	95	96	95	95
Shoulder arthroplasties											
Primary shoulder arthroplasties	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	97	96
Primary shoulder arthroplasties (orthopaedic surgeon)	n.a.	78	94	94	98	91	96	96	97	n.a.	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.	n.a.
Shoulder revision arthroplasties	n.a.	74	90	92	90	78	91	93	79	95	94
Elbow arthroplasties											
Primary elbow arthroplasties	n.a.	70	85	88	91	89	85	92	89	85	88
Elbow revision arthroplasties	n.a.	55	86	93	87	85	83	91	78	87	90
Wrist arthroplasties											
Primary wrist arthroplasties	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	59	85
Primary wrist arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	71	29	55	70	73	n.a.	n.a.
Primary wrist arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	64	62	50	56	75	n.a.	n.a.
Wrist revision arthroplasties	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	85	79
Wrist revision arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	18	83	77	100	93	n.a.	n.a.
Wrist revision arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	25	50	50	86	75	n.a.	n.a.
Finger arthroplasties											
Primary finger arthroplasties	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	60	77
Primary finger arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	53	63	66	65	81	n.a.	n.a.
Primary finger arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	67	68	60	82	84	n.a.	n.a.
Finger revision arthroplasties	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	100	100
Finger revision arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	17	100	90	41	83	n.a.	n.a.
Finger revision arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	24	40	57	67	100	n.a.	n.a.
Clubfoot											
Initial assessment	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	50	49

Please note: Completeness refers to the number of registered arthroplasties (orthopaedic, trauma and plastic surgery) in the LROI as of September 2024, compared to the total number of arhtroplasties performed in 2023 (based on the hospital information system). This pertains only to hospitals that submitted data for comparison.
Please note: Five orthopaedic hospitals, three trauma surgery hospitals, and seven plastic surgery hospitals did not provide hospital information system data for comparison.
Please note: Since 2022, completeness is no longer reported separately by specialism. The completeness of hip, shoulder, and elbow arthroplasties includes both orthopaedic and trauma surgery. Wrist and finger arthroplasties include orthopaedic, trauma, and plastic surgery.
Please note: Ankle, shoulder and elbow arthroplasties were registered since 2014; wrist and finger arthroplasties were registered since 2016; clubfoot treatments were registered since October 2021.

The completeness of number of registered procedures 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

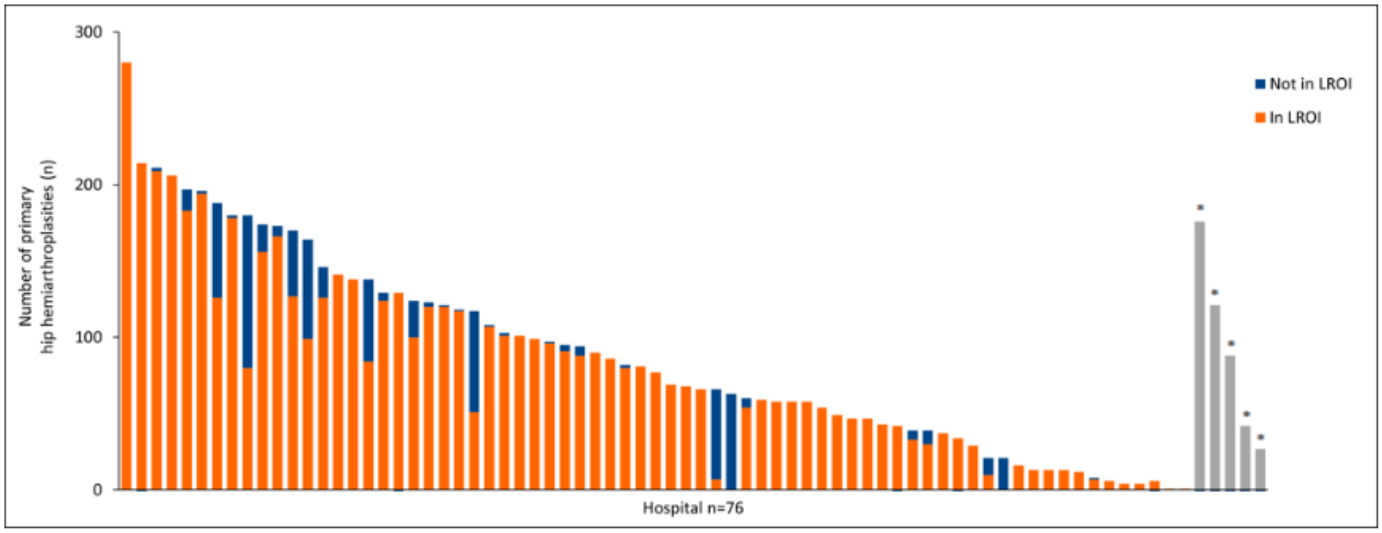
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary total hip arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness primary hip hemiarthroplasties per hospital

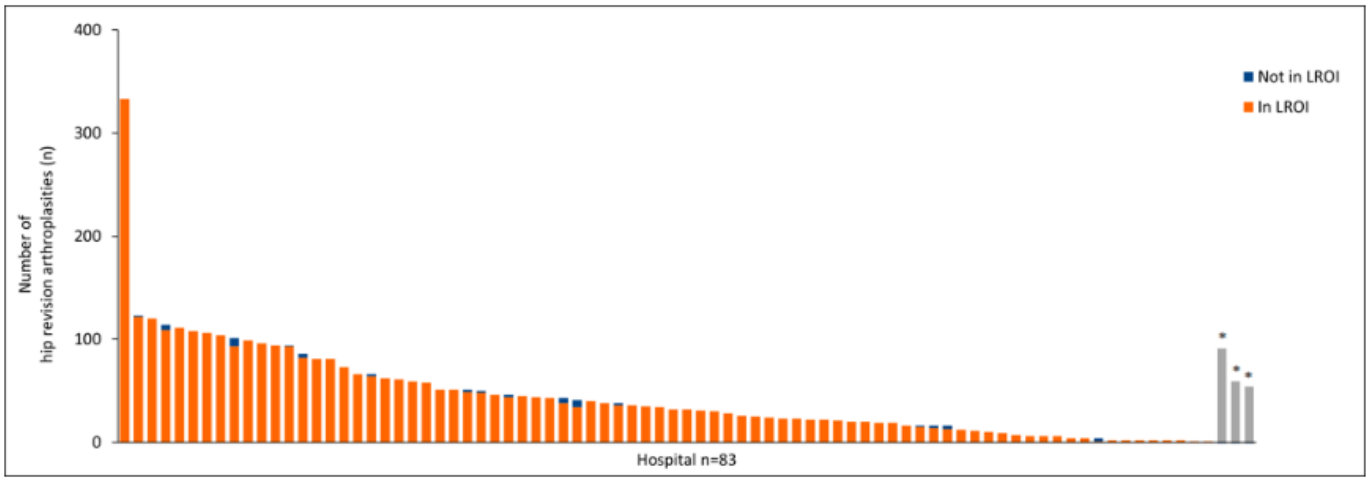
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary hip hemiarthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness hip revision arthroplasties per hospital

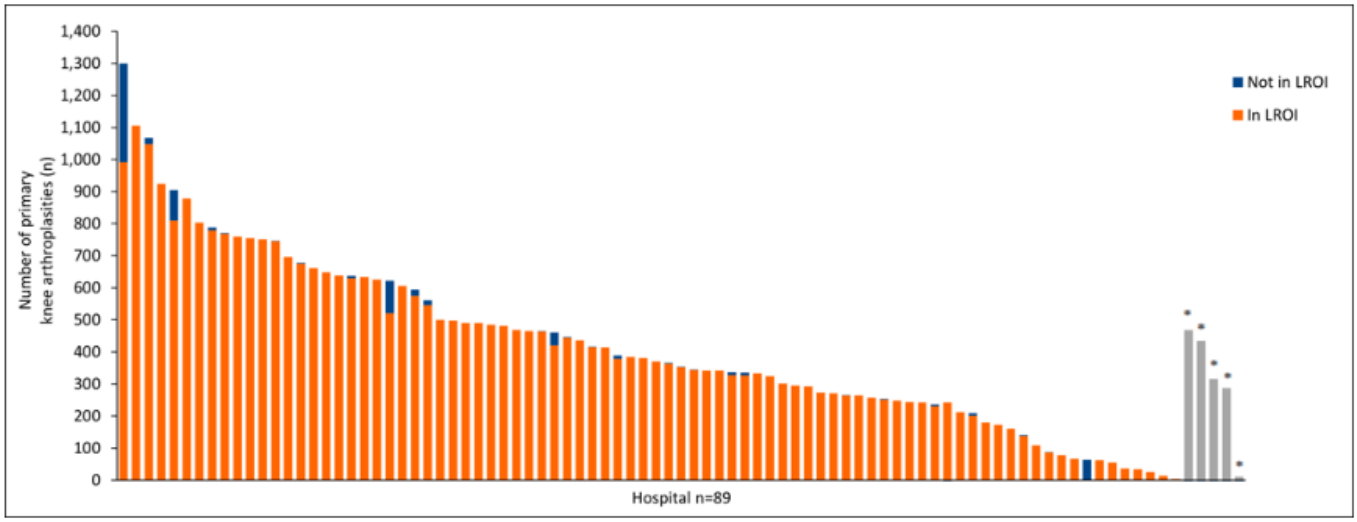
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for hip revision arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness primary knee arthroplasties per hospital

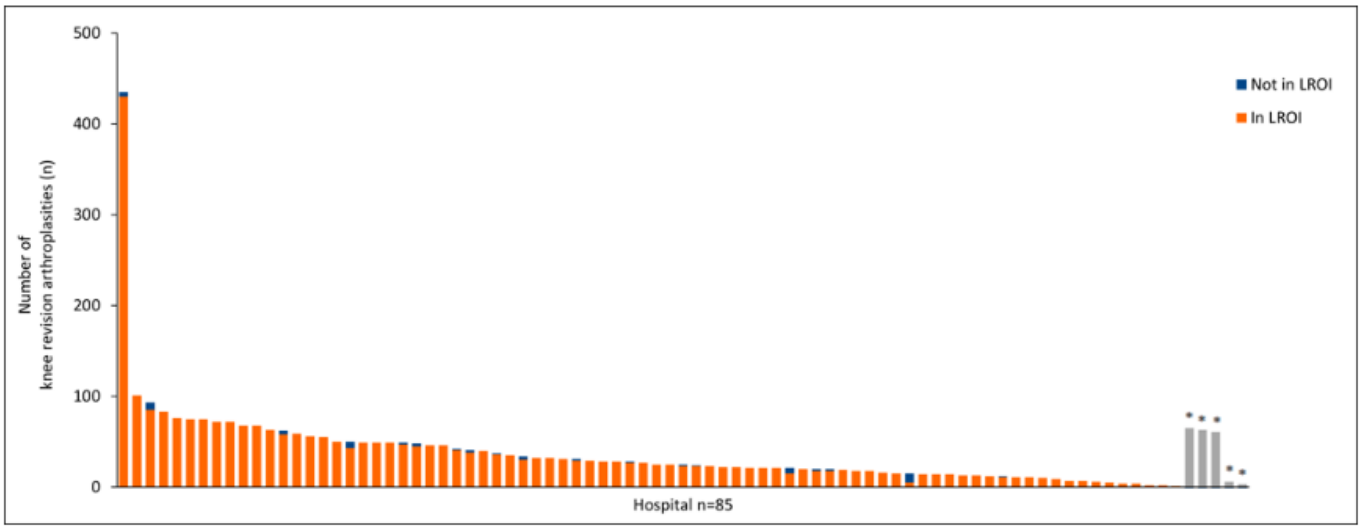
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary knee arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness knee revision arthroplasties per hospital

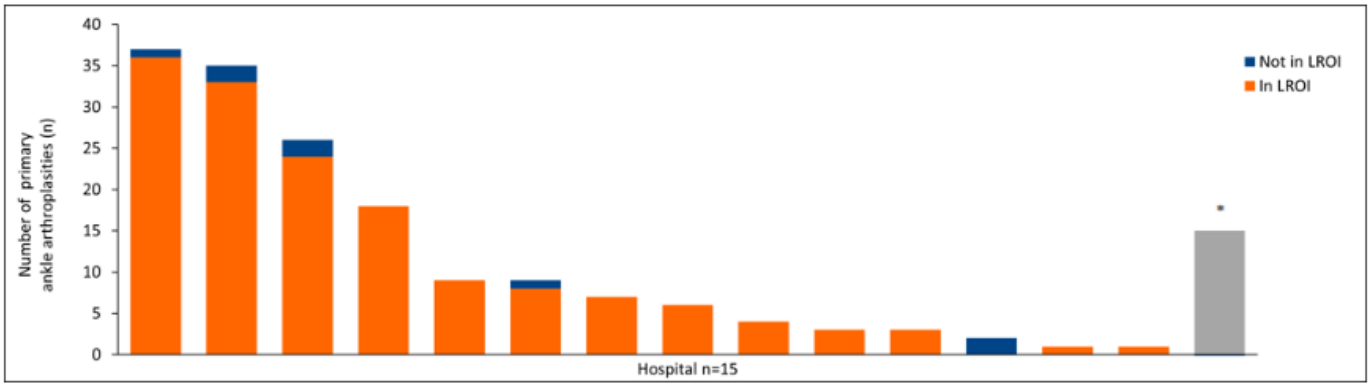
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for knee revision arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness primary ankle arthroplasties per hospital

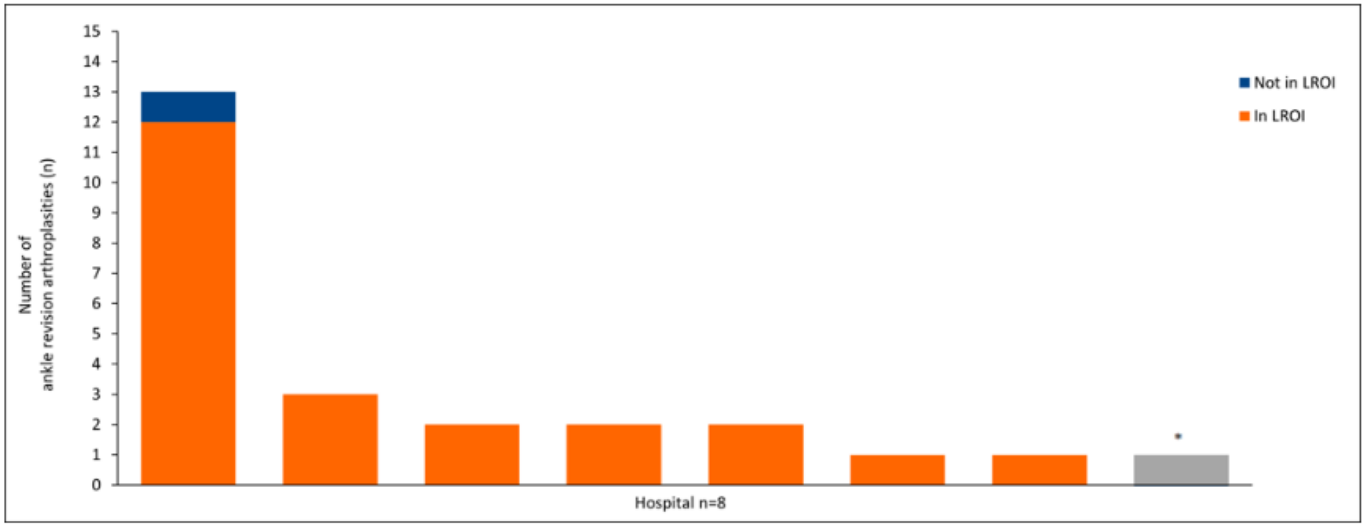
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary ankle arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness ankle revision arthroplasties per hospital

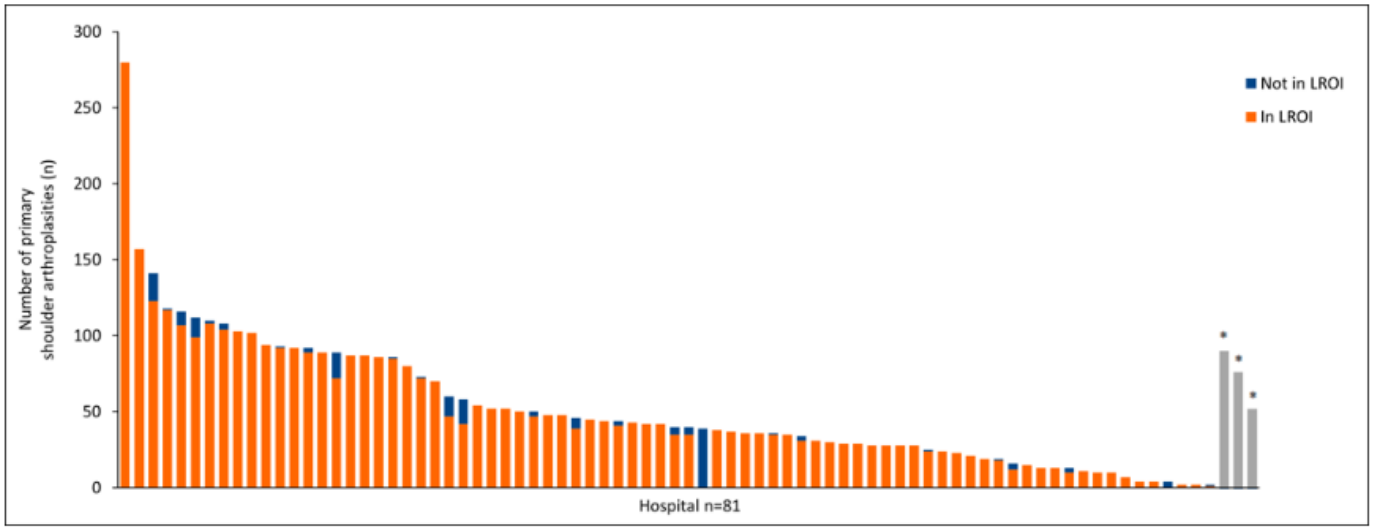
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for ankle revision arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness primary shoulder arthroplasties per hospital

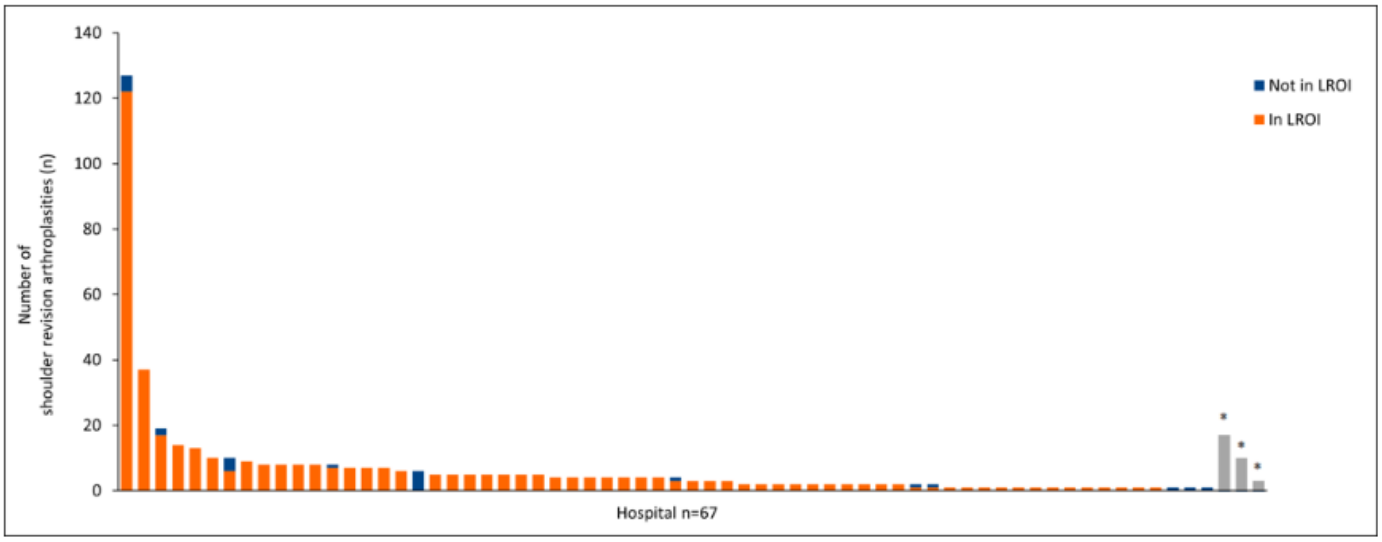
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary shoulder arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness shoulder revision arthroplasties per hospital

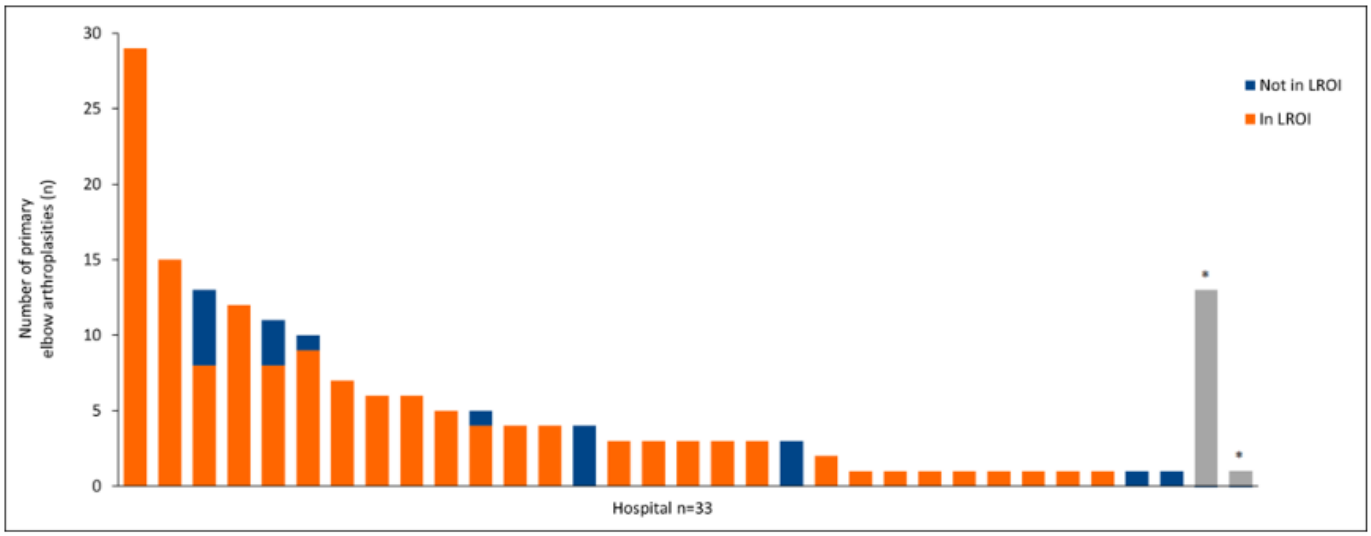
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for shoulder revision arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness primary elbow arthroplasties per hospital

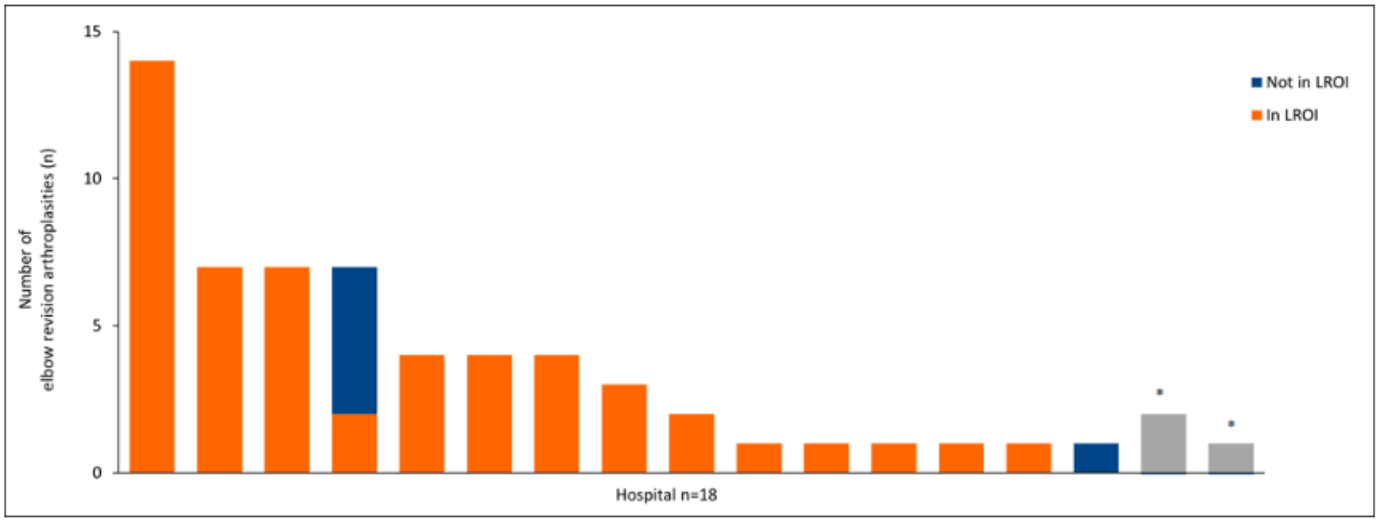
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary elbow arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness elbow revision arthroplasties per hospital

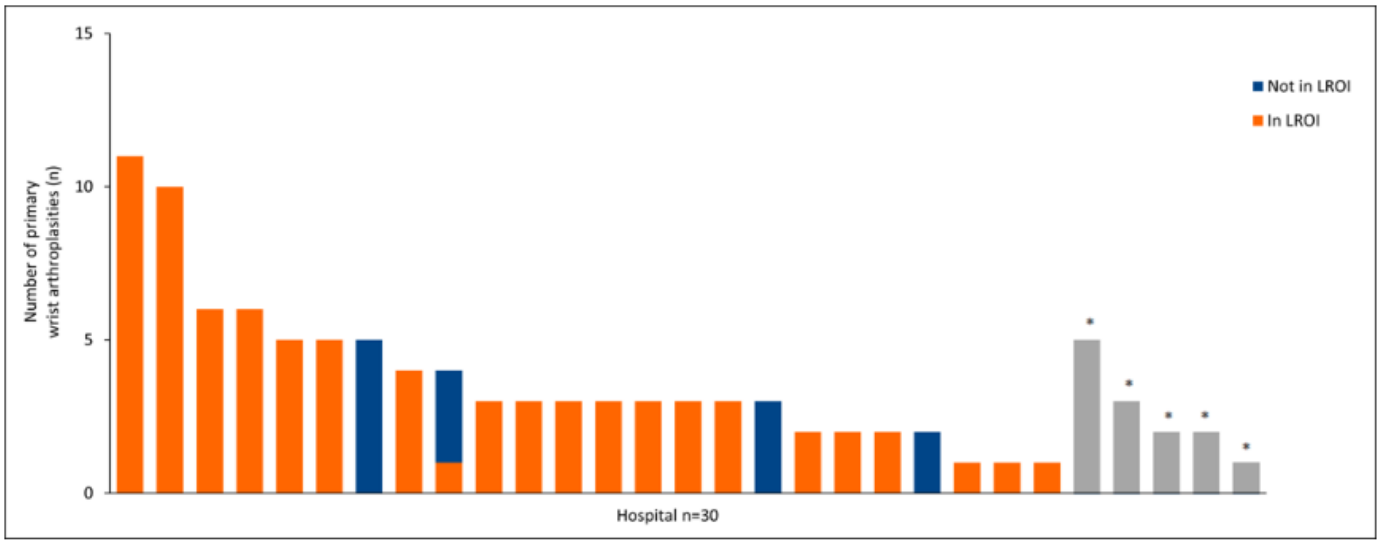
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for elbow revision arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness primary wrist arthroplasties per hospital

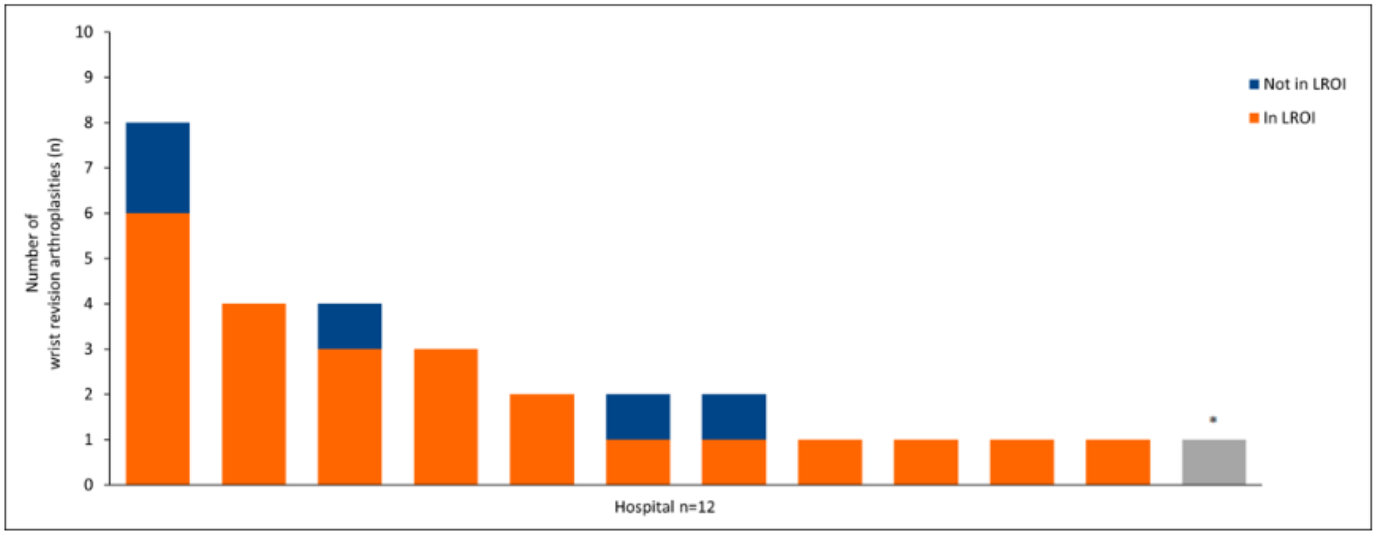
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary wrist arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness wrist revision arthroplasties per hospital

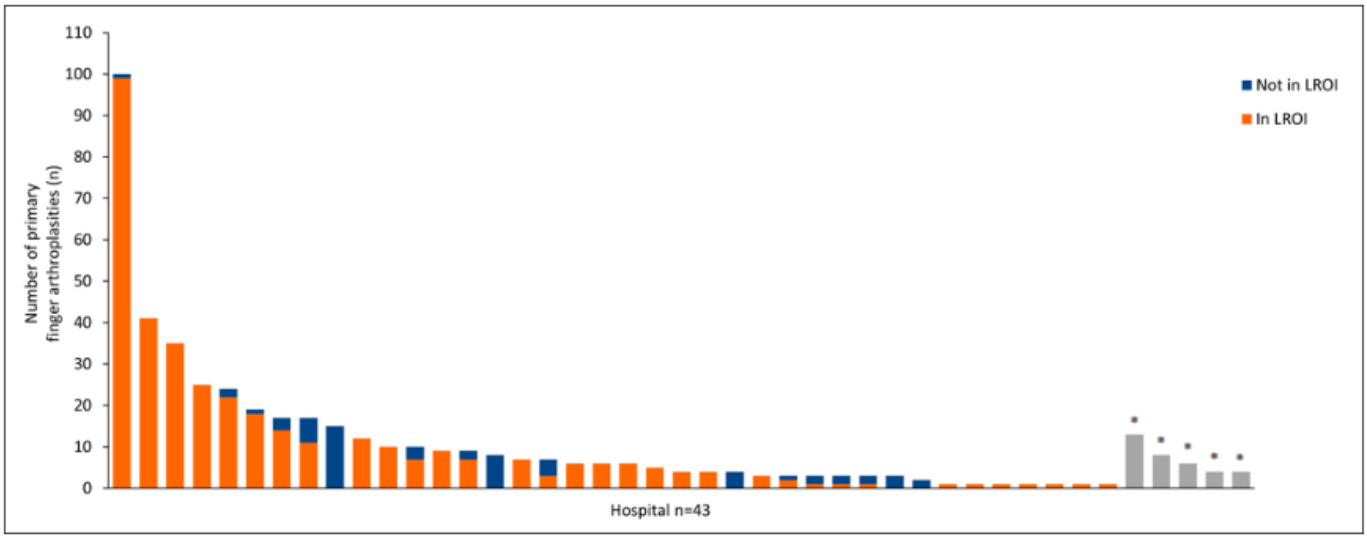
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for wrist revision arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness primary finger arthroplasties per hospital

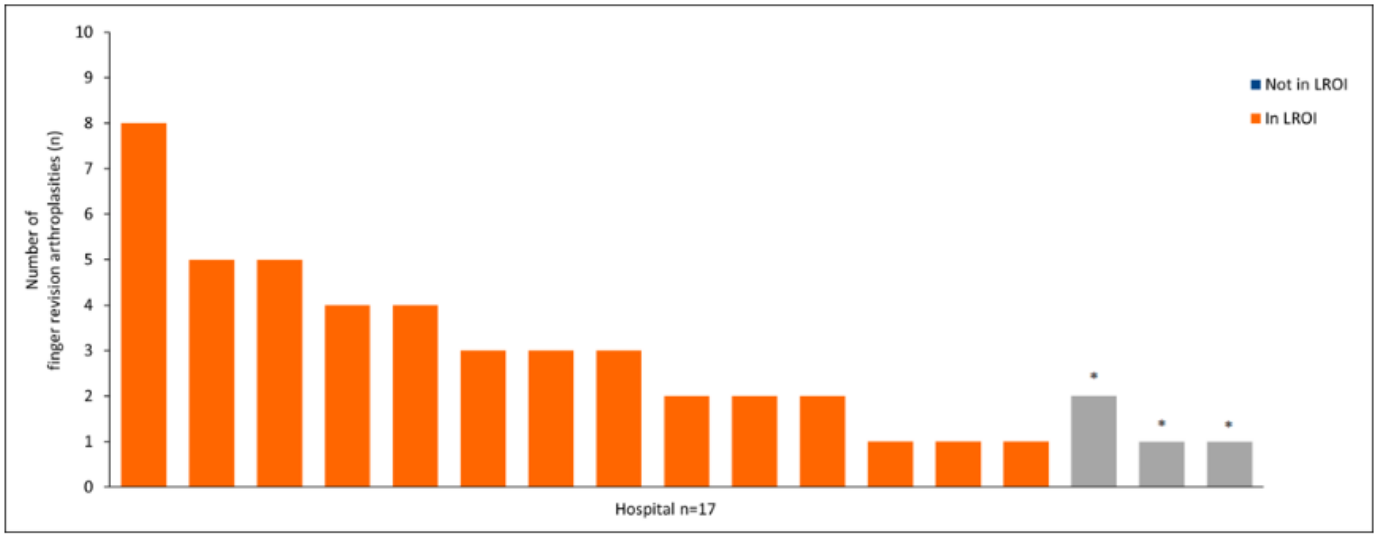
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary finger arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness finger revision arthroplasties per hospital

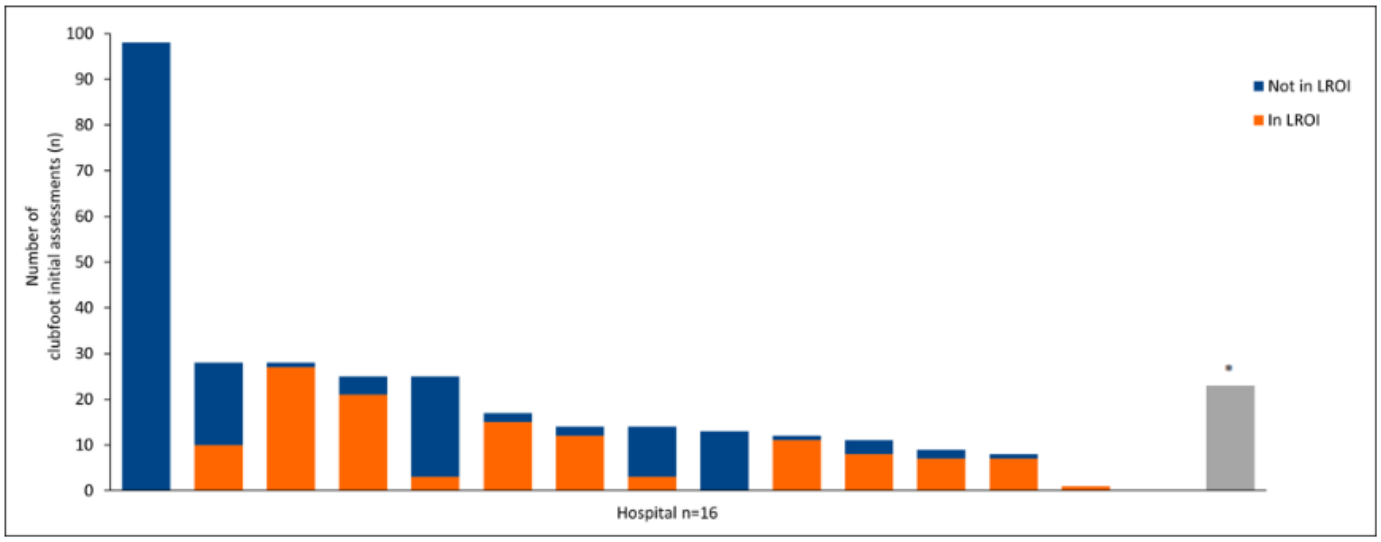
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for finger revision arthroplasties in 2023



* No data provided for comparison by the hospital account

Completeness Clubfoot initial assessments per hospital

Number of treatments performed (based on the hospital information system) and the number of registered treatments in the LROI per hospital account for clubfoot initial assessments in 2023

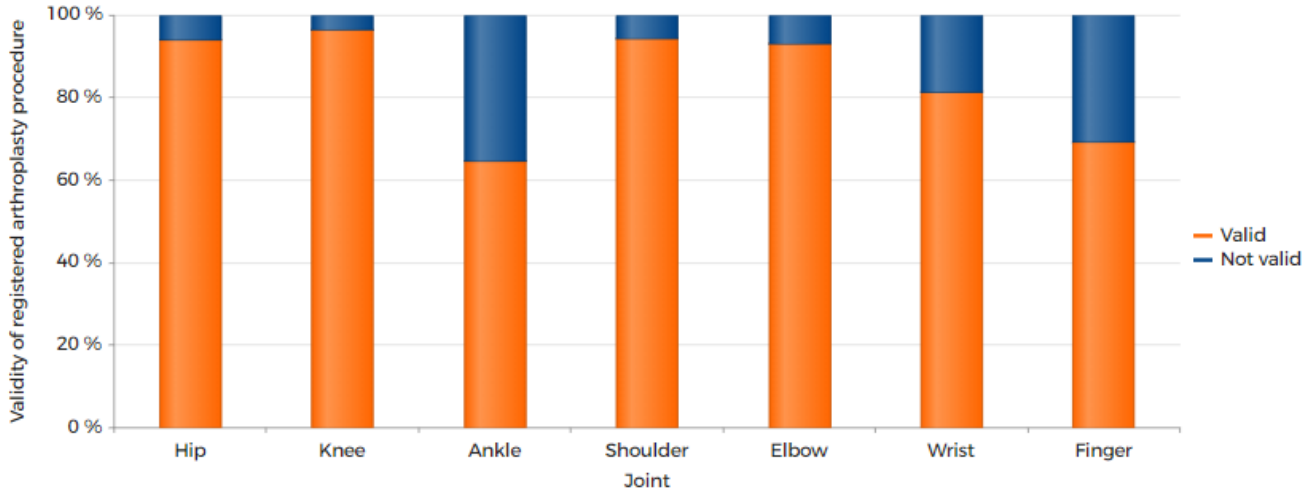


* No data provided for comparison by the hospital

Validity

Overall validity

FIGURE Validity (proportion [%] per procedure) of the registration of procedures in the LROI in 2023



	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Valid	94.02	96.55	64.74	94.34	93.15	81.45	69.23
Not valid	5.98	3.45	35.26	5.66	6.85	18.55	30.77
Total (n)	**46,918**	**39,643**	**190**	**4,610**	**219**	**124**	**416**

Validity per variable

TABLE Overview of validity by variable for each joint of hip, knee, ankle, shoulder, elbow, wrist and finger arthroplasties registered in the LROI in the Netherlands in 2023

	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Number of arthroplasties (n)	**46,918**	**39,643**	**190**	**4,610**	**219**	**124**	**416**
Number of primary arthroplasties (n)	42,990	36,351	166	4,139	162	96	370
Number of revision arthroplasties (n)	3,928	3,292	24	471	57	28	46
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	100.0	99.9	100.0	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	99,7	99,8	100.0	99,9	99,5	93,6	94,2
BMI	96,8	98,5	95,8	99.0	99,1	92,7	91,4
Smoking	98,1	99	100	99,3	99,1	90,3	92,3
ASA score	99,6	99,7	100.0	99,9	99,5	96	96,6
Fixation	99,7	99,8	65,3	99,7	100	92,7	84,9
Primary arthroplasty characteristics	%	%	%	%	%	%	%
Diagnosis	98,9	99,6	99,4	99,1	100.0	94,8	79,7
Charnley/Walch score	98,2	99,4	100.0	98,3	n.a.	n.a.	n.a.
Prosthesis	99,8	99,9	100.0	99,9	100.0	92,7	100
Surgical approach	99,6	99,7	100.0	98,7	99,4	88,5	83,5
Revision arthroplasty characteristics	%	%	%	%	%	%	%
Type of revision	99,4	99,2	100.0	99,1	100.0	96	84,8
Charnley score	100.0	100.0	n.a.	n.a.	n.a.	n.a.	n.a.
Reason for revision	98,2	98,3	100.0	98,5	100.0	96	84,8

Please note: Validity by variable as determined in April 2023.

HIS: hospital information system; BMI: body mass index

Participating hospitals

General hospitals

TABLE Overview of general hospitals registering joint arthroplasties and clubfood treatments in the LROI 2007-2023

Participating hospitals	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger	Clubfoot
Admiraal de Ruyter Ziekenhuis	x	x	x	x	x			
Albert Schweitzer Ziekenhuis	x	x		x		x	x	
Amphia	x	x		x	x	x	x	x
Antonius Ziekenhuis	x	x	x	x				
BovenIJ Ziekenhuis	x	x		x				
Bravis Ziekenhuis	x	x	x	x	x		x	
Canisius Wilhelmina Ziekenhuis	x	x		x		x	x	
Centraal Militair Hospitaal	x	x						
Deventer Ziekenhuis	x	x		x	x	x	x	
Diakonessenhuis	x	x	x	x	x	x	x	
ETZ	x	x	x	x	x	x	x	
Elkerliek Ziekenhuis	x	x	x	x	x		x	
Franciscus Gasthuis & Vlietland	x	x		x	x	x	x	
Groene Hart Ziekenhuis	x	x		x		x	x	
Haaglanden Medisch Centrum	x	x	x	x	x	x	x	
HagaZiekenhuis, locatie Den Haag	x	x	x	x	x	x	x	
HagaZiekenhuis, locatie Zoetermeer	x	x		x			x	
Havenziekenhuis *	x	x		x				
Het Flevoziekenhuis	x	x	x	x	x		x	
IJsselland Ziekenhuis	x	x		x	x			
Ikazia Ziekenhuis	x	x		x	x	x		
Interconfess. St. Gez. Rivierenland	x	x		x			x	
Jeroen Bosch Ziekenhuis	x	x		x	x	x	x	
MC Slotervaart *	x	x	x	x	x			
MC Zuiderzee *	x	x		x				
Maasstadziekenhuis	x	x	x	x	x	x	x	
Maxima Medisch Centrum	x	x		x	x	x	x	x
Meander Medisch Centrum	x	x	x	x		x	x	
Medisch Centrum Leeuwarden	x	x		x	x	x	x	
Medisch Spectrum Twente	x	x		x	x			x
Noordwest Ziekenhuisgroep	x	x	x	x	x	x	x	
OCON	x	x		x	x	x	x	x *
OLVG	x	x	x	x	x			x
Ommelander Ziekenhuis Groningen	x	x		x	x	x	x	
Prinses Maxima Centrum	x	x						
Reinier Haga Groep	x	x	x	x	x	x	x	
Reinier de Graaf Groep *	x	x	x	x	x		x	
Reinier de Graaf Groep, kinderorthopedie								x
Rivas Beatrixziekenhuis	x	x		x				
Rode Kruis Ziekenhuis	x	x		x	x		x	

SJG Weert	x	x		x	x			
Saxenburgh groep	x	x		x				
Sint Antonius Ziekenhuis	x	x		x	x		x	
Sint Maartenskliniek, Woerden *	x	x	x	x	x			
Sint Maartenskliniek, concern	x	x	x	x	x	x	x	x
Spaarne Gasthuis	x	x	x	x		x	x	
Spijkenisse Medisch Centrum	x	x		x				
St. Algem. Christ. Martini Zkh	x	x	x	x	x	x	x	
Stichting Alrijne Zkh	x	x	x	x		x	x	
Stichting Catharina Ziekenhuis	x	x		x	x			
Stichting Chr. Alg. Zkh noordwest-veluwe	x	x		x			x	
Stichting Dijklander Zkh	x	x	x	x	x			
Stichting GelreZiekenhuizen	x	x	x	x	x	x	x	
Stichting Isala Klinieken	x	x	x	x	x	x	x	
Stichting Laurentius Zkh	x	x	x	x	x	x	x	
Stichting Slingeland Zkh	x	x		x				
Stichting St. Anna Zorggroep	x	x	x	x	x			
Stichting het van Weel-Bethesda Zkh	x	x		x				
Streekziekenhuis Koningin Beatrix	x	x		x	x			
Tergooi MC	x	x		x	x	x	x	
Treant Zorggroep	x	x		x	x	x		
VieCuri Medisch Centrum	x	x		x	x		x	
Wilhelmina Ziekenhuis Assen	x	x		x	x		x	
Zaans Medisch Centrum	x	x	x	x	x		x	
Ziekenhuis Amstelland	x	x	x	x	x			
Ziekenhuis Bernhoven	x	x		x	x			
Ziekenhuis Gelderse Vallei	x	x		x				
Ziekenhuis Nij Smellinghe	x	x		x		x	x	
Ziekenhuis Rijnstate	x	x	x	x	x	x	x	
Ziekenhuis Tjongerschans	x	x		x				
ZiekenhuisGroep Twente	x							
ZorgSaam Ziekenhuis	x	x	x	x	x	x	x	
Zuyderland Medisch Centrum	x	x		x	x	x	x	

Please note: Since 2007, the LROI has been collecting data on hip and knee procedures, on ankle, shoulder and elbow procedures since 2014, on wrist and finger procedures since 2016, and on clubfoot treatments since 2022.

* These hospitals no longer perform joint replacement procedures.

University medical centres

TABLE Overview of university medical centers registering joint arthroplasties and clubfood treatments in the LROI 2007-2023

Participating hospitals	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger	Clubfoot
Amsterdam UMC	x	x	x	x	x			x
Erasmus MC	x	x		x	x	x	x	x
Leids Universitair Medisch Centrum	x	x	x	x	x	x	x	x
Maastricht UMC+	x	x	x	x	x	x	x	x
Radboudumc	x	x		x	x	x	x	x
UMC Groningen	x	x	x	x	x	x	x	x
UMC Utrecht	x	x		x		x	x	x

Please note: Since 2007, the LROI has been collecting data on hip and knee procedures, on ankle, shoulder and elbow procedures since 2014, on wrist and finger procedures since 2016, and on clubfoot treatments since 2022.

Private hospitals

TABLE Overview of private hospitals registering joint arthroplasties and clubfood treatments in the LROI 2007-2023

Participating hospitals	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger	Clubfoot
AVE Orthopedische Klinieken *	x	x	x	x				
Acibadem International Medical Center	x	x	x	x				
Annatommie mc, Amstelveen	x	x	x	x				
Annatommie mc, Utrecht	x	x	x	x				
Bergman Clinics, Loc. Amsterdam						x	x	
Bergman Clinics, Loc. Arnhem	x	x		x				
Bergman Clinics, Loc. Breda	x	x	x	x				
Bergman Clinics, Loc. Delft	x	x		x				
Bergman Clinics, Loc. Naarden	x	x	x	x		x	x	
Bergman Clinics, Loc. Rijswijk	x	x	x	x				
Bergman Clinics, Loc. Rotterdam	x	x		x				
Berne Kliniek						x	x	
CortoClinics	x	x						
DC Klinieken, Lairesse *	x	x		x				
Dr. Kuypers Kliniek							x	
Eisenhower Kliniek	x	x		x			x	
FlexClinics	x	x						
Kliniek ViaSana	x	x		x				
Medische Kliniek Velsen	x	x		x	x			
OrthoDirect *	x	x		x				
Orthoparc	x	x						
Orthopedie kliniek Amsterdam *		x						
Park Medisch Centrum	x	x						
Stichting Annadal Kliniek	x	x						
Stichting The Knee Clinic		x						
The Hand Clinic *						x	x	
Voor de hand							x	
Xpert Clinic, Loc. Amsterdam	x	x	x	x	x	x	x	
Xpert Clinic, Loc. Amstelveen	x	x						
Xpert Clinic, Loc. Utrecht	x							
Xpert Clinic, Loc. Eindhoven	x	x		x		x	x	
Xpert Clinic, Loc. Enschede						x	x	
Xpert Clinic, Loc. Rotterdam	x					x	x	
Xpert Clinic, Loc. Velp							x	

Please note: Since 2007, the LROI has been collecting data on hip and knee procedures, on ankle, shoulder and elbow procedures since 2014, on wrist and finger procedures since 2016, and on clubfoot treatments since 2022.

* 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