



Online LROI annual report 2025

Joint arthroplasty data to 31 December 2024

Introduction

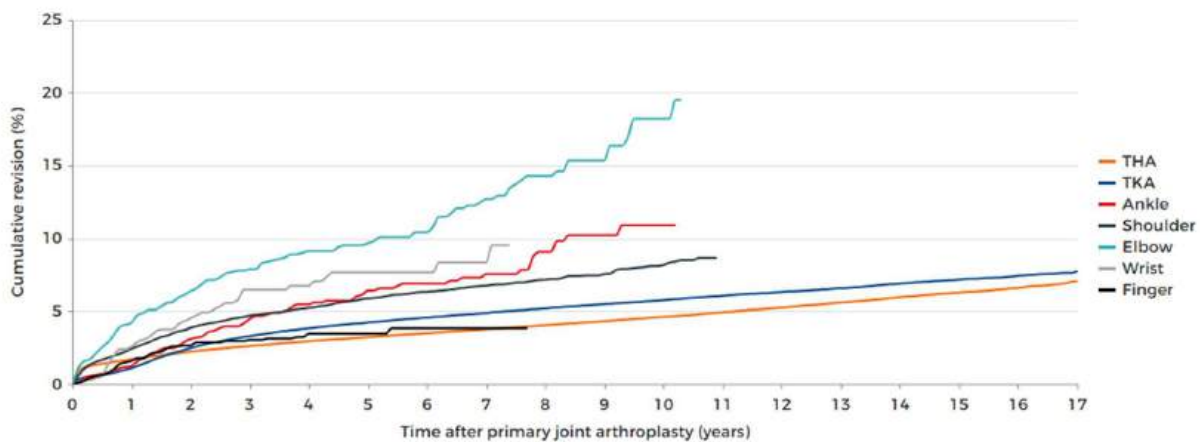
Welcome to LROI Report 2025

This online annual report 2025 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 2024. 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

See below for two figures that present the outcomes of revision procedures in the Netherlands between 2007 and 2024. 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.

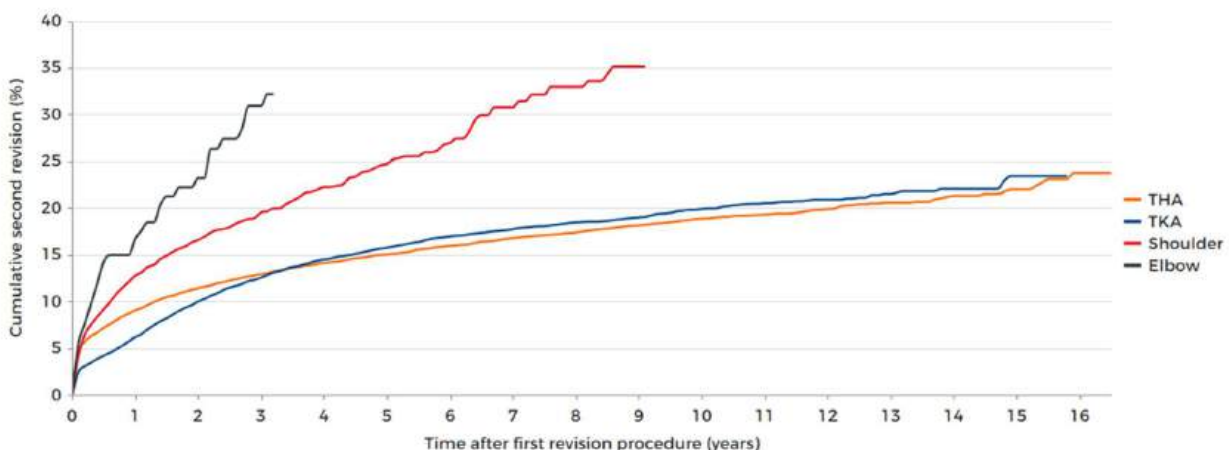
FIGURE First revision outcomes of primary THA, TKA, ankle, shoulder, elbow, wrist and finger arthroplasties in the Netherlands in 2007-2024



THA: total hip arthroplasty; TKA: total knee arthroplasty

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FIGURE Second revision outcomes of primary THA, TKA, shoulder and elbow arthroplasties after first revision procedure in the Netherlands in 2007-2024



THA: total hip arthroplasty; TKA: total knee arthroplasty

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Colophon

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Hip arthroplasty

In this section you will find all the information on hip arthroplasty

Numbers

Registered procedures

TABLE Number of registered hip arthroplasties per year of surgery (2007-2024) in the LROI in April 2025

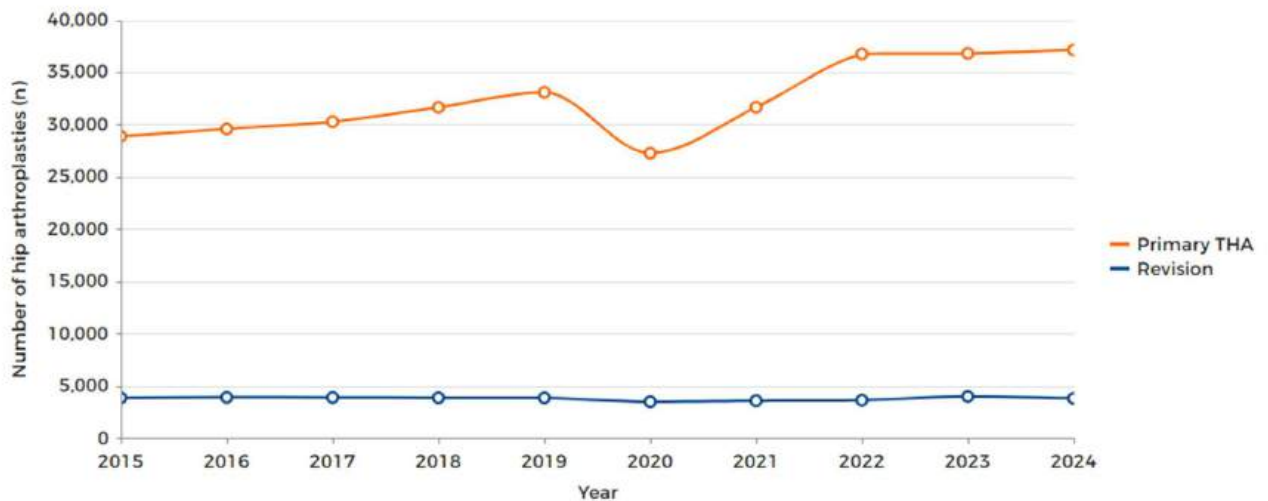
Year of surgery	Total hip arthroplasty	Hemiarthroplasty	Resurfacing arthroplasty	Unknown/missing	Revision arthroplasty	Total
2007	8,902	1,056	452	933	1,268	12,611
2008	15,452	1,524	731	395	1,858	19,960
2009	22,106	2,145	863	299	2,679	28,092
2010	23,914	2,423	610	295	2,951	30,193
2011	24,462	2,520	228	243	3,197	30,650
2012	25,818	2,898	10	329	3,766	32,821
2013	26,261	3,069	2	261	3,517	33,110
2014	28,193	3,766	0	151	3,583	35,693
2015	28,873	4,965	15	67	3,834	37,754
2016	29,573	5,451	16	99	3,883	39,022
2017	30,264	5,946	5	52	3,871	40,138
2018	31,634	6,386	2	25	3,843	41,890
2019	33,080	6,312	1	36	3,835	43,264
2020	27,249	6,547	0	18	3,465	37,279
2021	31,641	6,126	0	17	3,563	41,347
2022	36,751	6,496	0	27	3,615	46,889
2023	36,800	6,314	0	58	3,972	47,144
2024	37,136	6,017	0	14	3,782	46,949
Total (n)	498,109	79,961	2,935	3,319	60,482	644,806

Please note: The LROI is nearly complete as of 2010

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Type of procedures

FIGURE Number of primary total hip arthroplasties and hip revision arthroplasties registered in the LROI in the Netherlands in 2015-2024



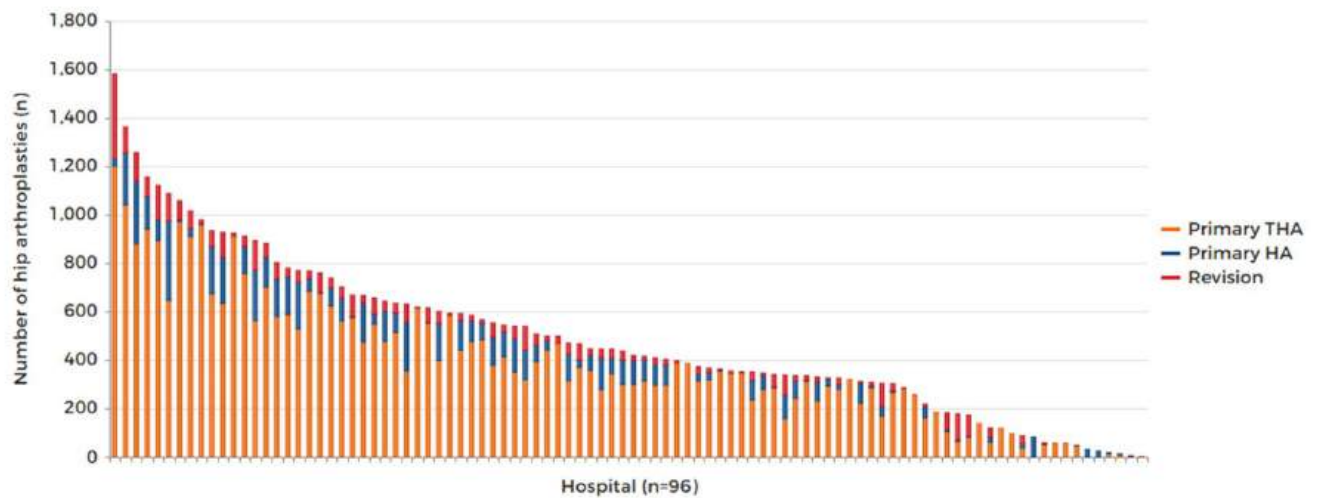
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Primary THA	28,873	29,573	30,264	31,634	33,080	27,249	31,641	36,751	36,800	37,136	323,001
Revision	3,834	3,883	3,871	3,843	3,835	3,465	3,563	3,615	3,972	3,782	37,663
Total (n)	32,707	33,456	34,135	35,477	36,915	30,714	35,204	40,366	40,772	40,918	360,664

THA: total hip arthroplasty

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Out of 37,136 primary total hip arthroplasties that were performed in 2024, 3.0% (n=1,129) was performed bilaterally.

Type of procedure per hospital

FIGURE Number of primary total hip arthroplasties, hemiarthroplasties and hip revision arthroplasties per hospital in the Netherlands in 2024 (n=46,935)

THA: total hip arthroplasty; HA: hemiarthroplasty

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Total hip arthroplasty

In this section you will find all the information on total hip arthroplasty:

Patient characteristics

By diagnosis

TABLE Patient characteristics of all patients with a registered primary total hip arthroplasty by diagnosis in the Netherlands in 2024

	Osteoarthritis	Fracture	Osteonecrosis	Late post-traumatic	Dysplasia	Rheumatoid arthritis	Post-Perthes disease	Tumour	Other	Total
N (%)	32,060 (86.4)	2,145 (5.8)	860 (2.4)	785 (2.2)	581 (1.6)	111 (0.2)	82 (0.2)	84 (0.2)	428 (1.2)	37,136
Mean age (years) (SD)	70.0 (9.7)	69.3 (8.8)	64.0 (14.7)	68.0 (13.3)	52.4 (13.3)	63.3 (14.8)	49.6 (14.7)	64.7 (11.5)	65.8 (15.1)	69.4 (10.4)
Age (years) (%)										
<50	2	2	15	9	38	17	50	10	12	4
50-59	12	10	18	12	33	12	28	18	15	13
60-69	29	34	26	25	18	28	13	36	24	29
70-79	41	46	27	37	9	38	4	29	34	40
>80	15	8	14	17	2	5	5	8	15	15
Gender (%)										
Men	37	37	50	42	27	21	74	39	41	37
Women	63	63	50	58	73	79	26	61	59	63
ASA score (%)										
ASA I	13	12	7	10	32	3	24	1	13	13
ASA II	60	55	52	52	59	63	57	24	58	59
ASA III-IV	27	32	41	37	9	34	18	75	28	28
Type of hospital (%)										
General	79	96	84	90	69	81	76	67	84	80
UMC	1	4	7	6	10	5	10	33	7	2
Private	20	0	9	4	22	14	15	0	9	18
Charnley-score (%)										
A One hip joint affected	39	8	37	42	49	27	71	23	34	38
B1 Both hip joints affected	32	3	13	4	27	23	11	5	17	29
B2 Contralateral hip joint with a total hip prosthesis	25	4	14	6	17	22	6	2	15	23
C Multiple joints affected or chronic disease that affects quality of life	3	1	4	2	3	23	4	2	6	3
Mean BMI (kg/m²) (SD)	27.4 (4.6)	25.1 (4.1)	26.9 (5.3)	25.6 (4.4)	26.3 (4.4)	26.9 (4.9)	28.2 (4.9)	26.6 (5.6)	26.9 (4.5)	27.2 (4.6)
Body Mass Index (kg/m²) (%)										
Underweight (<18.5)	1	3	2	3	2	3	2	4	2	1
Normal weight (>18.5-25)	33	48	39	46	41	34	23	43	33	35
Overweight (>25-30)	41	33	34	33	36	37	40	30	39	41
Obesity (>30-40)	23	10	20	14	19	24	33	19	20	22
Morbid obesity (>40)	1	0	2	1	1	2	1	2	1	1
Smoking (%)										
No	91	84	79	82	89	94	85	88	85	91
Yes	8	14	19	17	11	6	11	10	11	9

Please note: diagnosis 'Other' (428; 1.2%) includes other (183), inflammatory arthritis (30), post-infectious osteoarthritis (21), and 194 primary total hip arthroplasties where the diagnosis was not registered.

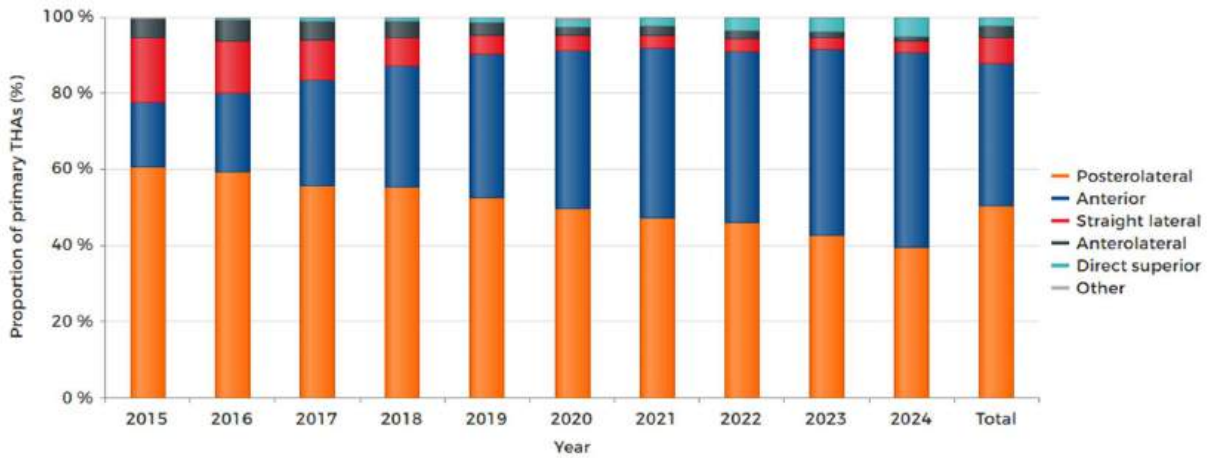
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation

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Procedure characteristics

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary total hip arthroplasty in the Netherlands in 2015-2024



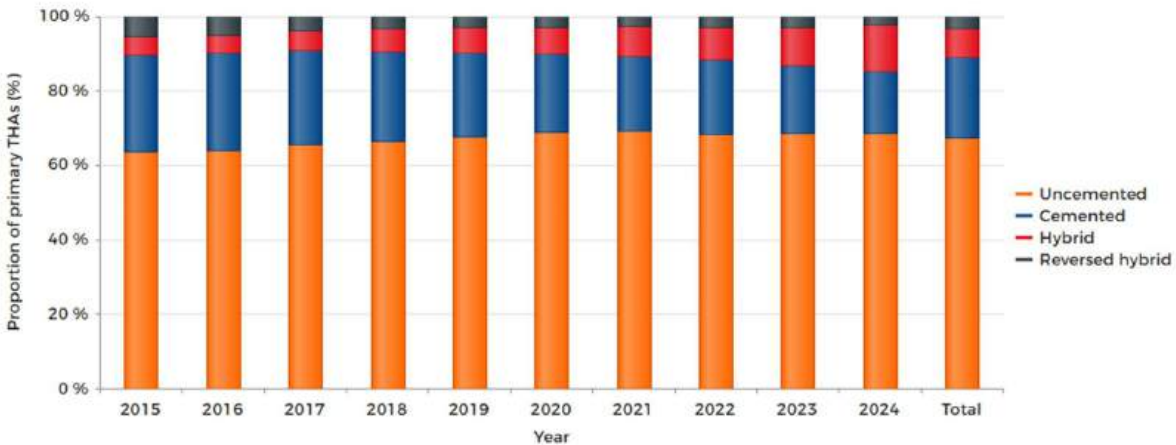
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Posterolateral	60.64	59.30	55.63	55.18	52.42	49.88	47.33	45.95	42.74	39.58	50.33
Anterior	16.80	20.92	27.76	31.91	37.70	41.37	44.39	45.00	48.67	51.13	37.38
Straight lateral	17.02	13.49	10.62	7.38	5.19	4.08	3.51	3.37	3.06	2.84	6.75
Anterolateral	5.10	5.48	4.98	4.44	3.45	2.03	2.33	2.04	1.68	1.40	3.20
Direct superior	0	0.30	0.80	0.84	1.12	1.94	2.31	3.49	3.68	4.85	2.06
Other	0.44	0.52	0.21	0.24	0.11	0.71	0.13	0.15	0.18	0.21	0.28
Total (n)	28,796	29,557	30,240	31,614	33,055	27,213	31,506	36,598	36,753	37,018	322,350

THA: total hip arthroplasty

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Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary total hip arthroplasties in the Netherlands in 2015-2024



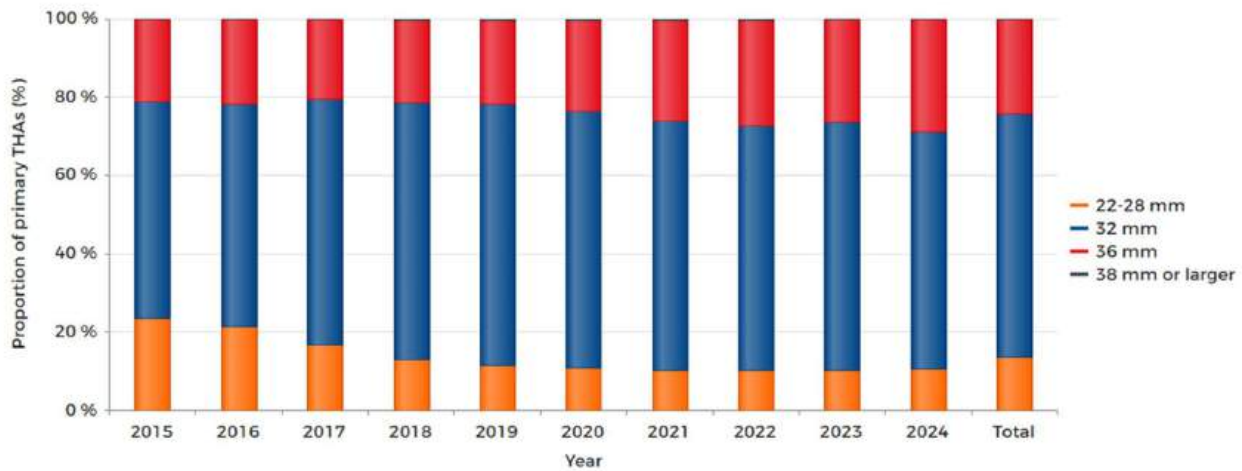
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Uncemented	63.64	64.06	65.60	66.54	67.73	68.97	69.23	68.21	68.68	68.70	67.24
Cemented	26.08	26.06	25.27	24.08	22.67	20.97	20.26	20.16	18.12	16.75	21.80
Hybrid	4.91	4.90	5.28	6.27	6.69	7.10	7.90	8.64	10.39	12.33	7.64
Reversed hybrid	5.37	4.99	3.85	3.12	2.91	2.97	2.61	2.99	2.81	2.22	3.32
Total (n)	28,746	29,421	29,829	31,452	32,848	27,040	31,409	36,575	36,650	36,938	320,908

THA: total hip arthroplasty

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Femoral head diameter

FIGURE Trend (proportion [%] per year) in femoral head component diameter in primary total hip arthroplasties in the Netherlands in 2015-2024



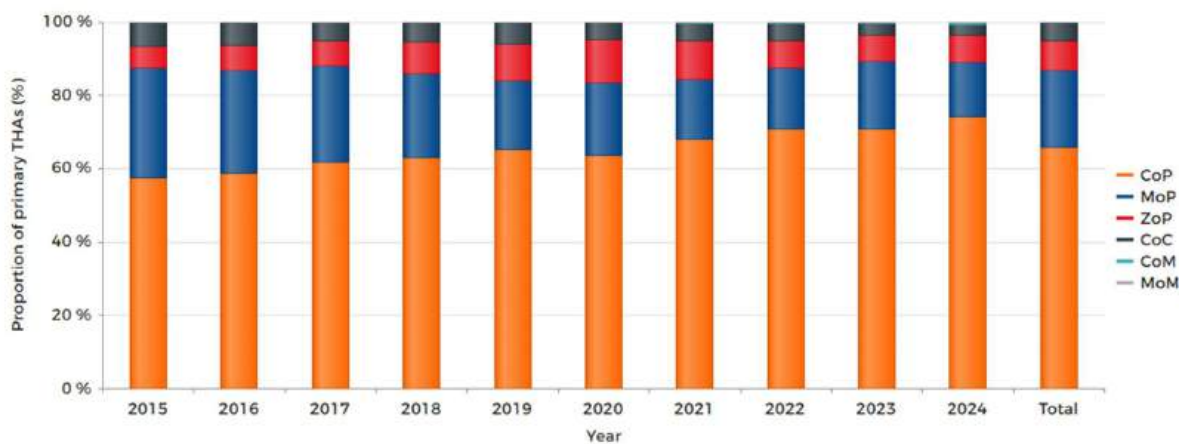
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
22-28 mm	23.38	21.22	16.54	13.02	11.49	10.70	10.18	10.32	10.33	10.58	13.52
32 mm	55.57	57.00	63.03	65.52	66.64	65.54	63.83	62.19	63.20	60.54	62.32
36 mm	20.83	21.48	20.15	21.11	21.53	23.39	25.66	27.10	26.17	28.68	23.85
38 mm or larger	0.22	0.30	0.28	0.34	0.34	0.37	0.33	0.39	0.30	0.20	0.31
Total (n)	28,619	28,781	29,493	30,812	31,558	25,268	31,087	36,099	36,303	36,332	314,352

THA: total hip arthroplasty

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Articulation

FIGURE Trend (proportion [%] per year) in articulation in primary total hip arthroplasties in the Netherlands in 2015-2024



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
CoP	57.45	58.72	61.73	63.20	65.37	63.79	67.91	70.85	70.73	74.22	65.87
MoP	29.92	28.24	26.23	22.69	18.56	19.69	16.45	16.55	18.71	14.77	20.84
ZoP	6.07	6.84	6.81	8.83	10.10	11.68	10.65	7.62	6.94	7.55	8.24
CoC	6.50	6.18	5.16	5.22	5.82	4.61	4.68	4.56	3.23	2.83	4.80
CoM	0.01	0.01	0.02	0.02	0.03	0.06	0.20	0.30	0.29	0.48	0.16
MoM	0.04	0.02	0.05	0.04	0.12	0.17	0.11	0.13	0.11	0.15	0.09
Total (n)	28,155	28,353	29,134	30,302	31,041	24,718	30,688	35,204	35,607	35,667	308,869

Please note: MoC was used in 4 (<0.01%) primary THAs in 2015-2024.

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

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Acetabulum

TABLE The most frequently registered acetabulum components in primary total hip arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Acetabulum cemented (n)	6,348	7,087	8,180	7,510	6,747
Acetabulum name; Proportion (%)					
Avantage Cemented	16.43	19.53	17.54	19.28	19.77
FAL Cup	7.10	6.73	11.83	18.52	17.09
Muller low profile Durasul	15.39	18.70	16.12	16.66	14.21
IP Cup	13.50	12.98	12.80	13.29	14.01
Exeter Rimfit X3	9.20	6.63	7.33	6.92	7.80
IP Cup X-Linked	2.50	3.30	3.75	4.82	5.88
CCB cup Low Profile	4.96	4.66	4.62	4.87	5.13
Polarcup cemented	2.41	2.58	2.32	2.44	2.74
FAL Cup X-Linked	1.98	1.81	2.20	1.76	2.50
Reflection All Poly XLPE	3.32	3.17	2.36	2.01	1.97
Year	2020	2021	2022	2023	2024
Acetabulum uncemented (n)	19,268	23,989	27,829	28,078	28,862
Acetabulum name; Proportion (%)					
Allofit	32.18	35.24	37.62	39.02	39.00
Pinnacle	19.45	20.34	19.36	19.89	17.38
G7 PPS	1.32	5.77	9.25	7.58	9.06
R3	14.40	13.24	8.90	8.78	8.91
Trident	7.74	8.83	7.29	7.61	8.69
RM Pressfit Vitamys cup	4.26	3.67	3.70	3.61	3.68
Pinnacle Gription	2.39	2.19	2.42	1.72	2.71
Trident Tritanium	3.50	0.63	2.54	3.31	2.25
Delta-TT	1.62	1.50	1.74	2.29	2.22
Continuum	5.13	2.86	2.12	1.67	1.54

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Femur

TABLE The most frequently registered femur components in primary total hip arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Femur cemented (n)	7,332	8,640	10,182	10,207	10,318
Femur name; Proportion (%)					
Lubinus SPII	34.02	34.85	36.97	39.78	38.19
Original ME Muller	27.67	28.13	28.52	31.72	31.85
Taperloc Hip Cemented CoCr	2.67	6.17	6.01	5.06	7.75
Exeter	12.51	9.43	8.97	7.70	7.28
Twinsys stem Cemented	1.90	1.31	3.51	3.39	3.65
Avenir Muller	.	0.01	0.83	1.92	2.46
Polarstem cemented	0.01	0.02	0.31	1.23	2.29
CPT	1.62	3.65	3.23	2.56	2.14
C-Stem AMT	6.70	5.74	5.64	2.01	1.71
Spectron EF	2.82	2.69	1.86	1.13	0.78
Year	2020	2021	2022	2023	2024
Femur uncemented (n)	17,616	22,167	25,711	25,897	25,742
Femur name; Proportion (%)					
Taperloc Complete	27.21	30.59	31.51	29.65	33.65
Corail	20.25	20.07	19.37	18.41	17.69
Accolade II	7.76	9.93	11.26	12.15	12.21
Polarstem	14.59	13.70	10.10	9.33	9.27
Fitmore	1.90	4.26	3.59	5.62	6.79
Avenir Muller	1.15	2.19	5.23	5.09	4.14
Corail AMT	2.43	3.27	3.57	3.68	3.63
Twinsys stem Cementless	4.17	3.46	3.40	3.26	2.83
M/L Taper	3.05	2.10	2.33	2.37	2.44
Optimys stem	1.31	1.35	1.36	1.51	1.69

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Bone cement

TABLE The most frequently registered bone cement used during primary total hip arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	4,120	5,145	6,390	6,289	6,755
Cement name; Proportion (%)					
Palacos R+G	51.00	50.44	59.51	70.28	65.33
Refobacin Bone Cement R	41.55	44.02	35.02	27.06	34.20
Refobacin Plus Bone Cement	7.43	5.50	5.45	2.66	0.44
Year	2020	2021	2022	2023	2024
Separately packed bone cement (n)	3,662	3,941	4,313	3,543	3,356
Cement name; Proportion (%)					
Palacos R+G	82.61	87.54	88.69	82.08	84.59
Refobacin Bone Cement R	7.24	3.81	4.22	10.47	6.82
Palacos MV+G	4.21	3.65	4.34	3.84	5.57
Simplex ABC Tobra	0.14	0.10	0.51	1.52	1.28
Subiton G	3.17	2.51	1.21	0.62	0.63
Copal G+C	0.63	0.81	0.60	0.45	0.45
Simplex ABC EC	0.85	0.33	0.19	0.34	0.21
Refobacin Revision	0.44	0.20	0.14	0.28	0.21
Copal G+V	0.52	0.28	0.09	0.06	0.18

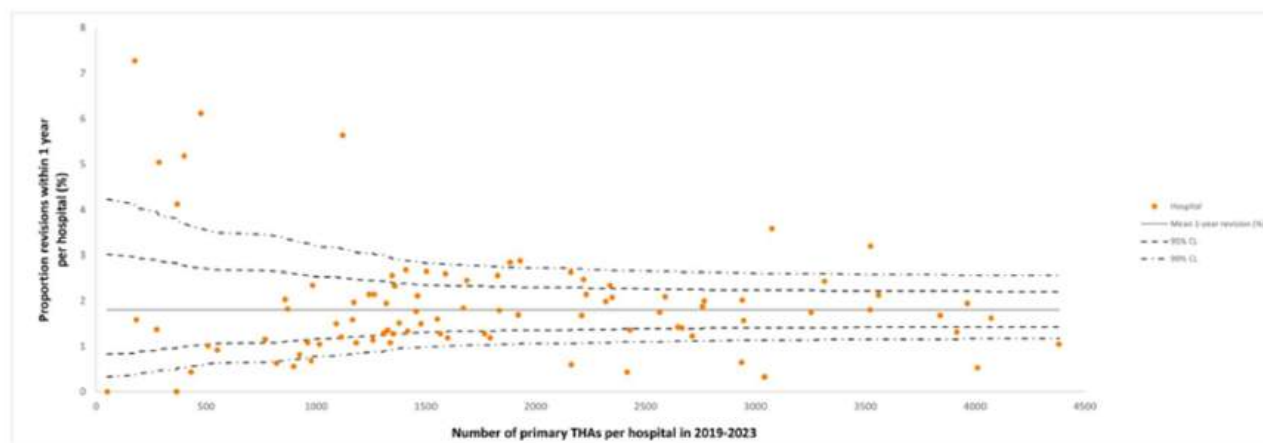
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Survival

Short term revision

Overall revision per hospital

Funnel plot of proportion of hip revision arthroplasties within one year after a total hip arthroplasty per hospital in the Netherlands in 2019-2023 (n=165,093)



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).

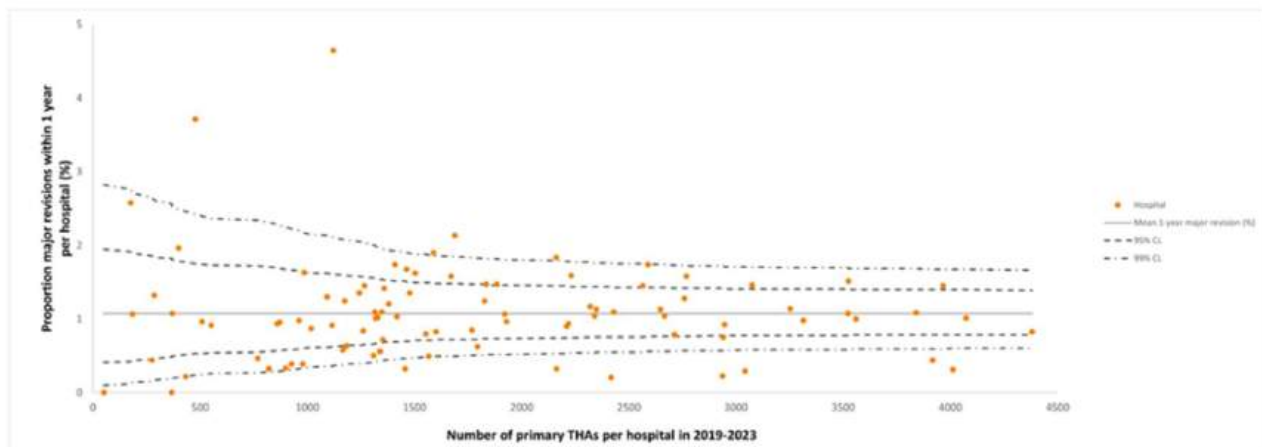
THA: total hip arthroplasty; CL: control limits.

The mean 1-year revision percentage is 1.80 in the Netherlands in 2019-2023.

Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Major revision per hospital

Funnel plot of proportion of hip major revision arthroplasties within one year after a total hip arthroplasty per hospital in the Netherlands in 2019-2023 (n=165,093)



Please note: Major revision is defined as revision of at least acetabulum or femur component.

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 1.07 in the Netherlands in 2019-2023.

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 2019-2023 (n=165,093)

	Cumulative 1-year revision percentage Kaplan Meier (95% CI)
Any type of revision	1.77 (1.70-1.83)
Major revision	0.97 (0.92-1.02)
Only acetabulum	0.32 (0.29-0.35)
Only femur	0.45 (0.42-0.48)
Acetabulum and femur	0.20 (0.18-0.22)
Minor revision	0.77 (0.73-0.81)
DAIR	0.58 (0.54-0.61)
No DAIR	0.19 (0.17-0.21)

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

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In 2019-2023, 2,027 (1.2%) primary THAs were implanted in patients who died within one year after the primary procedure.

First major or minor revision within 1 year

TABLE Cumulative 1-year first revision percentage of primary total hip arthroplasties by type of first major or minor revision in the Netherlands in 2019-2023 (n=165,093)

	Cumulative 1-year first revision percentage Kaplan Meier (95% CI)
First major revision	0.97 (0.92-1.02)
Acetabulum	0.61 (0.57-0.64)
Femur	0.73 (0.68-0.77)
Minor revision	0.77 (0.73-0.81)
Inlay	0.38 (0.35-0.41)
Femoral head	0.73 (0.68-0.77)

First major revision: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefore, 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

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In 2019-2023, 2,027 (1.2%) primary THAs were implanted in patients who died within one year after the primary procedure.

Reasons for revision within 1 year

TABLE Cumulative 1-year first revision percentage of primary total hip arthroplasties by type of first major or minor revision in the Netherlands in 2019-2023 (n=165,093)

	Cumulative 1-year first revision percentage Kaplan Meier (95% CI)
First major revision	0.97 (0.92-1.02)
Acetabulum	0.61 (0.57-0.64)
Femur	0.73 (0.68-0.77)
Minor revision	0.77 (0.73-0.81)
Inlay	0.38 (0.35-0.41)
Femoral head	0.73 (0.68-0.77)

First major revision: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefore, 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

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In 2019-2023, 2,027 (1.2%) primary THAs were implanted in patients who died within one year after the primary procedure.

Time after primary THA

TABLE Time after primary total hip arthroplasty until short-term revision in the Netherlands in 2017-2021 (n=153,311)

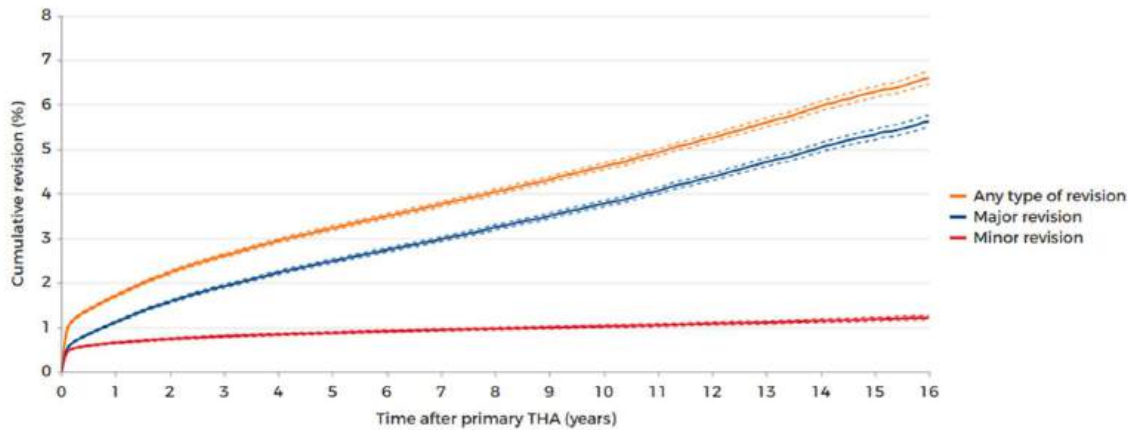
Time after primary THA	Percentage revisions (%)
Day 0-29	0.98
Day 30-182	0.60
Day 183-364	0.29
Day 365-730 (second year)	0.41
Day 731-1095 (third year)	0.31

THA: total hip arthroplasty

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Long term revision

By type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of total hip arthroplasties by type of revision in the Netherlands in 2007-2024 (n=496,430)

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	1yr	3yr	5yr	7yr	10yr	16yr
Any type of revision	1.64 (1.61-1.68)	2.58 (2.53-2.62)	3.19 (3.14-3.25)	3.73 (3.67-3.79)	4.58 (4.51-4.65)	6.57 (6.43-6.71)
Major revision	1.06 (1.03-1.09)	1.89 (1.85-1.93)	2.46 (2.41-2.51)	2.94 (2.89-3.00)	3.75 (3.68-3.81)	5.60 (5.46-5.73)
Minor revision	0.64 (0.62-0.66)	0.79 (0.76-0.81)	0.87 (0.84-0.89)	0.94 (0.91-0.96)	1.02 (0.98-1.05)	1.21 (1.16-1.26)

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. Therefore, the first three revision procedures were reviewed.

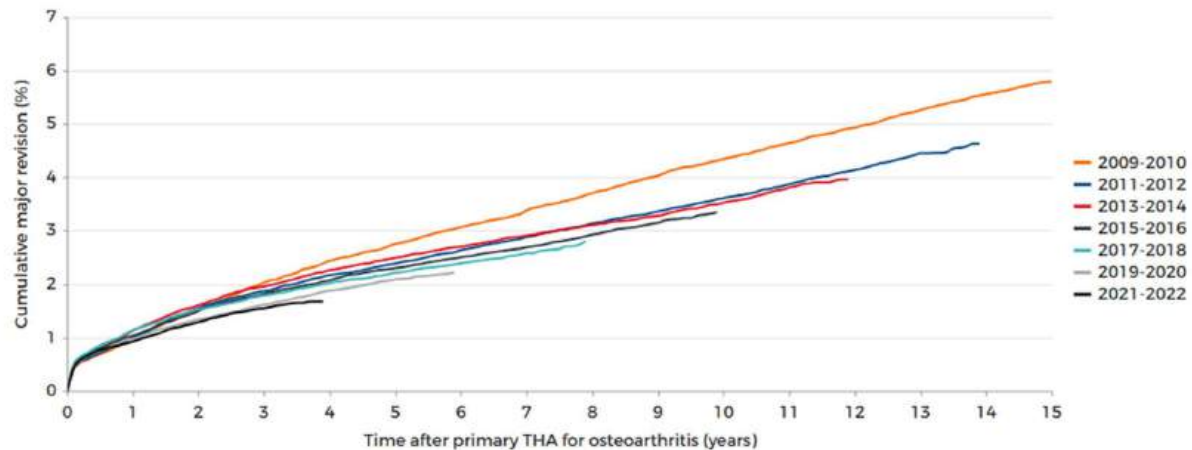
Minor revision: only inlay and/or femoral head exchange (including DAIR procedures).

THA: total hip arthroplasty; CI: confidence interval.

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In 2007-2024, 86,913 (17.5%) primary THAs were implanted in patients who died within sixteen years after the primary diagnosis.

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 2009-2022

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	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
2009-2010	38,354	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)	5.78 (5.52-6.03)
2011-2012	42,846	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	46,788	1.05 (0.96-1.14)	1.93 (1.81-2.06)	2.47 (2.32-2.61)	2.89 (2.73-3.04)	3.49 (3.32-3.67)	n.a.
2015-2016	50,311	1.00 (0.91-1.09)	1.79 (1.67-1.90)	2.28 (2.15-2.41)	2.66 (2.52-2.81)	3.35 (3.16-3.53)	n.a.
2017-2018	53,736	1.08 (0.99-1.16)	1.76 (1.65-1.88)	2.19 (2.06-2.31)	2.55 (2.41-2.69)	n.a.	n.a.
2019-2020	51,616	0.95 (0.87-1.04)	1.59 (1.48-1.69)	2.06 (1.94-2.19)	n.a.	n.a.	n.a.
2021-2022	58,859	0.88 (0.81-0.96)	1.54 (1.43-1.64)	n.a.	n.a.	n.a.	n.a.

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

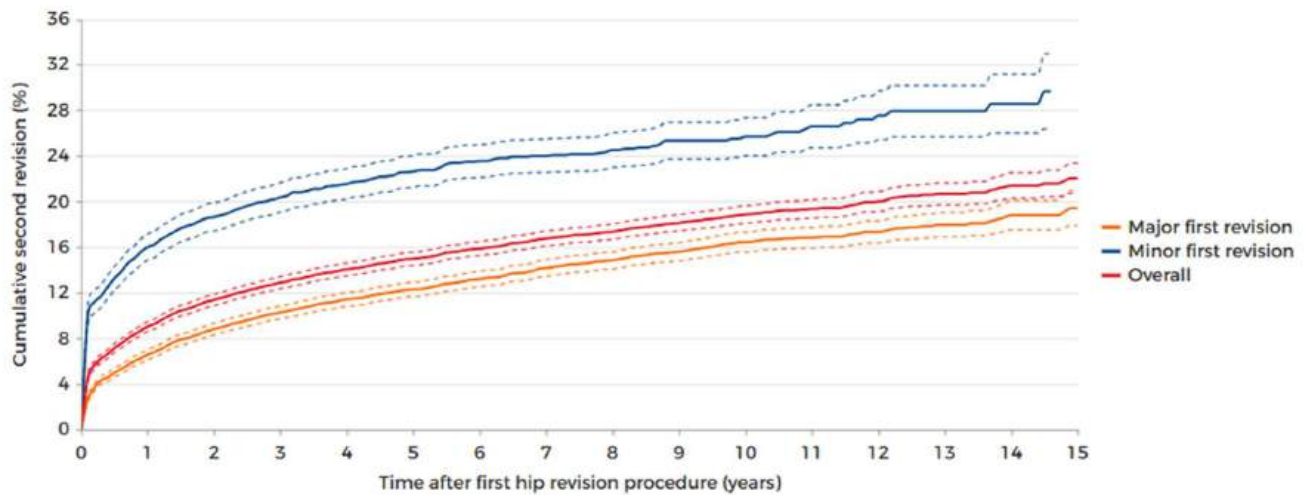
Major revision percentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

THA: total hip arthroplasty; CI: confidence interval.

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Re-revision

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 2007-2024 (n=17,219)

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	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Overall	17,219	8.69 (8.26-9.12)	12.74 (12.22-13.27)	14.93 (14.34-15.51)	16.69 (16.04-17.33)	18.81 (18.05-19.57)	22.05 (20.72-23.37)
Major first revision	12,764	6.25 (5.83-6.68)	10.16 (9.60-10.72)	12.25 (11.61-12.88)	14.09 (13.38-14.81)	16.44 (15.57-17.31)	19.43 (17.89-20.96)
Minor first revision	4,132	15.59 (14.46-16.72)	20.18 (18.90-21.47)	22.58 (21.19-23.96)	24.00 (22.54-25.47)	25.51 (23.87-27.15)	n.a.

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.

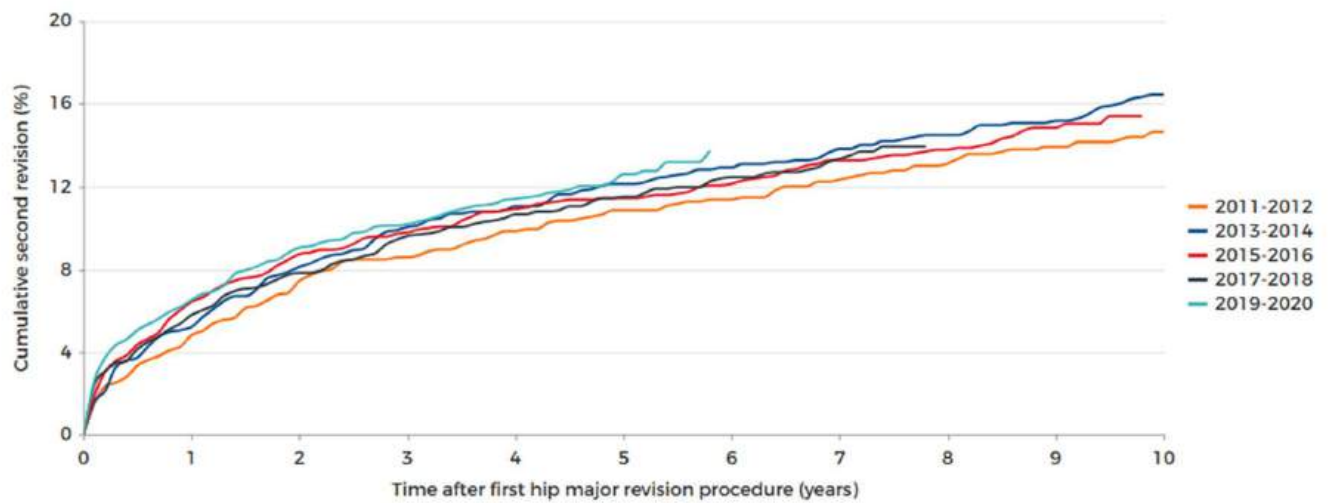
Major revision: revision of at least the acetabulum or femur component.

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

CI: confidence interval.

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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 2011-2020 (n=7,588)

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	Number (n)	1yr	3yr	5yr	7yr	10yr
2011-2012	1,100	4.29 (3.09-5.49)	8.59 (6.92-10.26)	10.85 (8.99-12.72)	12.23 (10.25-14.21)	14.64 (12.46-16.82)
2013-2014	1,311	5.08 (3.88-6.27)	9.90 (8.26-11.53)	12.13 (10.33-13.93)	13.64 (11.73-15.54)	16.43 (14.33-18.54)
2015-2016	1,538	6.05 (4.85-7.25)	9.72 (8.22-11.22)	11.44 (9.82-13.06)	13.26 (11.51-15.02)	n.a.
2017-2018	1,812	5.41 (4.37-6.46)	9.44 (8.08-10.81)	11.44 (9.94-12.95)	13.19 (11.54-14.85)	n.a.
2019-2020	1,827	6.20 (5.09-7.32)	10.12 (8.72-11.53)	12.24 (10.68-13.81)	n.a.	n.a.

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

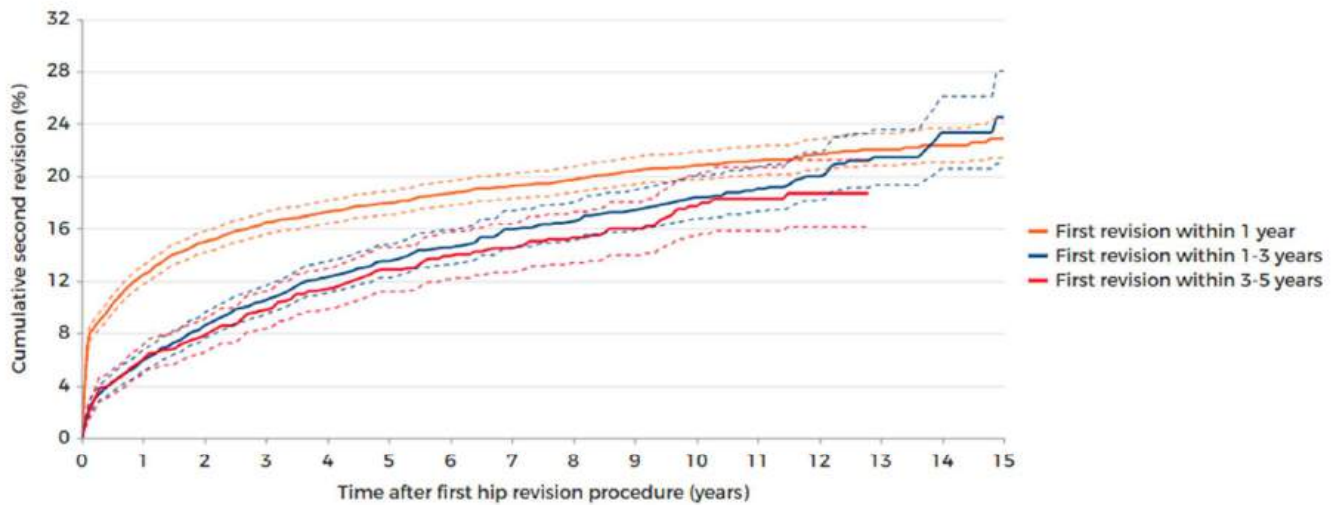
Major revision: revision of at least the acetabulum or femur component.

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

CI: confidence interval.

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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 2007-2024 (n=13,093)

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	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
First revision within 1 year	7,926	12.12 (11.39-12.85)	16.25 (15.40-17.10)	17.91 (17.01-18.81)	19.16 (18.21-20.12)	20.76 (19.70-21.83)	22.85 (21.38-24.33)
First revision within 1-3 years	3,335	5.53 (4.74-6.31)	10.38 (9.30-11.47)	13.50 (12.24-14.77)	15.94 (14.52-17.35)	18.29 (16.67-19.90)	24.48 (20.95-28.02)
First revision within 3-5 years	1,832	5.66 (4.59-6.74)	9.71 (8.28-11.13)	12.87 (11.19-14.56)	14.49 (12.64-16.34)	17.71 (15.39-20.03)	n.a.

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.

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Reasons for second revision

TABLE Reasons for second revision within ten 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 2007-2024

Reasons for second revision	Major revision (n=1,515)	Minor revision (n=879)	Any type of revision (n=2,472)
	Proportion (%)	Proportion (%)	Proportion (%)
Infection	32.54	60.86	43.16
Dislocation	25.68	25.37	25.04
Loosening of acetabulum component	18.94	4.55	13.47
Loosening of femur component	17.62	4.44	12.66
Peri-prosthetic fracture	9.90	2.73	7.24
Inlay wear	3.17	2.96	2.99
Malposition or malalignment	1.91	0.68	1.42
Symptomatic MoM bearing	1.19	0.34	0.93
Peri-articular ossification	0.99	0.46	0.77
Other	11.02	6.83	9.71

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%.

Please note: Malposition or malalignment has been registered since 2022.

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Survival by component

By cemented component name - 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 2007-2024 (n=99,087)

Femur component	Acetabulum component	Primary THA (n)	Hospitals (n)	Median (IQR) age (yr)	Type of revision (n)										Cumulative revision percentage (95% CI)				
					Revisions (n)	Total revision	Only femur	Only acetabulum	Only femoral head/neck	Unkown	1yr	3yr	5yr	10yr	16yr				
All cemented THAs for osteoarthritis		99,087	95	76 (71-81)	3,168	821	345	1,282	889	51	1.38 (1.31-1.44)	2.18 (2.04-2.33)	3.64 (3.55-3.73)	5.10 (5.08-5.21)	7.80 (7.65-7.94)	9.24 (9.06-9.41)			
Submus SPH	IP-Cup	14,636	21	77 (72-81)	461	11	55	209	120	6	1.14 (0.99-1.31)	1.98 (1.76-2.19)	2.56 (2.39-2.81)	2.88 (2.63-3.13)	3.24 (2.92-3.55)	4.10 (3.58-4.62)			
Original ME Muller	Muller low profile Durasil	11,137	21	75 (71-80)	326	40	5	108	180	3	1.91 (1.66-2.17)	2.91 (2.61-3.21)	2.99 (2.63-3.32)	3.20 (2.84-3.56)	3.72 (3.27-4.16)	4.47 (3.70-5.23)			
Submus SPH	PAL Cup	7,562	14	75 (71-80)	300	42	16	94	87	3	1.79 (1.48-2.04)	2.43 (2.04-2.76)	2.97 (2.57-3.36)	3.49 (3.05-3.93)	4.16 (3.59-4.74)	n.a.			
Original ME Muller	Muller low profile	6,579	13	75 (71-81)	208	27	2	128	45	6	1.42 (1.15-1.71)	2.53 (1.96-3.20)	3.68 (2.88-4.68)	5.10 (3.65-5.54)	6.33 (3.96-8.71)	4.24 (3.44-5.04)			
EXETER	EXETER SMHT XS	5,844	16	76 (69-80)	131	34	35	34	48	0	1.59 (1.09-1.76)	2.03 (1.66-2.41)	2.47 (2.04-2.89)	2.74 (2.28-3.20)	3.45 (2.83-4.08)	n.a.			
Spectron SF	Reflection All Poly XLPE	5,053	18	77 (73-82)	138	52	16	44	28	0	0.87 (0.45-0.96)	1.47 (1.12-1.80)	1.85 (1.34-2.32)	2.57 (2.10-3.03)	2.94 (2.31-3.56)	3.52 (2.87-4.18)			
STANMORE	STANMORE	3,383 ¹	3	75 (70-80)	90	23	2	50	6	3	0.71 (0.45-1.06)	1.43 (1.04-1.86)	1.87 (1.41-2.34)	2.08 (1.58-2.58)	2.66 (2.07-3.23)	4.58 (3.02-5.73)			
EXETER	EXETER TEMPORARY HOODED	2,827 ¹	13	77 (72-81)	117	28	34	48	14	3	1.17 (0.79-1.57)	1.72 (1.24-2.20)	2.29 (1.75-2.83)	2.97 (2.32-3.62)	4.36 (3.31-5.41)	6.15 (4.80-7.46)			
Submus SPH	SNP	2,500 ¹	6	75 (71-80)	91	10	8	37	1	0	0.29 (0.10-0.58)	0.66 (0.35-0.97)	0.91 (0.56-1.34)	1.49 (1.11-2.22)	2.00 (1.41-2.69)	2.48 (1.79-3.12)			
Original ME Muller	AVANTAGE Cemented	2,504 ¹	20	77 (71-82)	93	4	4	11	73	1	3.09 (2.40-3.78)	3.90 (3.07-4.73)	4.57 (3.35-5.86)	4.80 (3.69-5.91)	n.a.				
EXETER	EXETER	2,447 ¹	6	75 (68-79)	184	28	18	86	30	6	2.78 (2.13-3.42)	3.57 (2.82-4.31)	4.12 (3.33-4.91)	5.00 (4.13-5.88)	6.19 (5.21-7.18)	7.87 (6.49-9.25)			
EXETER	EXETER TEMPORARY PLANCED	2,439 ¹	7	75 (67-80)	95	20	9	33	9	2	0.79 (0.45-1.12)	1.42 (0.94-1.88)	1.99 (1.43-2.54)	2.28 (1.68-2.89)	3.53 (2.37-4.73)	6.40 (4.80-8.01)			
STANMORE	SNP	2,099 ¹	8	75 (71-79)	128	42	5	66	11	2	1.88 (1.35-2.32)	3.06 (2.31-3.80)	3.98 (3.15-4.83)	4.61 (3.69-5.53)	5.54 (4.59-6.58)	8.04 (6.53-9.55)			
Submus SPH	IP-Cup & Lincoln	1,933	8	76 (71-82)	30	11	8	11	22	0	1.72 (1.13-2.31)	2.43 (1.68-3.18)	3.11 (2.19-4.04)	3.11 (2.19-4.04)	3.74 (2.47-5.00)	n.a.			
CCA stem	CCB cup Low Profile	1,787 ¹	4	77 (70-80)	71	11	13	19	29	1	2.62 (1.37-4.87)	2.76 (2.01-3.50)	3.24 (2.47-4.00)	3.66 (2.79-4.57)	4.52 (3.39-5.64)	6.19 (4.62-7.76)			
Therapy stem Cemented	CCB cup Low Profile	1,706	7	80 (76-83)	38	5	17	8	7	1	1.19 (0.61-1.64)	2.43 (1.37-3.24)	3.12 (2.08-4.17)	3.20 (2.20-3.93)	3.30 (2.20-4.39)	n.a.			
C-Stem AMT	Marathon	1,540	6	79 (74-85)	21	2	3	0	16	0	1.84 (0.53-3.33)	1.38 (0.86-1.97)	1.58 (0.86-1.97)	1.58 (0.86-1.97)	n.a.	n.a.			
STANMORE	EXETER AMT Cemented	1,864 ¹	6	76 (71-81)	34	6	1	16	11	0	1.64 (0.56-1.88)	1.31 (0.85-1.77)	1.15 (1.34-2.93)	1.85 (1.34-2.55)	3.59 (2.00-4.88)	n.a.			
Submus SPH	AVANTAGE Cemented	1,277	20	78 (72-83)	45	7	2	4	31	1	2.97 (2.03-3.92)	3.29 (2.28-4.29)	4.11 (2.82-5.40)	4.60 (3.00-6.19)	4.60 (3.00-6.19)	n.a.			
STANMORE	All Poly Acrom Cup	1,090 ¹	3	74 (69-79)	23	3	4	13	0	1	6.29 (0.00-0.41)	1.39 (0.47-2.11)	1.81 (0.98-2.64)	1.88 (1.07-2.74)	2.52 (1.49-3.53)	n.a.			
STANMORE	HOLLER	879 ¹	3	76 (72-81)	14	3	2	6	1	0	6.69 (0.14-1.23)	1.37 (0.52-2.01)	1.27 (0.52-2.01)	1.41 (0.62-2.20)	1.62 (0.75-2.32)	n.a.			
Submus SPH	PAL Cup & Lincoln	679	5	76 (74-81)	11	0	1	7	2	0	0.84 (0.19-1.68)	1.76 (0.66-2.82)	2.22 (0.80-3.64)	2.22 (0.80-3.64)	n.a.	n.a.			
Spectron SF	Reflection All Poly	617 ¹	11	77 (74-82)	54	13	0	37	4	0	0.81 (0.10-1.33)	1.81 (0.75-2.87)	2.09 (1.33-3.00)	2.25 (1.81-2.69)	4.62 (3.44-5.78)	11.40 (8.48-14.32)			
EXETER	AVANTAGE Cemented	314	17	74 (68-81)	13	3	3	0	7	0	2.18 (0.90-2.45)	2.88 (1.39-3.77)	3.28 (1.60-4.96)	3.28 (1.60-4.96)	n.a.	n.a.			
STANMORE	AVANTAGE Cemented	269 ¹	11	75 (74-84)	11	0	1	0	10	0	2.18 (0.68-2.67)	3.01 (1.26-4.76)	3.01 (1.26-4.76)	3.01 (1.26-4.76)	n.a.	n.a.			
Submus SPH	Rotacup cemented	304	3	75 (71-79)	3	1	1	0	3	0	1.33 (0.35-2.74)	1.89 (0.22-3.55)	n.a.	n.a.	n.a.	n.a.			

* Denotes prosthesis combinations with no reported use in primary THAs in 2024.

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

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Only combinations with over 250 procedures and reported by at least 3 hospitals 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.

By cemented component name - 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 2007-2024 (n=99,087)

Femur component	Acetabulum component	Primary THA (n)	Median (IQR) age (yr)	Major revisions (n)	Cumulative revision percentage (95% CI)				
					1yr	3yr	5yr	10yr	16yr
All cemented THAs for osteoarthritis		99,087	76 (71-81)	2,379	0.67 (0.62-0.72)	1.37 (1.36-1.40)	1.87 (1.78-1.96)	2.39 (2.19-2.61)	3.56 (3.35-3.80)
Submus SPH	IP-Cup	14,636	77 (72-81)	365	0.57 (0.45-0.68)	1.38 (1.10-1.66)	1.90 (1.72-2.10)	2.27 (2.02-2.52)	3.63 (3.30-3.94)
Original ME Muller	Muller low profile Durasil	11,137	75 (71-80)	167	0.82 (0.47-0.77)	1.52 (0.91-1.52)	1.90 (1.23-1.75)	1.62 (1.36-1.90)	2.03 (1.68-2.38)
Submus SPH	PAL Cup	7,562	75 (71-80)	166	0.79 (0.39-0.99)	1.40 (1.21-1.77)	2.07 (1.72-2.43)	2.89 (2.17-3.61)	3.27 (2.75-3.81)
Original ME Muller	Muller low profile	6,579	77 (73-81)	164	0.89 (0.66-1.12)	1.73 (1.41-2.05)	2.05 (1.70-2.40)	2.43 (2.04-2.82)	2.62 (2.24-3.00)
EXETER	EXETER SMHT XS	5,844	76 (69-80)	109	0.76 (0.52-0.96)	1.34 (1.03-1.64)	1.75 (1.39-2.11)	2.03 (1.62-2.44)	2.41 (2.04-2.78)
Spectron SF	Reflection All Poly XLPE	5,053	77 (73-82)	114	0.36 (0.21-0.50)	1.09 (0.60-1.58)	1.33 (1.01-1.61)	2.15 (1.71-2.59)	2.54 (2.06-3.02)
STANMORE	STANMORE	3,383 ¹	75 (70-80)	82	0.54 (0.23-0.76)	1.27 (0.83-1.62)	1.60 (1.22-1.96)	1.88 (1.40-2.35)	2.40 (1.86-2.97)
EXETER	EXETER TEMPORARY HOODED	2,827 ¹	77 (72-81)	103	0.71 (0.40-1.02)	1.22 (0.81-1.63)	1.70 (1.26-2.12)	2.33 (1.81-2.98)	2.90 (2.08-4.11)
Submus SPH	SNP	2,500 ¹	75 (71-80)	50	0.20 (0.02-0.38)	0.61 (0.30-0.92)	0.91 (0.53-1.28)	1.65 (1.12-2.17)	1.96 (1.39-2.54)
Original ME Muller	AVANTAGE Cemented	2,504	77 (71-82)	25	0.42 (0.16-0.68)	1.05 (0.56-1.52)	1.40 (0.78-2.17)	1.71 (0.88-2.54)	n.a.

* Denotes prosthesis combinations with no reported use in primary THAs in 2024.

Major revision percentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefore, 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.

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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.

By uncemented component name - 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 2007-2024 (n=284,306)

Femur component	Acetabulum component	Primary THA (n)	Hospitals (n)	Median (IQR) age (yr)	Type of revision (n)						Cumulative revision percentage (95% CI)					
					Revisions (n)	Total revision	Only femur	Only acetabulum	Only femoral head/liner	Unknown	1yr	3yr	5yr	7yr	10yr	16yr
All uncemented THA for osteoarthritis		284,306	181	68 (62-74)	16,038	1,628	3,015	2,596	2,128	771	1.85 (1.51-2.22)	2.44 (2.28-2.59)	3.04 (2.77-3.31)	3.56 (3.48-3.63)	4.39 (4.29-4.48)	6.33 (6.14-6.52)
Corail	Pinnacle	48,692	30	69 (63-75)	1,178	228	346	268	204	13	1.12 (0.93-1.32)	1.74 (1.62-1.86)	2.18 (2.04-2.32)	2.51 (2.33-2.67)	3.22 (3.02-3.43)	4.35 (4.20-4.50)
TAPERLOC Complete	Alaris	34,830	45	67 (61-73)	735	133	233	190	161	18	1.48 (1.35-1.61)	2.11 (1.94-2.27)	2.54 (2.34-2.73)	2.84 (2.63-3.04)	4.00 (3.75-4.24)	5.49 (5.19-5.81)
Polaris	BS	16,436	17	70 (63-76)	388	57	115	71	160	5	1.46 (1.44-1.48)	2.28 (2.07-2.48)	2.70 (2.42-2.98)	3.15 (2.72-3.58)		
Allosic Zwymlarz SL	Alaris	15,147	18	70 (64-77)	286	97	227	146	125	5	1.21 (1.04-1.38)	2.00 (1.78-2.23)	2.41 (2.23-2.61)	3.11 (2.82-3.39)	4.11 (3.76-4.43)	5.36 (4.97-5.80)
CLS Spectra	Alaris	12,210	19	64 (58-69)	616	65	237	179	119	20	2.64 (2.36-2.93)	3.06 (2.82-3.30)	4.17 (3.80-4.53)	4.63 (4.26-5.03)	5.44 (5.00-5.88)	6.77 (5.90-7.63)
TAPERLOC Complete	EXCEED ART	8,897	11	69 (62-75)	216	38	90	44	50	4	1.40 (1.16-1.65)	1.86 (1.58-2.14)	2.16 (1.86-2.47)	2.44 (2.11-2.77)	2.69 (2.32-3.06)	
ACCOLADE II	TRIDENT	8,197	11	69 (62-75)	197	26	43	35	40	3	1.81 (1.52-2.10)	2.42 (2.24-2.60)	2.96 (2.67-3.24)	3.69 (3.35-4.03)		
ACCOLADE	TRIDENT	7,608	10	69 (62-76)	349	53	204	53	77	2	1.40 (1.13-1.66)	2.42 (2.24-2.60)	3.06 (2.75-3.37)	4.41 (3.91-4.89)	5.34 (4.77-5.91)	
MALLOY HEAD STEMS	MALLOY HEAD	6,017	15	65 (60-69)	250	31	24	112	77	6	1.41 (1.12-1.71)	2.25 (1.89-2.63)	2.68 (2.27-3.09)	3.20 (2.75-3.64)	3.74 (3.25-4.24)	5.41 (4.64-6.17)
Therapy stem Cementless	BM Pressfit Viscous cup	5,972	13	66 (60-72)	204	15	95	60	37	4	1.39 (1.16-1.62)	2.71 (2.42-3.03)	3.06 (2.61-3.54)	3.40 (2.89-3.91)	4.51 (4.12-5.71)	
TAPERLOC Complete	C7 PPS	5,895	18	70 (62-75)	119	16	35	22	33	4	1.37 (1.24-1.50)	2.19 (1.76-2.61)				
ACCOLADE	TRIDENT TITANIUM	4,359	7	68 (62-74)	163	18	53	42	37	3	1.08 (0.78-1.38)	3.21 (1.79-4.64)	2.76 (2.28-3.24)	3.21 (2.68-3.73)	3.63 (3.20-4.03)	
Acute Muller	Alaris	4,455	8	69 (62-75)	99	18	30	7	49	4	1.71 (1.32-2.10)	2.40 (1.89-2.92)	2.88 (2.19-3.58)	3.38 (2.48-4.36)	3.58 (2.40-4.76)	
PTMOORE	Alaris	4,189	16	67 (62-73)	65	13	28	4	19	1	1.26 (0.91-1.61)	1.80 (1.33-2.27)	2.07 (1.51-2.63)			
Corail ART	Pinnacle	3,541	20	69 (62-75)	47	5	8	9	24	1	0.89 (0.59-1.19)	1.27 (0.90-1.63)	1.42 (0.99-1.84)	1.42 (0.99-1.84)		
TAPERLOC HP system	EXCEED ART	3,585	14	69 (62-75)	136	25	37	45	29	8	1.18 (0.84-1.52)	2.31 (1.85-2.76)	2.69 (2.17-3.20)	3.01 (2.39-3.63)	3.24 (2.77-3.69)	
SL Flut	Bicon Flut	3,777	5	70 (64-76)	315	49	156	85	22	1	1.70 (1.29-2.11)	5.97 (3.38-8.56)	3.40 (4.68-5.13)	6.69 (4.68-7.28)	7.90 (7.00-8.79)	10.48 (9.15-11.82)
TAPERLOC HP system	MALLOY HEAD	3,670	13	67 (61-71)	149	28	42	50	28	1	1.45 (1.06-1.83)	2.63 (2.11-3.15)	2.96 (2.41-3.51)	3.41 (2.82-4.02)	3.71 (3.09-4.33)	5.01 (4.06-5.96)
Therapy stem Cementless	BM Pressfit cup	3,623	7	73 (68-78)	164	28	41	75	29	1	2.36 (2.04-2.68)	3.21 (2.43-3.79)	3.62 (3.00-4.24)	4.13 (3.48-4.84)	4.59 (4.11-5.78)	
TAPERLOC Complete	MALLOY HEAD	3,116	14	67 (61-72)	119	20	26	32	40	1	2.09 (1.39-2.80)	3.06 (2.48-3.67)	3.56 (2.73-4.40)	3.63 (2.99-4.27)	4.61 (3.28-5.94)	
Allosic offset	Reflexion	3,087	18	71 (68-77)	102	23	38	18	18	4	1.33 (0.95-1.74)	1.93 (1.43-2.43)	2.31 (1.94-2.68)	2.75 (2.14-3.36)	3.86 (3.40-4.32)	4.89 (3.79-6.24)
Symmetry	Reflexion	2,855	16	64 (60-72)	169	13	77	33	48	1	2.12 (1.66-2.64)	2.70 (2.11-3.29)	3.06 (2.45-3.71)	3.05 (2.31-3.77)	4.30 (3.43-5.13)	7.50 (6.40-9.01)
Allosic Zwymlarz SL	ALLOCLASSIC Zwymlarz CSF	2,903	8	69 (62-75)	749	19	66	27	37	2	1.11 (0.72-1.49)	2.65 (2.06-3.24)	2.37 (2.03-2.73)	3.03 (2.65-3.41)	3.37 (3.00-3.73)	5.38 (3.29-7.46)
ACCOLADE II	TRIDENT TITANIUM	2,279	9	68 (61-74)	44	7	18	5	14	0	1.60 (1.07-2.14)	2.41 (1.65-3.16)	2.79 (1.74-3.76)			
Symmetry	BS	2,104	9	66 (60-72)	70	11	36	12	9	2	1.81 (1.24-2.38)	2.29 (1.63-2.95)	2.85 (2.12-3.58)	3.10 (2.33-3.84)	3.47 (2.66-4.28)	
EXMAX	TRIDENT	2,073	4	69 (63-75)	77	7	21	20	28	1	0.84 (0.25-0.91)	1.66 (1.11-2.32)	2.22 (1.58-2.86)	2.80 (2.07-3.52)	3.25 (2.47-4.03)	4.37 (3.33-5.40)
Arthrology	BS	1,898	5	65 (59-69)	65	9	20	20	16	0	2.08 (1.44-2.72)	2.43 (1.80-3.05)	3.26 (2.43-4.07)	3.46 (2.36-4.57)	3.73 (2.82-4.63)	
MIL Taper	Corinnum	1,867	4	69 (62-75)	48	6	32	6	4	1	0.74 (1.14-2.32)	2.35 (1.62-3.07)	2.74 (1.92-3.56)	2.95 (2.04-3.87)		
EXMAX	TRIDENT TITANIUM	1,742	5	67 (61-73)	704	12	47	30	14	1	2.30 (1.69-2.90)	3.20 (2.71-4.47)	3.05 (2.03-4.07)	4.78 (3.78-5.80)	5.42 (4.32-6.52)	
MALLOY HEAD STEMS	EXCEED ART	1,637	10	65 (58-71)	39	4	16	17	2	0	0.67 (0.28-1.07)	1.60 (0.99-2.21)	1.75 (1.09-2.56)	2.05 (1.24-3.24)	2.33 (1.59-3.08)	
OMNIFIT HA	TRIDENT	1,501	8	63 (57-67)	160	22	70	26	32	4	3.07 (2.20-3.94)	4.48 (3.43-5.53)	4.26 (3.03-5.50)	7.73 (6.37-9.10)	8.68 (6.66-11.06)	11.53 (9.79-13.28)
Allosic Zwymlarz SL	Corinnum	1,283	7	71 (64-77)	33	7	15	4	11	1	1.84 (0.88-2.84)	2.14 (1.34-2.93)	2.50 (1.63-3.37)	2.70 (1.67-3.72)	3.06 (2.06-4.06)	
Optima stem	BM Pressfit Viscous cup	1,272	9	63 (56-70)	28	4	14	7	3	1	1.74 (1.00-2.47)	2.39 (1.40-3.38)	2.55 (1.60-3.50)	2.53 (1.60-3.50)		
CLS Spectra	BS Cementless cup	1,177	2	63 (56-69)	46	18	23	12	7	1	1.87 (1.10-2.63)	2.64 (1.75-3.50)	3.54 (2.31-4.77)	3.67 (2.76-4.56)	5.07 (3.80-6.34)	7.88 (6.21-9.56)
Corail	Pinnacle Graphite	1,069	18	71 (64-76)	17	2	6	3	6	0	0.30 (0.06-1.05)	2.21 (1.12-3.50)				
SL Flut	Hydro Imhoff LUBRICITY	974	3	70 (64-76)	66	14	33	11	6	2	1.13 (0.47-1.79)	2.27 (1.33-3.21)	3.26 (2.58-3.94)	4.44 (3.15-5.76)	5.63 (4.15-7.10)	7.54 (5.90-9.98)
Allosic Zwymlarz SL	Triology	960	5	68 (62-75)	30	10	10	9	4	0	1.13 (0.42-2.00)	2.18 (1.36-3.15)	3.00 (1.98-4.00)	2.62 (1.64-3.60)	3.09 (2.40-3.77)	3.70 (2.60-4.80)
Polaris	Reflexion	927	2	70 (64-76)	21	7	4	2	8	0	1.08 (0.41-1.75)	1.62 (0.81-2.40)	1.97 (1.07-2.88)	2.21 (1.22-3.71)	2.51 (1.39-3.63)	
TAPERLOC Complete	Corinnum	829	11	69 (59-74)	23	6	7	4	6	0	0.19 (0.09-0.27)	2.08 (1.27-2.78)	2.62 (1.68-3.56)			
SL Flut	BS	799	3	69 (63-75)	46	18	28	12	7	1	1.27 (0.49-2.06)	3.08 (1.97-4.38)	3.75 (2.41-5.09)	4.48 (3.35-5.62)	5.66 (4.39-6.93)	7.15 (5.46-9.22)
CLS Spectra	PTMOORE	792	5	66 (61-71)	42	4	21	6	10	1	1.85 (0.89-2.81)	3.26 (2.29-4.34)	2.64 (1.50-3.79)	3.33 (2.04-4.61)	4.53 (3.28-5.80)	6.01 (4.25-7.77)
M MAX S	Delta TT	702	4	64 (58-70)	39	5	17	8	9	0	3.87 (2.41-5.33)	5.24 (3.42-7.06)	5.00 (3.66-6.35)	6.64 (4.90-8.38)	8.23 (5.27-11.19)	
Optima stem	BM Pressfit cup	604	4	70 (64-75)	13	2	6	1	4	0	1.62 (0.62-2.62)	2.22 (0.92-3.53)	2.70 (1.64-3.75)	2.70 (1.16-4.31)		
PTMOORE	C7 PPS	658	8	58 (52-69)	6	0	3	1	1	1	0.94 (0.19-1.69)					
CLS Spectra	BS Pressfit cup	620	5	66 (60-71)	61	8	25	21	5	4	3.08 (1.70-4.38)	4.36 (2.75-5.97)	5.89 (3.84-7.93)	6.94 (4.40-8.93)	7.60 (5.43-9.88)	11.43 (8.67-14.20)
CLS Spectra	BM Pressfit Viscous cup	589	4	69 (64-75)	25	6	8	7	2	0	1.01 (0.21-1.82)	2.36 (1.15-3.62)	3.25 (1.81-4.69)	3.94 (2.37-5.54)	4.14 (3.32-5.76)	
MIL Taper	Alaris	554	3	66 (60-72)	18	1	5	9	7	0	2.22 (0.96-3.47)	2.64 (1.27-4.00)	3.07 (1.84-4.33)	3.23 (1.75-4.63)	3.56 (3.05-4.07)	
CBM stem	BM Pressfit cup	531	4	75 (68-79)	20	4	8	12	2	0	2.19 (0.96-3.42)	3.88 (2.10-5.71)	3.88 (2.23-5.53)	4.29 (2.37-6.00)	5.07 (3.15-6.99)	
Allosic Zwymlarz SL	Tubercular Metal	543	3	68 (62-75)	30	2	11	9	7	1	0.58 (0.00-1.17)	1.85 (0.71-2.98)	2.61 (1.28-3.95)	3.38 (1.84-4.91)	3.98 (2.00-5.96)	6.02 (3.78-8.28)

* Denotes prosthesis combinations with no reported use in primary THAs in 2024.

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

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Only combinations with over 500 procedures and reported by at least 3 hospitals 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.

By uncemented component name - 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 2007-2024 (n=284,306)

Femur component	Acetabulum component	Primary THA (n)	Median (IQR) age (yr)	Major revisions (n)	Cumulative revision percentage (95% CI)							
					1yr	2yr	3yr	4yr	5yr	6yr	7yr	8yr
All uncemented THA for osteoarthritis		284,306	68 (62-74)	6,101	1.88 (1.54-2.22)	1.88 (1.51-2.25)	3.45 (2.34-4.56)	2.88 (1.79-3.98)	3.82 (2.52-5.13)	5.40 (3.22-8.57)		
Coral	Pinnacle	48,692	69 (63-75)	1,178	0.82 (0.60-1.04)	0.24 (0.17-0.34)	0.44 (0.32-0.56)	0.82 (0.59-1.05)	1.02 (0.79-1.25)	2.34 (1.55-3.13)	4.22 (2.40-5.94)	
TAPERLOC Complete	Alaris	34,830	67 (61-73)	580	1.62 (0.92-2.32)	1.91 (1.40-2.42)	2.62 (1.85-3.39)	2.11 (1.30-2.92)	3.45 (2.30-4.60)			
Polaris	RE	18,106	70 (63-76)	240	0.80 (0.57-1.03)	1.24 (1.16-1.32)	1.75 (1.53-1.97)	2.17 (1.70-2.64)	n/a			
Allosigma Zweigmoder SL	Alaris	16,527	70 (64-77)	107	0.87 (0.67-1.07)	1.54 (1.34-1.74)	2.02 (1.62-2.42)	2.20 (1.71-2.69)	3.54 (2.62-4.46)	4.54 (3.07-6.01)		
CS	RE	12,110	67 (60-74)	107	1.90 (1.27-2.53)	2.08 (1.52-2.64)	2.53 (1.81-3.25)	2.64 (1.84-3.44)	n/a			8.25 (5.75-10.75)
TAPERLOC Complete	EXCEED	8,497	69 (65-75)	172	0.46 (0.30-0.62)	0.64 (1.19-0.80)	0.85 (1.34-1.24)	0.97 (1.62-2.21)	2.17 (1.30-3.03)			
ACCOLADE R	TRIDENT	8,039	69 (62-76)	136	1.26 (1.00-1.49)	1.62 (1.30-1.94)	1.87 (1.47-2.27)	1.93 (1.47-2.39)				
ACCOLADE	TRIDENT	7,908	69 (62-76)	221	1.00 (0.80-1.20)	2.22 (1.80-2.64)	2.99 (2.40-3.58)	3.94 (3.13-4.75)	4.10 (3.40-4.80)			
MAJORITY HEADSTAYS	MAJORITY HEAD	6,804	69 (62-76)	107	0.90 (0.70-1.10)	1.60 (1.20-2.00)	2.00 (1.40-2.60)	2.00 (1.40-2.60)	2.00 (1.40-2.60)	3.00 (2.00-4.00)	3.00 (2.00-4.00)	
Malloy cement Cementless	MM Femoral Femoral cut	5,032	69 (60-78)	12	1.50 (1.10-1.90)	2.20 (1.60-2.80)	3.52 (2.20-4.84)	n/a				

PROMs
Respons
Per year

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2024



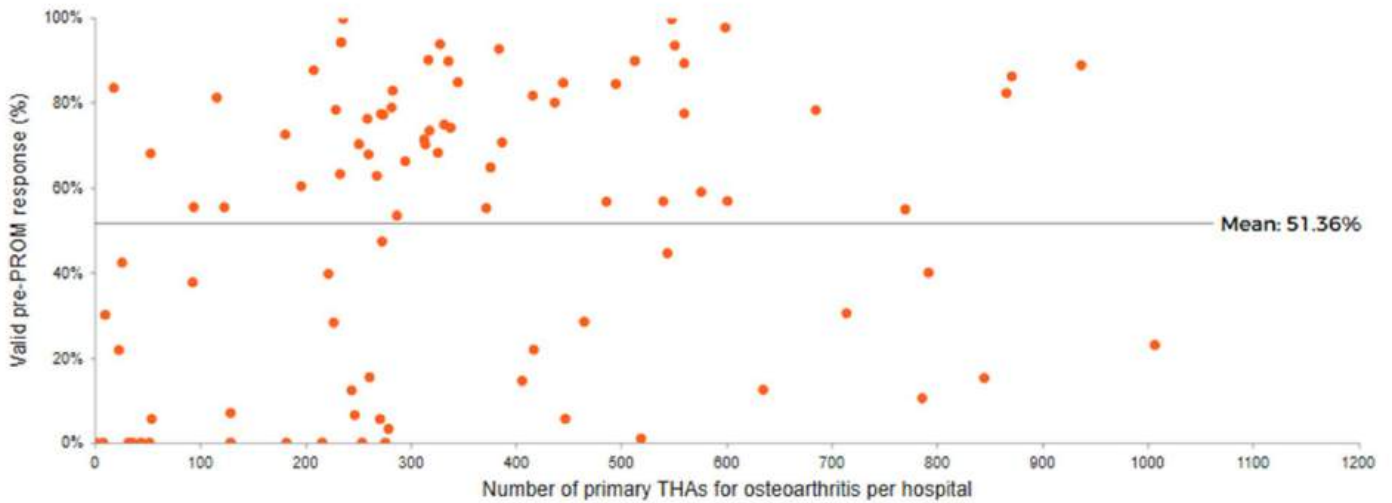
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	17.81	38.81	49.55	55.54	60.32	62.57	58.66	60.48	64.31	65.09	57.47
Pre- and 12 months PROM	11.02	23.60	31.81	37.73	39.86	40.29	39.42	42.74	42.90	38.10	n.a.
Pre-, 3- and 12 months PROM	7.58	18.01	25.51	31.17	33.14	32.55	31.81	35.32	36.98	32.32	n.a.
Total THAs for osteoarthritis (n)	24,196	24,838	25,376	26,175	27,495	28,557	23,086	26,963	31,352	31,340	31,586

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.
THA: total hip arthroplasty; PROM: patient reported outcome measure.

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Pre-PROM per hospital

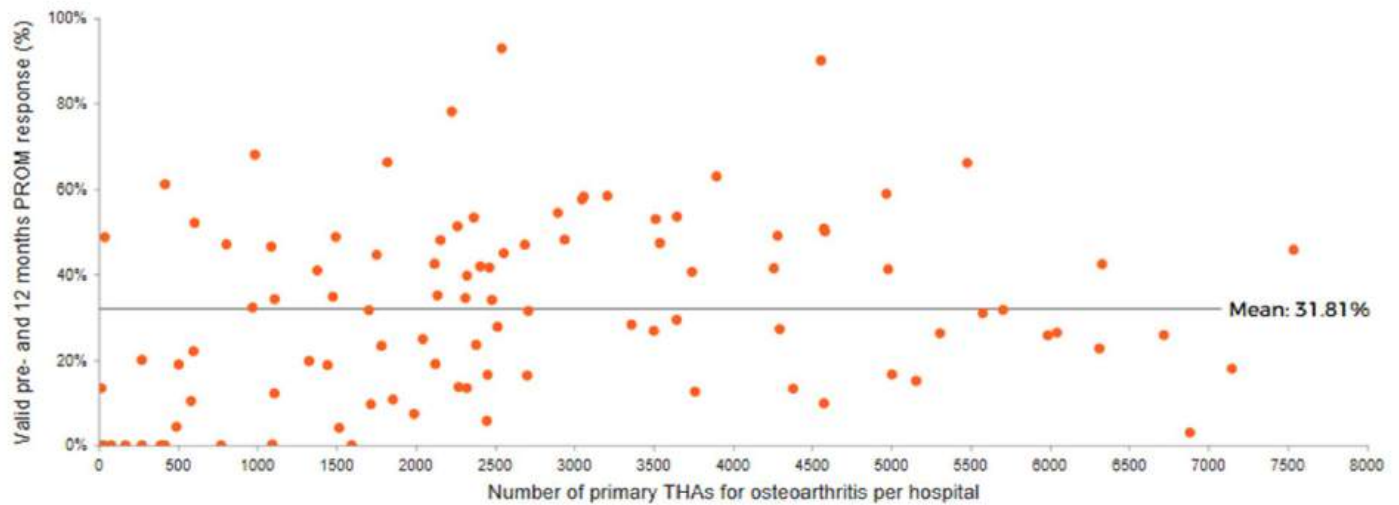
FIGURE Scatterplot of pre-operative response percentage of patients who underwent a primary THA for osteoarthritis per hospital in the Netherlands in 2024



THA: total hip arthroplasty; PROM: patient reported outcome measure.
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The mean pre-operative response rate is 51.4% in the Netherlands in 2024.
Of the 92 hospitals, 46 (51%) scored above the 60% response rate.

PROM trajectory per hospital

FIGURE Scatterplot of PROM trajectory (pre-operative and 12 months postoperative) response percentage of patients who underwent a primary THA for osteoarthritis per hospital in the Netherlands in 2014-2023

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

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

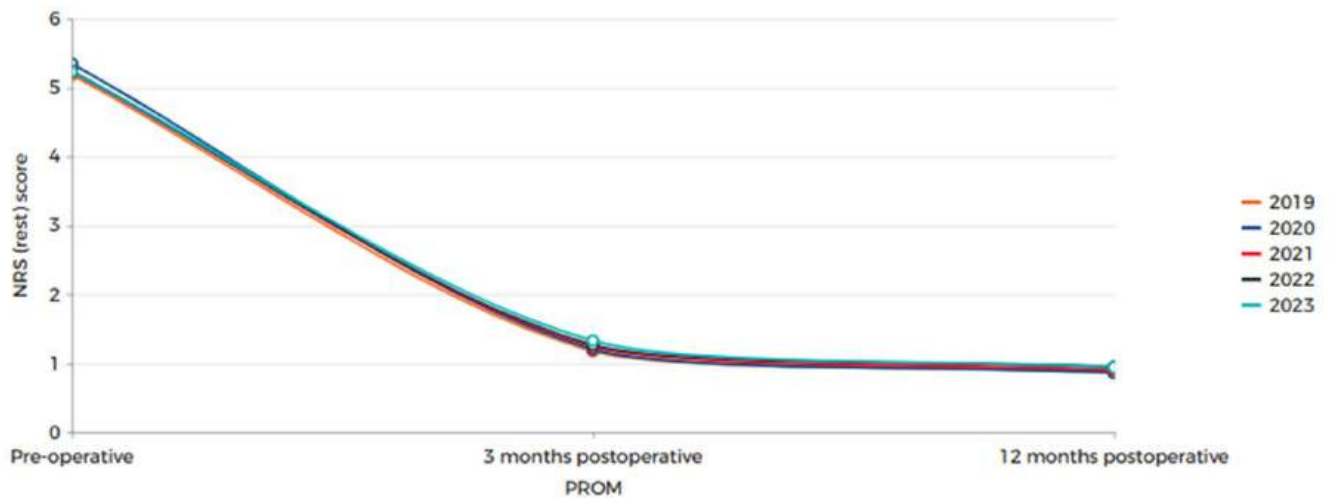
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The mean PROM trajectory response rate was 31.8% in the Netherlands between 2014-2023.

Of the 100 hospitals, 8 (8%) scored above the 60% response rate.

Outcomes

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 in the Netherlands in 2019-2023

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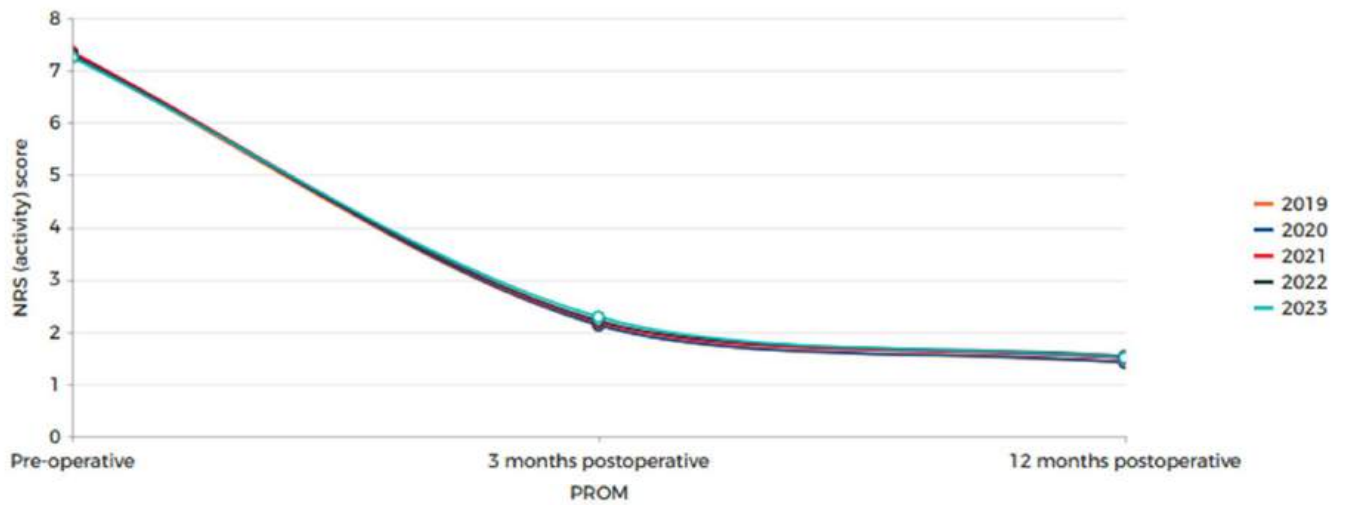
NRS (rest) score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	9,295	5.18 (5.13-5.23)	1.17 (1.14-1.21)	0.88 (0.84-0.91)
2020	7,344	5.35 (5.29-5.40)	1.20 (1.16-1.25)	0.86 (0.82-0.90)
2021	9,522	5.24 (5.19-5.29)	1.24 (1.21-1.28)	0.90 (0.87-0.94)
2022	11,594	5.22 (5.18-5.27)	1.27 (1.23-1.30)	0.94 (0.91-0.98)
2023	10,130	5.23 (5.18-5.28)	1.33 (1.29-1.37)	0.94 (0.90-0.97)
Total	47,885	5.24 (5.22-5.26)	1.25 (1.23-1.26)	0.91 (0.89-0.92)

THA: total hip arthroplasty; CI: confidence interval.

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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 in the Netherlands in 2019-2023

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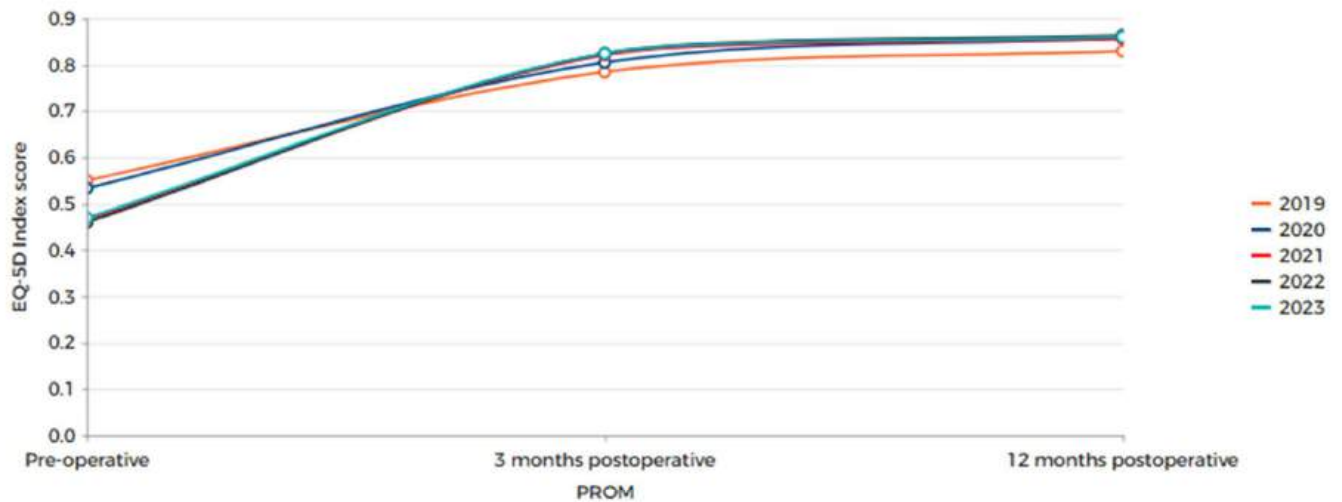
NRS (activity) score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	9,295	7.28 (7.24-7.32)	2.13 (2.08-2.17)	1.41 (1.36-1.45)
2020	7,344	7.34 (7.30-7.39)	2.13 (2.08-2.18)	1.42 (1.37-1.47)
2021	9,522	7.34 (7.30-7.38)	2.19 (2.14-2.23)	1.49 (1.44-1.53)
2022	11,594	7.30 (7.26-7.33)	2.21 (2.17-2.25)	1.53 (1.49-1.57)
2023	10,130	7.25 (7.21-7.29)	2.28 (2.24-2.33)	1.50 (1.46-1.55)
Total	47,885	7.30 (7.28-7.32)	2.19 (2.17-2.21)	1.48 (1.46-1.50)

THA: total hip arthroplasty; CI: confidence interval.

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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.

EQ-5D 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 in the Netherlands in 2019-2023

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EQ-5D Index score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	9,295	0.55 (0.55-0.55)	0.78 (0.78-0.79)	0.83 (0.83-0.83)
2020	7,344	0.53 (0.53-0.54)	0.81 (0.80-0.81)	0.86 (0.85-0.86)
2021	9,522	0.46 (0.46-0.47)	0.82 (0.82-0.82)	0.86 (0.85-0.86)
2022	11,594	0.46 (0.46-0.47)	0.83 (0.82-0.83)	0.86 (0.86-0.87)
2023	10,130	0.47 (0.46-0.48)	0.82 (0.82-0.83)	0.86 (0.86-0.86)
Total	47,885	0.49 (0.49-0.49)	0.81 (0.81-0.82)	0.85 (0.85-0.86)

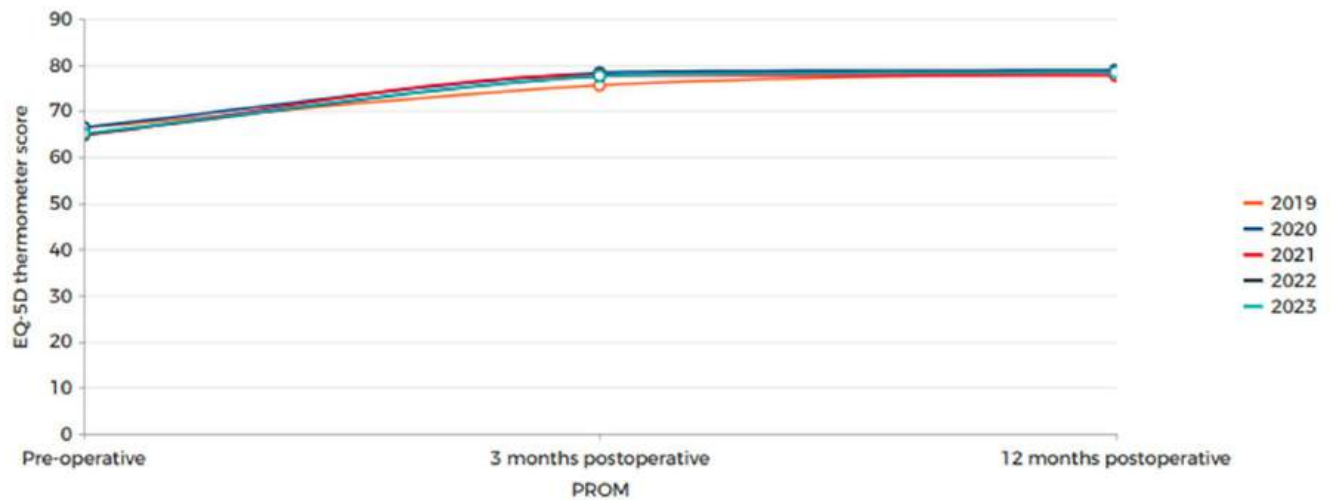
THA: total hip arthroplasty; CI: confidence interval.

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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

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a THA for osteoarthritis in the Netherlands in 2019-2023



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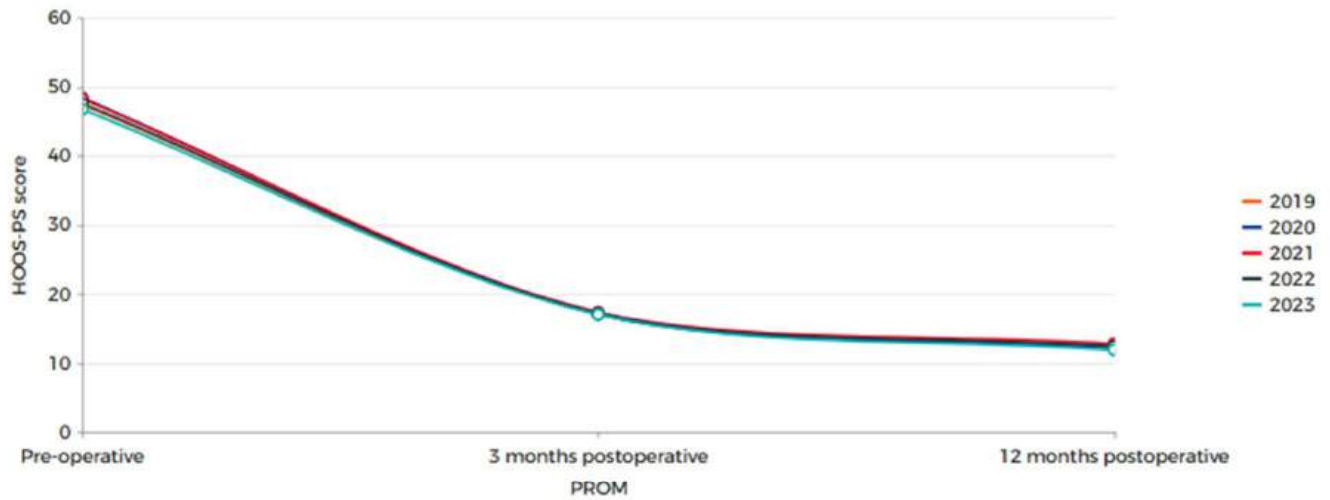
EQ-5D thermometer score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	9,295	66.42 (66.01-66.82)	75.57 (75.14-76.00)	78.47 (78.09-78.85)
2020	7,344	66.47 (66.00-66.94)	78.34 (77.94-78.74)	78.91 (78.50-79.32)
2021	9,522	64.75 (64.33-65.17)	77.85 (77.50-78.20)	77.71 (77.33-78.09)
2022	11,594	64.91 (64.54-65.28)	77.59 (77.26-77.92)	78.67 (78.34-79.00)
2023	10,130	65.17 (64.77-65.57)	77.65 (77.31-77.99)	78.45 (78.11-78.80)
Total	47,885	65.46 (65.28-65.64)	77.38 (77.21-77.54)	78.43 (78.27-78.59)

THA: total hip arthroplasty; CI: confidence interval.

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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 in the Netherlands in 2019-2023

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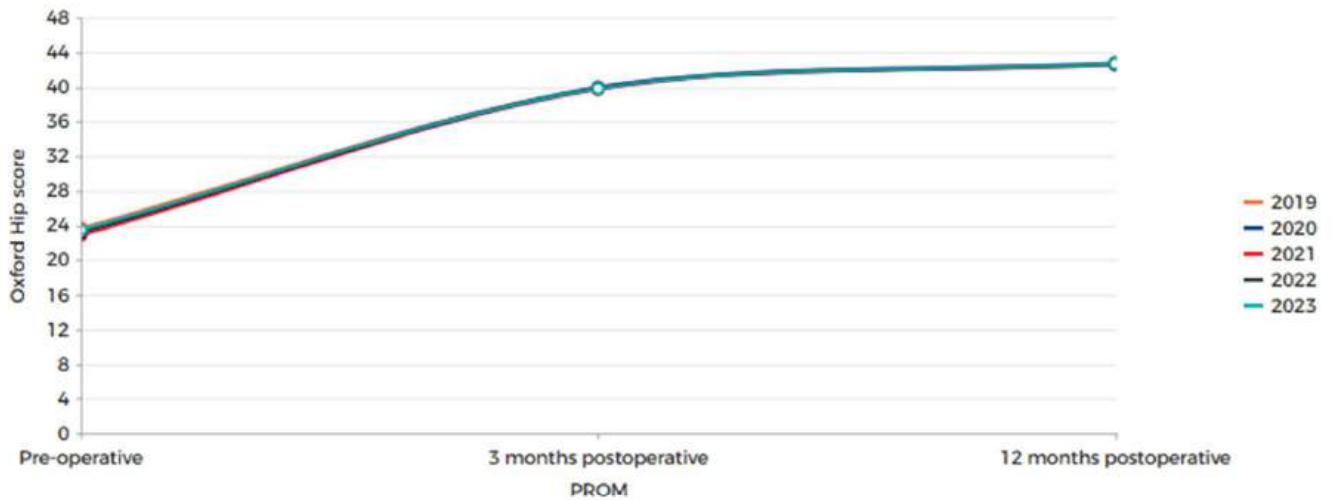
HOOS-PS score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	9,295	47.34 (46.98-47.69)	17.06 (16.76-17.36)	12.31 (12.01-12.61)
2020	7,344	48.36 (47.96-48.76)	17.04 (16.71-17.37)	12.15 (11.83-12.48)
2021	9,522	48.22 (47.85-48.58)	17.31 (17.01-17.61)	12.74 (12.44-13.04)
2022	11,594	47.56 (47.23-47.88)	17.22 (16.95-17.48)	12.43 (12.16-12.70)
2023	10,130	46.70 (46.35-47.05)	16.99 (16.70-17.29)	11.87 (11.58-12.16)
Total	47,885	47.59 (47.43-47.75)	17.13 (17.00-17.26)	12.31 (12.18-12.44)

THA: total hip arthroplasty; CI: confidence interval.

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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 in the Netherlands in 2019-2023

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Oxford Hip score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	9,295	23.73 (23.56-23.90)	39.95 (39.80-40.09)	42.77 (42.63-42.91)
2020	7,344	23.31 (23.12-23.51)	40.01 (39.85-40.16)	42.80 (42.65-42.96)
2021	9,522	22.85 (22.68-23.03)	39.70 (39.55-39.85)	42.55 (42.41-42.69)
2022	11,594	23.13 (22.97-23.28)	39.78 (39.65-39.91)	42.58 (42.46-42.70)
2023	10,130	23.49 (23.32-23.66)	39.82 (39.68-39.96)	42.69 (42.56-42.83)
Total	47,885	23.30 (23.22-23.37)	39.84 (39.77-39.90)	42.67 (42.61-42.73)

THA: total hip arthroplasty; CI: confidence interval.

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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.

Hip hemiarthroplasty

In this section you will find all the information on hip hemiarthroplasty:

Patient characteristics

By specialism

TABLE Patient characteristics of all patients with a primary hemiarthroplasty by specialism in the Netherlands in 2024

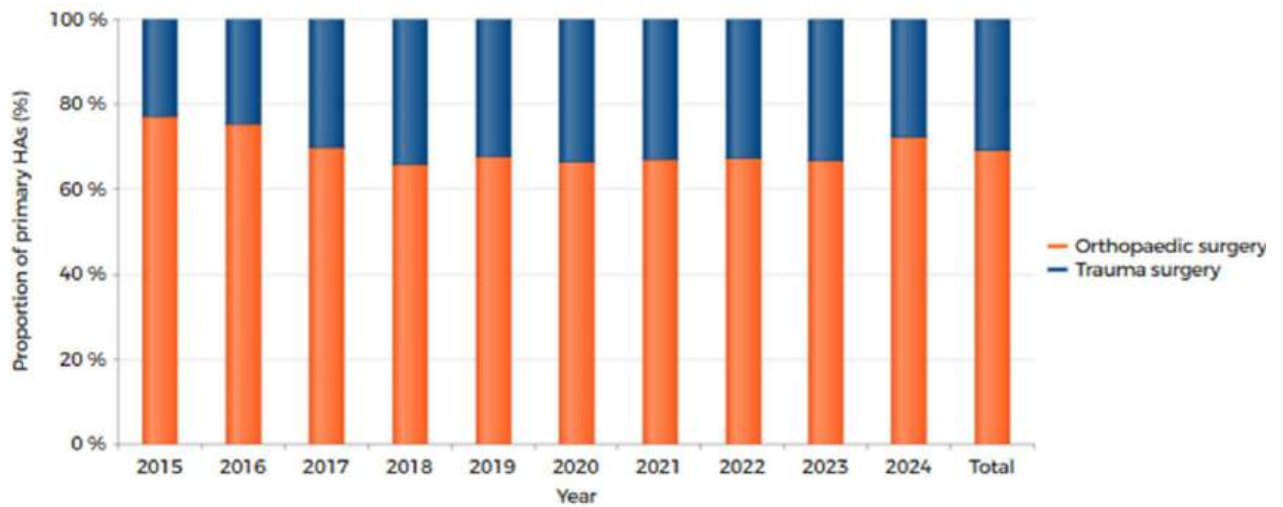
	Orthopaedic surgery	Trauma surgery	Total
N(%)	4,345 (72.4)	1,660 (27.6)	6,017
Mean age (years) (SD)	80.4 (9.3)	81.7 (7.6)	80.7 (8.9)
Age (years) (%)			
<50	1	0	0
50-59	2	1	2
60-69	7	5	7
70-79	30	30	30
>80	59	64	61
Gender (%)			
Men	37	37	37
Women	63	63	63
ASA score (%)			
ASA I	2	2	2
ASA II	30	29	29
ASA III-IV	68	69	69
Type of hospital (%)			
General	97	95	96
UMC	3	5	3
Private	0	0	0
Diagnosis (%)			
Fracture	88	92	89
Osteoarthritis	8	0	6
Post-traumatic	0	0	0
Tumour	0	0	1
Osteonecrosis	0	0	0
Dysplasia	0	0	0
Rheumatoid arthritis	0	0	0
Post-Perthes	0	0	0
Other	1	7	3
Mean BMI (kg/m²) (SD)	24.8 (4.4)	24.4 (4.5)	24.7 (4.4)
Body Mass Index (kg/m²) (%)			
Underweight (<=18.5)	5	4	5
Normal weight (>18.5-25)	49	47	55
Overweight (>25-30)	28	23	30
Obesity (>30-40)	9	6	9
Morbid obesity (>40)	0	0	0
Smoking (%)			
No	89	74	90
Yes	9	10	10

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation

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Procedure characteristics

Specialism

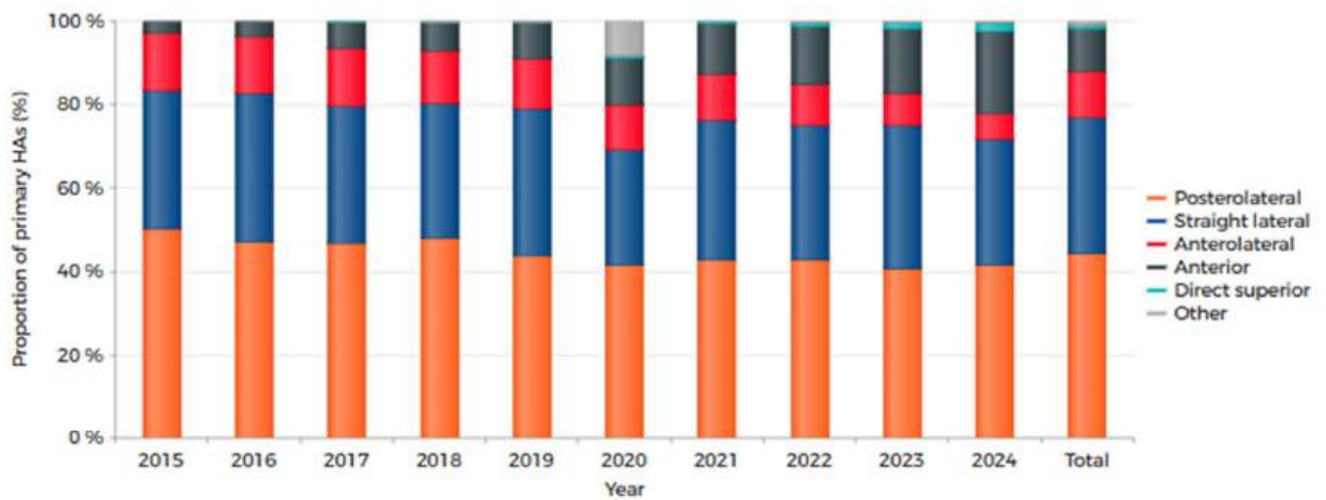
FIGURE Trend (proportion [%] per year) in specialism for performing a primary hemiarthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Orthopaedic surgery	77.19	75.35	69.89	66.04	67.70	66.53	67.29	67.40	66.72	72.36	69.34
Trauma surgery	22.81	24.65	30.11	33.96	32.30	33.47	32.71	32.60	33.28	27.64	30.66
Total (n)	4,747	5,261	5,723	6,081	6,295	6,537	6,109	6,458	6,299	6,005	59,515

HA: hemiarthroplasty

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Surgical approach

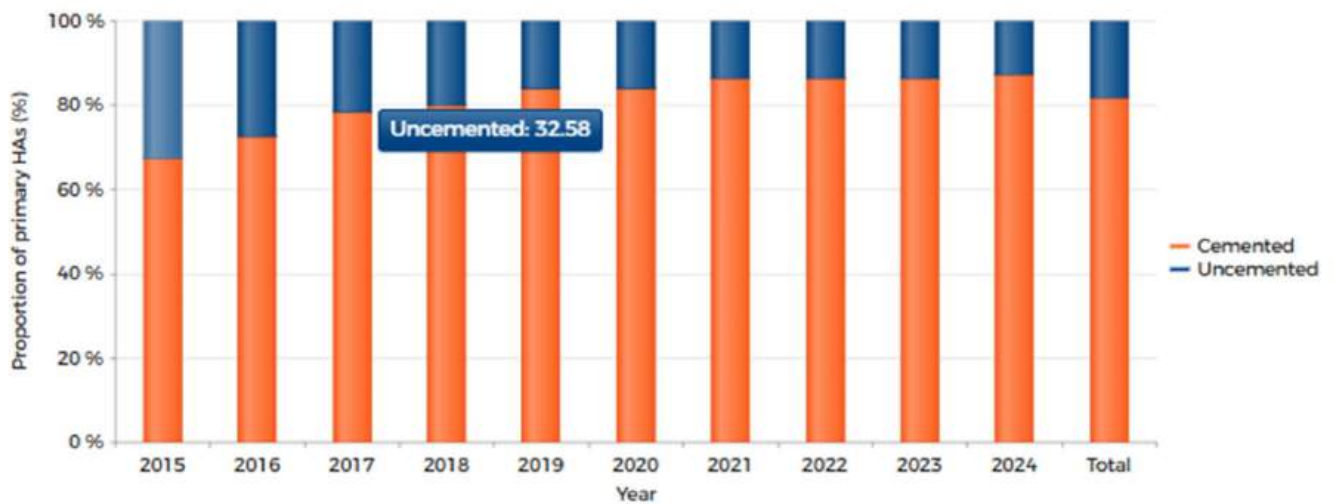
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary hemiarthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Posterolateral	50.26	47.36	46.83	48.25	43.73	41.61	42.82	42.86	40.87	41.81	44.45
Straight lateral	33.26	35.48	32.97	32.08	35.56	27.84	33.63	32.40	34.22	29.94	32.68
Anterolateral	13.60	13.41	13.87	12.64	11.69	10.47	10.98	9.79	7.80	6.09	10.94
Anterior	2.77	3.62	6.04	6.62	8.67	11.11	12.07	13.62	15.35	19.83	10.21
Direct superior	0	0	0.17	0.11	0.19	0.72	0.45	1.17	1.56	2.11	0.67
Other	0.11	0.13	0.12	0.29	0.16	8.26	0.05	0.17	0.21	0.22	1.05
Total (n)	4,757	5,443	5,911	6,240	6,286	6,516	5,992	6,433	6,286	5,931	59,795

HA: hemiarthroplasty

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Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary hemiarthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cemented	67.42	72.70	78.58	80.05	83.90	84.08	86.46	86.40	86.53	87.45	81.83
Uncemented	32.58	27.30	21.42	19.95	16.10	15.92	13.54	13.60	13.47	12.55	18.17
Total (n)	4,693	5,345	5,811	6,111	6,187	6,349	6,047	6,389	6,228	5,799	58,959

HA: hemiarthroplasty

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Most frequently registered – Femur

TABLE The most frequently registered femur components in primary hemiarthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Femur (n)	6,066	5,825	6,047	6,081	5,783
Femur name; Proportion (%)					
Lubinus SPII	18.28	19.11	23.37	22.46	25.82
Original ME Muller	28.37	25.29	25.00	25.44	25.25
Corail Cemented	1.70	3.00	4.37	7.98	7.00
C-Stem AMT	4.75	6.75	5.62	5.38	5.10
Polarstem cemented	0.00	0.60	1.24	1.15	4.70
CPT	0.15	4.60	4.94	4.83	3.87
Lubinus Classic Plus	2.70	3.16	2.83	2.66	3.35
Exeter	4.86	1.42	3.26	1.96	3.11
Taperloc Perloc Complete	0.53	0.52	0.46	0.31	2.92
Alloclassic Zweymuller SL	3.51	3.12	1.97	3.14	2.77

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*Most frequently registered - Femoral head***TABLE** The most frequently registered femoral head components in primary hemiarthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Femoral head component (n)	6,105	5,768	6,052	6,054	5,664
Femoral head name; Proportion (%)					
ZimmerBiomet Unipolar Head	33.51	28.28	26.69	27.24	28.11
Link CoCr head	18.98	22.04	25.96	22.98	23.64
Link Modular Cathcard Unipolar head	9.98	13.56	12.90	16.47	16.07
ZimmerBiomet Versys Endo	0.88	5.65	6.31	6.46	6.57
Link Modular trauma head	1.67	1.01	1.75	4.06	4.96
Smith & Nephew Oxinium head	0.07	0.57	0.78	0.68	3.99
Stryker UHR Unitrax	6.93	3.71	5.12	4.33	3.97
Mathys Stainless Steel head	11.01	9.41	8.74	7.30	3.53
ZimmerBiomet CoCr Modular Heads	0.28	0.97	1.27	0.89	2.86
Smith & Nephew Uni-polar	6.00	4.13	2.21	2.33	2.03

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*Most frequently registered - Bone cement***TABLE** The most frequently registered bone cement used during primary hemiarthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	2,553	2,846	3,112	3,187	3,023
Cement name; Proportion (%)					
Palacos R+G	48.69	49.79	49.23	56.86	51.51
Refobacin Bone Cement R	41.25	43.64	43.99	38.50	48.23
Refobacin Plus Bone Cement	10.07	6.50	6.78	4.64	0.17
Copal G+C	0.00	0.00	0.00	0.00	0.10
Year	2020	2021	2022	2023	2024
Separately packed bone cement (n)	1,710	1,586	1,497	1,347	1,447
Cement name; Proportion (%)					
Palacos R+G	64.15	76.04	79.49	65.33	68.07
Copal G+C	7.19	10.91	11.36	11.95	13.68
Palacos MV+G	4.80	6.05	6.35	7.20	8.78
Simplex ABC TOBRA	0.06	0.00	0.27	0.97	5.87
Simplex ABC EC	0.58	0.25	0.33	0.82	1.87
Refobacin Bone Cement R	16.37	1.13	1.14	12.77	1.45
Copal G+V	0.29	0.06	0.00	0.52	0.14
Refobacin Revision	0.23	0.06	0.07	0.07	0.07
Simplex P	1.40	0.00	0.07	0.00	0.07

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Survival

Short term revision

TABLE Time after primary hemiarthroplasty until short-term revision in the Netherlands in 2017-2021 (n=31,156)

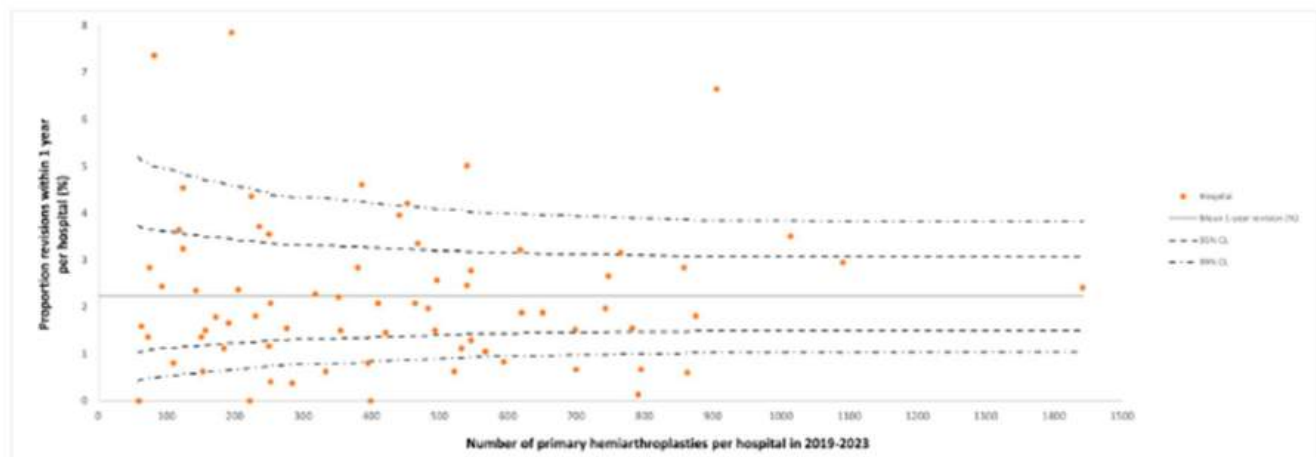
Time after primary HA	Percentage revisions (%)
Day 0-29	1.08
Day 30-182	0.67
Day 183-364	0.20
Day 365-730 (second year)	0.49
Day 731-1095 (third year)	0.30

HA: hemiarthroplasty

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In 2017-2021, 13,798 (44.3%) primary HAs were implanted in patients who died within three years after the primary procedure.

Overall revision per hospital

Funnel plot of proportion of hip revision arthroplasties within one year after a hemiarthroplasty per hospital in the Netherlands in 2018-2022 (n=31,696)

Please note: The proportions of revisions within 1 year per hospital were adjusted for casemix factors age, gender, ASA score, BMI and smoking; CL: control limits.

The mean 1-year revision percentage is 2.24 in the Netherlands in 2019-2023.
Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Revision and mortality rates within 1 year.

TABLE Revision procedures and mortality within 1 year after primary hemiarthroplasty by year in the Netherlands in 2019-2023 (n=31,696)

Procedure year	Number of hemiarthroplasties	Number of revisions	Percentage revisions	Number of deaths	Percentage deaths
2019	6,269	143	2.3%	1,412	22.5%
2020	6,514	135	2.1%	1,565	24.0%
2021	6,116	123	2.0%	1,455	23.8%
2022	6,490	157	2.4%	1,459	22.5%
2023	6,307	151	2.4%	1,196	19.0%

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By type of revision within 1 year

TABLE Cumulative 1-year revision percentage of primary hemiarthroplasties by type of revision in the Netherlands in 2019-2023 (n=31,696)

	Cumulative 1-year revision percentage
	Kaplan Meier (95% CI)
Any type of revision	2.35 (2.17-2.52)
Major revision	1.47 (1.33-1.61)
Minor revision	0.84 (0.74-0.95)
DAIR	0.67 (0.58-0.76)
No DAIR	0.17 (0.13-0.22)

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 the femur component.

Minor revision: only femoral head exchange (including DAIR procedures).

HA: hemiarthroplasty; CI: confidence interval

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In 2019-2023, 7,087 (22.4%) primary HAs were implanted in patients who died within one year after the primary procedure.

Reasons for revision within 1 year

TABLE Reasons for revision within one year of primary hemiarthroplasties by type of revision in the Netherlands in 2019-2023

	Major revision (n=473)	Minor revision (n=255)	Any type of revision (n=709)
Reasons for revision	Proportion (%)	Proportion (%)	Proportion (%)
Infection	19.03	79.61	38.93
Dislocation	47.78	10.98	35.54
Peri-prosthetic fracture	15.22	1.96	10.72
Loosening of femur component	6.77	0.00	4.65
Malposition or malalignment	4.02	0.78	2.96
Girdlestone situation	2.75	0.00	1.27
Inlay wear	1.27	0.39	0.99
Peri-articular ossification	0.42	0.00	0.28
Symptomatic MoM bearing	0.00	0.00	0.00
Other	16.70	9.80	14.53

Major revision: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefore, 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%.

Please note: Malposition or malalignment has been registered since 2022.

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Conversion to total hip arthroplasty

TABLE Conversions from primary hemiarthroplasty to total hip arthroplasty within 1 year in the period 2019-2023 (n=31,696)

Number of revision procedures	709
Number of conversions	338
Percentage conversions	47.7 %

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Time after primary hemi

TABLE Time after primary hemiarthroplasty until short-term revision in the Netherlands in 2017-2021 (n=31,156)

Time after primary HA	Percentage revisions (%)
Day 0-29	1.08
Day 30-182	0.67
Day 183-364	0.20
Day 365-730 (second year)	0.49
Day 731-1095 (third year)	0.30

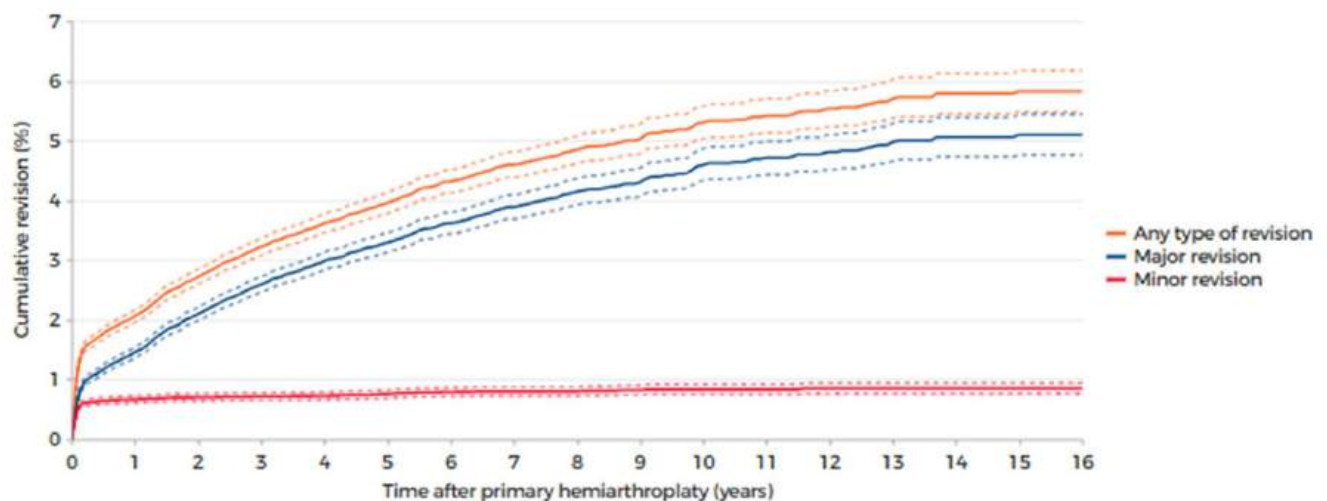
HA: hemiarthroplasty

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In 2017-2021, 13,798 (44.3%) primary HAs were implanted in patients who died within three years after the primary procedure.

Long term revision

By type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of hemiarthroplasties by type of revision in the Netherlands in 2007-2024 (n=79,587)

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	1yr	3yr	5yr	7yr	10yr	16yr
Any type of revision	1.99 (1.89-2.10)	3.18 (3.04-3.32)	3.92 (3.75-4.10)	4.60 (4.38-4.81)	5.29 (5.01-5.56)	5.83 (5.48-6.17)
Major revision	1.39 (1.31-1.48)	2.55 (2.42-2.68)	3.26 (3.10-3.43)	3.89 (3.69-4.09)	4.56 (4.30-4.83)	5.10 (4.76-5.44)
Minor revision	0.66 (0.60-0.72)	0.72 (0.65-0.78)	0.75 (0.69-0.82)	0.80 (0.73-0.87)	0.83 (0.75-0.92)	0.85 (0.76-0.94)

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 component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

Minor revision: only femoral head exchange (including DAIR procedures).

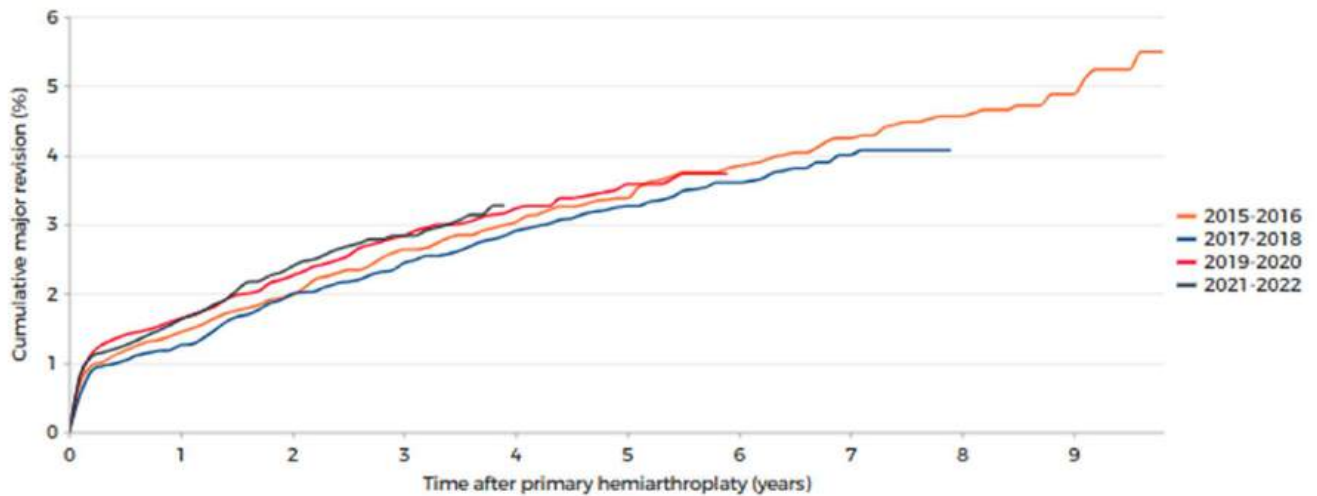
HA: hemiarthroplasty; CI: confidence interval.

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16,737 (21.0%) of primary hemiarthroplasties were implanted in patients who died within one year, 38,130 (47.9%) within five years, 44,733 (56.2%) within ten years, and 45,542 (57.2%) within sixteen 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 procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of hemiarthroplasties by procedure year of primary HA in the Netherlands in 2015-2024 (n=47,766)

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	Number (n)	1yr	3yr	5yr	7yr	10yr
2015-2016	10,376	1.38 (1.14-1.62)	2.59 (2.23-2.94)	3.38 (2.95-3.81)	4.25 (3.72-4.78)	5.50 (4.59-6.40)
2017-2018	12,257	1.18 (0.98-1.38)	2.34 (2.04-2.64)	3.24 (2.86-3.63)	4.00 (3.52-4.49)	n.a.
2019-2020	12,783	1.59 (1.36-1.82)	2.81 (2.48-3.13)	3.50 (3.11-3.90)	n.a.	n.a.
2021-2022	12,606	1.54 (1.31-1.76)	2.84 (2.50-3.18)	n.a.	n.a.	n.a.

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

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

HA: hemiarthroplasty; CI: confidence interval.

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13,057 (27.2%) of primary hemiarthroplasties were implanted in patients who died within one year, 29,029 (60.5%) within five years, and 32,354 (67.5%) within ten years

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

Survival by component

By cemented femur – fracture

TABLE Cumulative revision percentages of cemented primary hemiarthroplasties by femoral component in fracture patients treated by orthopaedic surgeons in the Netherlands in 2007-2024 (n=40,563)

Femur component	Primary HA (n)	Hospital (n)	Median IQR (yr)	Revisions (n)	Type of revision (n)							Cumulative revision percentage (95% CI)					
					Total revision	Only femur	Only acetabulum	Only femoral head/neck	Unknown	Of which conversion to TKA		1yr	3yr	5yr	7yr	10yr	16yr
All cemented HAs for fracture	40,563	76	83 (79-88)	1,675	261	45	218	134	17	764		1.78 (1.64-1.91)	3.85 (3.66-4.04)	5.47 (5.24-5.70)	6.86 (6.58-7.14)	8.32 (7.97-8.67)	9.79 (9.35-10.23)
Cemented HAs for fracture	10,004	27	85 (79-88)	249	41	5	190	107	6	239		2.16 (1.92-2.41)	3.74 (3.55-3.94)	5.05 (4.78-5.31)	6.72 (6.32-7.11)	8.28 (7.79-8.76)	9.87 (9.37-10.37)
Uniflex SMI	10,028	25	85 (79-88)	217	34	5	168	46	5	158		1.41 (1.16-1.65)	2.51 (2.14-2.88)	2.94 (2.50-3.38)	3.62 (3.00-4.23)	4.28 (3.43-5.13)	4.97 (3.94-5.99)
EKAETER	5,002	20	85 (79-88)	83	25	9	27	30	0	53		1.80 (1.17-2.04)	2.29 (1.74-2.84)	2.88 (2.25-3.51)	2.75 (2.11-3.38)	3.40 (2.30-4.50)	3.57 (2.80-4.33)
C Stem AMT	2,239	5	84 (79-88)	82	18	12	16	17	0	23		3.06 (1.45-2.70)	3.13 (2.28-4.03)	4.40 (3.03-5.77)	n.a.	n.a.	n.a.
STANMORE	2,272*	13	85 (79-88)	57	15	1	25	5	1	47		0.60 (0.43-1.21)	1.79 (1.17-2.42)	3.09 (2.15-4.02)	4.32 (3.06-5.59)	5.63 (3.82-7.42)	n.a.
CCA stem	1,848	12	84 (79-88)	47	8	2	23	15	1	26		1.40 (0.94-1.36)	2.15 (1.47-2.80)	3.78 (2.32-5.04)	4.59 (3.04-6.13)	4.59 (3.04-6.13)	n.a.
Spektrum EP	1,245	17	83 (79-88)	65	14	1	30	17	1	42		2.31 (1.19-3.03)	3.57 (2.60-4.54)	4.06 (2.88-5.23)	4.74 (3.42-6.06)	5.75 (3.94-7.57)	n.a.
Corail Cemented	1,244	8	83 (77-88)	22	10	1	10	2	0	27		2.16 (1.19-2.13)	4.38 (3.09-6.07)	6.81 (5.01-9.61)	n.a.	n.a.	n.a.
CPT	1,034	5	83 (77-87)	27	14	5	10	7	1	18		3.19 (2.08-4.31)	4.92 (3.12-6.71)	n.a.	n.a.	n.a.	n.a.
TAPERLOC Hip Cemented CoCr	848	5	85 (81-89)	14	4	0	10	0	0	14		0.34 (0.00-0.61)	3.16 (1.74-5.57)	3.92 (1.79-6.11)	4.59 (2.63-7.15)	n.a.	n.a.
Enigma stem Cemented	338	5	84 (79-88)	13	2	1	4	4	1	6		2.22 (0.58-2.88)	3.33 (1.01-6.06)	4.59 (1.28-6.52)	n.a.	n.a.	n.a.
Bera	274*	0	83 (80-89)	0	4	0	4	0	0	0		1.16 (0.00-2.40)	3.19 (0.62-5.40)	5.15 (0.63-5.40)	4.22 (1.12-7.30)	4.22 (1.12-7.30)	n.a.
Polarex cemented	227	3	82 (77-88)	8	1	2	2	1	0	3		2.34 (0.51-4.38)	n.a.	n.a.	n.a.	n.a.	n.a.
Quintus	187*	2	82 (77-87)	3	2	0	0	0	0	2		1.30 (0.00-2.00)	2.22 (0.90-4.75)	2.22 (0.90-4.75)	2.22 (0.90-4.75)	2.22 (0.90-4.75)	n.a.
CS Plus	134*	3	84 (79-88)	5	3	0	2	0	0	4		0.80 (0.00-2.38)	4.59 (1.10-9.08)	n.a.	n.a.	n.a.	n.a.
Compass	130*	3	85 (79-88)	2	0	0	1	0	1	0		0.87 (0.00-2.58)	2.21 (0.90-5.58)	n.a.	n.a.	n.a.	n.a.
MIND Hip Stem	90*	2	82 (77-88)	4	0	0	2	1	1	2		4.52 (0.17-8.90)	n.a.	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary HAs in 2024.

Please note: n.a. if <50 cases were at risk; HA: hemiarthroplasty; CI: confidence interval; IQR: interquartile range.

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Only combinations with over 50 procedures and reported by at least 3 hospitals have been listed.

8,600 (21.2%) of primary hemiarthroplasties were implanted in patients who died within one year, 19,736 (48.7%) within five years, 23,165 (57.1%) within ten years, and 23,553 (58.1%) within sixteen 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 uncemented femur – fracture

TABLE Cumulative revision percentages of uncemented primary hemiarthroplasties by femoral component in fracture patients treated by orthopaedic surgeons in the Netherlands in 2007-2024 (n=13,126)

Femur component	Primary HA (n)	Hospitals (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)						Cumulative revision percentage (95% CI)					
					Total revision	Only femur	Only acetabulum	Only femoral head/neck	Unknown	Of which conversion to THA	1yr	5yr	10yr	15yr	20yr	25yr
All uncemented HA for non-fracture	13,126	71	81 (76-86)	528	145	145	166	87	12	268	3.76 (3.41-2.98)	8.93 (8.58-9.38)	14.88 (14.25-15.52)	19.40 (18.88-19.91)	23.11 (22.68-23.54)	27.07 (26.70-27.48)
Allosaurus	1,565	7	81 (79-83)	112	26	42	10	11	6	20	3.75 (3.35-4.61)	9.18 (8.71-9.71)	15.79 (15.43-16.22)	20.65 (20.27-21.03)	24.51 (24.15-24.87)	n.a.
DB10	1,851*	12	84 (78-88)	74	27	13	20	5	0	40	2.51 (1.72-3.30)	3.75 (2.74-4.77)	6.34 (5.36-7.31)	9.42 (8.37-10.48)	12.55 (11.52-13.58)	15.71 (14.67-16.75)
Allosaurus Zweymüller SL	1,301	16	84 (80-88)	62	13	15	28	4	2	38	2.04 (1.36-2.72)	4.28 (3.11-5.44)	6.58 (5.34-7.81)	9.79 (8.74-10.84)	14.13 (13.09-15.17)	18.95 (17.92-19.98)
Corail	1,278	12	83 (78-88)	51	8	4	22	2	0	29	1.98 (1.46-1.88)	2.77 (1.83-3.78)	3.98 (2.71-5.26)	4.29 (2.94-5.63)	5.22 (3.71-6.73)	n.a.
Trochanter stem Cementless	300	7	84 (78-88)	34	6	0	13	6	1	21	2.55 (1.33-3.77)	4.11 (2.83-5.48)	6.18 (4.70-7.54)	7.10 (5.77-8.43)	n.a.	n.a.
BAKROC Complete	740	19	84 (77-89)	22	8	3	8	5	0	13	2.40 (1.31-3.64)	3.70 (2.74-4.65)	5.41 (4.35-6.47)	7.41 (6.39-8.43)	n.a.	n.a.
SL Plus	392*	9	83 (77-88)	13	3	1	3	0	0	9	1.90 (1.30-2.50)	2.83 (2.02-3.63)	4.05 (3.15-4.95)	4.28 (3.15-5.41)	5.52 (4.24-6.80)	n.a.
SOMAC	202*	4	83 (78-87)	4	1	2	0	1	0	0	1.59 (0.80-2.38)	1.59 (0.80-2.38)	1.59 (0.80-2.38)	1.59 (0.80-2.38)	n.a.	n.a.
TAPROC HIP system	180*	7	84 (79-88)	3	4	1	2	0	0	3	2.54 (1.07-5.01)	3.81 (2.41-5.21)	5.78 (3.20-10.18)	5.78 (3.20-10.18)	n.a.	n.a.
Biolam	130	4	88 (78-88)	8	2	0	0	1	0	2	4.48 (3.84-5.12)	n.a.	n.a.	n.a.	n.a.	n.a.
Allosaurus offset	110	8	85 (80-89)	7	1	3	3	0	0	4	4.48 (3.84-5.12)	5.62 (3.22-10.05)	n.a.	n.a.	n.a.	n.a.
Original HG Muller	82*	19	84 (77-88)	1	1	0	0	0	0	1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Isobius DHS	56	12	84 (78-88)	2	1	0	2	0	0	2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary HAs in 2024.

Please note: n.a. if <50 cases were at risk; HA: hemiarthroplasty; CI: confidence interval; IQR: interquartile range.

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Only combinations with over 50 procedures and reported by at least 3 hospitals have been listed.

2,813 (21.4%) of primary hemiarthroplasties were implanted in patients who died within one year, 6,679 (50.9%) within five years, 8,177 (62.3%) within ten years, and 8,373 (63.8%) within sixteen 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 cemented femur - other diagnosis

TABLE Cumulative revision percentages of cemented primary hemiarthroplasties by femoral component in patients treated by orthopaedic surgeons for indications other than fracture in the Netherlands in 2007-2024 (n=3,631)

Femur component	Primary HA (n)	Hospitals (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)						Cumulative revision percentage (95% CI)					
					Total revision	Only femur	Only acetabulum	Only femoral head/neck	Unknown	Of which conversion to THA	1yr	5yr	10yr	15yr	20yr	25yr
All cemented HA for non-fracture	3,631	79	79 (72-85)	145	58	0	72	25	3	100	2.42 (2.00-2.83)	4.83 (4.30-5.37)	6.99 (6.12-7.85)	9.18 (8.31-10.05)	10.88 (9.88-11.88)	12.80 (11.70-13.90)
Isobius DHS	204	22	79 (71-87)	24	4	0	1	13	0	18	1.55 (0.75-2.40)	3.00 (2.16-3.83)	3.94 (3.03-4.79)	5.70 (4.15-7.25)	7.70 (5.72-9.67)	9.70 (7.52-11.88)
Original HG Muller	716	33	80 (72-88)	34	10	0	17	7	0	26	1.13 (0.81-1.45)	4.76 (3.29-6.23)	5.75 (4.07-7.44)	6.75 (5.03-8.47)	8.02 (6.26-9.78)	n.a.
Erafon	407	21	79 (71-87)	18	6	1	9	2	0	12	1.77 (1.47-2.06)	3.06 (2.26-3.86)	4.84 (3.28-6.40)	4.97 (3.53-6.41)	6.02 (4.56-7.48)	n.a.
Stemline	294*	11	79 (72-85)	8	0	0	8	2	0	8	3.70 (3.00-4.40)	2.27 (0.26-4.27)	1.40 (0.08-2.72)	4.28 (1.25-7.33)	n.a.	n.a.
CCR stem	130	13	83 (76-87)	7	2	0	3	1	1	5	3.28 (0.88-5.82)	3.30 (0.27-6.32)	3.30 (0.27-6.32)	3.30 (0.27-6.32)	3.30 (0.27-6.32)	n.a.
Spectron EF	130	16	79 (74-88)	14	2	0	10	2	0	10	4.40 (3.41-5.39)	5.21 (3.27-7.15)	6.20 (4.24-8.16)	6.20 (4.24-8.16)	n.a.	n.a.
Taparita Hip Cemented GAO	87	7	82 (77-87)	3	1	1	0	0	0	2	2.40 (0.00-5.87)	n.a.	n.a.	n.a.	n.a.	n.a.
Bach	70*	5	84 (78-88)	0	0	0	0	0	0	0	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)	n.a.	n.a.
C Stem AMT	75	5	82 (76-88)	1	0	0	0	1	0	0	1.38 (0.04-4.01)	n.a.	n.a.	n.a.	n.a.	n.a.
DPI	66	4	82 (77-88)	5	2	0	0	2	0	2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary HAs in 2024.

Please note: n.a. if <50 cases were at risk; HA: hemiarthroplasty; CI: confidence interval; IQR: interquartile range.

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Only combinations with over 50 procedures and reported by at least 3 hospitals have been listed.

784 (21.6%) of primary hemiarthroplasties were implanted in patients who died within one year, 1,527 (42.1%) within five years, 1,832 (50.5%) within ten years, and 1,931 (53.2%) within sixteen 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 uncemented femur - other diagnosis

TABLE Cumulative revision percentages of uncemented primary hemiarthroplasties by femoral component in patients treated by orthopaedic surgeons for indications other than fracture in the Netherlands in 2007-2024 (n=1,787)

Femur component	Primary HA (n)	Hospitals (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)						Cumulative revision percentage (95% CI)					
					Total revision	Only femur	Only acetabulum	Only femoral head/neck	Unknown	Of which conversion to THA	1yr	5yr	10yr	15yr	20yr	25yr
All uncemented HA for non-fracture	1,787	68	77 (69-84)	35	23	18	22	16	2	47	3.01 (2.30-3.82)	4.34 (3.23-5.44)	5.34 (4.18-6.51)	6.00 (4.70-7.30)	6.88 (5.38-8.38)	7.64 (6.21-9.07)
Allosaurus Zweymüller SL	268	17	82 (77-87)	11	2	4	0	3	0	4	2.07 (0.81-4.93)	5.33 (3.17-8.42)	4.28 (2.78-5.78)	4.28 (2.78-5.78)	4.28 (2.78-5.78)	4.28 (2.78-5.78)
Corail	174	16	74 (68-81)	7	0	2	4	1	0	4	1.18 (0.00-2.74)	2.42 (0.07-4.78)	3.29 (0.42-6.05)	n.a.	n.a.	n.a.
Taparita Hip Cemented	153	20	78 (68-88)	4	0	2	2	0	0	2	1.05 (0.00-4.11)	1.05 (0.00-4.11)	1.47 (0.00-3.95)	n.a.	n.a.	n.a.
DB10	154*	8	82 (75-87)	7	1	0	4	2	0	5	2.00 (0.00-4.94)	5.18 (1.43-8.92)	5.18 (1.43-8.92)	5.18 (1.43-8.92)	5.18 (1.43-8.92)	n.a.
Accolade	77*	6	81 (75-86)	0	0	0	0	0	0	0	0.00 (0.00-0.00)	0.00 (0.00-0.00)	n.a.	n.a.	n.a.	n.a.
Taparita Hip system	80*	9	88 (84-92)	5	2	0	3	0	0	4	1.60 (0.00-4.00)	n.a.	n.a.	n.a.	n.a.	n.a.
SL Plus	50*	7	82 (72-87)	4	2	1	1	0	0	3	1.75 (0.00-5.16)	n.a.	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary HAs in 2024.

Please note: n.a. if <50 cases were at risk; HA: hemiarthroplasty; CI: confidence interval; IQR: interquartile range.

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Only combinations with over 50 procedures and reported by at least 3 hospitals have been listed.

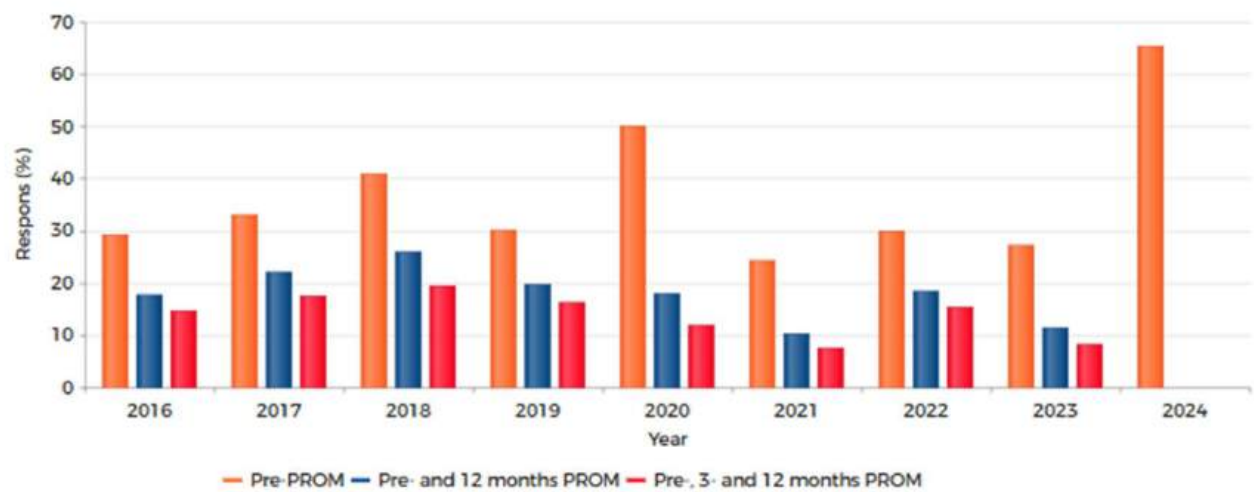
226 (12.6%) of primary hemiarthroplasties were implanted in patients who died within one year, 544 (30.4%) within five years, 719 (40.2%) within ten years, and 765 (42.8%) within sixteen years after the primary procedure.

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

PROMs

Response

Response per year

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a HA for osteoarthritis in the Netherlands in 2016-2024

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	29.11	33.04	40.79	30.05	50.00	24.30	30.00	27.27	65.35
Pre- and 12 months PROM	17.72	22.03	25.99	19.70	17.91	10.28	18.46	11.36	n.a.
Pre-, 3- and 12 months PROM	14.56	17.62	19.49	16.26	11.94	7.48	15.38	8.33	n.a.
Total HAs for osteoarthritis (n)	158	227	277	203	134	107	130	132	329

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

HA: hemiarthroplasty; PROM: patient reported outcome measure.

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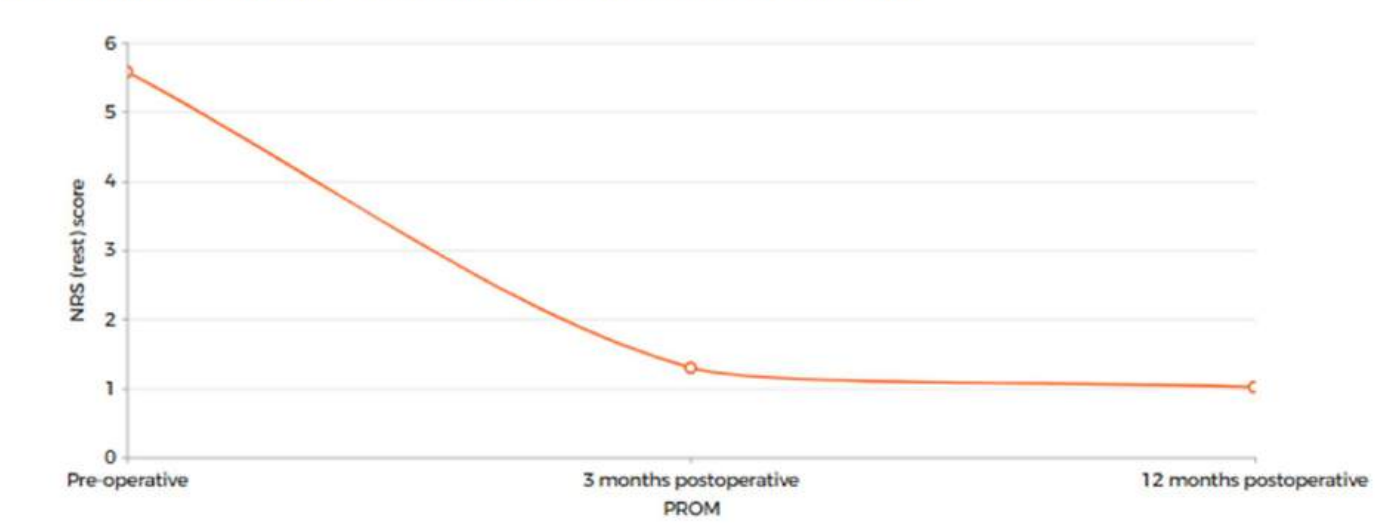
This figure includes hemiarthroplasties performed for osteoarthritis. For hemiarthroplasties performed for fractures, preoperative PROMs are often not available.

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Outcomes

NRS (rest)

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a HA for osteoarthritis in the Netherlands in 2016-2023



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NRS (rest) score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
205	5.58 (5.22-5.95)	1.30 (1.02-1.57)	1.02 (0.77-1.26)

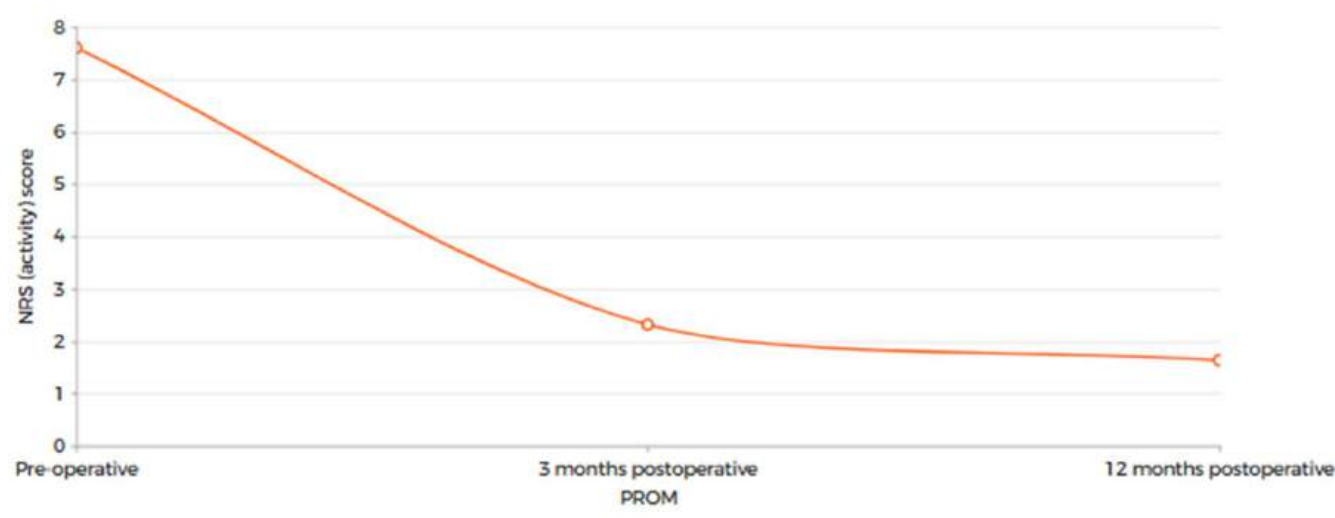
HA: hemiarthroplasty; CI: confidence interval.

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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 HA for osteoarthritis in the Netherlands in 2016-2023



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NRS (activity) score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
205	7.60 (7.36-7.85)	2.32 (1.99-2.64)	1.64 (1.32-1.95)

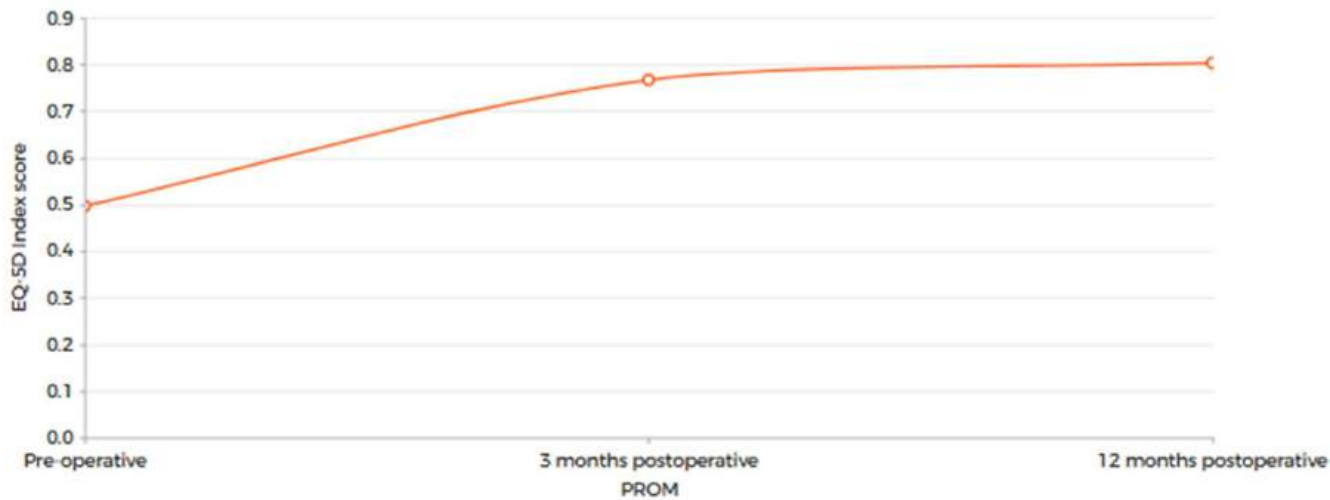
HA: hemiarthroplasty; CI: confidence interval.

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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.

EQ-5D Index score

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D index scores of patients who underwent a HA for osteoarthritis in the Netherlands in 2016-2023



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EQ-5D Index score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
205	0.50 (0.47-0.53)	0.77 (0.74-0.79)	0.80 (0.78-0.83)

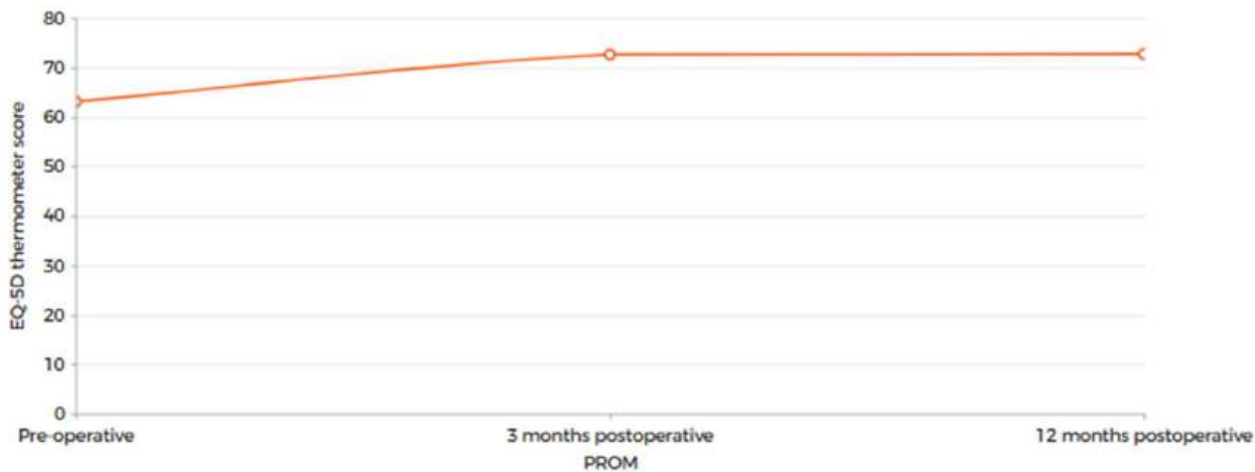
HA: hemiarthroplasty; CI: confidence interval.

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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

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a HA for osteoarthritis in the Netherlands in 2016-2023



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EQ-5D thermometer score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
205	63.07 (59.85-66.30)	72.57 (69.26-75.87)	72.66 (68.94-76.39)

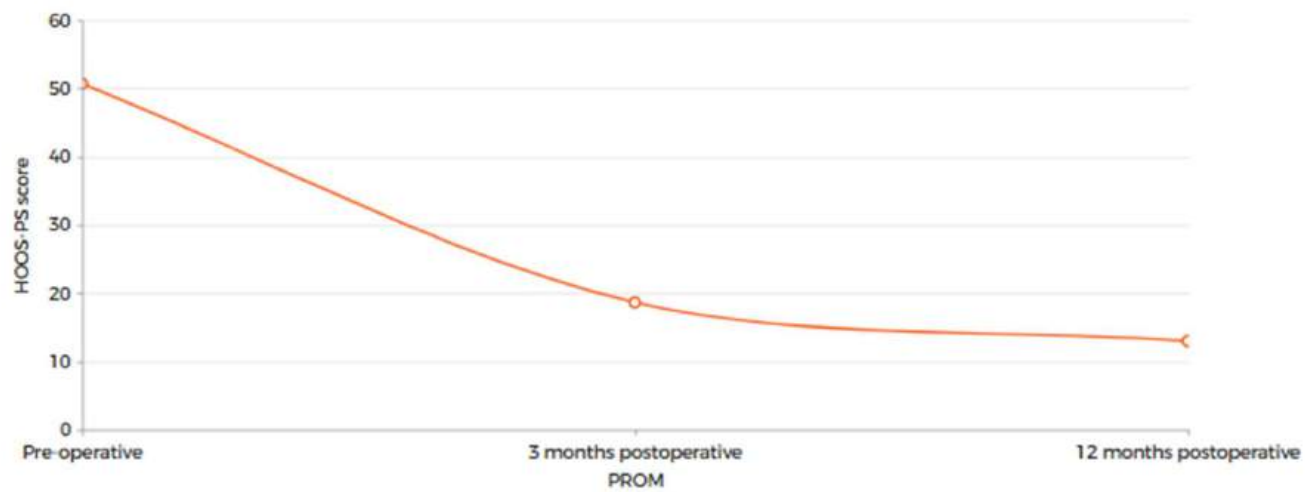
HA: hemiarthroplasty; CI: confidence interval.

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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 HA for osteoarthritis in the Netherlands in 2016-2023



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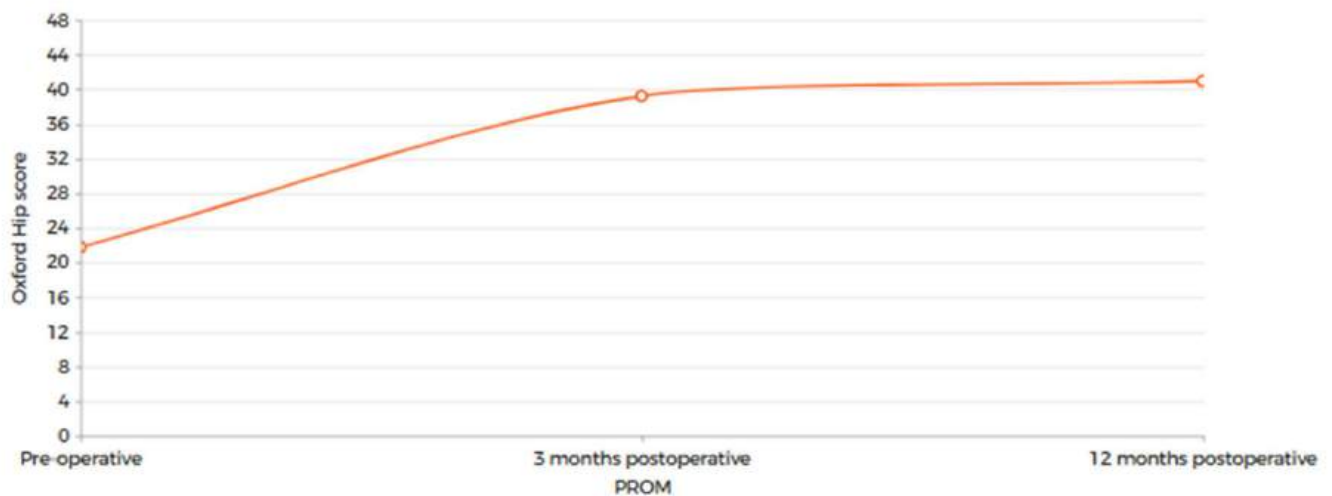
HOOS-PS score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
205	50.68 (48.00-53.36)	18.65 (16.53-20.77)	12.99 (10.81-15.16)

HA: hemiarthroplasty; CI: confidence interval.

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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 HA for osteoarthritis in the Netherlands in 2016-2023

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Oxford Hip Score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
205	21.78 (20.60-22.96)	39.23 (38.29-40.17)	40.95 (39.89-42.01)

HA: hemiarthroplasty; CI: confidence interval.

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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.

Hip revision arthroplasty

In this section you will find all the information on hip revision arthroplasty:

Revision characteristics

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a hip revision arthroplasty in the Netherlands in 2015-2024

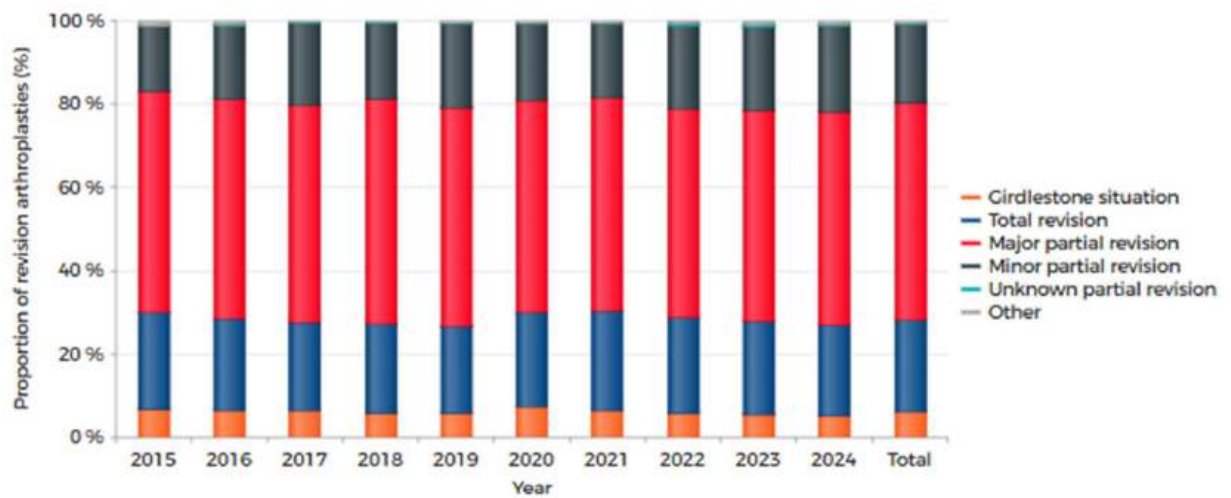
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Hip revision arthroplasty (n)	3,834	3,883	3,871	3,843	3,835	3,465	3,563	3,615	3,972	3,782	37,663
Reasons for revision; Proportion (%)											
Infection	17.89	19.39	21.21	20.74	22.69	25.11	25.32	24.23	25.98	26.86	22.90
Loosening of acetabulum component	24.80	22.30	21.78	21.13	20.55	18.56	16.84	18.31	15.81	16.18	19.66
Dislocation	19.93	19.42	17.82	18.92	18.46	17.60	18.92	17.43	17.50	16.63	18.27
Loosening of femur component	19.51	18.77	18.16	19.20	17.18	16.97	17.15	15.49	14.48	14.25	17.13
Inlay wear	19.56	18.31	18.19	15.95	15.83	13.45	13.05	13.11	12.29	11.16	15.13
Peri-prosthetic fracture	11.37	12.46	14.65	14.36	14.50	17.06	16.22	16.82	16.64	17.27	15.10
Malposition or malalignment								6.61	7.15	8.06	
Cirdlestone situation	5.74	6.05	5.24	4.79	4.51	4.33	4.86	4.20	4.46	3.44	4.77
Symptomatic MoM bearing	4.56	3.94	2.66	2.73	2.82	2.57	2.30	2.27	2.04	1.43	2.74
Peri-articular ossification	2.03	2.34	1.47	1.30	1.12	1.18	1.15	0.91	0.98	0.74	1.33
Other	11.27	10.61	10.07	11.27	12.78	10.79	11.82	10.37	10.12	11.05	11.01

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

Please note: Malposition or malalignment has been registered since 2022.

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Type of revision

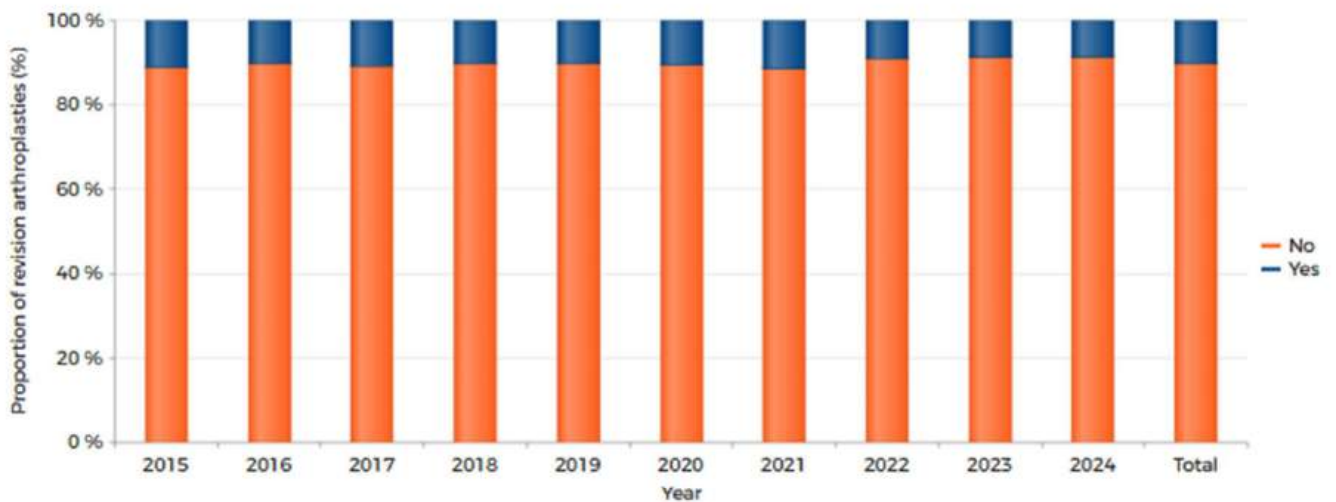
FIGURE Trend (proportion [%] per year) in type of revision in hip revision arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Girdlestone situation	6.74	6.53	6.32	5.87	5.92	7.51	6.32	5.72	5.46	5.33	6.16
Total revision	23.19	21.95	21.17	21.45	20.63	22.48	23.96	23.15	22.46	21.55	22.18
Major partial revision	53.07	52.85	52.18	53.96	52.58	51.13	51.26	49.90	50.57	51.30	51.90
Minor partial revision	15.77	17.55	19.87	18.07	20.14	18.39	17.84	19.93	20.11	20.44	18.82
Unknown partial revision	0.08	0.10	0.08	0.23	0.24	0.03	0.11	0.64	0.51	0.35	0.24
Other	1.15	1.01	0.39	0.42	0.50	0.46	0.51	0.67	0.91	1.04	0.71
Total (n)	3,812	3,858	3,860	3,836	3,819	3,448	3,560	3,603	3,959	3,768	37,523

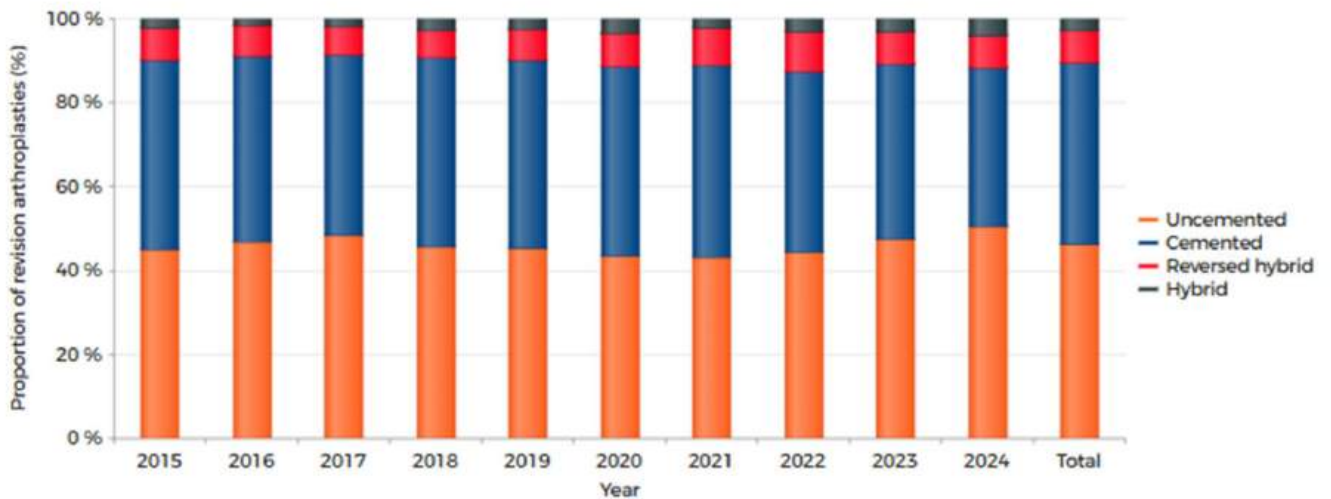
Major partial revision: revision of at least acetabulum or femur component; Minor partial revision: only inlay and/or femoral head exchange (including DAIR procedures); Unknown partial revision: partial revision of which the revised components were unknown.

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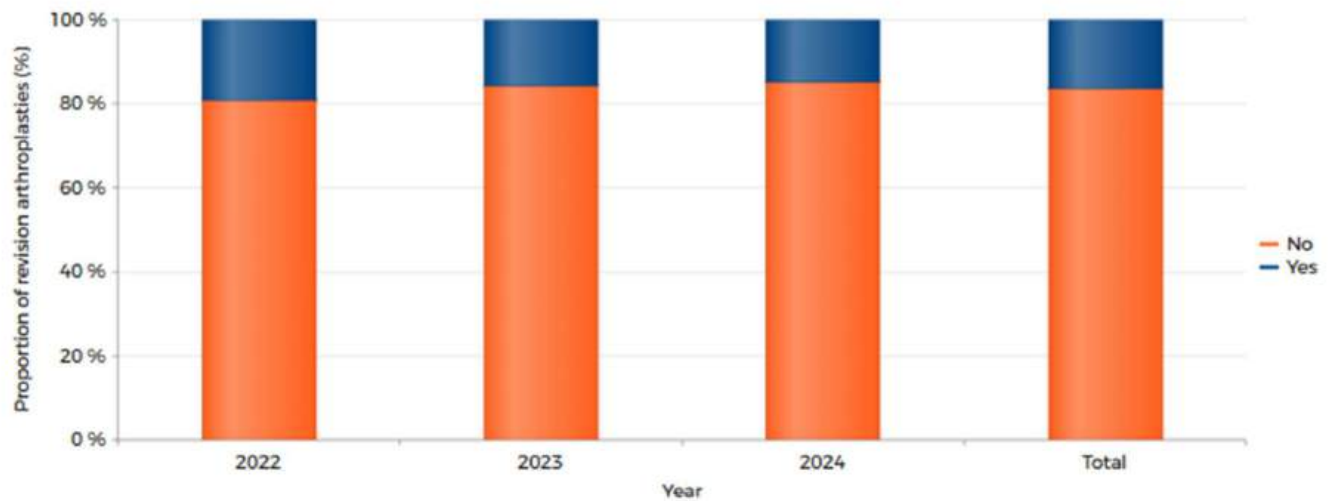
In 1,190 (62%) major partial hip revision arthroplasties the acetabulum component was revised and in 743 (38%) major partial revision arthroplasties the femur component was revised in 2024.

*Conversion to total hip arthroplasty***FIGURE** Trend (proportion [%] per year) in conversions from hemiarthroplasty to total hip arthroplasty in the Netherlands in 2015-2024

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*Fixation***FIGURE** Trend (proportion [%] per year) in type of fixation in hip revision arthroplasties in the Netherlands in 2015-2024

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*Cement-in-cement***FIGURE** Trend (proportion [%] per year) in use of cement-in-cement technique in hip revision arthroplasties in the Netherlands in 2015-2024

	2022	2023	2024	Total
No	80.85	84.47	85.14	83.60
Yes	19.15	15.53	14.86	16.40
Total (n)	1,535	1,835	1,702	5,072

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*Most frequently registered – Acetabulum***TABLE** The most frequently registered acetabulum components in hip revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Acetabulum cemented (n)	1,674	1,891	1,807	1,969	1,765
Acetabulum name; Proportion (%)					
Avantage Cemented	42.29	46.85	39.99	38.79	37.06
G7 - OSSEOTI	0.06	0.85	2.33	3.72	9.02
Polarcup cemented	10.75	9.20	9.43	8.92	8.17
BiMobile DM	0.90	1.22	2.55	6.88	5.39
Trabecular Metal	4.96	5.08	7.10	5.50	3.75
G7 PPS	0.00	0.48	1.00	0.82	3.46
Bi-Mentum Cemented Cups	0.12	3.75	3.88	1.94	3.29
Continuum	6.51	4.44	3.44	3.06	2.38
Redapt	1.49	1.53	1.94	0.87	2.33
Avantage Reload	2.69	1.96	2.00	2.34	1.82
Year	2020	2021	2022	2023	2024
Acetabulum uncemented (n)	431	449	443	539	584
Acetabulum name; Proportion (%)					
G7 - OSSEOTI	0.23	3.34	9.03	12.99	25.34
G7 PPS	0.00	2.00	3.84	2.97	10.10
Continuum	22.04	16.26	12.87	10.58	7.02
Allofit	6.96	11.14	9.71	8.53	5.31
Delta-One TT	11.60	10.47	8.58	7.24	4.97
Avantage Reload	9.98	7.57	7.00	8.53	4.97
Trident II Tritanium	0.00	0.45	2.93	4.82	4.62
Avantage Cemented	2.78	4.23	2.93	2.78	4.45
Bi-Mentum Press-fit	0.00	2.45	2.48	3.71	3.77
Redapt	2.55	2.90	3.39	1.86	3.42

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*Most frequently registered – Femur***TABLE** The most frequently registered femur components in hip revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Femur cemented (n)	587	599	574	611	555
Femur name; Proportion (%)					
Lubinus SPII	22.15	23.04	28.05	33.55	34.41
Exeter	25.04	21.54	22.13	17.35	21.62
Original ME Muller	10.90	7.01	10.63	10.64	9.01
Taperloc Hip Cemented CoCr	1.02	2.84	3.31	3.11	5.23
Spectron EF	7.50	5.01	4.88	3.60	4.68
C-Stem AMT	4.60	4.34	4.70	4.75	3.24
Polarstem cemented	0.00	0.83	1.05	1.96	3.06
CPT	6.81	11.52	5.40	5.73	3.06
Twinsys stem Cemented	2.39	2.00	2.61	3.93	2.88
MP Reconstruction Prosthesis	2.56	4.67	2.61	2.29	1.98
Year	2020	2021	2022	2023	2024
Femur uncemented (n)	707	781	784	844	838
Femur name; Proportion (%)					
Arcos	12.31	22.66	21.81	22.04	25.54
Restoration Modular	17.40	10.50	12.76	14.10	13.25
MP Reconstruction Prosthesis	12.87	18.82	16.33	12.68	12.41
Redapt	10.47	8.19	9.95	5.81	8.11
Wagner SL	3.39	3.84	2.81	5.45	3.94
Revitan	10.04	6.15	4.34	4.15	3.70
Taperloc Complete	3.11	2.94	3.32	3.44	3.70
Corail Revision	1.84	3.07	3.83	4.74	3.58
Reclaim Revision hip	1.27	1.02	2.17	2.49	3.34
Alloclassic SLL	3.11	3.20	3.44	3.67	2.51

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*Most frequently registered - Bone cement***TABLE** The most frequently registered bone cement used during hip revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	460	575	565	580	640
Cement name; Proportion (%)					
Palacos R+G	51.96	56.70	57.88	67.93	70.00
Refobacin Bone Cement R	40.65	36.52	35.93	29.31	26.56
Copal G+C	0.00	0.00	0.00	0.00	2.97
Refobacin Plus Bone Cement	5.87	2.78	3.89	2.76	0.47
Year	2020	2021	2022	2023	2024
Separately packed bone cement (n)	901	912	871	868	651
Cement name; Proportion (%)					
Palacos R+G	31.85	32.02	35.71	29.84	40.55
Copal G+C	29.63	35.31	29.28	36.41	18.89
Refobacin Revision	14.65	15.24	16.65	12.90	13.52
Copal G+V	5.99	6.47	5.40	5.88	7.83
Simplex ABC TOBRA	0.67	0.55	2.87	4.38	6.45
Palacos MV+G	4.00	3.07	4.71	3.80	5.38
Refobacin Bone Cement R	5.55	2.19	1.95	3.57	3.84
Subiton G	1.78	2.85	1.61	1.15	1.69
Simplex ABC EC	4.44	1.97	1.38	1.61	1.38
Cemex VancoGenx	1.00	0.22	0.34	0.35	0.15

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PROMs

Response

per year

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a hip revision arthroplasty in the Netherlands in 2014-2024



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	4.71	9.53	15.75	15.47	18.92	21.27	16.41	20.08	21.34	23.65	19.73
Pre- and 12 months PROM	2.09	3.83	6.73	6.58	7.85	9.07	6.69	7.69	8.17	8.25	n.a.
Pre-, 3- and 12 months PROM	1.27	2.43	4.76	4.62	5.52	6.27	4.65	5.35	5.90	5.69	n.a.
Total revision arthroplasties (n)	3,545	3,789	3,804	3,768	3,731	3,747	3,376	3,461	3,524	3,881	3,684

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

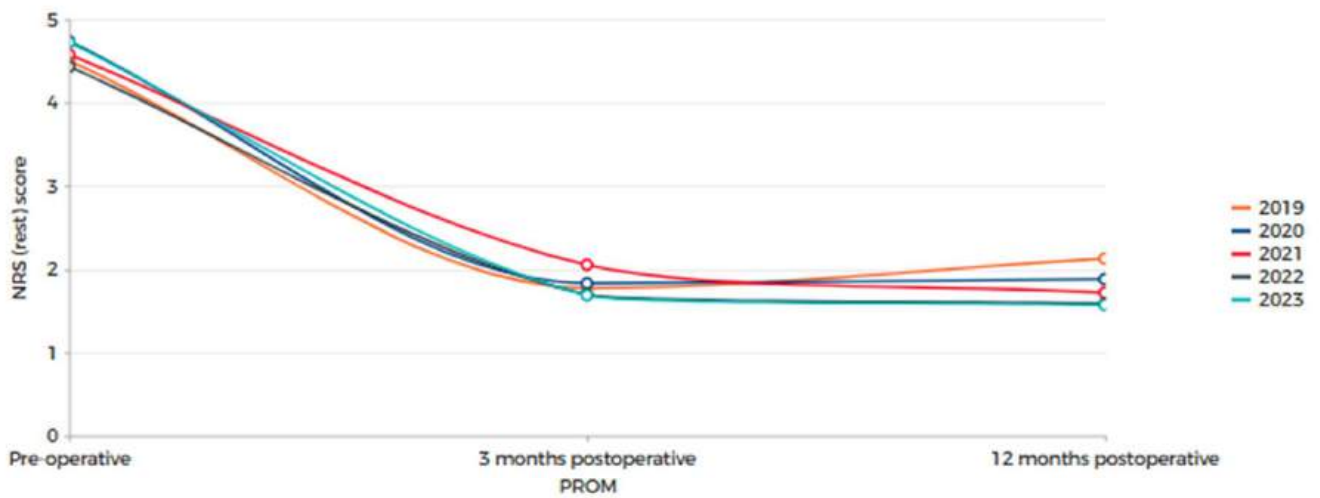
PROM: patient reported outcome measure.

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Outcomes

NRS (rest)

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a hip revision in the Netherlands in 2019-2023

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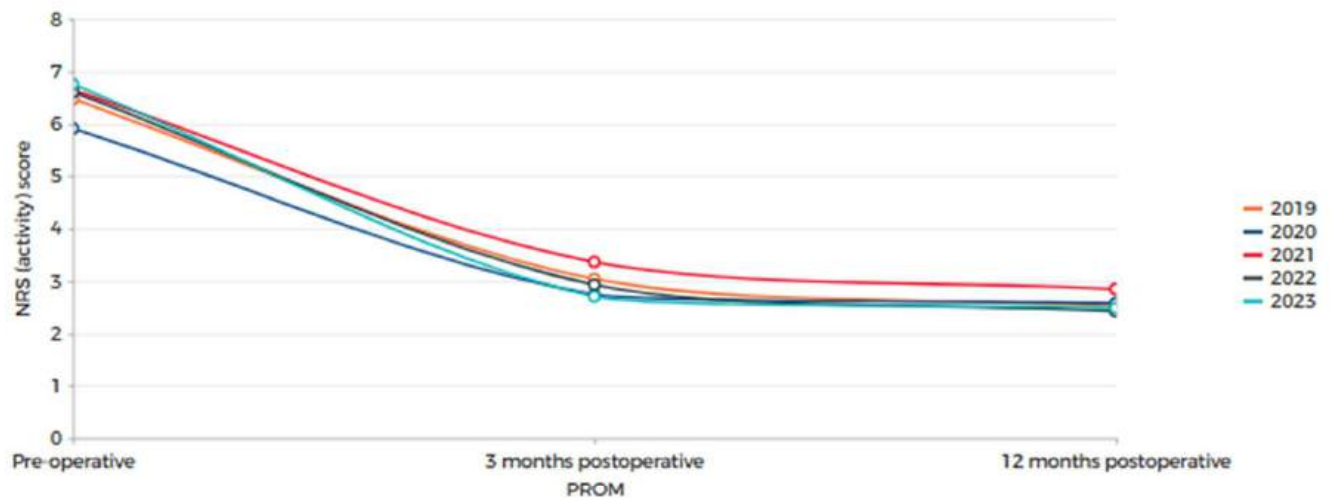
NRS (rest) score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	235	4.50 (4.13-4.88)	1.77 (1.49-2.05)	2.13 (1.78-2.48)
2020	157	4.74 (4.29-5.19)	1.83 (1.48-2.18)	1.88 (1.47-2.30)
2021	185	4.58 (4.18-4.98)	2.05 (1.68-2.43)	1.72 (1.37-2.07)
2022	208	4.44 (4.06-4.82)	1.70 (1.37-2.02)	1.59 (1.25-1.92)
2023	221	4.73 (4.36-5.10)	1.69 (1.40-1.98)	1.57 (1.26-1.88)
Total	1,006	4.59 (4.42-4.76)	1.80 (1.65-1.94)	1.78 (1.62-1.94)

CI: confidence interval

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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 hip revision in the Netherlands in 2019-2023

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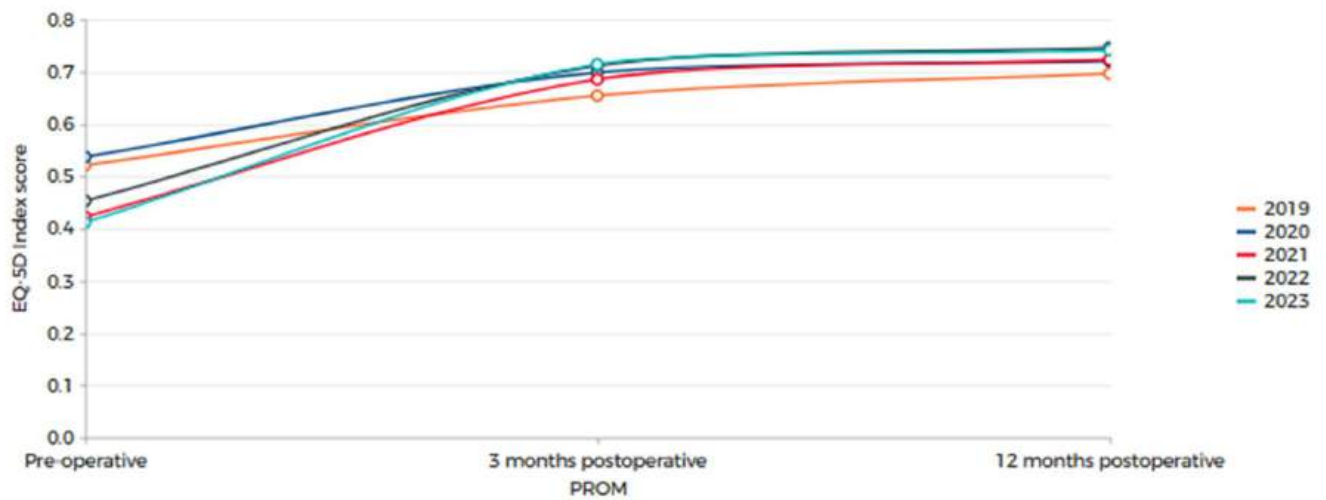
NRS (activity) score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	235	6.47 (6.10-6.83)	3.04 (2.70-3.38)	2.52 (2.17-2.88)
2020	157	5.91 (5.42-6.41)	2.74 (2.33-3.16)	2.58 (2.13-3.03)
2021	185	6.65 (6.26-7.03)	3.36 (2.93-3.79)	2.85 (2.42-3.28)
2022	208	6.60 (6.25-6.96)	2.93 (2.55-3.30)	2.43 (2.04-2.81)
2023	221	6.76 (6.41-7.10)	2.71 (2.38-3.03)	2.48 (2.13-2.84)
Total	1,006	6.51 (6.33-6.68)	2.95 (2.79-3.12)	2.56 (2.38-2.73)

CI: confidence interval

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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.

EQ-5D index score

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D index scores of patients who underwent a hip revision in the Netherlands in 2019-2023

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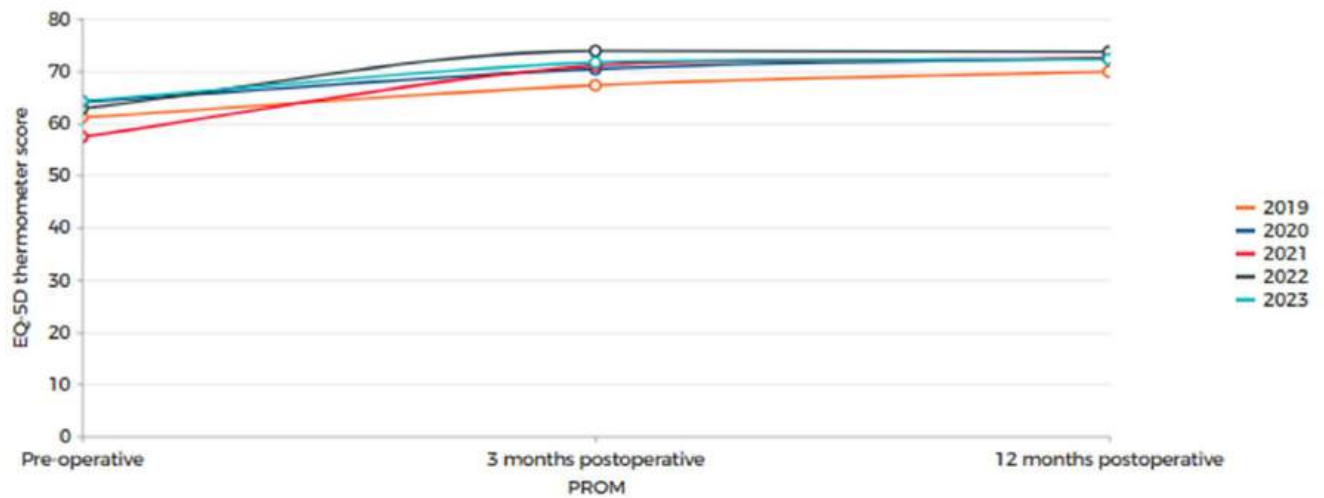
EQ-5D Index score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	235	0.52 (0.49-0.55)	0.65 (0.63-0.68)	0.70 (0.67-0.73)
2020	157	0.54 (0.50-0.57)	0.70 (0.67-0.73)	0.72 (0.68-0.76)
2021	185	0.42 (0.38-0.46)	0.69 (0.65-0.72)	0.72 (0.69-0.76)
2022	208	0.45 (0.41-0.49)	0.71 (0.68-0.74)	0.75 (0.71-0.78)
2023	221	0.41 (0.37-0.45)	0.71 (0.69-0.74)	0.74 (0.71-0.78)
Total	1,006	0.47 (0.45-0.48)	0.69 (0.68-0.71)	0.73 (0.71-0.74)

CI: confidence interval

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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

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a hip revision in the Netherlands in 2019-2023

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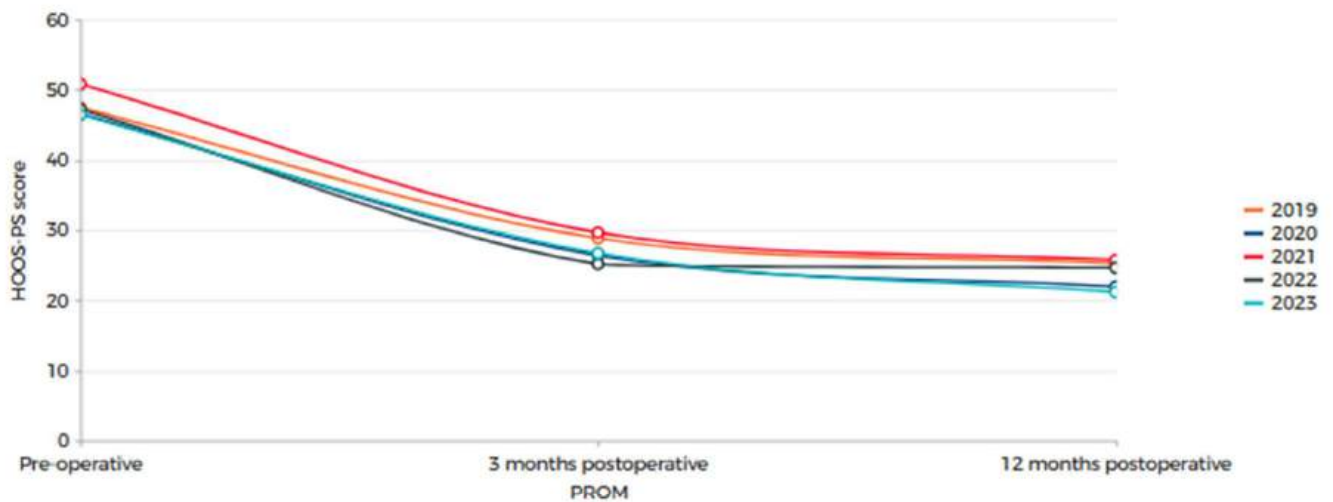
EQ-5D thermometer score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	235	61.06 (58.15-63.98)	67.25 (64.27-70.23)	69.87 (67.27-72.47)
2020	157	63.99 (60.49-67.50)	70.36 (67.53-73.19)	72.44 (69.34-75.53)
2021	185	57.36 (54.11-60.60)	71.09 (68.28-73.90)	72.43 (69.67-75.18)
2022	208	62.77 (59.74-65.80)	73.82 (71.62-76.02)	73.65 (71.17-76.12)
2023	221	64.24 (61.44-67.04)	71.64 (69.25-74.02)	72.22 (69.60-74.84)
Total	1,006	61.89 (60.51-63.26)	70.74 (69.54-71.94)	72.03 (70.83-73.23)

CI: confidence interval

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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 hip revision in the Netherlands in 2019-2023

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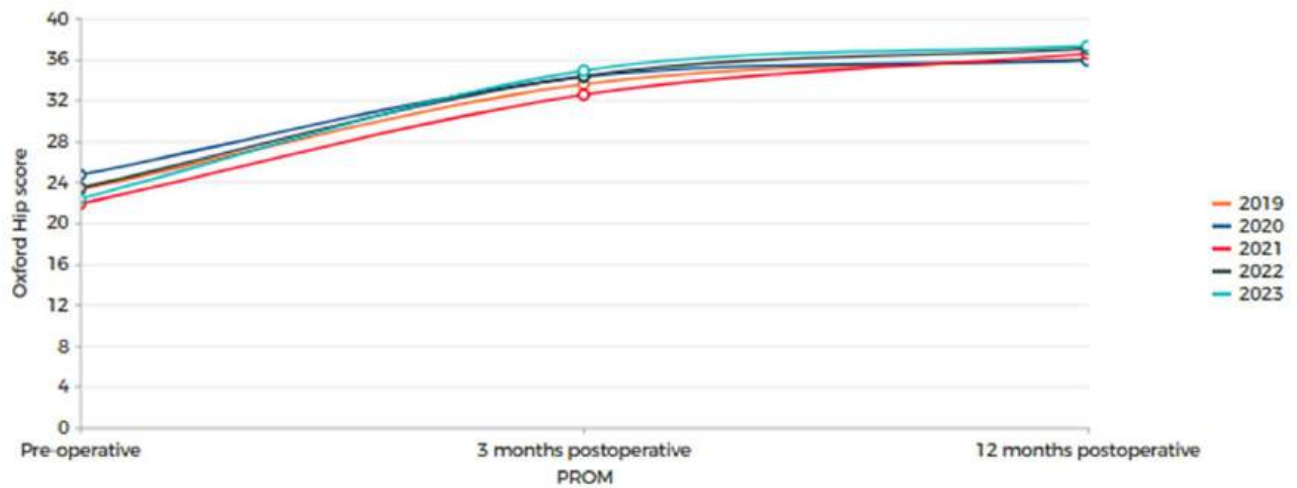
HOOS-PS score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	235	47.46 (44.63-50.30)	28.86 (26.14-31.57)	25.29 (22.66-27.92)
2020	157	46.58 (42.91-50.25)	26.42 (23.25-29.59)	21.95 (18.70-25.19)
2021	185	50.83 (47.91-53.75)	29.65 (26.88-32.43)	25.74 (22.52-28.97)
2022	208	47.22 (44.41-50.03)	25.18 (22.65-27.71)	24.64 (21.80-27.48)
2023	221	46.46 (43.57-49.34)	26.73 (24.34-29.11)	21.18 (18.63-23.72)
Total	1,006	47.69 (46.36-49.02)	27.34 (26.14-28.54)	23.88 (22.60-25.16)

CI: confidence interval

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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 hip revision in the Netherlands in 2019-2023

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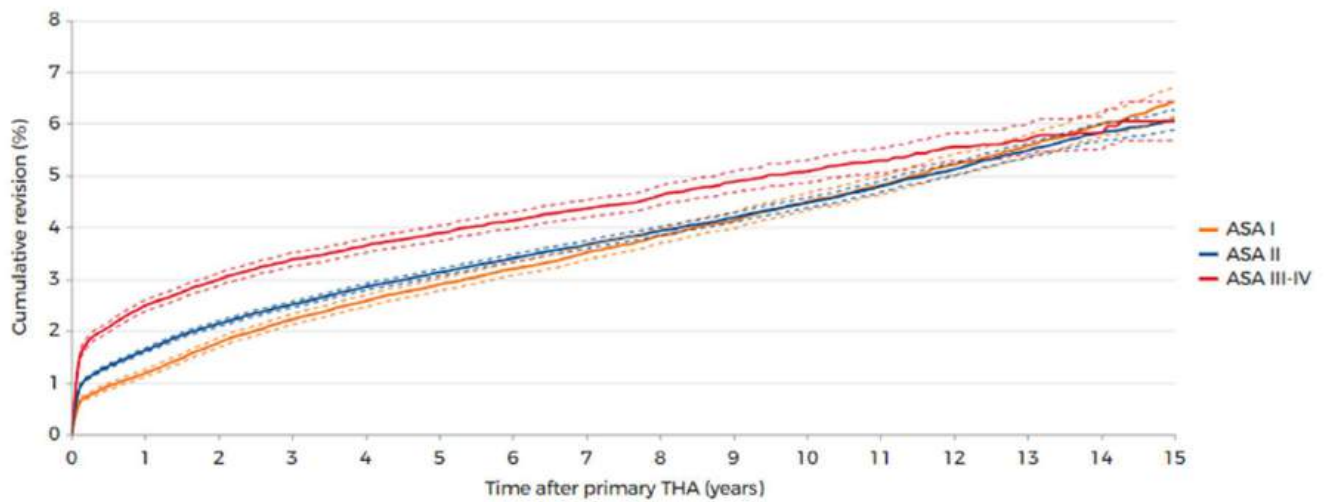
Oxford Hip score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	235	23.27 (21.91-24.63)	33.57 (32.30-34.83)	36.04 (34.74-37.34)
2020	157	24.69 (22.90-26.48)	34.28 (32.76-35.80)	35.89 (34.16-37.62)
2021	185	21.87 (20.47-23.27)	32.53 (31.06-33.99)	36.54 (35.10-37.99)
2022	208	23.42 (22.03-24.81)	34.38 (33.10-35.65)	37.02 (35.66-38.38)
2023	221	22.38 (20.94-23.82)	34.89 (33.70-36.08)	37.29 (36.02-38.56)
Total	1,006	23.08 (22.43-23.73)	33.96 (33.37-34.56)	36.60 (35.98-37.22)

CI: confidence interval

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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 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)

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	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)

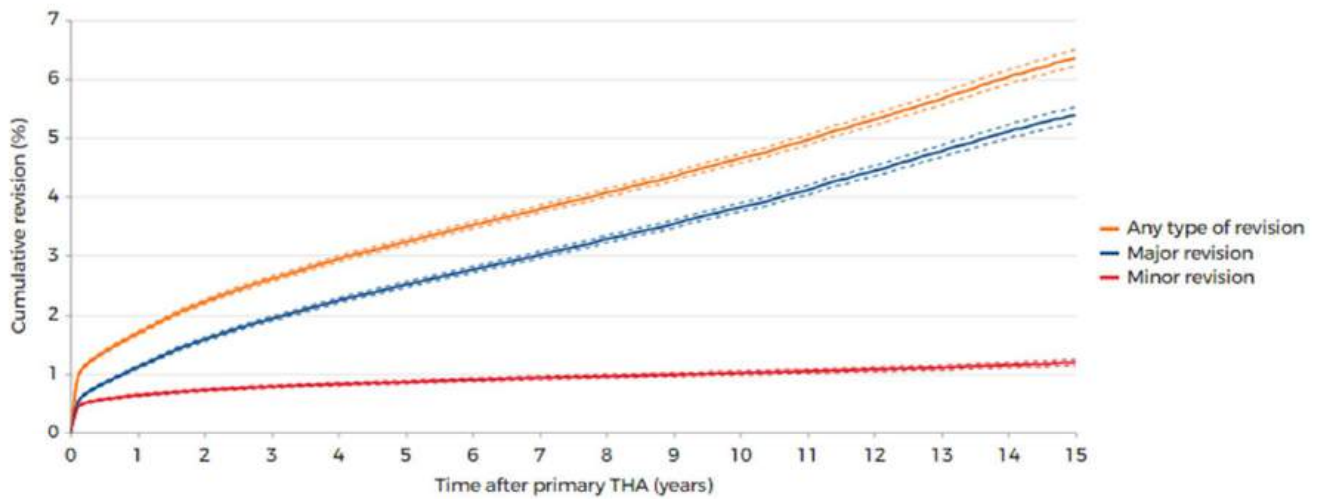
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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. Therefore, the first three revision procedures were reviewed.

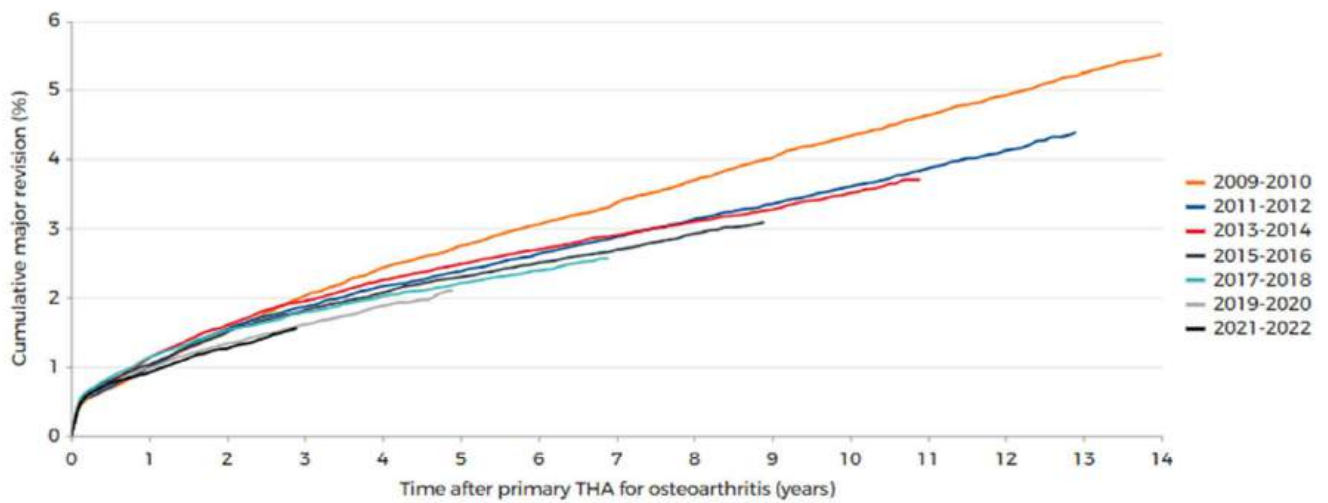
Minor revision: only inlay and/or femoral head exchange (including DAIR procedures).

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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.

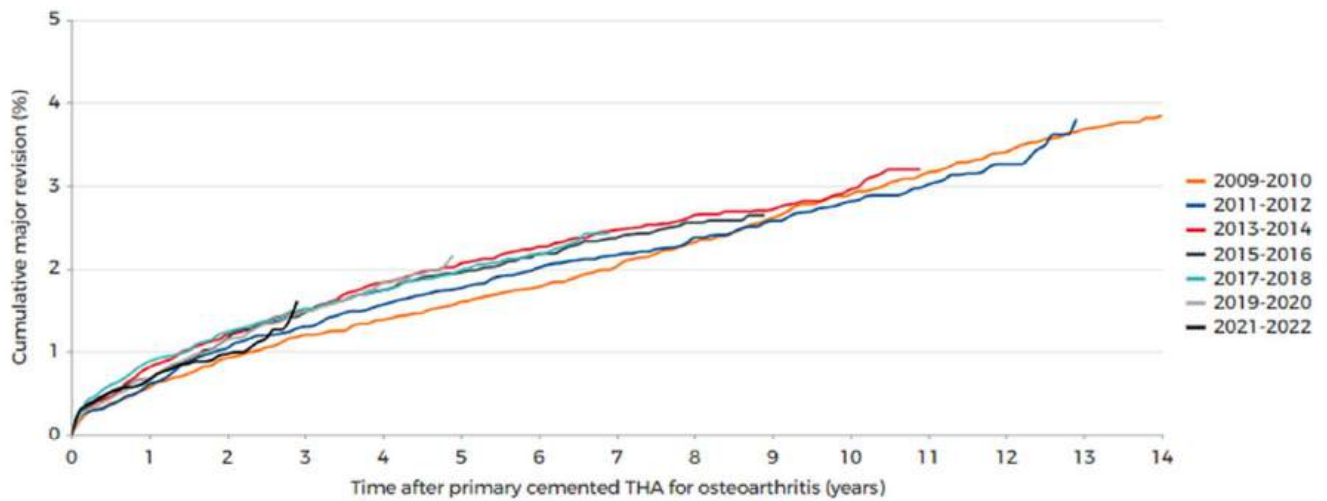
Please note: n.a. if <50 cases were at risk.

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

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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.

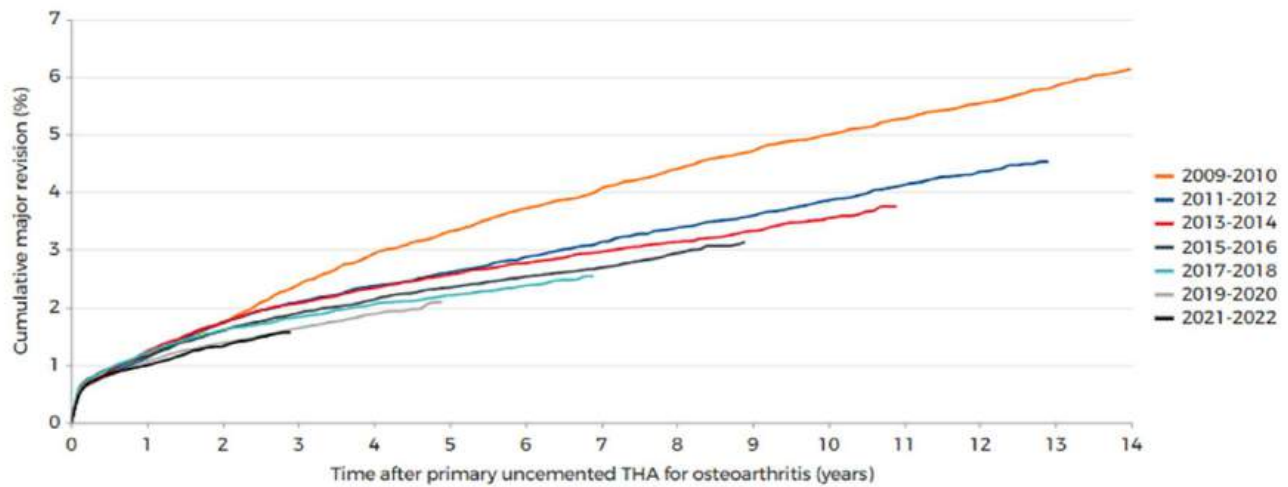
Please note: n.a. if <50 cases were at risk.

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

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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.

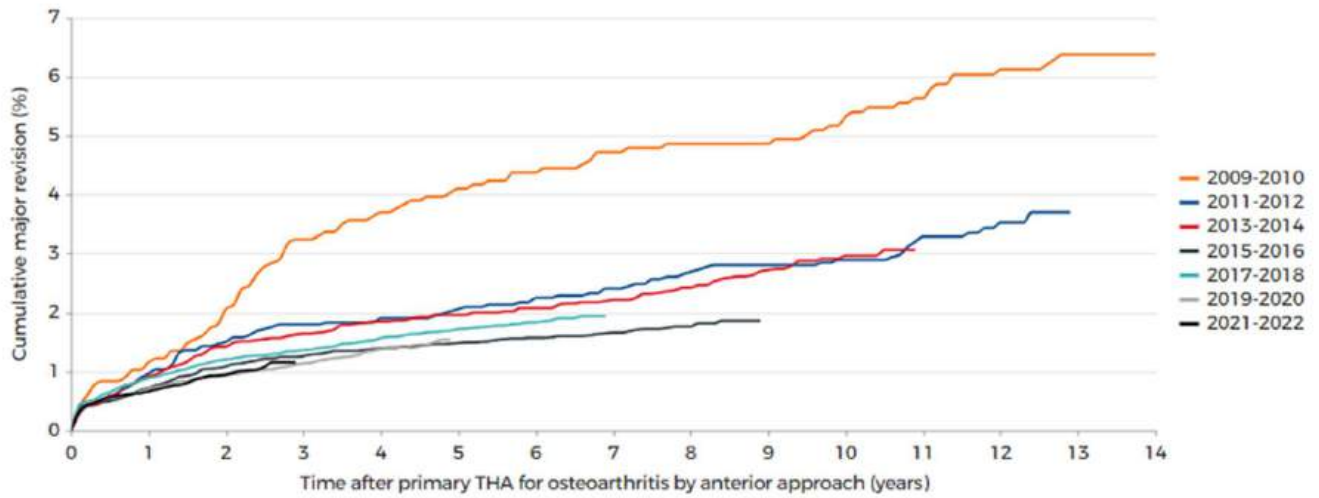
Please note: n.a. if <50 cases were at risk.

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

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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.

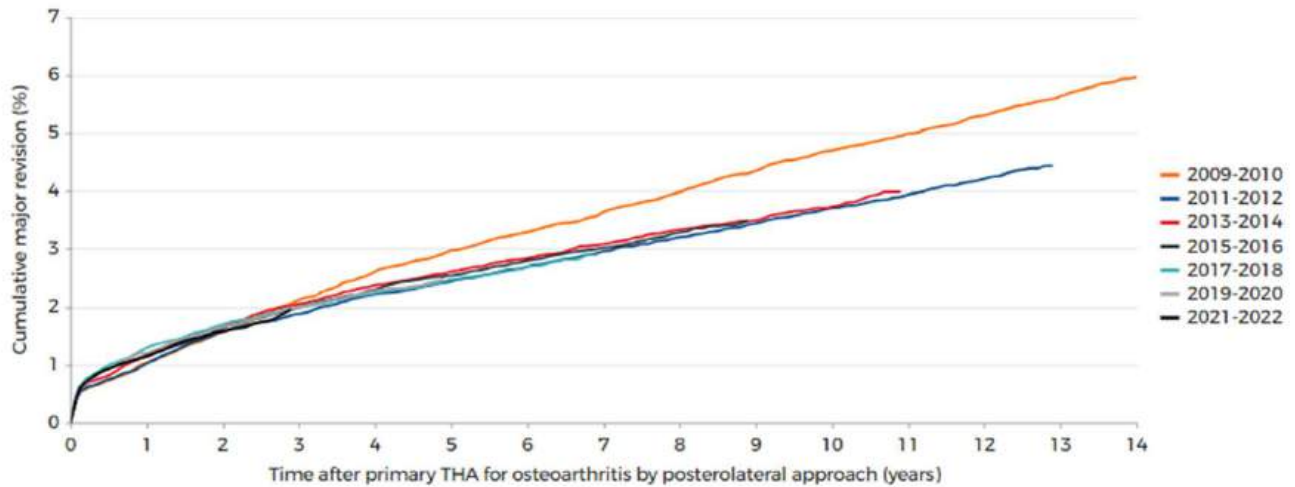
Please note: n.a. if <50 cases were at risk.

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

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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.

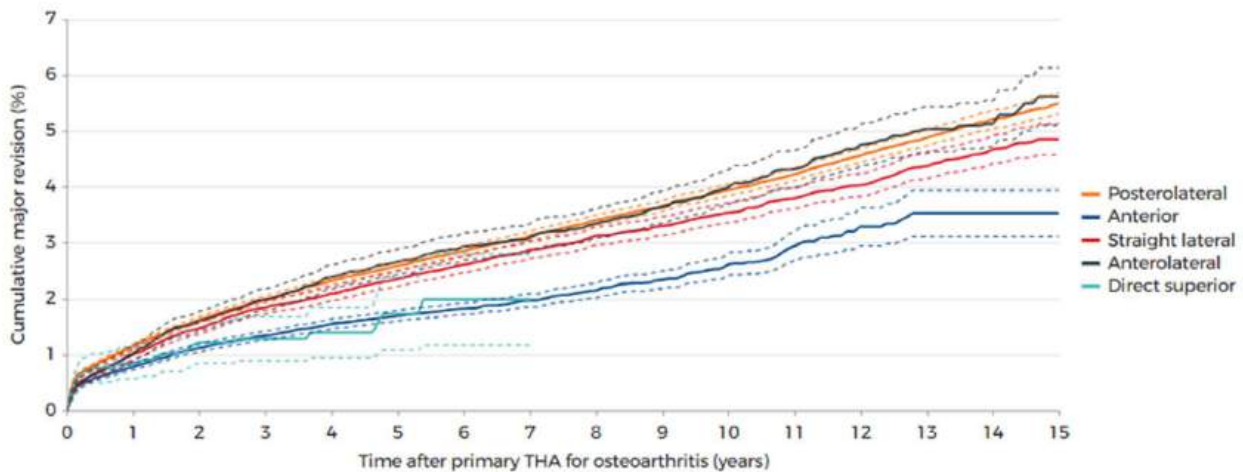
Please note: n.a. if <50 cases were at risk.

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

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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.

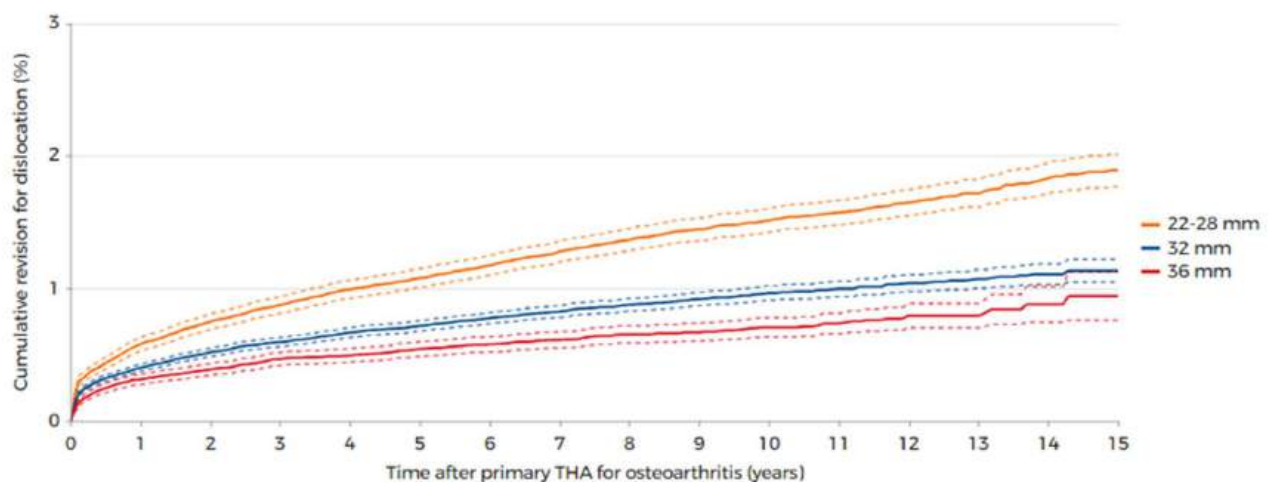
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

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

THA: total hip arthroplasty; CI: confidence interval.

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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)

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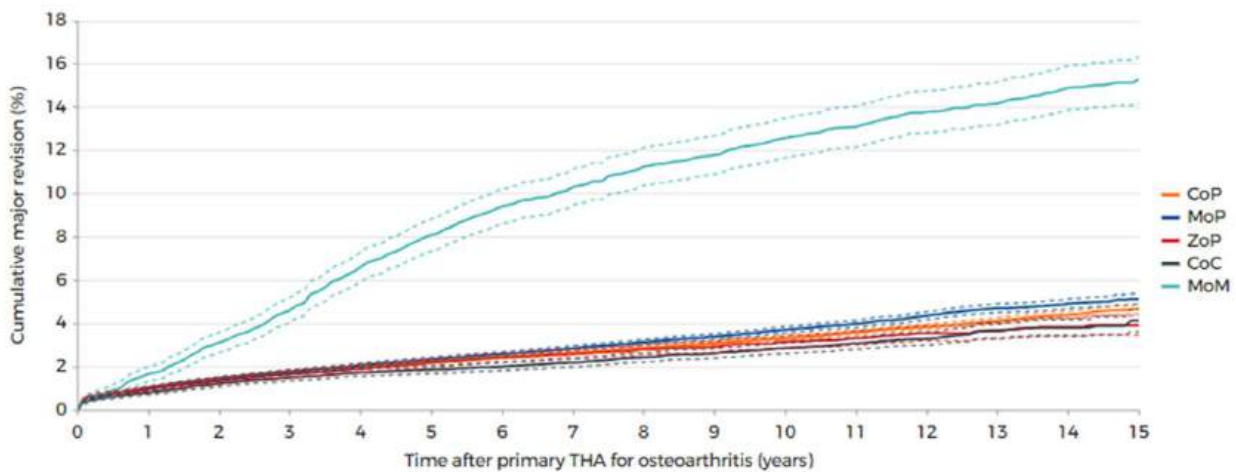
	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
22-28 mm	85,814	0.56 (0.51-0.61)	0.86 (0.80-0.93)	1.07 (1.00-1.14)	1.26 (1.18-1.34)	1.50 (1.42-1.59)	1.89 (1.77-2.01)
32 mm	211,982	0.39 (0.36-0.41)	0.59 (0.56-0.63)	0.71 (0.67-0.75)	0.82 (0.78-0.87)	0.96 (0.91-1.01)	1.13 (1.05-1.22)
36 mm	82,313	0.31 (0.27-0.35)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

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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)

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	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)

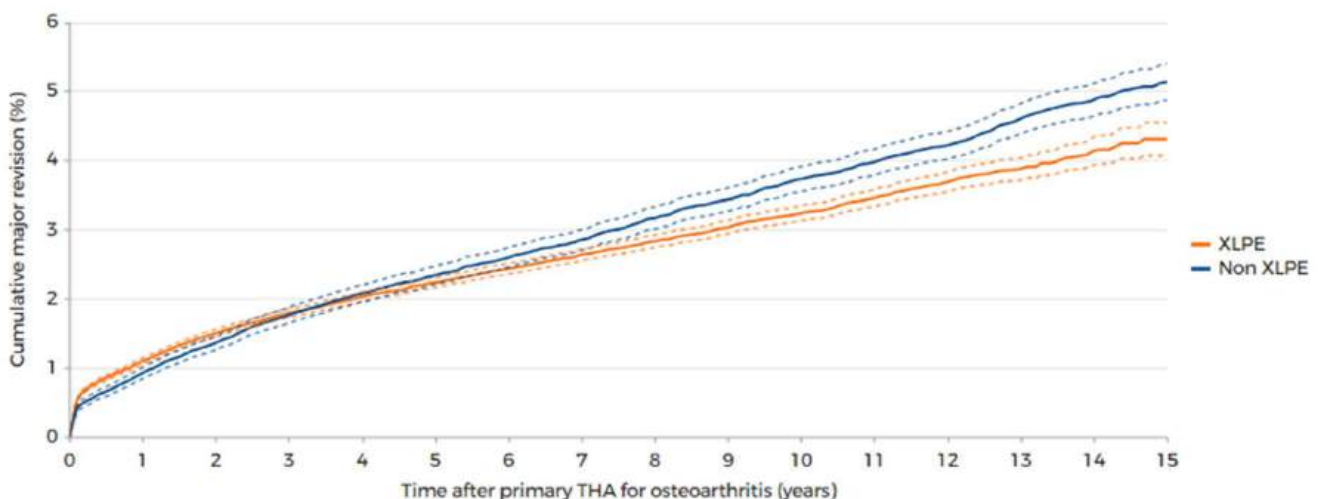
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

Major revision percentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefore, 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.

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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)

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	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)

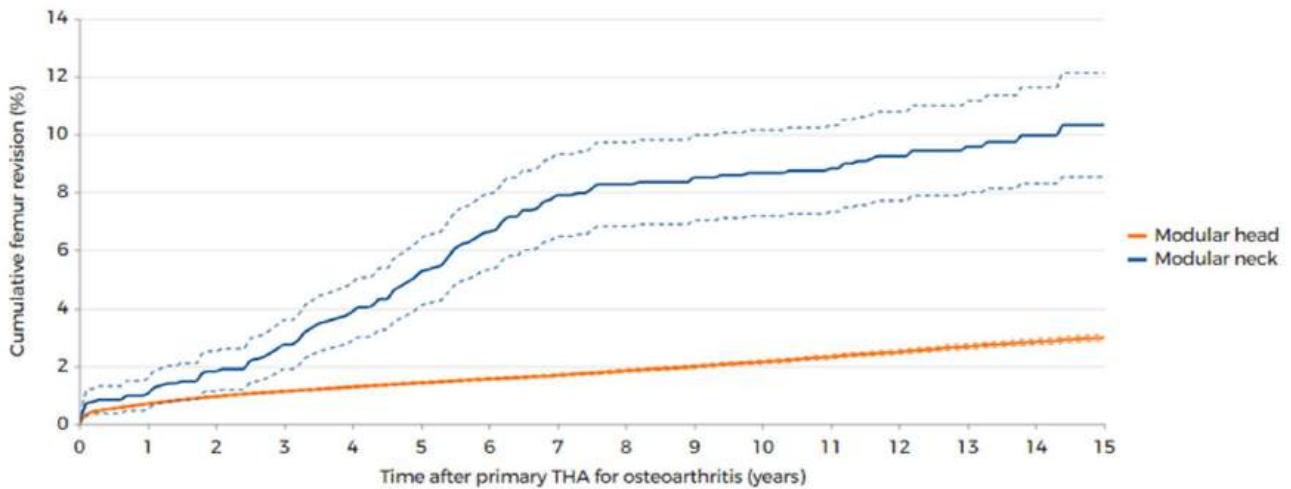
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

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

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

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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)

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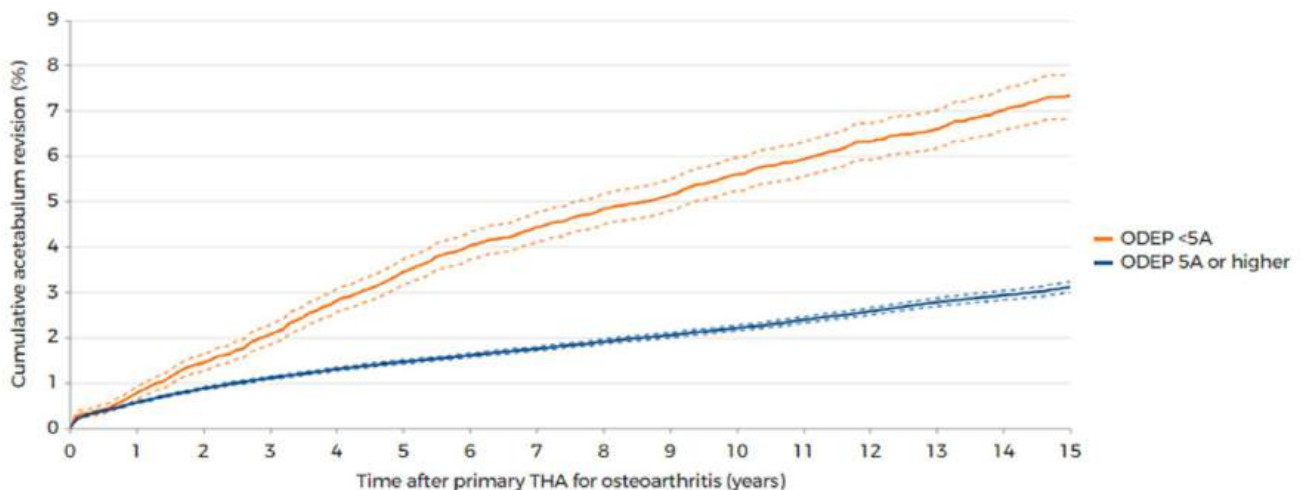
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Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

THA: total hip arthroplasty; CI: confidence interval.

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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)

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

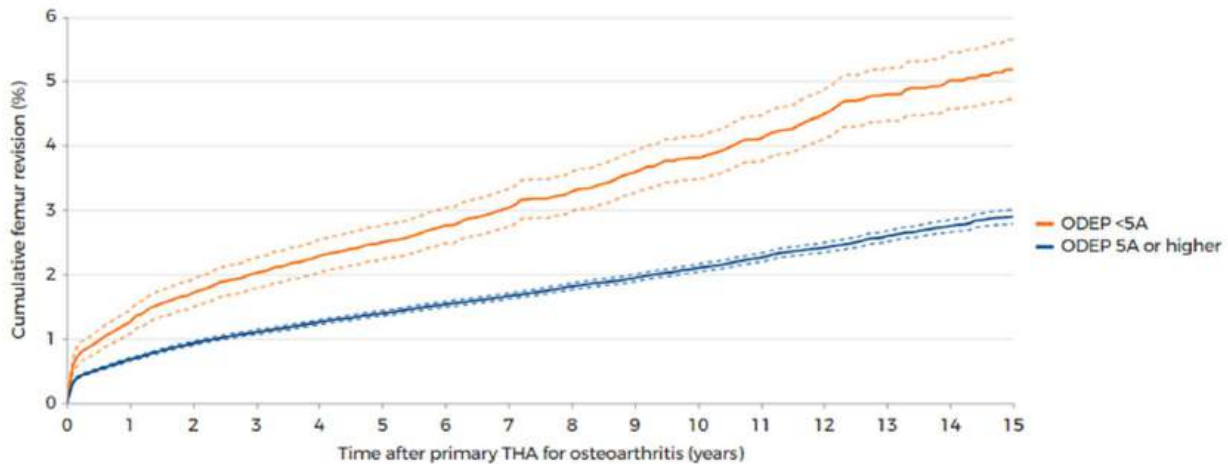
Acetabulum revision percentage: first revision of the acetabulum component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

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.

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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)

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	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.

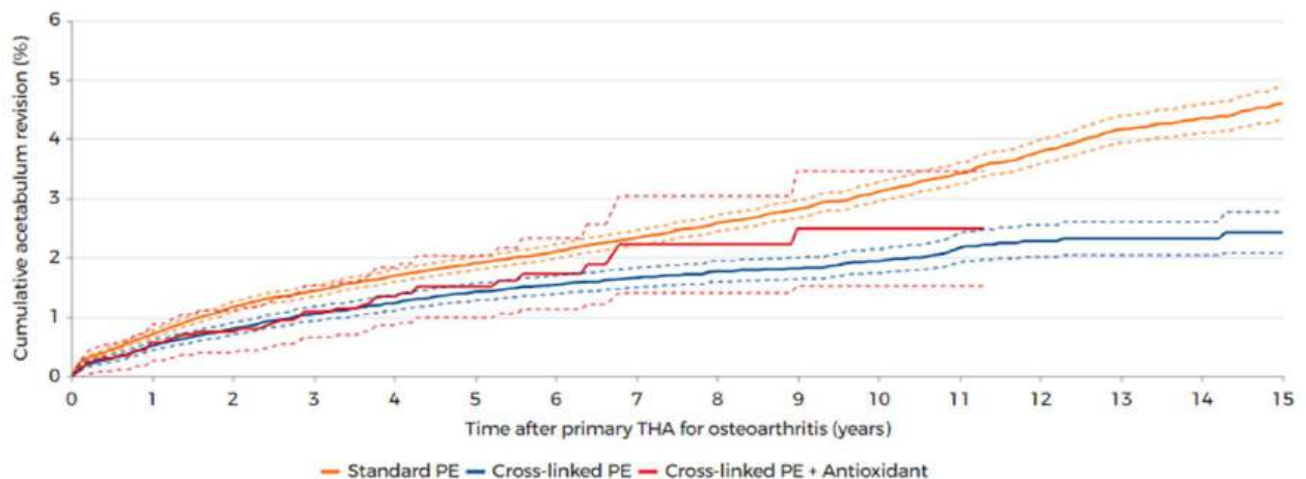
Femur revision percentage: first revision of the femur component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

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.

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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)

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	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.

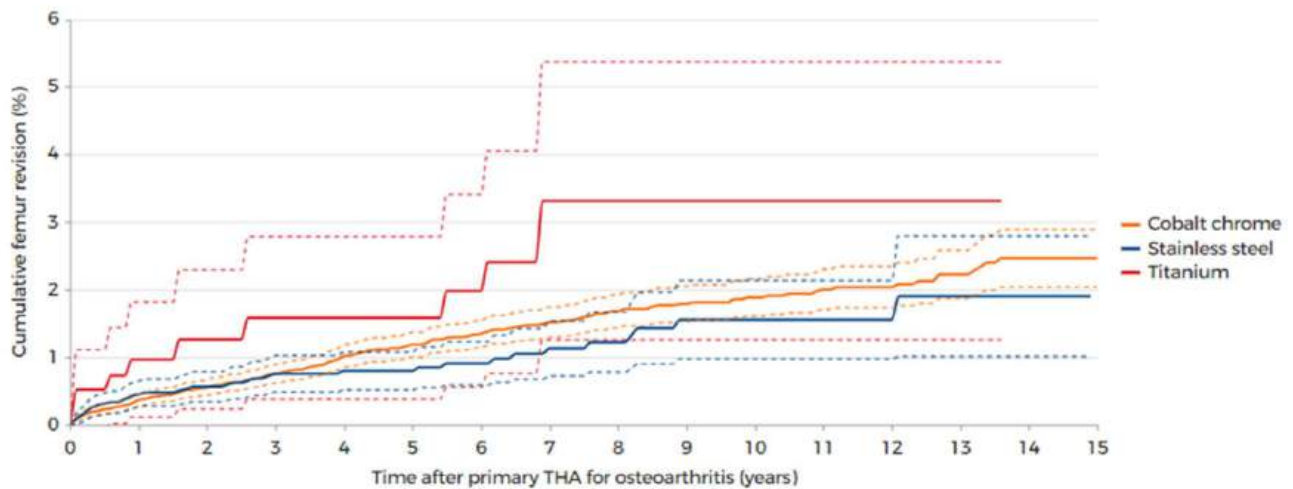
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

Acetabulum revision percentage: first revision of the acetabulum component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

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

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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)

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	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.

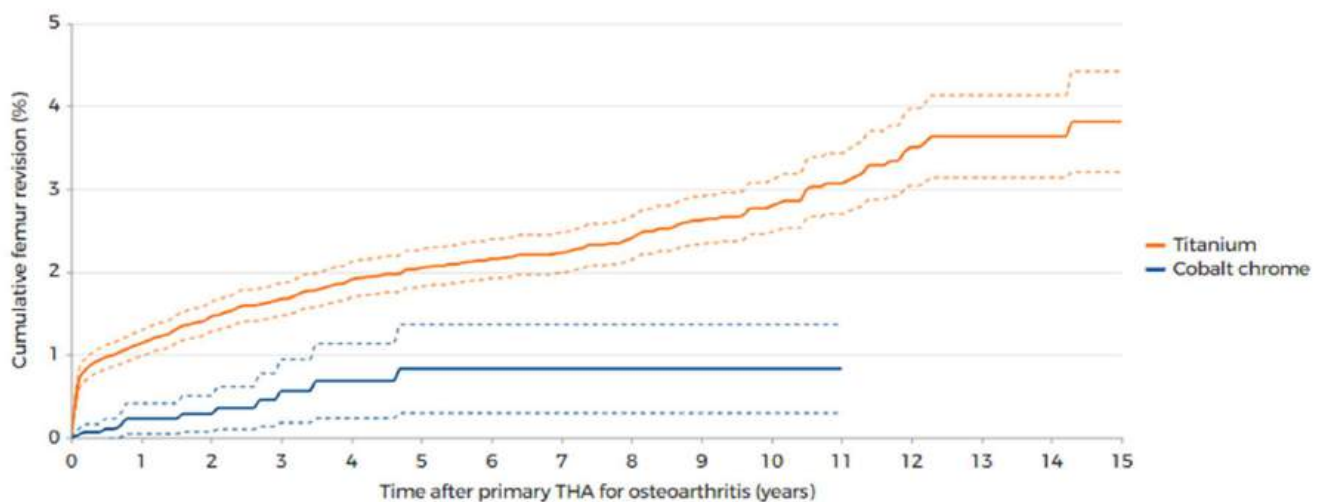
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

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

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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.

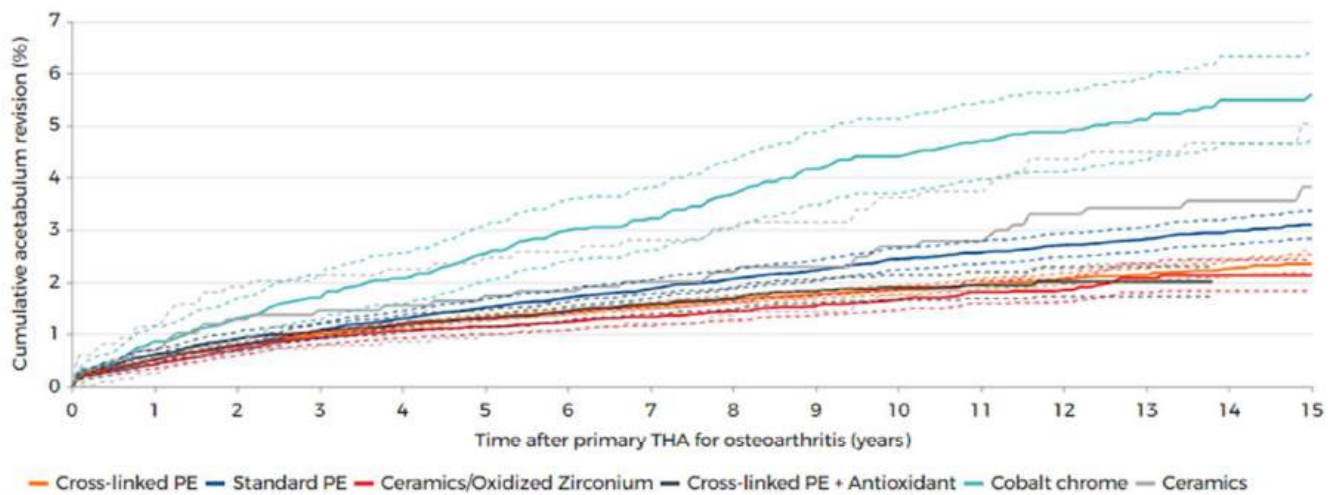
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

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

THA: total hip arthroplasty; CI: confidence interval.

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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)

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	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. Therefore, the first three revision procedures were reviewed.

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

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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)

Femur component	Acetabulum component	Primary THAs (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)					Cumulative revision percentage (95% CI)				
					Total revision	Only femur	Only acetabulum	Only femoral head/inlay	Unknown	1Yr	3Yr	5Yr	7Yr	10Yr
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)
Lubinus SPII	IP Cup	15,859	77 (72 - 81)	429	66	33	192	112	6	1.12 (0.96-1.29)	1.97 (1.79-2.20)	2.53 (2.27-2.79)	2.85 (2.56-3.13)	3.21 (2.89-3.54)
Original ME Muller	Muller low profile Duracul	10,415	75 (71 - 80)	295	33	5	85	167	3	1.83 (1.37-2.09)	2.40 (2.10-2.71)	2.86 (2.51-3.20)	3.11 (2.74-3.49)	3.61 (3.14-4.08)
Lubinus SPII	FAL Cup	7,333	75 (70 - 80)	238	36	14	87	76	5	1.82 (1.31-2.13)	2.49 (2.12-2.87)	3.07 (2.64-3.51)	3.63 (3.13-4.13)	4.35 (3.71-4.99)
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)
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)
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)
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)
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)
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)
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)
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)
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)
Original ME Muller	AVANTAGE 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 (3.33-5.97)	5.14 (3.70-6.57)	n.a.
CCA Item	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)
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.
C Stem AMT	Marathon	1,520	79 (74 - 83)	20	1	3	0	16	0	1.06 (0.34-1.57)	1.37 (0.77-1.96)	1.37 (0.77-1.96)	n.a.	n.a.
Twinstem 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)
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)
Lubinus SPII	AVANTAGE 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.
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 (1.33-3.71)
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)
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 (0.63-2.30)
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)
Lubinus SPII	FAL Cup X Linked	547	78 (74 - 81)	7	0	1	3	3	0	0.78 (0.02-1.55)	1.33 (0.25-2.45)	2.14 (0.25-4.02)	n.a.	n.a.
Spectron EF	Muller low profile Duracul	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.
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)	2.54 (0.97-3.71)	3.11 (1.50-4.73)	4.79 (2.51-7.06)
EXETER	AVANTAGE 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)
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)
STANMORE	AVANTAGE 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.
CHE hufstiel	Hufstanne	273*	75 (71 - 80)	27	7	3	17	0	0	0.37 (0.00-1.10)	1.31 (0.04-2.98)	2.70 (0.73-4.67)	4.39 (1.85-6.92)	7.23 (3.89-10.56)
TAPERLOC Hip Cemented CoCr	ZICA 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.
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)	3.96 (1.42-6.53)	4.31 (1.76-7.27)

* 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.

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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)

Femur component	Acetabulum component	Primary THAs (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)					Cumulative revision percentage (95% CI)					
					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	196	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	133	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	8,899	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)	3.14 (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)
Twintys stem Cementless	BM 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	CT PPS	4,302	70 (63-75)	79	14	29	18	16	2	1.72 (1.32-2.12)	2.32 (1.70-2.73)	n.a.	n.a.	n.a.	n.a.
TAPERLOC HIP system	EXCEED-ABT	3,895*	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)
Twintys stem Cementless	BM 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)	63	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)	3.53 (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	34	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)
FITMODE	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	43	28	14	1	2.30 (1.60-3.00)	3.59 (2.71-4.47)	3.93 (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 Gption	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	BM 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)	2.23 (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	BM 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 (2.58-4.73)	4.44 (3.13-5.76)	5.61 (4.13-7.10)	7.80 (5.92-9.68)
Alloclassic Zweymüller SL	Triology	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 (0.81-2.43)	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 (4.70-8.48)
Alloclassic Zweymüller 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 (1.69-4.05)	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 Gption	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 Vitarmys cup	593*	65 (60-70)	24	8	7	7	2	0	1.61 (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 (2.37-6.01)	4.83 (2.97-6.70)	n.a.
IM 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 Zweymüller SL	Triabecular 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.

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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)

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 cemented THAs for osteoarthritis					94,211	76 (71 - 81)	2,158	6.66 (6.60-6.71)	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	13,889	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 Duralul	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 DIMFIT 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 percentage: first revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefore, 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.

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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)
Coral	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	0.83 (0.71-1.00)	1.34 (1.14-1.74)	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 Vitamus 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 percentage: 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.

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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-C	64.066	75 (69 - 80)	2.153	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)	2.23 (1.84-2.63)	2.75 (2.30-3.21)	3.73 (3.16-4.30)	4.16 (3.53-4.80)
PALACOS MV-C	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 (4.33-6.79)	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 (2.48-4.22)	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)	23	0.82 (0.28-1.33)	1.65 (0.89-2.41)	1.69 (0.89-2.41)	1.87 (1.06-2.68)	2.56 (1.31-3.61)	n.a.
Refobacin Plus Bone Cement	480*	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 MV	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 C	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 CEMENTACIN Bone Cement	275*	74 (70 - 79)	22	0.99 (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	0.99 (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)	1.812	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-C	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)	1.80 (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 Centa	324*	80 (75 - 83)	8	0.93 (0.00-1.99)	1.80 (0.39-3.39)	2.24 (0.60-3.88)	2.24 (0.60-3.88)	3.22 (0.71-5.74)	n.a.

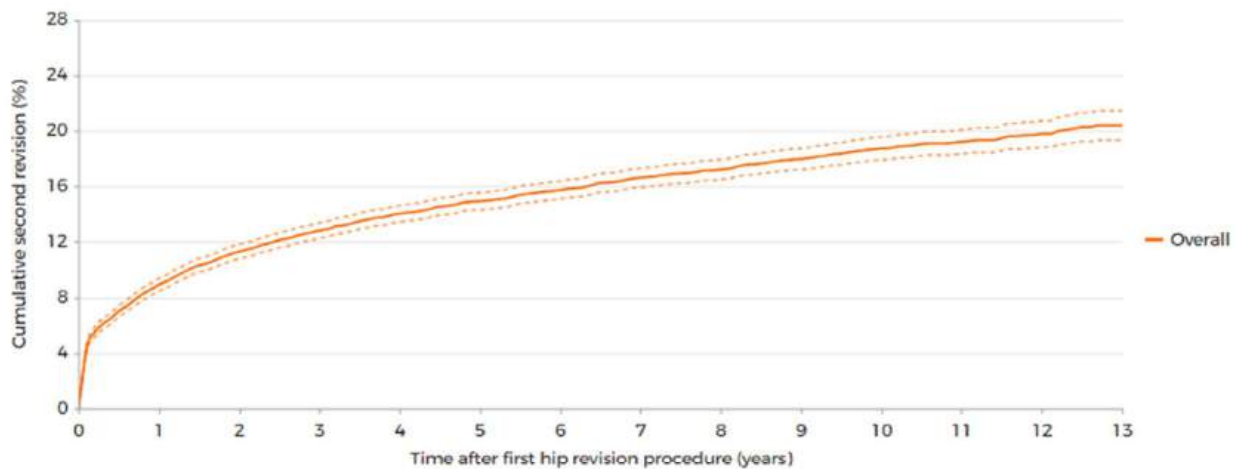
* Denotes types of bone cement with no reported use in primary THAs in 2023.
Please note: n.a. if <50 cases were at risk; THA: total hip arthroplasty; CI: confidence interval; IQR: interquartile range.

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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)

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	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)

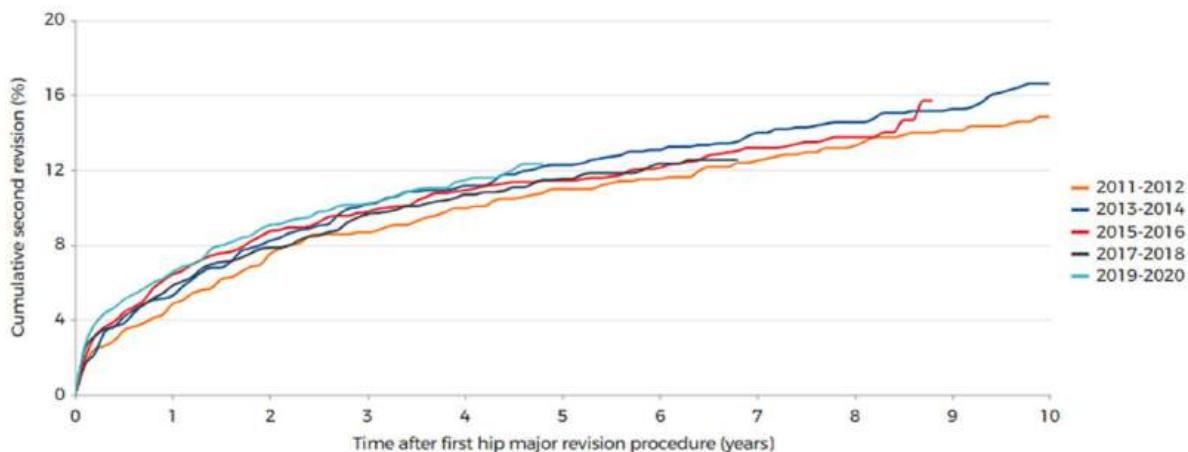
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

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

CI: confidence interval.

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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)

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	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.

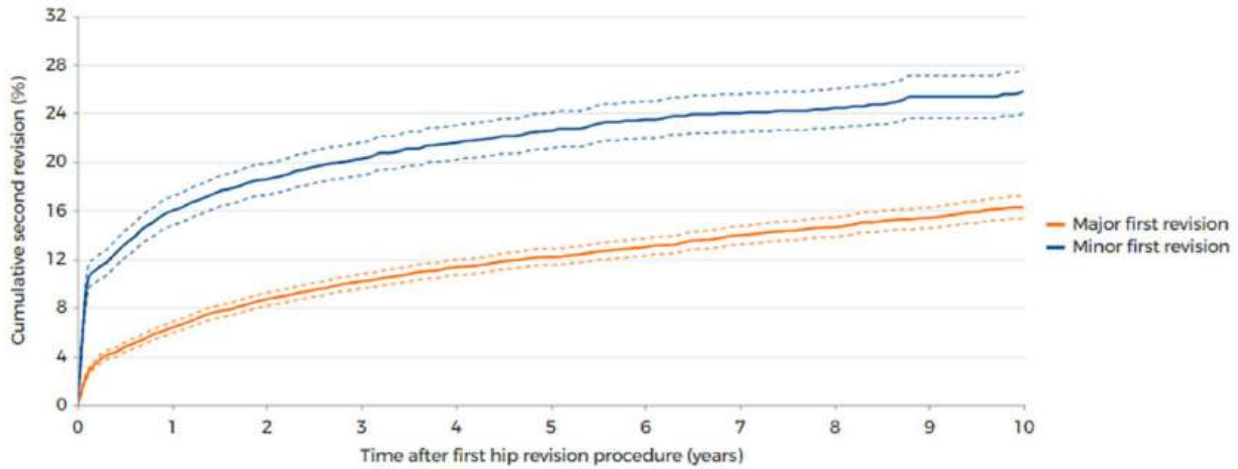
Please note: n.a. if <50 cases were at risk.

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.

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*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)

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	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.

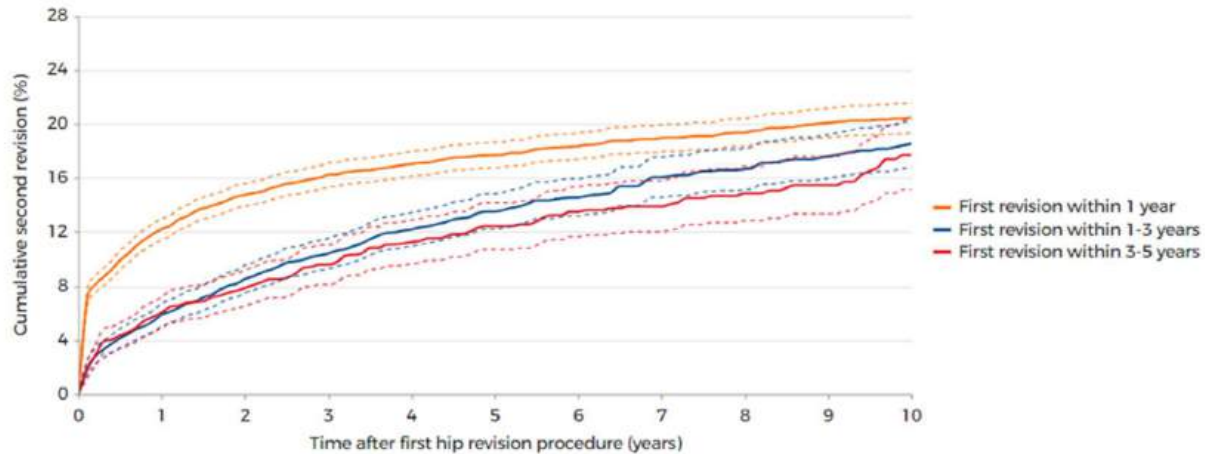
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

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.

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*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)

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	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)

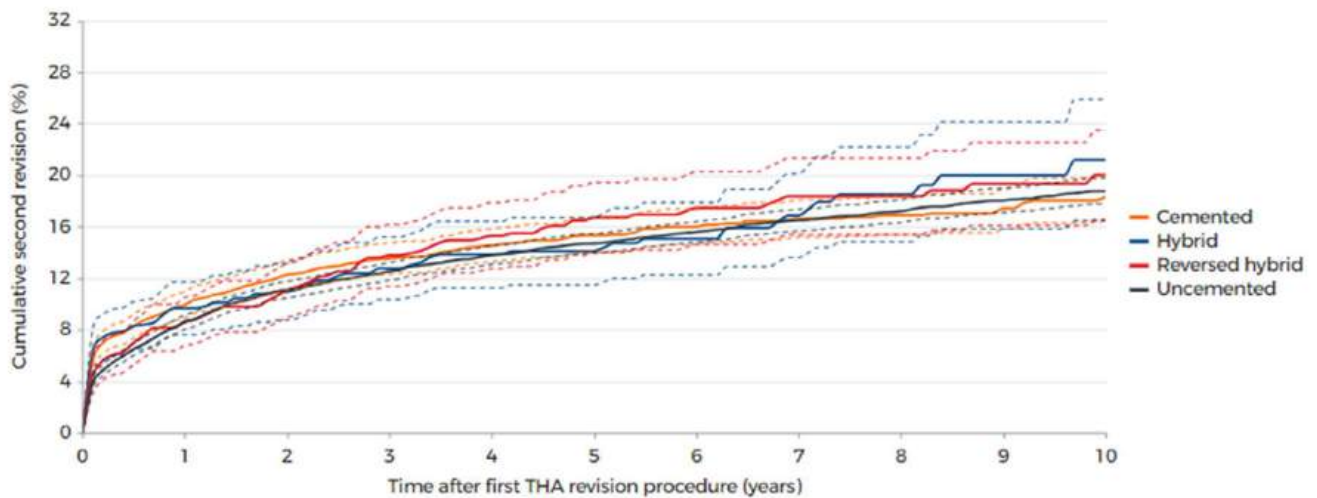
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

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

CI: confidence interval.

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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)

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	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.

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Reasons for second 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

Reasons for second revision	Major revision (n=1,296)	Minor revision (n=779)	Any type of revision (n=2,146)
	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%.

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Knee arthroplasty

In this section you will find all the information on knee arthroplasty

Numbers

Registered procedures

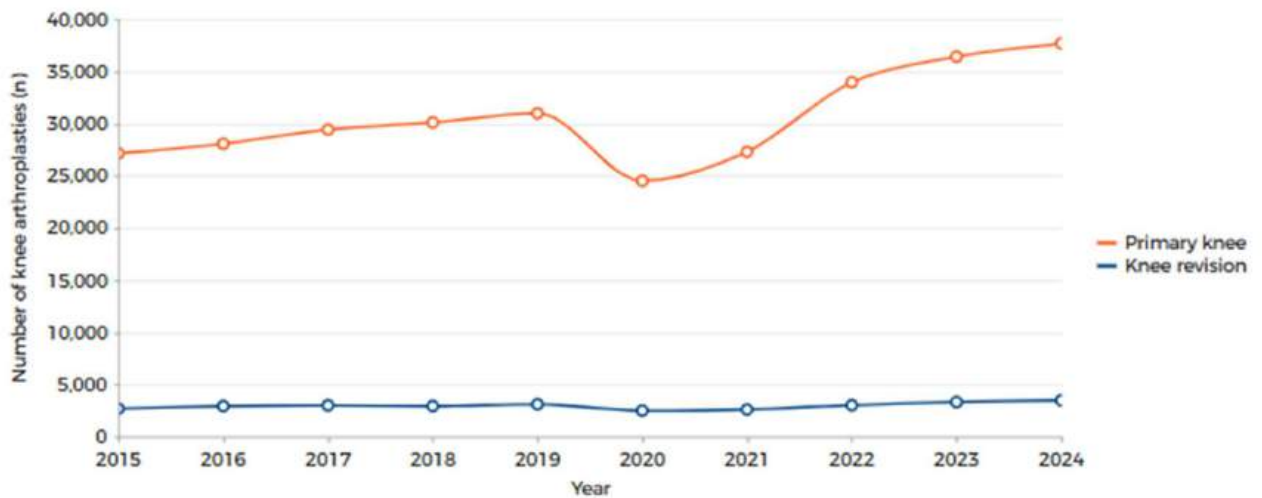
TABLE Number of registered knee arthroplasties per year of surgery (2007-2024) in the LROI in April 2025

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	1,715	143	241	1,624	22,231
2011	19,521	1,587	116	208	1,794	23,226
2012	21,727	1,579	171	254	2,117	25,848
2013	22,300	1,805	135	207	2,309	26,756
2014	24,242	2,364	116	117	2,556	29,395
2015	24,244	2,694	156	48	2,685	29,827
2016	24,884	2,948	144	98	2,926	31,000
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	19,620	4,725	158	22	2,496	27,021
2021	21,518	5,666	108	13	2,602	29,907
2022	26,836	6,995	116	26	3,013	36,986
2023	28,343	7,927	126	33	3,309	39,738
2024	28,708	8,808	155	16	3,478	41,165
Total (n)	393,299	64,982	2,448	2,856	42,740	506,325

Please note: The LROI is nearly complete as of 2010

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Type of procedures

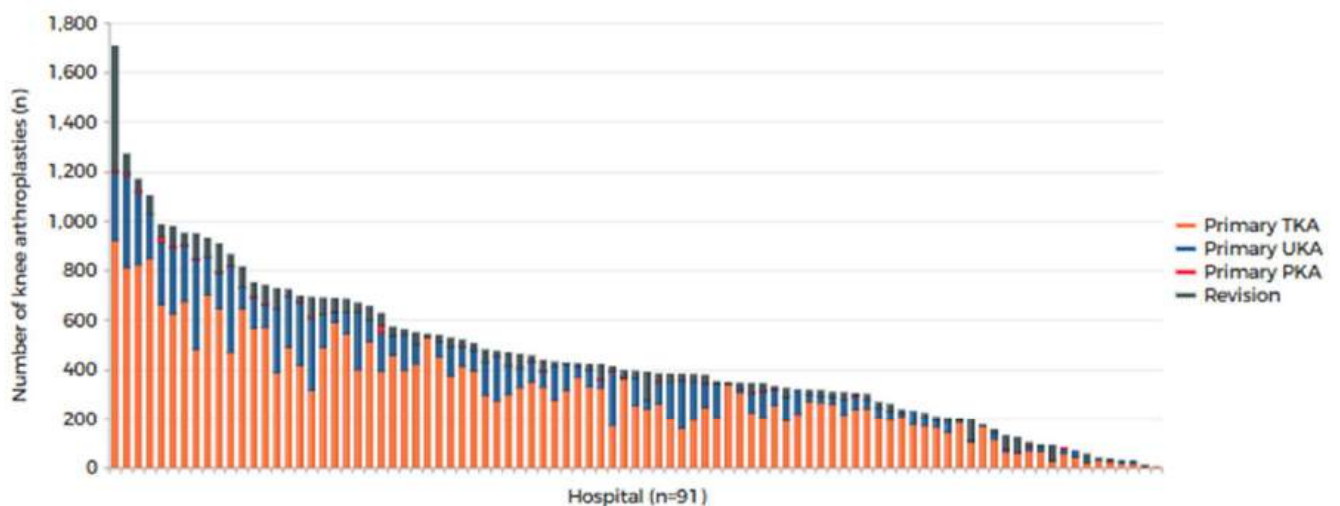
FIGURE Number of primary knee arthroplasties and knee revision arthroplasties registered in the LROI in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Primary knee	27,142	28,074	29,428	30,119	30,991	24,525	27,305	33,973	36,429	37,687	305,673
Knee revision	2,685	2,926	2,997	2,930	3,101	2,496	2,602	3,013	3,309	3,478	29,537
Total (n)	29,827	31,000	32,425	33,049	34,092	27,021	29,907	36,986	39,738	41,165	335,210

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Out of 37,687 primary knee arthroplasties that were performed in 2024, 3.2% (n=1,218) was performed bilaterally.

Type of procedure per hospital

FIGURE Number of primary knee arthroplasties and knee revision arthroplasties per hospital in the Netherlands in 2024 (n=41,149)

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

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Total knee arthroplasty

In this section you will find all the information on total knee arthroplasty

Patient characteristics

By diagnosis

TABLE Patient characteristics of all patients with a registered primary total knee arthroplasty by type of diagnosis in the Netherlands in 2024

	Osteoarthritis	Post-traumatic	Rheumatoid arthritis	Osteonecrosis	Other	Total
N(%)	27,663 (96.4)	456 (1.6)	210 (0.8)	124 (0.4)	255 (0.8)	28,708
Mean age (years) (SD)	69.8 (8.5)	64 (9.4)	67.1 (9.6)	70.4 (10.9)	65.6 (13.9)	69.6 (8.7)
Age (years) (%)						
<50	1	6	5	3	12	1
50-59	12	25	17	8	11	12
60-69	33	41	33	33	34	33
70-79	42	24	39	35	31	41
>80	12	4	7	21	12	12
Gender (%)						
Men	38	45	28	31	45	38
Women	62	55	72	69	55	62
ASA score (%)						
ASA I	9	16	1	7	9	9
ASA II	61	61	62	58	57	61
ASA III-IV	30	22	37	34	32	30
Type of hospital (%)						
General	78	71	82	82	68	78
UMC	1	9	4	4	17	1
Private	21	20	13	14	15	21
Charnley-score (%)						
A One knee joint affected	34	63	24	51	40	35
B1 Both knee joints affected	36	17	32	10	21	36
B2 Contralateral knee with a TKA	25	5	21	10	9	25
C Multiple joints affected or chronic disease that affects quality of life	4	5	21	6	10	4
Mean BMI (kg/m²) (SD)	29.6 (4.9)	28.1 (4.7)	28.6 (4.7)	27.9 (4.2)	27.9 (5)	29.5 (4.9)
Body Mass Index (kg/m²) (%)						
Underweight (<18.5)	0	1	1	0	2	0
Normal weight (>18.5-25)	18	27	21	27	21	18
Overweight (>25-30)	40	40	41	42	39	40
Obesity (>30-40)	38	30	34	30	26	38
Morbid obesity (>40)	3	1	1	0	1	3
Smoking (%)						
No	93	88	95	89	80	93
Yes	6	11	4	10	14	7

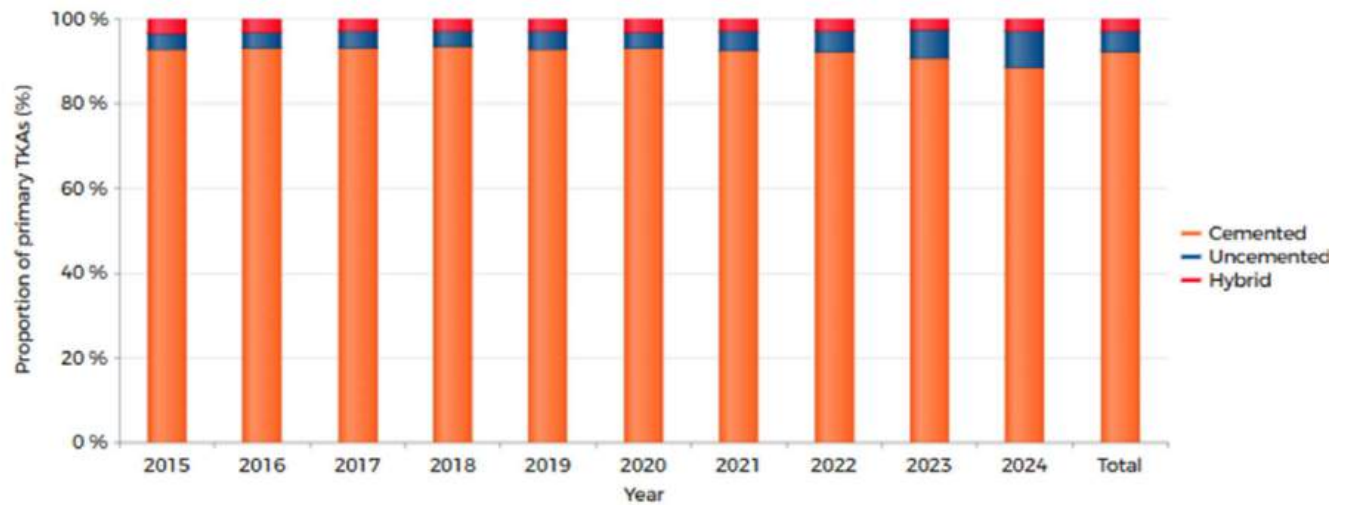
Please note: The diagnosis category 'Other' (255 cases: 1%) includes other (78), inflammatory arthritis (42), fracture (acute) (16), tumour (metastasis) (3), tumour (primary) (16) and 100 primary total knee arthroplasties where the diagnosis was not registered.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation

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Procedure characteristics

Fixation

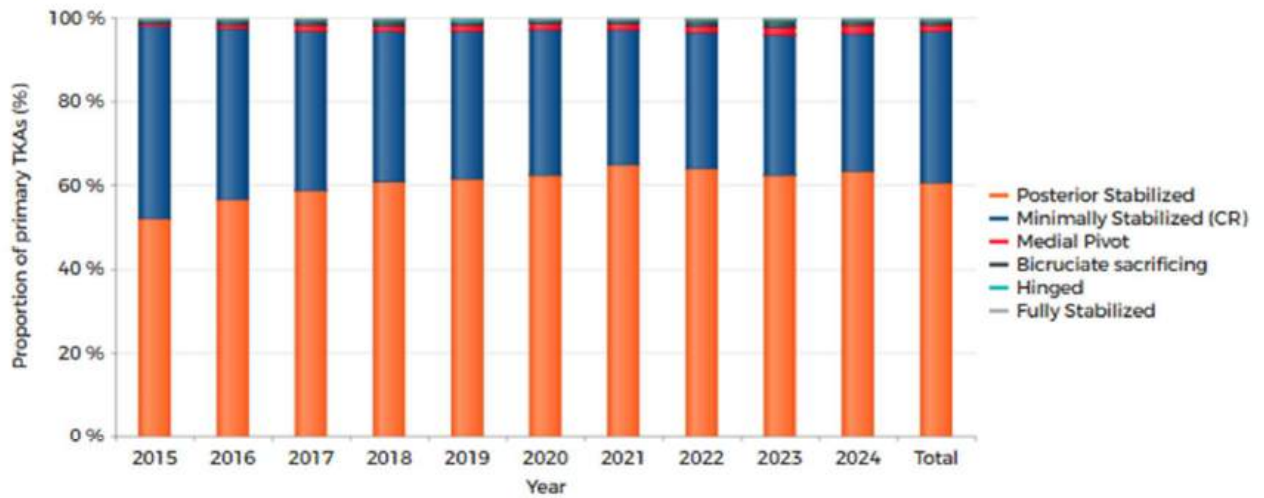
FIGURE Trend (proportion [%] per year) in type of fixation in primary total knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cemented	93.04	93.29	93.38	93.57	92.83	93.28	92.49	92.27	90.95	88.50	92.27
Uncemented	3.59	3.64	3.94	3.71	4.48	3.63	4.81	5.12	6.73	8.89	4.96
Hybrid	3.37	3.07	2.68	2.72	2.69	3.09	2.69	2.61	2.32	2.61	2.77
Total (n)	24,073	24,771	25,444	25,709	25,694	19,550	21,411	26,704	28,227	28,166	249,749

TKA: total knee arthroplasty

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Type of femur component

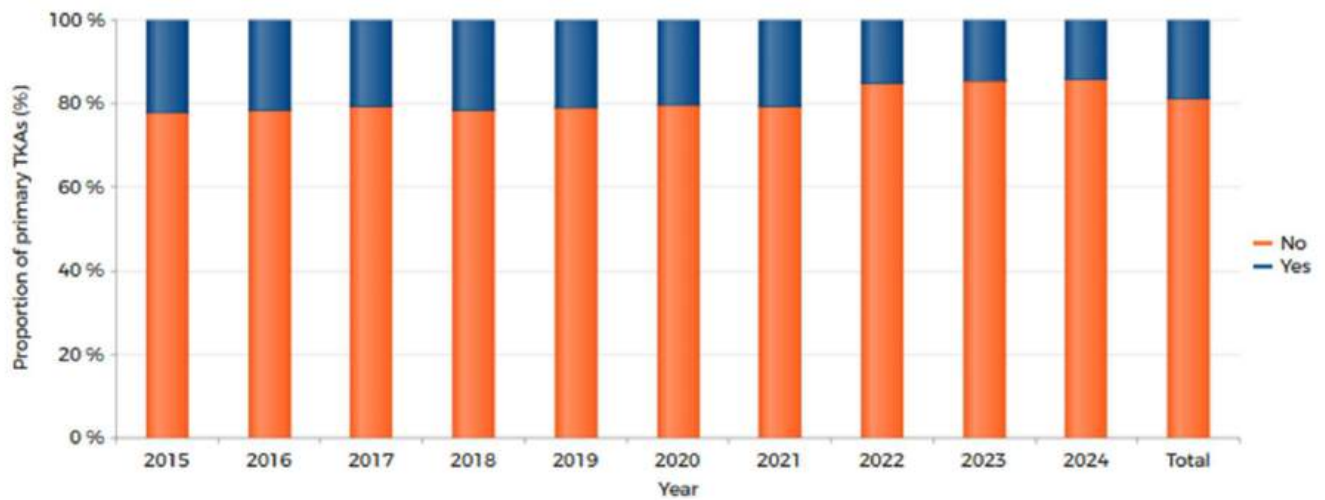
FIGURE Trend (proportion [%] per year) in type of femur component in primary total knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Posterior Stabilized	52.16	56.64	58.74	61.18	61.68	62.51	64.91	64.07	62.53	63.38	60.81
Minimally Stabilized (CR)	45.90	40.97	38.20	35.60	35.32	34.66	32.19	32.45	33.45	33.07	36.11
Medial Pivot	0.59	0.83	1.54	1.24	1.44	1.64	1.67	1.76	2.01	2.14	1.50
Bicruciate sacrificing	0.88	1.06	0.97	1.33	0.77	0.49	0.51	1.08	1.43	0.83	0.96
Hinged	0.24	0.24	0.25	0.31	0.35	0.40	0.42	0.33	0.37	0.41	0.33
Fully Stabilized	0.23	0.26	0.30	0.34	0.44	0.30	0.31	0.31	0.22	0.17	0.29
Total (n)	23,868	23,757	23,980	24,994	24,865	18,185	21,149	26,399	27,910	28,318	243,425

TKA: total knee arthroplasty

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Implantation of patella

FIGURE Trend (proportion [%] per year) in implantation of patella in primary total knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	78.01	78.51	79.42	78.55	79.21	79.75	79.47	85.06	85.49	85.88	81.14
Yes	21.99	21.49	20.58	21.45	20.79	20.25	20.53	14.94	14.51	14.12	18.86
Total (n)	24,080	24,711	25,334	25,661	25,651	19,346	21,367	26,648	28,208	28,552	249,558

TKA: total knee arthroplasty

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Most frequently registered - Total knee prostheses

TABLE The most frequently registered primary total knee arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Total knee arthroplasties (n)	18,185	21,149	26,400	27,128	27,910
Femur name; Proportion (%)					
Genesis II	22.23	21.26	20.23	19.27	18.35
Persona	3.40	9.44	11.74	13.48	17.41
Attune	3.66	7.04	9.73	12.96	15.92
Triathlon	8.55	9.56	9.50	12.10	14.88
Vanguard Complete Knee	20.70	19.05	16.42	13.90	12.16
NexGen	19.46	17.32	17.51	13.70	9.38
PFC / SIGMA	8.54	7.27	6.72	6.32	4.18
Legion	0.15	0.16	0.13	0.14	1.92
balanSys	1.86	1.74	1.76	1.82	1.68
SAIPH	0.00	0.01	0.22	0.72	1.14

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*Most frequently registered - Bone cement***TABLE** The most frequently registered bone cement used during primary total knee arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	9,042	12,436	16,475	16,713	17,606
Cement name; Proportion (%)					
Palacos R+G	51.70	49.26	49.74	57.18	52.98
Refobacin Bone Cement R	39.36	45.16	43.73	37.57	46.00
Refobacin Plus Bone Cement	8.94	5.55	6.53	5.25	1.02
Copal G+C	0.00	0.00	0.00	0.00	0.01
Year	2020	2021	2022	2023	2024
Separately packed bone cement (n)	7,120	6,281	6,868	5,974	4,856
Cement name; Proportion (%)					
Palacos R+G	70.08	81.74	80.10	70.91	79.02
Subiton G	4.96	5.80	5.63	5.89	6.18
Refobacin Bone Cement R	16.70	5.83	6.16	15.05	5.44
PalacosS MV+G	3.15	2.37	3.07	3.23	4.90
Biomet Bone Cement R	1.57	3.49	4.16	4.18	4.16
Copal G+C	0.06	0.30	0.09	0.08	0.10
Biomet Plus Bone Cement	0.84	0.02	0.00	0.15	0.10
Refobacin Revision	0.06	0.19	0.10	0.27	0.06
Palacos R	0.00	0.00	0.01	0.00	0.02
Refobacin Plus Bone Cement	0.04	0.00	0.00	0.00	0.02

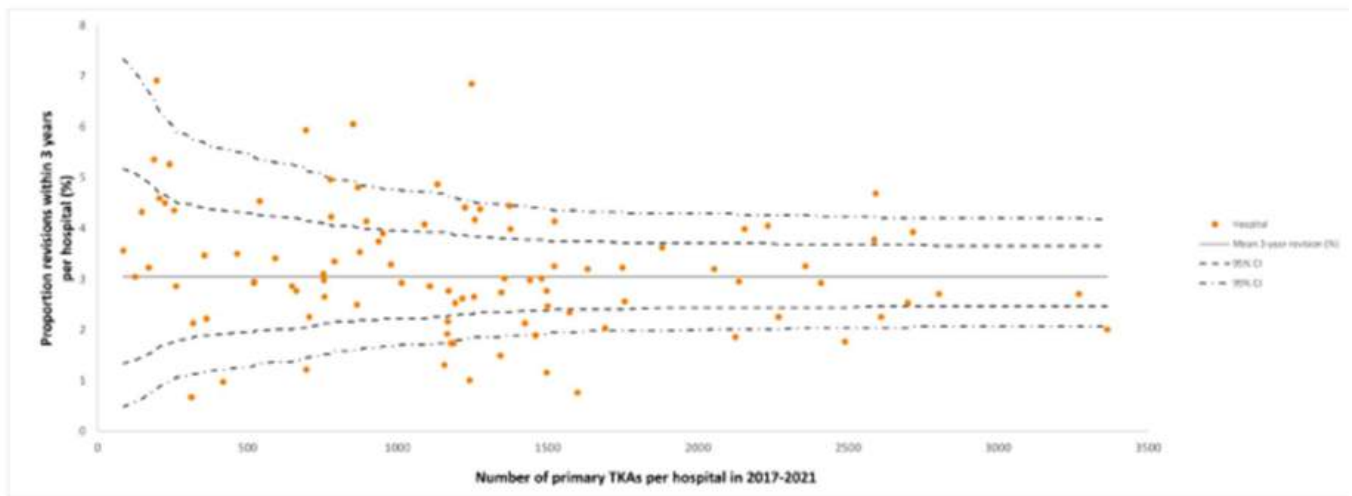
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Survival

Short term revision

Overall revision per hospital

Funnel plot of proportion of knee revision arthroplasties within three years after a total knee arthroplasty per hospital in the Netherlands in 2017-2021 (n=117,945)



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).

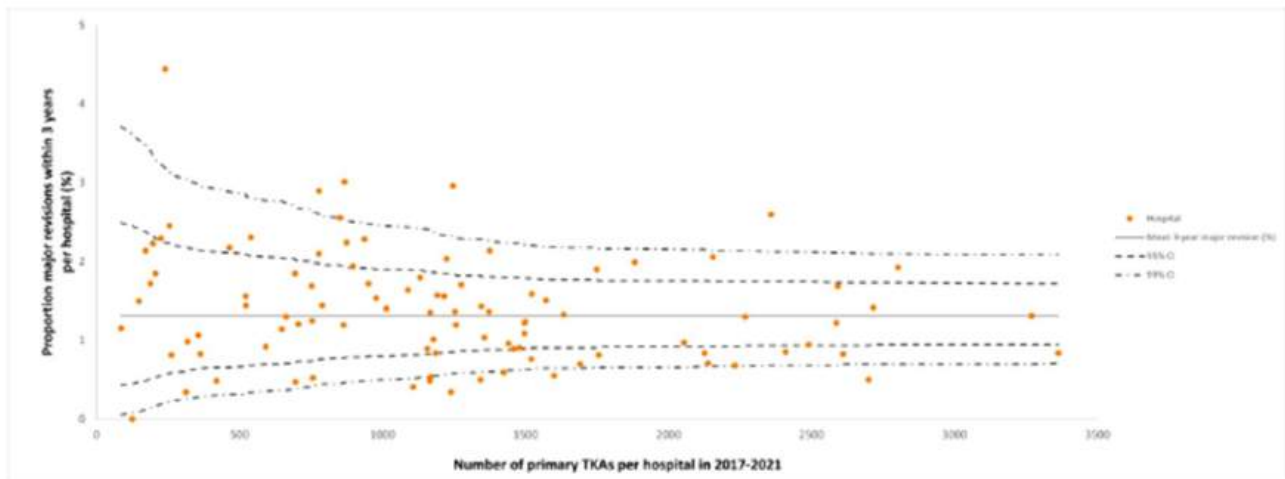
TKA: total knee arthroplasty; CL: control limits.

The mean 3-years revision percentage is 2.95 in the Netherlands in 2017-2021.

Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Major revision per hospital

Funnel plot of proportion of knee major revision arthroplasties within three years after a total knee arthroplasty per hospital in the Netherlands in 2017-2021 (n=117,945)



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 1.31 in the Netherlands in 2017-2021.

Control limits indicate the plausible range of outcome if all hospitals perform equally well.

By type of revision within 3 years

TABLE Cumulative 3-year revision percentage of primary total knee arthroplasties by type of revision in the Netherlands in 2017-2021 (n=117,945)

	Cumulative 3-year revision percentage
	Kaplan Meier (95% CI)
Any type of revision	3.03 (2.93-3.13)
Major revision	1.17 (1.11-1.23)
Only tibia	0.21 (0.18-0.24)
Only femur	0.11 (0.09-0.13)
Femur and tibia	0.85 (0.79-0.90)
Minor revision	1.81 (1.73-1.88)
DAIR	0.60 (0.55-0.64)
No DAIR	0.73 (0.69-0.78)
Patella addition	0.47 (0.43-0.51)

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

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In 2017-2021, 3,979(3.4%) 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 2017-2021 (n=117,945)

	Cumulative 3-year first revision percentage
	Kaplan Meier (95% CI)
First major revision	1.30 (1.23-1.36)
Tibia	1.18 (1.12-1.25)
Femur	1.09 (1.03-1.15)
First minor revision	1.81 (1.73-1.88)
Inlay	1.29 (1.23-1.36)
Patella addition	0.78 (0.73-0.83)

First major revision: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefore, 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

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In 2017-2021, 3,979(3.4%) primary TKAs were implanted in patients who died within three years 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 2017-2021

Reasons for revision	Major revision (n=1,545)	Minor revision (n=2,128)	Any type of revision (n=3,588)
	Proportion (%)	Proportion (%)	Proportion (%)
Infection	22.98	33.13	27.42
Patellar pain	10.74	35.57	26.20
Instability	30.23	21.62	25.03
Loosening of tibia component	28.41	0.23	11.79
Malalignment	26.86	1.03	11.65
Arthrofibrosis	11.13	6.11	8.33
Patellar dislocation	4.27	4.09	4.10
Loosening of femur component	8.16	0.19	3.51
Peri-prosthetic fracture	5.11	0.23	2.40
Revision after knee removal	4.01	0.56	1.76
Progression of osteoarthritis	0.19	2.63	1.64
Insert wear	0.32	1.08	0.81
Loosening of patella component	0.71	0.75	0.78
Other	5.57	12.64	10.03

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

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Time after primary TKA

TABLE Time after primary total knee arthroplasty until short-term revision in the Netherlands in 2017-2021 (n=117,945)

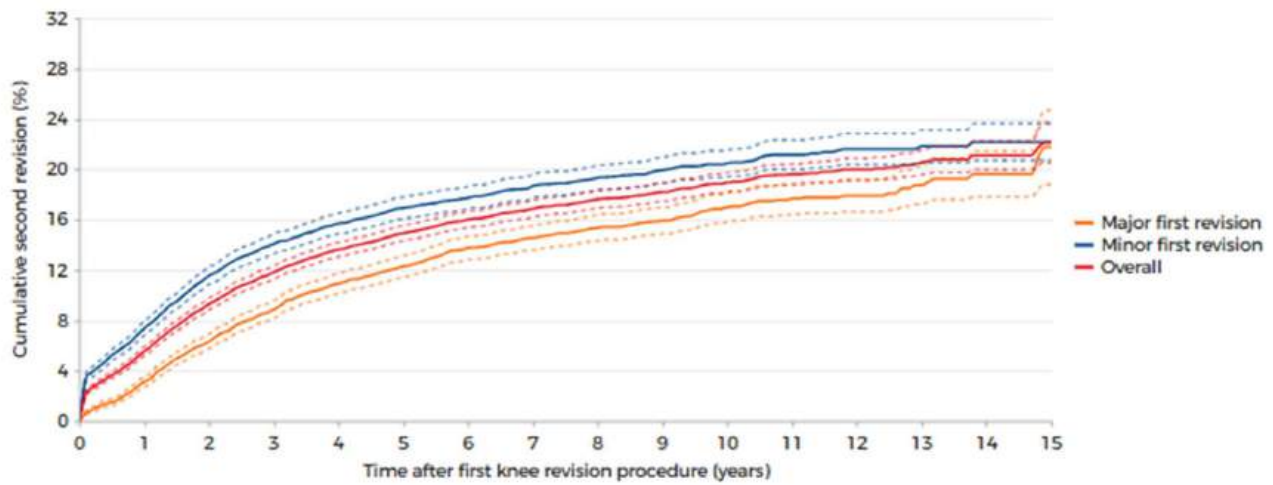
Time after primary TKA	Percentage revisions (%)
Day 0-29	0.38
Day 30-182	0.37
Day 183-364	0.38
Day 365-730 (second year)	1.20
Day 731-1095 (third year)	0.71

TKA: total knee arthroplasty

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Long term revision

By type of 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 2007-2024 (n=15,756)

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	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Overall	16,576	5.11 (4.77-5.45)	11.57 (11.05-12.09)	14.82 (14.22-15.43)	16.74 (16.08-17.40)	18.85 (18.08-19.62)	22.10 (20.53-23.68)
Major first revision	7,380	2.74 (2.36-3.13)	8.62 (7.93-9.31)	12.14 (11.29-12.98)	14.51 (13.55-15.47)	16.85 (15.70-17.99)	21.75 (18.80-24.70)
Minor first revision	8,887	6.87 (6.33-7.41)	13.84 (13.07-14.61)	16.86 (16.00-17.73)	18.45 (17.52-19.38)	20.41 (19.34-21.47)	22.17 (20.72-23.63)

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).

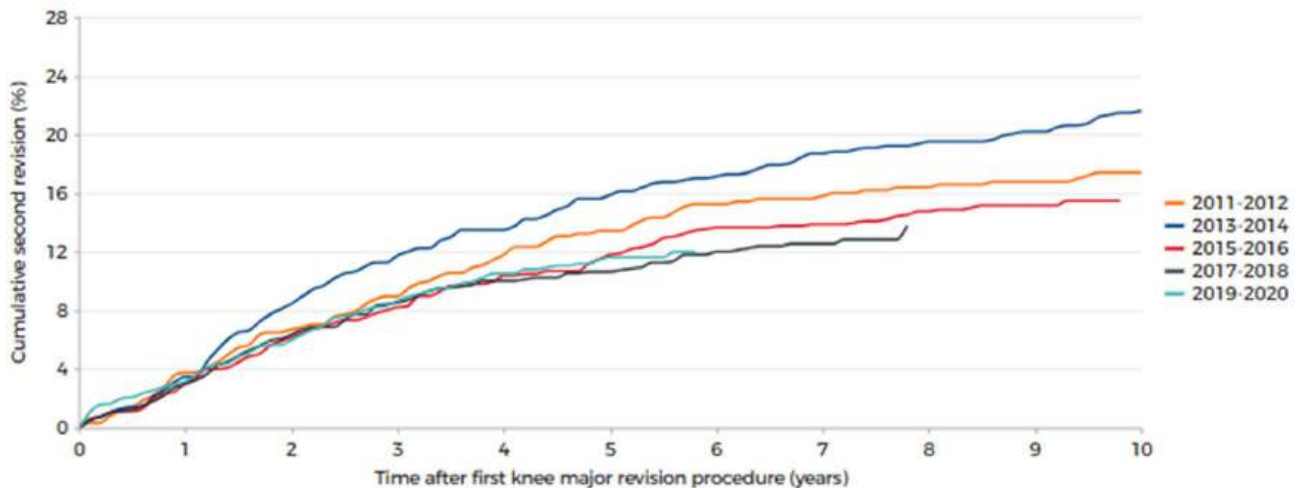
Major revision: revision of at least the femur or tibia component.

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

CI: confidence interval.

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By procedure year

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 2011-2020 (n=4,670)

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	Number (n)	1yr	3yr	5yr	7yr	10yr
2011-2012	590	3.59 (2.08-5.09)	8.97 (6.64-11.30)	13.43 (10.63-16.22)	15.63 (12.64-18.62)	17.42 (14.27-20.56)
2013-2014	837	3.12 (1.94-4.31)	11.28 (9.12-13.44)	15.63 (13.14-18.12)	18.71 (16.03-21.40)	21.49 (18.63-24.35)
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	1,047	2.78 (1.78-3.78)	8.43 (6.74-10.13)	10.65 (8.76-12.54)	12.55 (10.49-14.61)	n.a.
2019-2020	1,144	2.98 (1.99-3.96)	8.32 (6.71-9.94)	11.47 (9.57-13.37)	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.

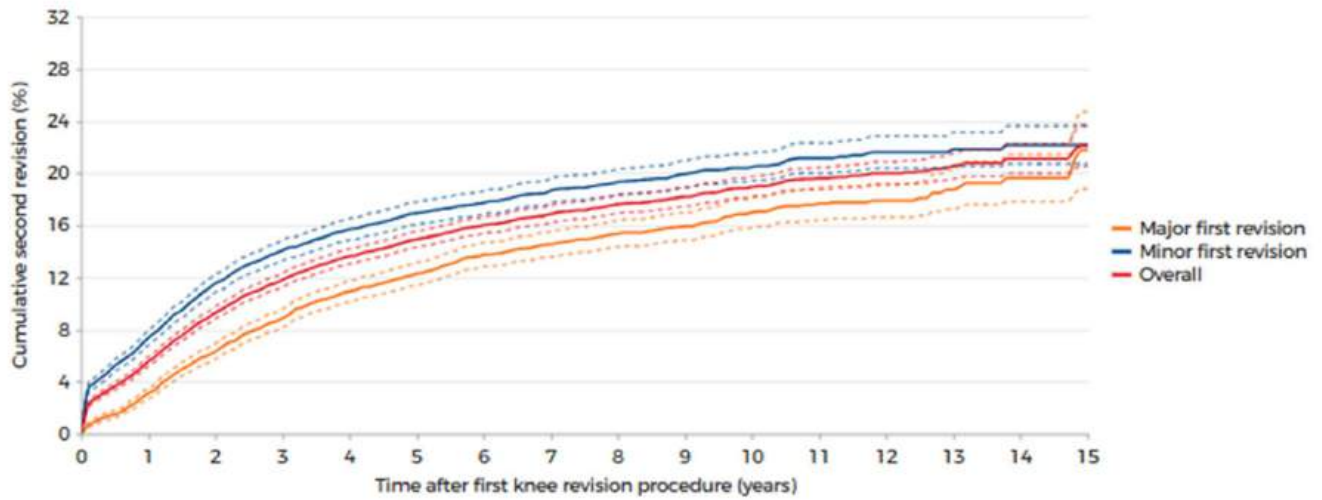
Major revision: revision of at least the femur or tibia component.

CI: confidence interval.

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Rerevision

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 2007-2024 (n=15,756)

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	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Overall	16,576	5.11 (4.77-5.45)	11.57 (11.05-12.09)	14.82 (14.22-15.43)	16.74 (16.08-17.40)	18.85 (18.08-19.62)	22.10 (20.53-23.68)
Major first revision	7,380	2.74 (2.36-3.13)	8.62 (7.93-9.31)	12.14 (11.29-12.98)	14.51 (13.55-15.47)	16.85 (15.70-17.99)	21.75 (18.80-24.70)
Minor first revision	8,887	6.87 (6.33-7.41)	13.84 (13.07-14.61)	16.86 (16.00-17.73)	18.45 (17.52-19.38)	20.41 (19.34-21.47)	22.17 (20.72-23.63)

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).

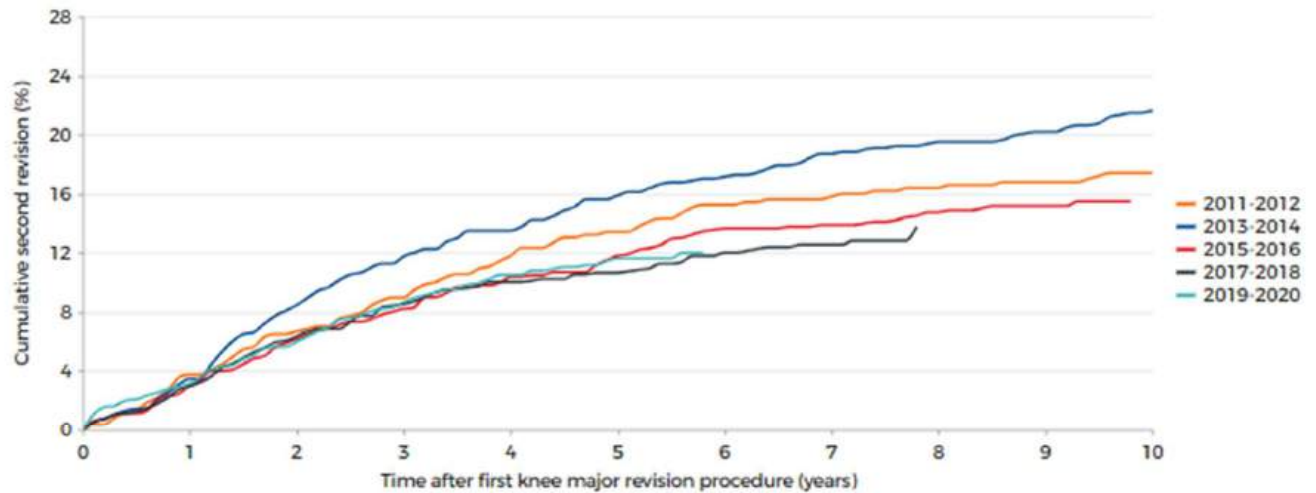
Major revision: revision of at least the femur or tibia component.

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

CI: confidence interval.

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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 2011-2020 (n=4,670)

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	Number (n)	1yr	3yr	5yr	7yr	10yr
2011-2012	590	3.59 (2.08-5.09)	8.97 (6.64-11.30)	13.43 (10.63-16.22)	15.63 (12.64-18.62)	17.42 (14.27-20.56)
2013-2014	837	3.12 (1.94-4.31)	11.28 (9.12-13.44)	15.63 (13.14-18.12)	18.71 (16.03-21.40)	21.49 (18.63-24.35)
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	1,047	2.78 (1.78-3.78)	8.43 (6.74-10.13)	10.65 (8.76-12.54)	12.55 (10.49-14.61)	n.a.
2019-2020	1,144	2.98 (1.99-3.96)	8.32 (6.71-9.94)	11.47 (9.57-13.37)	n.a.	n.a.

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

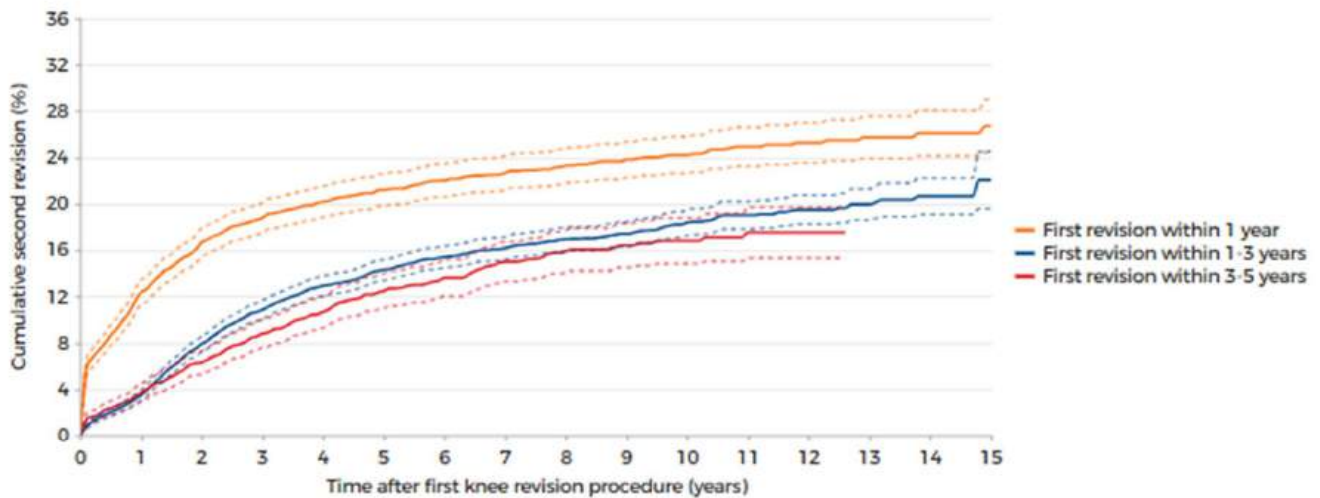
One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.

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

CI: confidence interval.

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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 2007-2024 (n=13,054)

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	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
First revision within 1 year	3,894	11.52 (10.50-12.54)	18.60 (17.31-19.88)	21.17 (19.78-22.55)	22.55 (21.09-24.00)	24.21 (22.63-25.80)	26.72 (24.43-29.01)
First revision within 1-3 years	6,788	3.12 (2.70-3.54)	10.64 (9.87-11.42)	14.18 (13.28-15.08)	16.08 (15.11-17.06)	18.21 (17.10-19.33)	22.05 (19.59-24.52)
First revision within 3-5 years	2,372	3.38 (2.65-4.12)	8.55 (7.36-9.75)	12.33 (10.85-13.81)	14.90 (13.19-16.62)	16.81 (14.83-18.78)	n.a.

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.

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Reasons for second revision by type of first revision

TABLE Reasons for second revision within ten 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 2007-2024

Reasons for second revision	Major revision (n=860)	Minor revision (n=998)	Any type of revision (n=1,939)
	Proportion (%)	Proportion (%)	Proportion (%)
Infection	24.42	50.80	38.89
Instability	31.40	24.65	27.54
Loosening of tibia component	19.42	12.02	15.37
Patellar pain	18.02	9.52	13.62
Malalignment	10.35	9.02	9.80
Loosening of femur component	11.40	4.31	7.68
Arthrofibrosis	8.14	4.51	6.24
Patellar dislocation	3.84	3.51	3.56
Insert wear	2.56	2.20	2.53
Loosening of patella component	2.67	1.30	2.06
Peri-prosthetic fracture	1.05	0.50	0.72
Progression of osteoarthritis	0.23	0.30	0.26
Other	7.67	5.91	6.81

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%.

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Survival by component

By cemented component name - overall 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 2007-2024 (n=336,805)

Femur component	Tibia component	Primary TKAs (n)	Median (IQR) age (yr)	Major revisions (n)	Cumulative revision percentage (95% CI)							
					1yr	3yr	5yr	7yr	10yr	16yr		
All cemented TKAs for osteoarthritis							0.34 (0.32-0.36)	1.48 (1.44-1.53)	2.08 (2.03-2.13)	2.52 (2.46-2.58)	3.14 (3.06-3.21)	4.31 (4.18-4.45)
Genesi II	Genesi II	73,772	69 (63-76)	1,642	0.39 (0.34-0.43)	1.57 (1.48-1.67)	2.10 (1.99-2.21)	2.44 (2.32-2.57)	2.88 (2.73-3.02)	3.49 (3.26-3.73)		
NovGen	NovGen	66,429	69 (63-76)	1,833	0.29 (0.25-0.33)	1.39 (1.29-1.48)	2.06 (1.94-2.18)	2.75 (2.61-2.89)	3.80 (3.62-3.98)	5.39 (5.05-5.73)		
VANQUARD COMPLETE KNEE	VANQUARD COMPLETE KNEE	54,035	69 (63-76)	1,134	0.38 (0.33-0.44)	1.44 (1.34-1.55)	1.89 (1.77-2.02)	2.19 (2.06-2.33)	2.61 (2.45-2.78)	3.49 (3.17-3.80)		
PPC / SIGMA	PPC / SIGMA	54,666	70 (63-76)	639	0.27 (0.21-0.32)	1.19 (1.07-1.31)	1.65 (1.50-1.79)	1.83 (1.70-2.01)	2.18 (2.01-2.36)	2.48 (2.23-2.70)		
LCS	LCS	17,254	70 (63-76)	689	0.38 (0.29-0.47)	2.29 (2.06-2.51)	3.17 (2.90-3.44)	3.79 (3.50-4.09)	4.30 (3.98-4.63)	5.20 (4.62-5.77)		
TRIATHLON	TRIATHLON	13,982	71 (64-76)	248	0.45 (0.33-0.58)	1.58 (1.35-1.81)	2.16 (1.87-2.45)	2.49 (2.16-2.85)	2.83 (2.42-3.24)			
Persena	Persena	13,620	69 (62-75)	82	0.23 (0.14-0.31)	0.83 (0.64-1.07)	1.33 (1.02-2.04)	1.96 (0.98-2.95)	2.42 (1.09-3.75)			
ATTUNE	ATTUNE	12,552	70 (63-76)	89	0.29 (0.19-0.39)	0.96 (0.75-1.20)	1.39 (1.04-1.75)	1.81 (1.27-2.35)				
Dalansys	Dalansys	5,020	69 (62-76)	114	0.33 (0.17-0.50)	1.36 (1.19-1.54)	2.33 (1.85-2.81)	2.86 (2.30-3.42)	3.21 (2.59-3.84)	3.62 (2.85-4.40)		
ACC V2	ACC V2	4,437*	71 (65-77)	121	0.14 (0.03-0.23)	1.08 (0.77-1.39)	1.49 (1.13-1.85)	1.94 (1.33-2.56)	2.38 (1.92-2.85)	3.38 (2.76-4.01)		

* Denotes prosthesis combinations with no reported use in primary TKAs in 2024.

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

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

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

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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.

By cemented component name - 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 2007-2024 (n=19,289)

Femur component	Tibia component	Primary TKAs (n)	Median (IQR) age (yr)	Major revisions (n)	Cumulative revision percentage (95% CI)									
					1yr	3yr	5yr	7yr	10yr	16yr				
All uncemented TKAs for osteoarthritis							19,289	69 (62-75)	488	0.58 (0.46-0.69)	1.99 (1.77-2.20)	3.58 (3.33-3.83)	3.91 (3.64-3.96)	4.17 (3.68-4.66)
LCS	LCS	8,031	70 (63-76)	255	0.56 (0.43-0.74)	2.13 (1.84-2.43)	3.04 (2.70-2.98)	2.77 (2.42-3.12)	3.35 (3.04-3.67)	3.33 (2.69-3.78)				
TRIATHLON	TRIATHLON	3,277	68 (62-74)	41	0.40 (0.22-0.69)	0.88 (0.53-1.24)	1.29 (0.79-1.89)	1.76 (1.00-2.44)	2.43 (1.42-3.63)	n.a.				
TRIATHLON	TRIATHLON TRITANIUM	1,896	68 (62-74)	6	0.30 (0.00-0.60)	n.a.	n.a.	n.a.	n.a.	n.a.				
ATTUNE	ATTUNE	1,252	67 (61-73)	8	0.20 (0.00-0.48)	1.33 (0.29-2.37)	2.24 (0.19-4.23)	n.a.	n.a.	n.a.				
ACS	ACS	907	69 (61-75)	21	1.06 (0.37-1.74)	2.16 (1.14-3.18)	2.74 (1.53-3.95)	3.00 (1.69-4.31)	3.00 (1.69-4.31)	n.a.				
NovGen	NovGen	243	70 (63-77)	16	1.26 (0.00-2.87)	4.29 (1.69-6.88)	5.22 (2.34-8.10)	6.80 (3.19-10.02)	7.62 (3.70-11.34)	n.a.				
Genesi II	Genesi II	247	69 (63-76)	6	0.43 (0.00-1.27)	2.71 (0.97-4.83)	2.71 (0.97-4.83)	2.71 (0.97-4.83)	2.71 (0.97-4.83)	n.a.				
ACS LD	ACS LD	234	70 (61-76)	9	1.30 (0.00-2.76)	3.90 (1.12-5.89)	3.97 (1.43-6.51)	3.97 (1.43-6.51)	n.a.	n.a.				

* Denotes prosthesis combinations with no reported use in primary TKAs in 2024.

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

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

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

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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.

By uncemented component name - 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 2007-2024 (n=19,289)

Femur component	Tibia component	Primary TKAs (n)	Hospitals (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)					Cumulative revision percentage (95% CI)						
						Total revision	Patella addition	Only femur	Only tibia	Only insert/patella	Unknown	1yr	3yr	5yr	7yr	10yr	16yr
All uncemented TKAs for osteoarthritis																	
LCS	LCS	8,031	23	70 (63-76)	421	128	51	10	96	132	4	0.93 (0.85-1.14)	3.42 (3.14-3.70)	4.23 (3.92-4.57)	4.80 (4.45-5.15)	5.41 (5.02-5.81)	6.54 (5.96-7.12)
TRIATHLON	TRIATHLON	3,277	13	68 (62-74)	73	27	7	1	4	34	0	0.90 (0.73-1.13)	1.90 (1.18-2.42)	2.48 (1.60-3.13)	3.05 (2.22-3.89)	3.50 (2.46-4.33)	n.a.
TRIATHLON	TRIATHLON TRITANIUM	1,896	9	68 (62-74)	14	4	2	0	2	6	0	0.68 (0.24-1.13)	n.a.	n.a.	n.a.	n.a.	n.a.
ATTUNE	ATTUNE	1,252	12	67 (61-73)	22	4	6	0	0	12	0	0.80 (0.27-1.32)	3.71 (2.04-5.37)	3.71 (2.04-5.37)	n.a.	n.a.	n.a.
ACS	ACS	907	7	69 (61-75)	37	11	7	2	5	11	1	1.73 (0.86-2.60)	3.79 (2.45-5.13)	4.58 (3.04-6.12)	4.64 (3.23-6.44)	5.45 (3.64-7.26)	n.a.
NovGen	NovGen	243	24	70 (63-77)	21	11	1	1	2	5	0	1.87 (0.05-3.30)	5.35 (2.62-8.49)	7.00 (3.68-10.32)	8.38 (4.60-12.17)	10.29 (5.75-14.83)	n.a.
Genesi II	Genesi II	247	29	69 (63-76)	11	5	3	0	1	1	1	0.86 (0.00-2.05)	4.50 (1.77-7.22)	5.05 (2.13-7.97)	5.05 (2.13-7.97)	5.05 (2.13-7.97)	n.a.
ACS LD	ACS LD	234*	3	70 (61-76)	15	6	3	0	2	4	0	1.30 (0.00-2.75)	5.49 (2.48-8.69)	6.15 (3.03-9.28)	6.63 (3.39-9.88)	n.a.	n.a.
VANQUARD COMPLETE KNEE	VANQUARD COMPLETE KNEE	170	23	68 (61-74)	15	7	2	0	4	2	0	2.38 (0.07-4.68)	5.50 (2.00-9.00)	5.50 (2.00-9.00)	7.87 (3.35-12.19)	9.82 (4.81-14.82)	n.a.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2024.

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

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Only combinations with over 100 procedures and reported by at least 3 hospitals 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.

By uncemented component name - major revision

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 2007-2024

Bone cement	Primary TKAs (n)	Median (IQR) age (yr)	Revisions (n)	Cumulative revision percentage (95% CI)					
				1yr	3yr	5yr	7yr	10yr	16yr
Separately packed	168,394	69 (63-76)	8,768	0.90 (0.85-0.94)	3.23 (3.14-3.31)	4.20 (4.11-4.30)	4.87 (4.77-4.98)	5.76 (5.65-5.88)	7.44 (7.24-7.63)
PALACOS B-C	141,263	69 (63-76)	7,238	0.92 (0.87-0.97)	3.25 (3.13-3.32)	4.21 (4.10-4.31)	4.86 (4.74-4.98)	5.75 (5.62-5.89)	7.48 (7.23-7.72)
Refobacin Bone Cement R	13,619	69 (63-76)	749	0.83 (0.68-0.98)	3.11 (2.81-3.41)	3.99 (3.64-4.33)	4.91 (4.52-5.30)	6.36 (5.88-6.85)	8.27 (7.66-9.00)
PALACOS MV-C	8,447	70 (64-76)	400	0.79 (0.60-0.99)	3.04 (2.67-3.42)	4.01 (3.58-4.44)	4.77 (4.29-5.25)	5.32 (4.79-5.84)	n.a.
Simplex ABC BC	5,077*	69 (62-76)	361	0.93 (0.60-1.19)	3.70 (3.18-4.22)	4.98 (4.38-5.59)	5.96 (5.30-6.63)	7.01 (6.28-7.74)	9.15 (7.66-10.64)
Simplex ABC TOBRA	4,864*	66 (60-73)	234	0.76 (0.55-1.03)	2.34 (1.82-2.85)	3.01 (2.32-3.69)	3.56 (2.83-4.08)	4.48 (3.68-5.08)	6.32 (5.37-7.27)
Refobacin Plus Bone Cement	3,053	68 (60-75)	198	1.02 (0.65-1.37)	4.28 (3.56-5.00)	5.35 (4.56-6.16)	5.78 (4.95-6.62)	6.34 (5.44-7.22)	6.93 (5.97-7.93)
Sublon C	2,148	69 (61-75)	103	1.53 (1.00-2.07)	5.39 (4.31-6.47)	6.49 (5.21-7.78)	n.a.	n.a.	n.a.
PALACOS B	1,674	69 (62-76)	75	0.54 (0.19-0.89)	2.60 (1.63-3.37)	3.23 (2.37-4.08)	3.75 (2.82-4.67)	4.45 (3.44-5.47)	4.85 (3.76-5.93)
Bornet Plus Bone Cement	1,431	68 (61-76)	68	1.04 (0.52-1.57)	3.48 (2.50-4.41)	4.35 (3.28-5.42)	4.52 (3.45-5.61)	5.00 (4.02-6.18)	n.a.
PALAMED C	1,349*	70 (65-76)	64	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)	5.39 (4.06-6.72)
Bornet Bone Cement R	1,301	69 (62-75)	42	0.75 (0.20-1.23)	3.28 (2.10-4.42)	5.00 (3.28-6.72)	6.05 (3.82-8.28)	6.05 (3.82-8.28)	n.a.
VERSABOND	631*	71 (63-78)	38	0.83 (0.01-1.28)	3.43 (3.63-7.20)	6.42 (4.50-8.35)	6.93 (4.93-8.93)	7.48 (5.40-9.56)	n.a.
comfys IG	547*	64 (58-69)	41	1.10 (0.22-1.97)	3.31 (1.80-4.81)	5.73 (3.77-7.69)	6.87 (4.75-9.01)	7.62 (5.33-9.92)	n.a.
Simplex P	398*	70 (62-77)	24	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)	7.25 (4.39-10.13)
Simplex HV	377*	66 (61-73)	7	0.27 (0.00-0.78)	1.60 (0.33-2.87)	1.89 (0.50-3.28)	1.89 (0.50-3.28)	n.a.	n.a.
SynormIC	334*	71 (65-77)	12	0.60 (0.00-1.43)	3.68 (1.65-5.72)	3.68 (1.65-5.72)	3.68 (1.65-5.72)	n.a.	n.a.
Pre-packed in a vacuum mixing system	126,537	70 (63-76)	4,381	1.08 (1.00-1.11)	3.35 (3.09-3.59)	4.81 (3.89-4.74)	4.62 (4.46-4.77)	5.56 (5.31-5.78)	7.47 (6.85-8.08)
Refobacin Bone Cement R	23,479	70 (64-76)	1,338	1.04 (0.90-1.13)	3.10 (2.94-3.26)	3.97 (3.79-4.16)	4.67 (4.49-4.86)	5.64 (5.34-5.95)	n.a.
PALACOS B-C	11,953	71 (64-76)	1,549	1.19 (1.09-1.28)	3.27 (3.10-3.45)	4.02 (3.80-4.23)	4.48 (4.23-4.73)	5.41 (4.99-6.03)	n.a.
Refobacin Plus Bone Cement	16,871	68 (62-74)	769	0.72 (0.59-0.84)	3.10 (2.83-3.37)	3.94 (3.63-4.25)	4.49 (4.15-4.82)	5.23 (4.85-5.61)	6.83 (6.02-7.63)
Cemex Conta	1,359*	71 (65-77)	103	1.04 (0.50-1.57)	4.91 (3.76-6.07)	5.68 (4.44-6.92)	6.31 (5.01-7.62)	7.46 (6.01-8.91)	n.a.

* Denotes types of bone cement with no reported use in primary TKAs in 2024.

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

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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.

By bone cement

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 2007-2024 (n=336,805)

Femur component	Tibial component	Primary TKAs (n)	Hospitals (n)	Median (IQR) age (yr)	Revisions (n)	Total revision	Patella addition	Type of revision (n)				Unknown	Cumulative revision percentage (95% CI)					
								Only femur	Only tibia	Only insert/patella			1yr	3yr	5yr	7yr	10yr	16yr
All cemented TKAs for osteoarthritis		336,805	163	70 (63-76)	15,061	8,341	2,670	572	1,255	4,879	344	0.88 (0.82-0.93)	3.18 (3.12-3.24)	4.12 (4.05-4.20)	4.77 (4.69-4.85)	5.67 (5.57-5.77)	7.48 (7.23-7.73)	
Cemex II	Cemex II	73,772	36	69 (63-76)	3,776	883	805	264	279	1,469	76	1.19 (1.12-1.27)	3.83 (3.68-3.97)	4.88 (4.71-5.04)	5.31 (5.13-5.49)	6.36 (6.15-6.58)	8.12 (7.71-8.52)	
NexGen	NexGen	66,429	46	69 (63-76)	3,067	1,325	309	81	336	923	71	0.85 (0.78-0.92)	2.71 (2.58-2.83)	3.70 (3.53-3.86)	4.33 (4.13-4.51)	5.75 (5.53-5.97)	7.68 (7.28-8.03)	
VANGUARD COMPLETE KNEE	VANGUARD COMPLETE KNEE	54,033	33	69 (63-75)	2,213	787	379	53	150	794	50	0.89 (0.81-0.96)	3.02 (2.87-3.17)	3.75 (3.58-3.92)	4.28 (4.09-4.46)	4.97 (4.75-5.18)	6.44 (6.00-6.87)	
PRC / SICMA	PRC / SICMA	34,666	22	70 (63-76)	1,377	438	283	33	97	491	35	0.86 (0.79-0.94)	2.91 (2.75-3.10)	3.65 (3.44-3.85)	4.01 (3.79-4.23)	4.60 (4.33-4.85)	5.11 (4.81-5.42)	
LCS	LCS	17,254	24	70 (63-76)	605	470	50	34	148	110	13	0.61 (0.40-0.73)	3.11 (2.85-3.37)	4.15 (3.85-4.45)	4.79 (4.46-5.11)	5.33 (4.97-5.69)	6.64 (5.50-7.56)	
TRIATHLON	TRIATHLON	13,962	24	71 (64-76)	521	139	77	23	52	223	7	1.43 (1.23-1.63)	3.53 (3.21-3.89)	4.30 (3.91-4.68)	4.79 (4.34-5.21)	5.60 (5.02-6.19)	n.a.	
Persona	Persona	13,050	24	69 (62-75)	230	54	32	2	11	148	3	0.82 (0.66-0.96)	2.69 (2.32-3.06)	3.67 (3.03-4.30)	4.01 (3.08-4.94)	5.26 (3.27-7.25)	n.a.	
ATTUNE	ATTUNE	12,392	24	70 (63-76)	205	59	47	7	13	75	4	0.73 (0.57-0.88)	2.32 (1.90-2.67)	2.85 (2.39-3.31)	3.58 (2.87-4.28)	n.a.	n.a.	
IsolardSys	IsolardSys	5,028	9	69 (62-76)	267	79	84	7	18	83	6	0.96 (0.68-1.23)	4.31 (3.70-4.92)	5.51 (4.80-6.22)	6.27 (5.49-7.05)	7.26 (6.28-8.12)	8.47 (7.09-9.85)	
ACC V2	ACC V2	4,420*	14	71 (65-77)	181	111	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 (2.63-3.71)	3.85 (3.26-4.44)	5.19 (4.44-5.94)	
TC Plus	TC Plus	3,867*	3	70 (63-76)	148	81	33	2	5	22	5	0.69 (0.40-0.90)	2.34 (1.85-2.82)	3.13 (2.36-3.70)	3.48 (2.87-4.09)	4.26 (3.32-4.93)	5.92 (4.35-7.31)	
Optetrak	Optetrak	3,073*	9	70 (62-76)	474	318	80	3	33	23	7	1.05 (0.69-1.41)	3.33 (4.53-6.13)	7.16 (6.23-8.08)	9.18 (8.13-10.22)	12.86 (11.60-14.12)	22.79 (20.50-25.08)	
ACS	ACS	2,035	10	67 (60-73)	146	37	23	9	12	37	8	0.67 (0.36-0.98)	3.73 (3.05-4.48)	4.72 (3.91-5.53)	5.05 (4.21-5.88)	5.49 (4.62-6.37)	n.a.	
SCORPIO HRC	SCORPIO	2,031*	8	70 (63-76)	145	34	47	10	4	29	1	0.84 (0.49-1.19)	3.16 (2.49-3.83)	4.48 (3.68-5.28)	5.11 (4.26-5.97)	5.66 (4.75-6.58)	n.a.	
Journey II BCS	Journey BCS	2,407	9	68 (62-74)	122	22	40	0	0	37	3	0.94 (0.55-1.33)	4.04 (3.16-4.92)	5.40 (4.34-6.46)	6.36 (5.17-7.55)	8.80 (6.88-10.71)	n.a.	
SCORPIO	SCORPIO	2,249*	10	71 (63-76)	124	67	23	3	6	21	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)	6.48 (5.33-7.62)	
MEK	MEK	2,081	7	70 (63-76)	47	22	11	0	0	12	2	0.30 (0.06-0.54)	1.48 (0.87-2.04)	2.46 (1.79-3.54)	3.48 (2.39-4.96)	4.82 (3.06-6.58)	n.a.	
NexGen CFP	NexGen	1,347	8	68 (61-74)	40	25	5	0	2	7	1	0.45 (0.09-0.81)	1.48 (0.82-2.15)	2.45 (1.58-3.32)	2.79 (1.82-3.69)	3.35 (2.29-4.41)	n.a.	
PRC / SICMA	LCS	1,212*	9	66 (58-75)	59	31	11	3	1	11	2	0.53 (0.01-0.63)	1.93 (1.15-2.71)	2.86 (1.85-3.84)	3.89 (2.77-5.00)	4.91 (3.30-5.73)	6.24 (4.47-8.03)	
Innex	Innex	1,120*	10	70 (62-77)	40	14	11	0	4	11	0	0.96 (0.40-1.51)	2.15 (1.30-2.99)	2.79 (1.82-3.76)	3.18 (2.14-4.21)	3.38 (2.31-4.45)	3.83 (2.45-5.02)	
Journey BCS	Journey BCS	890*	8	66 (59-72)	146	17	61	1	3	62	2	1.13 (0.43-1.82)	6.84 (5.17-8.51)	8.36 (6.32-10.20)	10.22 (8.19-12.23)	12.34 (10.11-14.56)	22.55 (18.58-26.52)	
Profile	Profile	772*	6	68 (61-76)	62	43	7	2	2	7	1	0.52 (0.01-0.81)	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 (6.56-10.76)	
Segon	Cemex II	377	16	68 (61-75)	16	5	0	2	0	9	0	3.04 (1.01-5.06)	6.43 (2.15-10.71)	8.00 (2.80-12.20)	n.a.	n.a.	n.a.	
Advance MP	Advance	314*	3	71 (65-76)	33	7	7	1	5	10	3	1.52 (0.40-2.44)	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*	5	70 (63-77)	14	3	3	1	2	5	0	1.47 (0.04-2.90)	2.94 (0.59-4.95)	3.31 (1.18-5.44)	4.06 (1.71-6.41)	4.81 (2.26-7.37)	5.19 (2.34-7.84)	

* Denotes prosthesis combinations with no reported use in primary TKAs in 2024.

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

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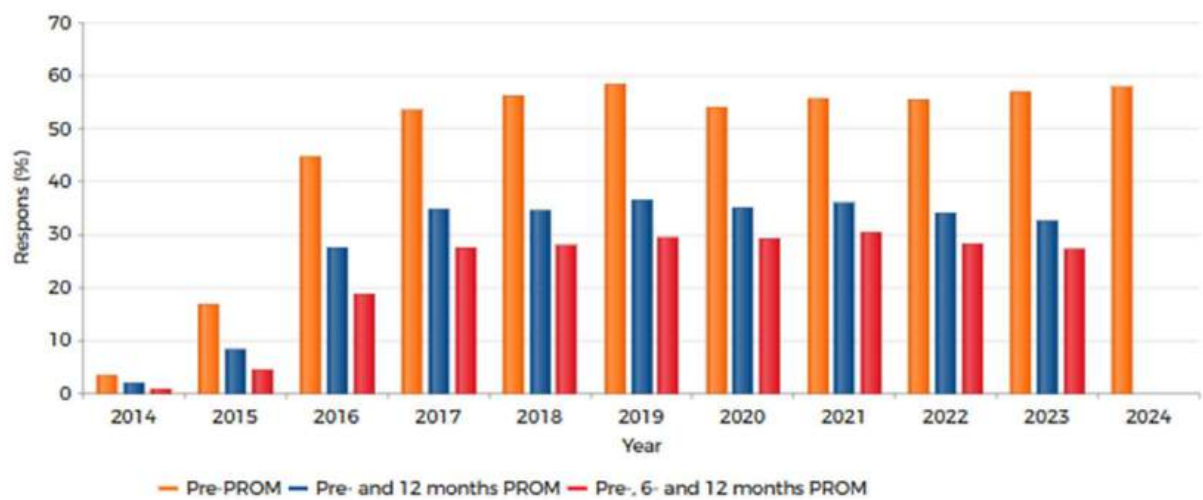
Only combinations with over 250 procedures and reported by at least 3 hospitals have been listed.

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

Per year

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2024

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	3.45	16.81	44.66	53.40	56.12	58.42	53.99	55.64	55.47	56.79	57.94
Pre- and 12 months PROM	1.99	8.15	27.39	34.84	34.59	36.38	35.05	36.02	34.00	32.68	n.a.
Pre-, 6- and 12 months PROM	0.74	4.46	18.65	27.53	27.85	29.47	29.14	30.30	28.20	27.27	n.a.
Total TKAs for osteoarthritis (n)	22,830	22,930	23,656	24,421	24,784	24,818	18,742	20,396	25,606	27,076	27,345

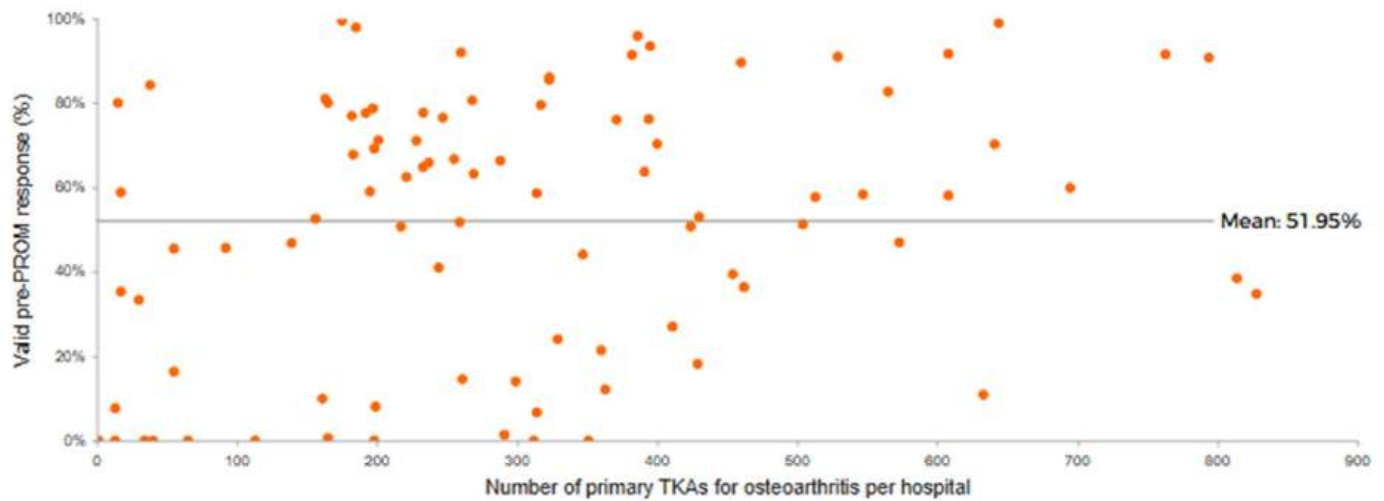
Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

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

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Pre-PROM per hospital

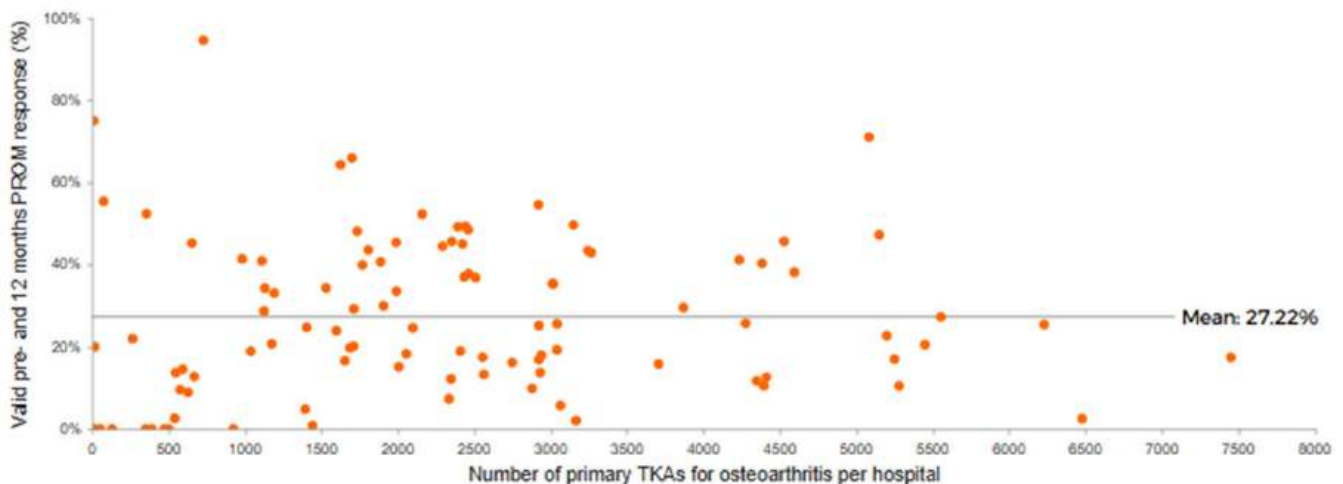
FIGURE Scatterplot of pre-operative response percentage of patients who underwent a primary TKA for osteoarthritis per hospital in the Netherlands in 2024

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

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The mean pre-operative response rate is 51.9% in the Netherlands in 2024.
Of the 90 hospitals, 41 (46%) scored above the 60% response rate.

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 2014-2023

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

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

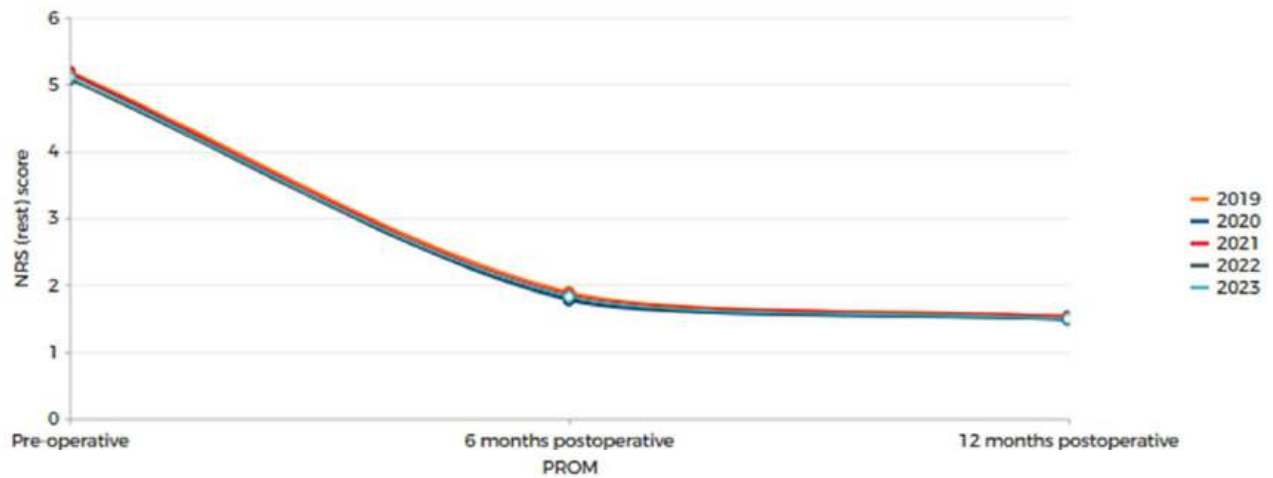
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The mean PROM trajectory response rate was 27.2% in the Netherlands between 2014-2023.
Of the 101 hospitals, 5 (5%) scored above the 60% response rate.

Outcomes

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 in the Netherlands in 2014-2023



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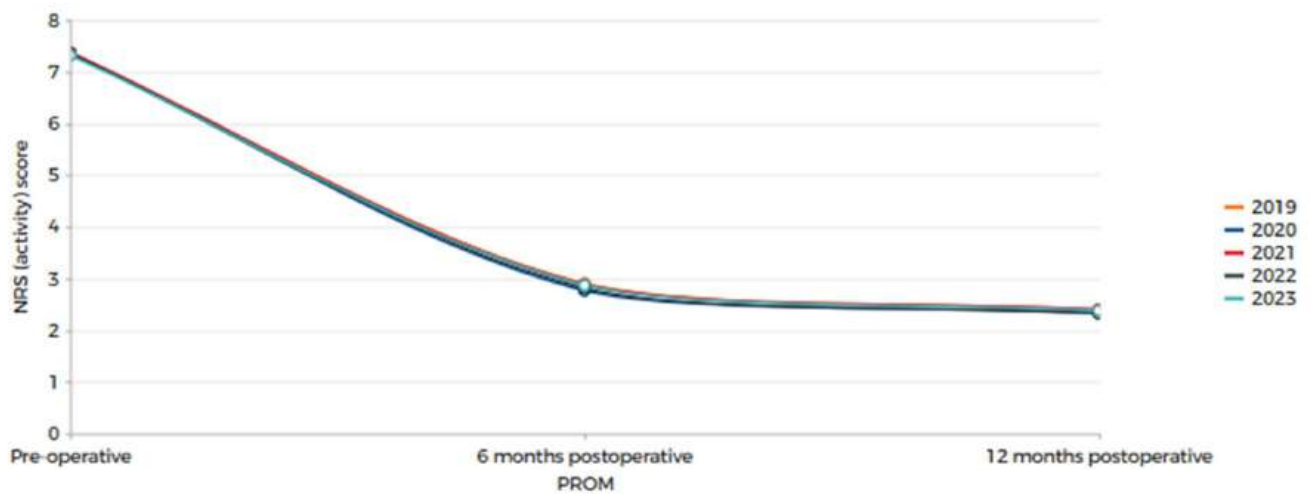
NRS (rest) score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	7,315	5.20 (5.14-5.26)	1.89 (1.84-1.95)	1.53 (1.48-1.58)
2020	5,465	5.16 (5.10-5.23)	1.77 (1.71-1.83)	1.48 (1.43-1.54)
2021	6,182	5.16 (5.10-5.23)	1.86 (1.80-1.91)	1.53 (1.47-1.58)
2022	7,220	5.07 (5.01-5.13)	1.80 (1.75-1.85)	1.48 (1.43-1.53)
2023	7,383	5.11 (5.05-5.17)	1.83 (1.78-1.88)	1.50 (1.45-1.55)
Total	33,565	5.14 (5.11-5.17)	1.83 (1.81-1.86)	1.50 (1.48-1.53)

TKA: total knee arthroplasty; CI: confidence interval.

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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 in the Netherlands in 2014-2023

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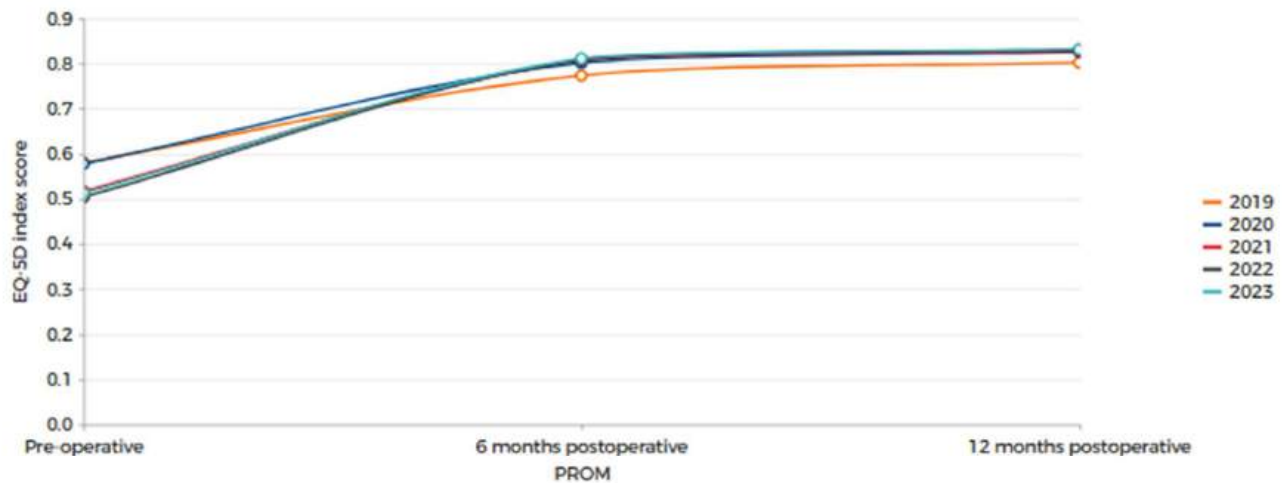
NRS (activity) score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	7,315	7.36 (7.31-7.40)	2.90 (2.84-2.96)	2.40 (2.34-2.45)
2020	5,465	7.36 (7.31-7.41)	2.77 (2.70-2.83)	2.34 (2.27-2.40)
2021	6,182	7.37 (7.32-7.42)	2.89 (2.82-2.95)	2.40 (2.34-2.47)
2022	7,220	7.35 (7.31-7.39)	2.81 (2.76-2.87)	2.32 (2.27-2.38)
2023	7,383	7.32 (7.27-7.36)	2.87 (2.82-2.93)	2.38 (2.33-2.44)
Total	33,565	7.35 (7.33-7.37)	2.85 (2.83-2.88)	2.37 (2.34-2.40)

TKA: total knee arthroplasty; CI: confidence interval.

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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.

EQ-5D 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 in the Netherlands in 2014-2023

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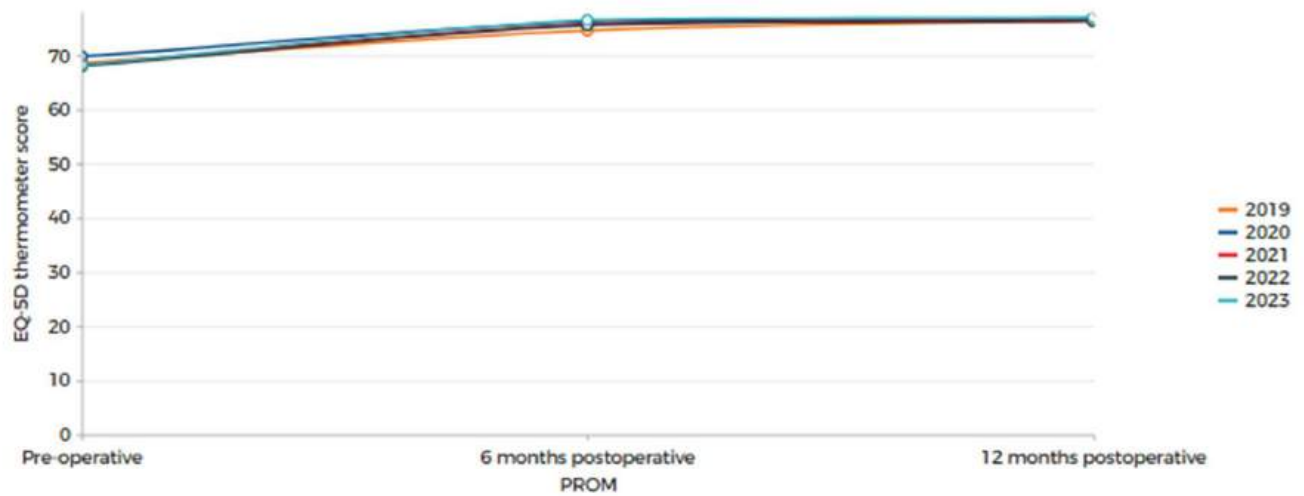
EQ-5D Index score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	7,315	0.58 (0.58-0.58)	0.77 (0.77-0.78)	0.80 (0.80-0.81)
2020	5,465	0.58 (0.57-0.58)	0.80 (0.80-0.81)	0.83 (0.82-0.83)
2021	6,182	0.52 (0.51-0.52)	0.81 (0.80-0.81)	0.83 (0.82-0.83)
2022	7,220	0.50 (0.50-0.51)	0.81 (0.80-0.81)	0.83 (0.83-0.84)
2023	7,383	0.51 (0.51-0.52)	0.81 (0.81-0.82)	0.83 (0.83-0.84)
Total	33,565	0.54 (0.53-0.54)	0.80 (0.80-0.80)	0.82 (0.82-0.83)

TKA: total knee arthroplasty; CI: confidence interval.

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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

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2023

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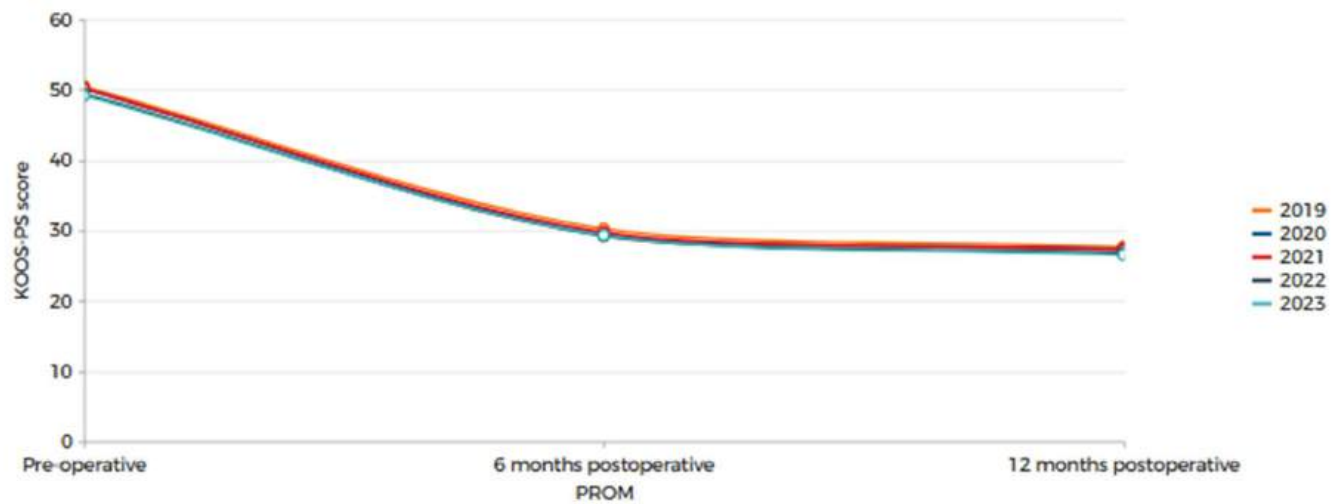
EQ-5D thermometer score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	7,315	68.66 (68.20-69.12)	74.68 (74.21-75.15)	76.51 (76.08-76.95)
2020	5,465	69.85 (69.33-70.36)	76.29 (75.80-76.78)	76.77 (76.28-77.26)
2021	6,182	68.33 (67.85-68.82)	75.84 (75.38-76.30)	76.50 (76.02-76.97)
2022	7,220	68.08 (67.64-68.53)	75.65 (75.21-76.08)	76.48 (76.06-76.90)
2023	7,383	68.32 (67.87-68.77)	76.58 (76.19-76.97)	77.09 (76.70-77.48)
Total	33,565	68.59 (68.38-68.80)	75.78 (75.58-75.98)	76.67 (76.47-76.87)

TKA: total knee arthroplasty; CI: confidence interval.

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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 in the Netherlands in 2014-2023

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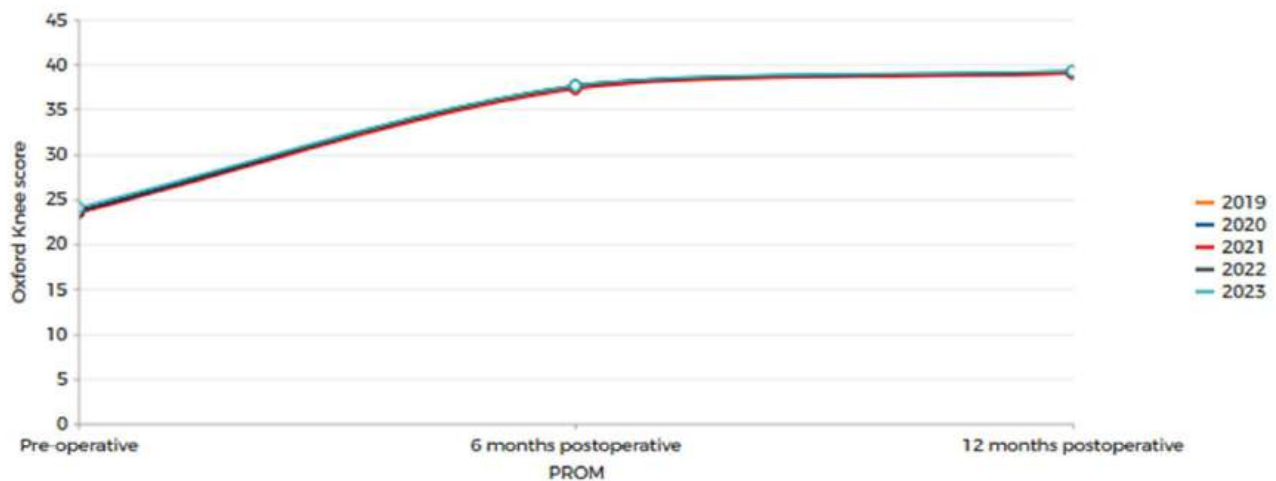
KOOS-PS score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	7,315	50.48 (50.14-50.82)	30.24 (29.91-30.56)	27.68 (27.33-28.03)
2020	5,465	50.14 (49.74-50.53)	29.47 (29.10-29.84)	27.34 (26.94-27.73)
2021	6,182	50.18 (49.81-50.55)	29.72 (29.36-30.08)	27.24 (26.86-27.62)
2022	7,220	49.43 (49.09-49.77)	29.22 (28.89-29.54)	26.76 (26.41-27.11)
2023	7,383	49.18 (48.84-49.52)	29.32 (29.00-29.64)	26.54 (26.19-26.89)
Total	33,565	49.87 (49.71-50.03)	29.60 (29.45-29.75)	27.10 (26.94-27.26)

TKA: total knee arthroplasty; CI: confidence interval.

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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 in the Netherlands in 2014-2023

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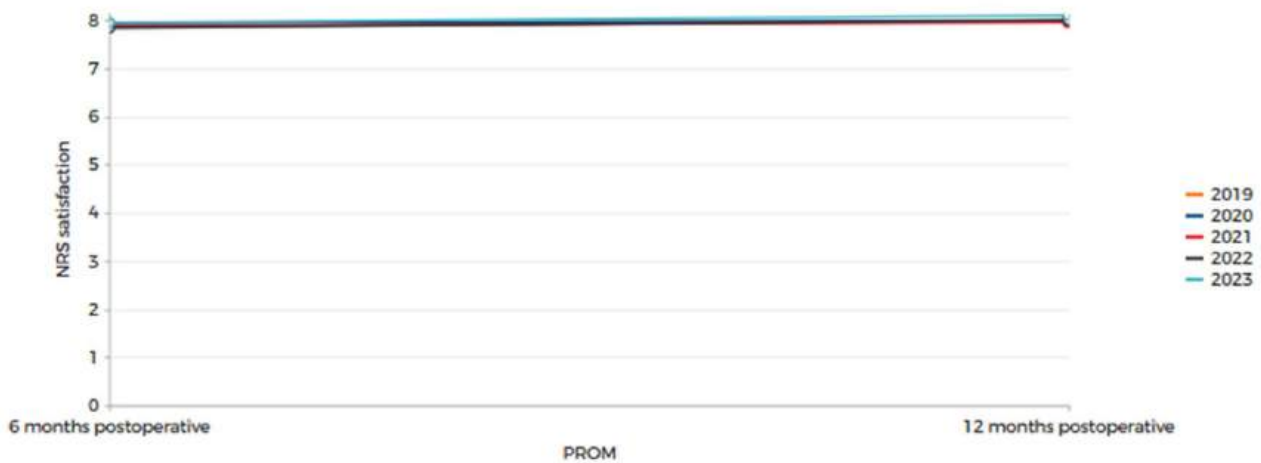
Oxford Knee score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	7,315	23.63 (23.45-23.80)	37.41 (37.23-37.60)	39.06 (38.87-39.24)
2020	5,465	23.84 (23.63-24.05)	37.67 (37.46-37.88)	39.08 (38.86-39.29)
2021	6,182	23.49 (23.30-23.68)	37.28 (37.08-37.48)	39.02 (38.82-39.22)
2022	7,220	23.65 (23.48-23.83)	37.60 (37.41-37.78)	39.25 (39.07-39.43)
2023	7,383	24.08 (23.91-24.26)	37.67 (37.49-37.85)	39.28 (39.09-39.46)
Total	33,565	23.74 (23.66-23.82)	37.53 (37.44-37.61)	39.14 (39.06-39.23)

TKA: total knee arthroplasty; CI: confidence interval.

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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 in the Netherlands in 2014-2023

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NRS satisfaction		6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)
2019	7,315	7.85 (7.80-7.90)	7.99 (7.94-8.04)
2020	5,465	7.94 (7.88-7.99)	8.00 (7.94-8.05)
2021	6,182	7.88 (7.83-7.93)	7.95 (7.90-8.00)
2022	7,220	7.84 (7.79-7.89)	8.00 (7.95-8.05)
2023	7,383	7.94 (7.90-7.99)	8.10 (8.06-8.15)
Total	33,565	7.89 (7.87-7.91)	8.01 (7.99-8.03)

TKA: total knee arthroplasty; CI: confidence interval.

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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.

Unicondylar knee arthroplasty

In this section you will find all the information on unicondylar knee arthroplasty

Patient characteristics

By diagnosis

TABLE Patient characteristics of all patients with a registered primary unicondylar knee arthroplasty by type of diagnosis in the Netherlands in 2024

	Osteoarthritis	Other	Total
N(%)	8,638 (98.4)	133 (1.6)	8,808
Mean age (years) (SD)	66.3 (8.6)	65.6 (10.8)	66.3 (8.6)
Age (years) (%)			
<50	2	7	2
50-59	21	20	21
60-69	39	37	39
70-79	32	26	32
>80	6	10	6
Gender (%)			
Men	47	53	47
Women	53	47	53
ASA score (%)			
ASA I	12	17	13
ASA II	66	65	66
ASA III-IV	22	18	22
Type of hospital (%)			
General	70	65	70
UMC	0	0	0
Private	30	35	30
Charnley-score (%)			
A One knee joint affected	43	52	43
B1 Both knee joints affected	35	18	35
B2 Contralateral knee with a TKA	20	5	19
C Multiple joints affected or chronic disease that affects quality of life	2	1	2
Mean BMI (kg/m ²) (SD)	29 (4.4)	28 (4.5)	29 (4.4)
Body Mass Index (kg/m ²) (%)			
Underweight (<=18.5)	0	1	0
Normal weight (>18.5-25)	19	28	19
Overweight (>25-30)	43	41	44
Obesity (>30-40)	35	28	36
Morbid obesity (>40)	1	1	1
Smoking (%)			
No	91	86	92
Yes	8	13	8

Please note: The diagnosis category 'Other' (133 cases; 2%) includes osteonecrosis (93), other (20), post-traumatic (16) and rheumatoid arthritis (4). In addition, there were 37 primary unicondylar knee arthroplasties for which no diagnosis was registered.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation

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By unicondylar side

TABLE Patient characteristics of all patients with a registered primary unicondylar knee arthroplasty by unicondylar side in the Netherlands in 2024

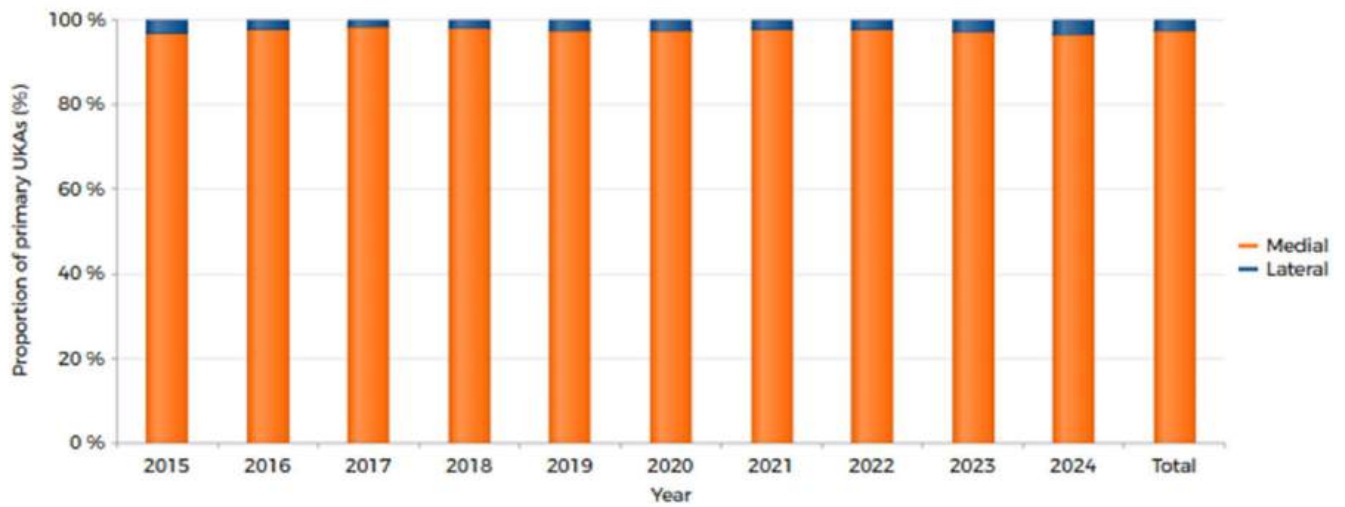
	Medial	Lateral	Total
N(%)	8,084 (96.6)	281 (3.4)	8,808
Mean age (years) (SD)	66.3 (8.6)	65.9 (10.5)	66.3 (8.6)
Age (years) (%)			
<50	2	6	2
50-59	21	24	21
60-69	40	33	39
70-79	32	28	32
>80	6	9	6
Gender (%)			
Men	48	29	47
Women	52	71	53
ASA score (%)			
ASA I	12	17	13
ASA II	66	65	66
ASA III-IV	21	18	22
Diagnosis (%)			
Osteoarthritis	98	98	98
Other	2	2	2
Type of hospital (%)			
General	69	57	70
UMC	0	0	0
Private	30	43	30
Charnley-score (%)			
A One knee joint affected	41	68	43
B1 Both knee joints affected	36	22	35
B2 Contralateral knee with a TKA	20	8	19
C Multiple joints affected or chronic disease that affects quality of life	2	2	2
Mean BMI (kg/m²) (SD)	29 (4.4)	27.9 (4.3)	29 (4.4)
Body Mass Index (kg/m²) (%)			
Underweight (<18.5)	0	0	0
Normal weight (>18.5-25)	19	26	19
Overweight (>25-30)	44	45	44
Obesity (>30-40)	36	28	36
Morbid obesity (>40)	1	1	1
Smoking (%)			
No	93	92	92
Yes	7	8	8

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation

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Procedure characteristics

Unicondylar side

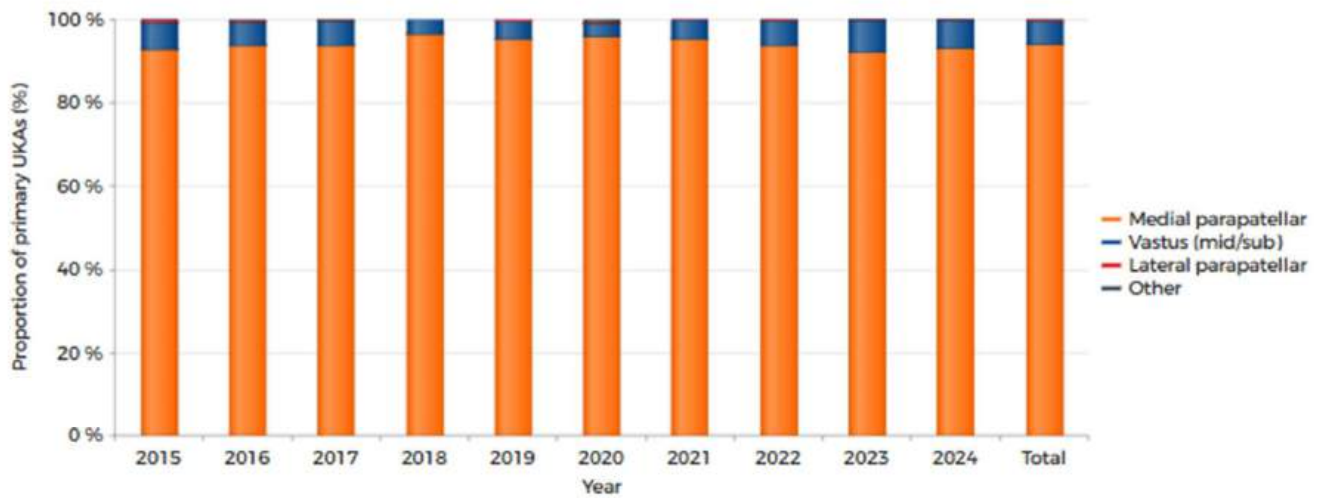
FIGURE Trend (proportion [%] per year) in medial and lateral unicondylar knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Medial	96.99	97.94	98.58	98.04	97.62	97.57	97.89	97.86	97.29	96.64	97.54
Lateral	3.01	2.06	1.42	1.96	2.38	2.43	2.11	2.14	2.71	3.36	2.46
Total (n)	2,589	2,817	3,229	3,563	4,446	4,494	5,397	6,686	7,558	8,365	49,144

UKA: unicondylar knee arthroplasty

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Medial UKA approach

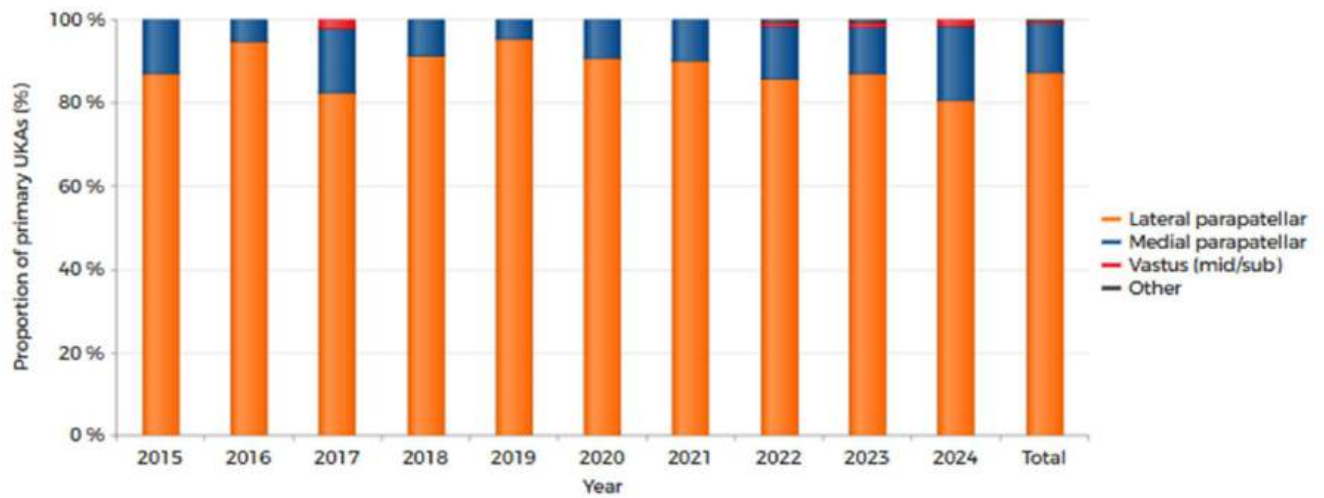
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary medial unicondylar knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Medial parapatellar	92.91	93.82	93.78	96.65	95.55	96.14	95.45	93.90	92.40	93.20	94.22
Vastus (mid/sub)	6.57	5.70	5.91	3.35	4.27	3.06	4.43	5.93	7.48	6.68	5.54
Lateral parapatellar	0.40	0.22	0.13	0	0.18	0.07	0.11	0.11	0.10	0.10	0.12
Other	0.12	0.25	0.19	0	0	0.73	0	0.06	0.03	0.03	0.12
Total (n)	2,497	2,752	3,183	3,491	4,333	4,376	5,256	6,522	7,330	7,894	47,634

UKA: unicondylar knee arthroplasty

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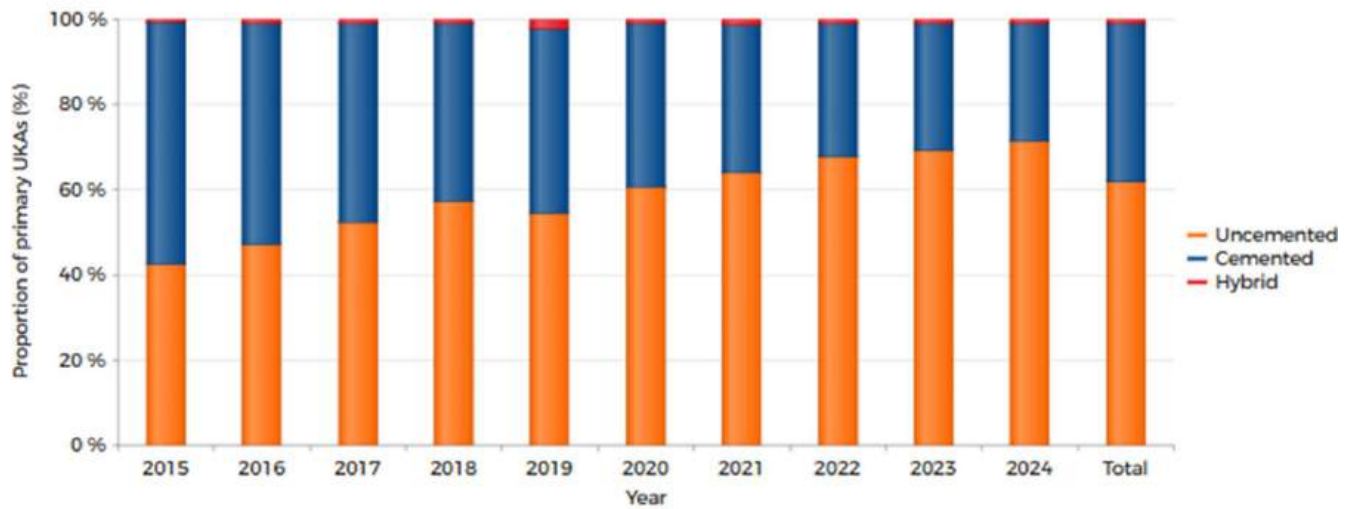
Lateral UKA approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary lateral unicondylar knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Lateral parapatellar	87.01	94.83	82.61	91.43	95.28	90.83	90.27	86.01	87.25	80.68	87.39
Medial parapatellar	12.99	5.17	15.22	8.57	4.72	9.17	9.73	12.59	10.78	17.80	11.68
Vastus (mid/sub)	0	0	2.17	0	0	0	0	0.70	1.47	1.52	0.76
Other	0	0	0	0	0	0	0	0.70	0.49	0	0.17
Total (n)	77	58	46	70	106	109	113	143	204	264	1,190

UKA: unicondylar knee arthroplasty

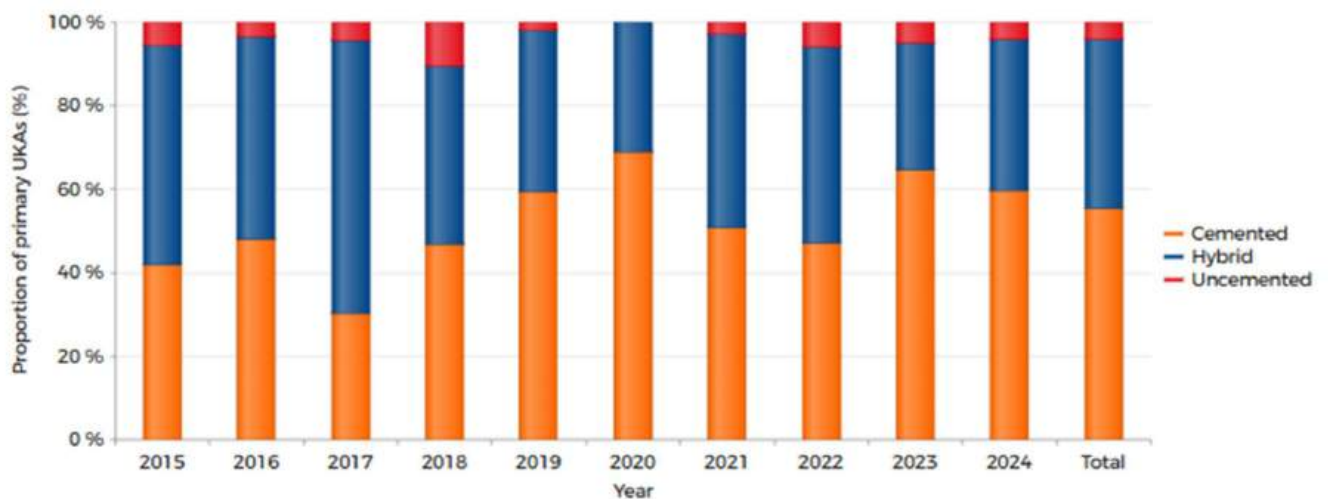
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*Medial UKA fixation***FIGURE** Trend (proportion [%] per year) in type of fixation in primary medial unicondylar knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Uncemented	42.49	47.28	52.34	57.45	54.68	60.80	64.03	67.85	69.25	71.42	62.11
Cemented	56.99	51.71	46.81	41.55	43.31	38.26	34.89	31.35	29.84	27.73	36.89
Hybrid	0.52	1.02	0.85	1.00	2.01	0.94	1.08	0.80	0.91	0.85	0.99
Total (n)	2,502	2,756	3,181	3,490	4,325	4,378	5,277	6,535	7,343	8,071	47,858

UKA: unicondylar knee arthroplasty

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*Lateral UKA fixation***FIGURE** Trend (proportion [%] per year) in type of fixation in primary lateral unicondylar knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cemented	41.89	48.28	30.43	47.06	59.41	68.87	50.91	47.14	64.85	59.86	55.57
Hybrid	52.70	48.28	65.22	42.65	38.61	31.13	46.36	47.14	30.20	36.20	40.29
Uncemented	5.41	3.45	4.35	10.29	1.98	0	2.73	5.71	4.95	3.94	4.14
Total (n)	74	58	46	68	101	106	110	140	202	279	1,184

UKA: unicondylar knee arthroplasty

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*Most frequently registered - Unicondylar knee prostheses***TABLE** The most frequently registered primary unicondylar knee arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Unicondylar knee arthroplasties (n)	4,072	5,467	6,859	7,719	8,593
Femur name; Proportion (%)					
Oxford PKR Uncemented	58.87	65.76	68.60	70.63	72.18
Physica ZUK	17.41	16.57	15.18	13.07	13.77
Oxford PKR Cemented	19.94	13.99	11.72	10.97	9.30
Journey Uni	1.65	0.70	1.33	1.85	1.87
Restoris MCK	0.12	1.54	2.01	1.23	1.59

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*Most frequently registered - Bone cement***TABLE** The most frequently registered bone cement used during primary unicondylar knee arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	629	935	1,113	998	1,245
Cement name; Proportion (%)					
Palacos R+G	50.87	63.42	59.12	70.84	57.19
Refobacin Bone Cement R	43.40	34.97	38.81	26.85	41.85
Refobacin Plus Bone Cement	5.72	1.60	2.07	2.30	0.96
Year	2020	2021	2022	2023	2024
Separately packed bone cement (n)	1,066	965	1,011	1,162	1,055
Cement name; Proportion (%)					
Palacos R+G	70.17	78.86	79.33	74.61	75.73
Biomet Bone Cement R	5.44	7.36	10.78	8.61	13.08
Palacos MV+G	8.63	7.77	6.63	7.40	8.91
Refobacin Bone Cement R	10.79	2.69	0.30	6.54	0.57
Subiton G	2.91	2.49	2.47	2.67	1.61

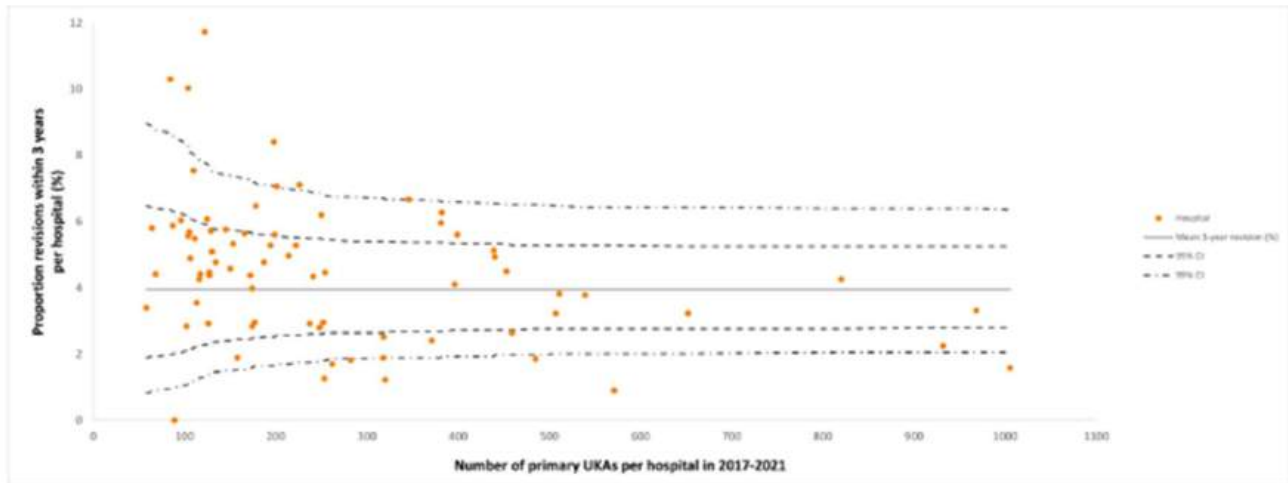
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Survival

Short term revision

Overall revision per hospital

Funnel plot of proportion of knee revision arthroplasties within three years after a medial unicondylar knee arthroplasty per hospital in the Netherlands in 2017-2021 (n=20,601)



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).

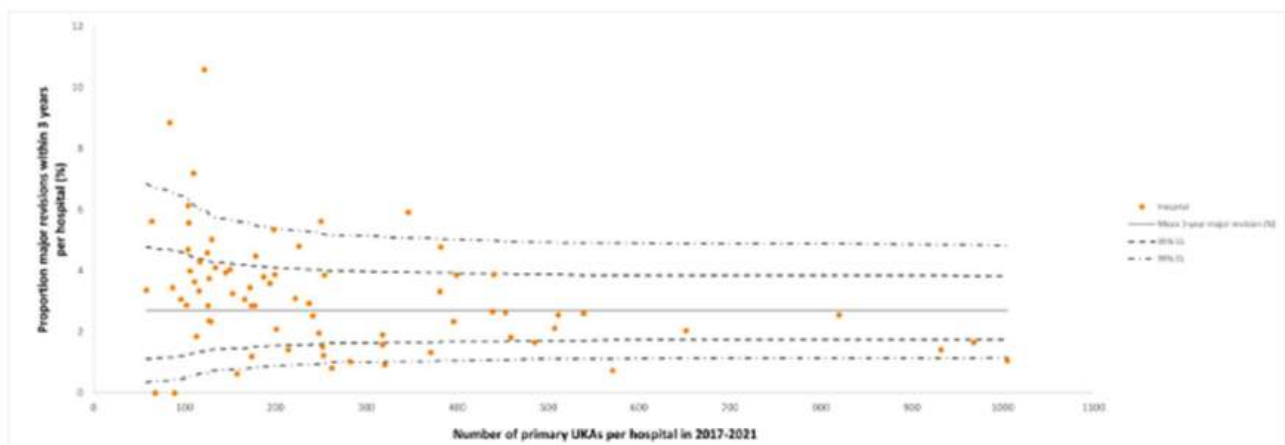
UKA: unicondylar knee arthroplasty; CL: control limits.

The mean 3-years revision percentage is 3.95 in the Netherlands in 2017-2021.

Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Major revision per hospital

Funnel plot of proportion of knee major revision arthroplasties within three years after a medial unicondylar knee arthroplasty per hospital in the Netherlands in 2017-2021 (n=20,601)



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 2.71 in the Netherlands in 2017-2021.

Control limits indicate the plausible range of outcome if all hospitals perform equally well.

By type of revision 3 years

TABLE Cumulative 3-year revision percentage of primary unicondylar knee arthroplasties by type of revision in the Netherlands in 2017-2021 (n=22,894)

	Cumulative 3-year revision percentage Kaplan Meier (95% CI)
Any type of revision	3.94 (3.69-4.19)
Major revision	2.44 (2.24-2.64)
Only tibia	0.09 (0.05-0.13)
Only femur	0.02 (0.00-0.03)
Femur and tibia	2.33 (2.13-2.52)
Minor revision	1.46 (1.30-1.62)
DAIR	0.30 (0.23-0.37)
No DAIR	1.15 (1.02-1.29)
Patella addition	0.00 (0.00-0.01)

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).

UKA: unicondylar knee arthroplasty; CI: confidence interval

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In 2017-2021, 421 (1.8%) primary UKAs 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 unicondylar knee arthroplasties by type of first major or minor revision in the Netherlands in 2017-2021 (n=22,894)

	Cumulative 3-year first revision percentage Kaplan Meier (95% CI)
First major revision	2.71 (2.50-2.92)
Tibia	2.69 (2.47-2.90)
Femur	2.63 (2.42-2.84)
First minor revision	1.46 (1.30-1.62)
Inlay	1.46 (1.30-1.61)
Patella addition	0.02 (0.00-0.03)

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

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

UKA: unicondylar knee arthroplasty; CI: confidence interval

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In 2017-2021, 421 (1.8%) primary UKAs were implanted in patients who died within three years after the primary procedure.

Conversion to total knee arthroplasty

TABLE Conversions from primary unicondylar knee arthroplasty to total knee arthroplasty within 3 years in the period 2017-2021

Number of revision procedures	913
Number of conversions	481
Percentage conversions	52.7 %

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Reasons for revision by type of revision

TABLE Reasons for revision within three years of primary unicondylar knee arthroplasties by type of revision in the Netherlands in 2017-2021

Reasons for revision	Major revision (n=631)	Minor revision (n=335)	Any type of revision (n=913)
	Proportion (%)	Proportion (%)	Proportion (%)
Instability	20.44	27.76	21.47
Progression of osteoarthritis	28.05	0.30	18.29
Loosening of tibia component	21.55	0.60	15.01
Patellar pain	16.16	1.79	11.39
Infection	6.02	20.60	11.06
Malalignment	15.21	1.49	11.06
Peri-prosthetic fracture	9.03	2.69	7.01
Insert wear	1.11	5.07	2.63
Revision after knee removal	3.33	0.60	2.30
Loosening of femur component	2.85	0.00	1.86
Arthrofibrosis	2.22	0.60	1.75
Patellar dislocation	0.79	0.60	0.66
Loosening of patella component	0.16	0.00	0.11
Other	13.00	37.61	22.12

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

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Time after primary UKA

TABLE Time after primary unicondylar knee arthroplasty until short-term revision in the Netherlands in 2017-2021 (n=22,894)

Time after primary UKA	Percentage revisions (%)
Day 0-29	0.24
Day 30-182	0.89
Day 183-364	0.64
Day 365-730 (second year)	1.32
Day 731-1095 (third year)	0.90

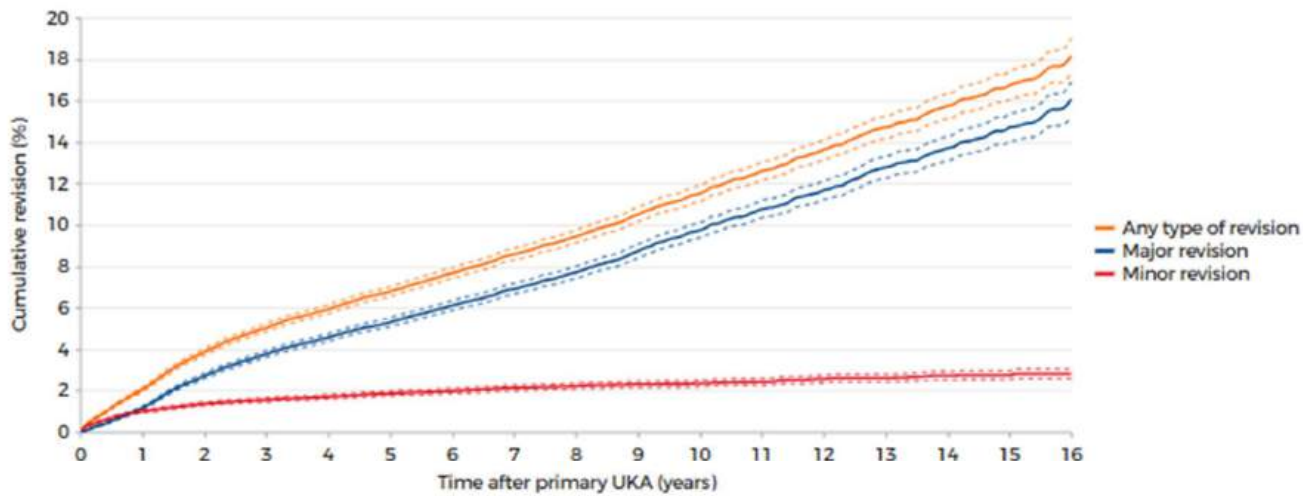
UKA: unicondylar knee arthroplasty

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Long term revision

By type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of unicondylar knee arthroplasties by type of revision in the Netherlands in 2007-2024 (n=64,773)



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	1yr	3yr	5yr	7yr	10yr	16yr
Any type of revision	1.87 (1.76-1.98)	4.94 (4.75-5.12)	6.70 (6.47-6.93)	8.52 (8.24-8.80)	11.43 (11.05-11.82)	17.77 (16.97-18.57)
Major revision	1.02 (0.94-1.10)	3.67 (3.51-3.83)	5.23 (5.03-5.44)	6.85 (6.59-7.11)	9.66 (9.30-10.03)	15.68 (14.90-16.46)
Minor revision	0.94 (0.86-1.01)	1.53 (1.43-1.63)	1.84 (1.73-1.96)	2.12 (1.99-2.25)	2.34 (2.19-2.49)	2.81 (2.58-3.04)

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. Therefore, the first three revision procedures were reviewed.

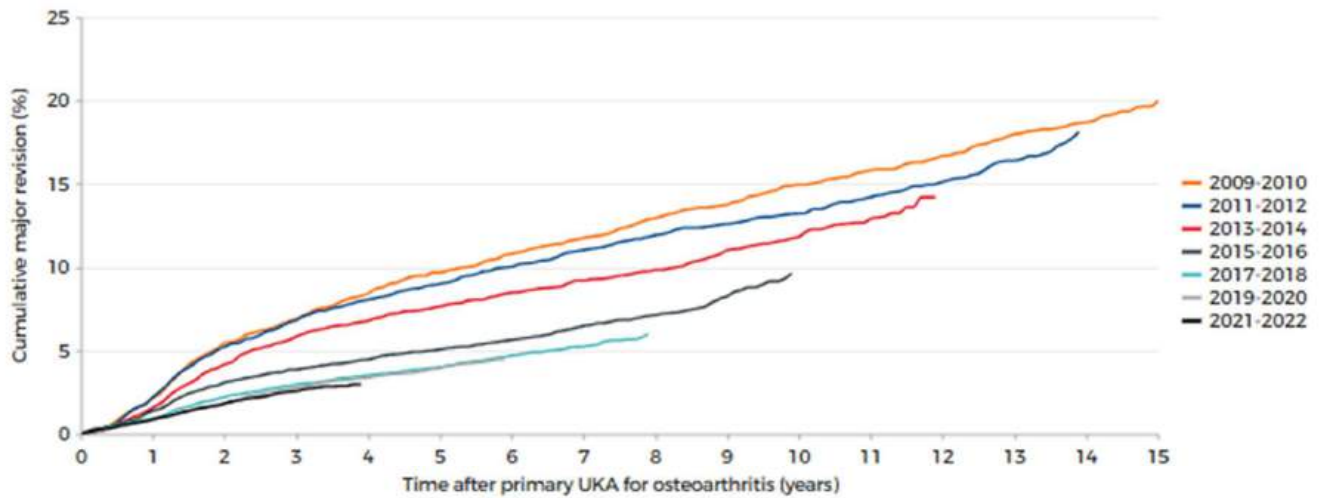
Minor revision: only insert and/or patella exchange (including patella addition).

UKA: unicondylar knee arthroplasty; CI: confidence interval.

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In 2007-2024, 3,341 (5.2%) primary UKAs were implanted in patients who died within sixteen years after the primary diagnosis

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 2009-2024

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	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
2009-2010	3,153	1.81 (1.35-2.28)	6.77 (5.89-7.65)	9.68 (8.64-10.72)	11.66 (10.53-12.79)	14.90 (13.63-16.16)	19.65 (18.21-21.10)
2011-2012	3,075	1.79 (1.32-2.26)	6.71 (5.82-7.59)	8.93 (7.92-9.94)	10.96 (9.85-12.08)	13.20 (11.98-14.41)	n.a.
2013-2014	4,039	1.34 (0.99-1.70)	5.63 (4.92-6.35)	7.55 (6.73-8.37)	9.20 (8.30-10.10)	11.74 (10.73-12.75)	n.a.
2015-2016	5,517	1.22 (0.93-1.51)	3.85 (3.34-4.36)	5.00 (4.43-5.58)	6.38 (5.72-7.03)	9.62 (8.51-10.72)	n.a.
2017-2018	7,588	0.86 (0.65-1.07)	2.88 (2.50-3.26)	3.96 (3.52-4.41)	5.22 (4.70-5.74)	n.a.	n.a.
2019-2020	9,385	0.78 (0.60-0.96)	2.70 (2.37-3.02)	3.89 (3.48-4.29)	n.a.	n.a.	n.a.
2021-2022	12,405	0.76 (0.61-0.91)	2.54 (2.25-2.83)	n.a.	n.a.	n.a.	n.a.

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

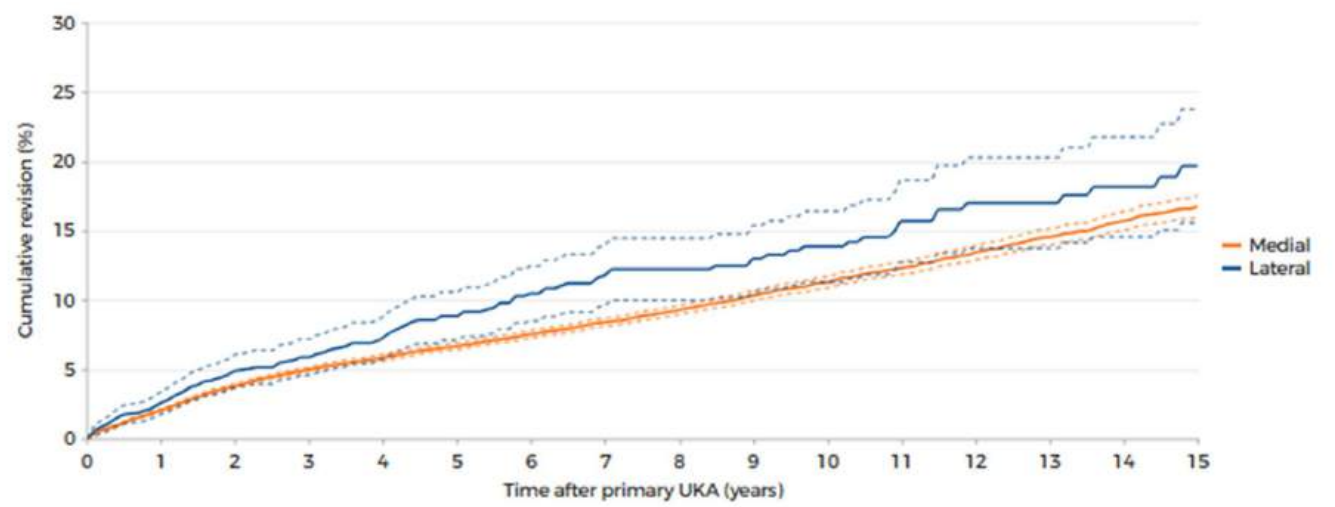
Major revision percentage: first revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

UKA: unicondylar knee arthroplasty

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By unicondylar side

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of unicondylar knee arthroplasties by unicondylar side of primary UKA in the Netherlands in 2007-2024 (n=60,273)



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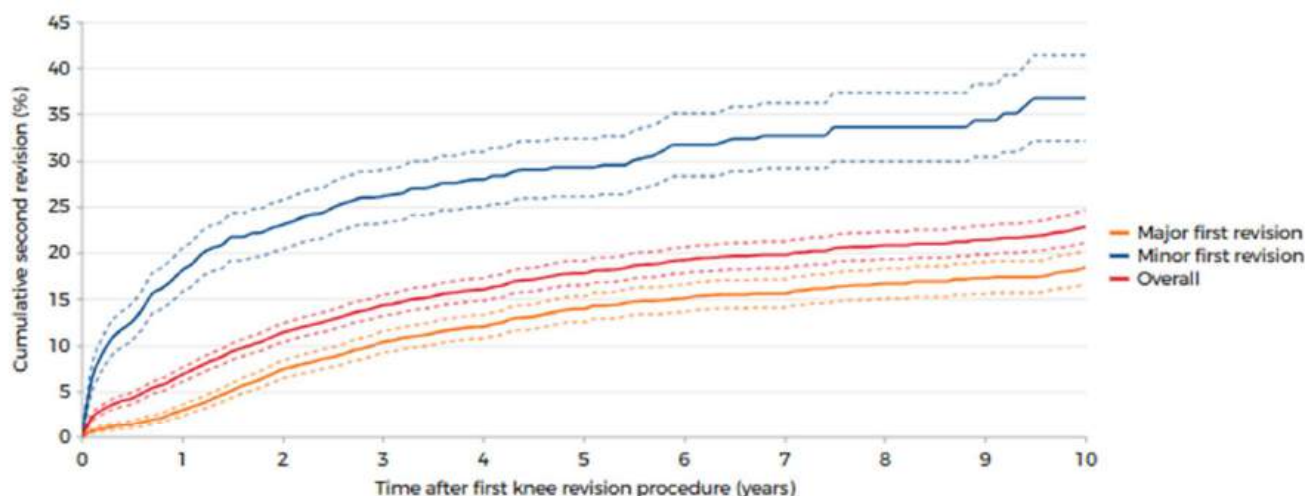
	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
Medial	58,710	1.86 (1.74-1.97)	4.87 (4.68-5.07)	6.61 (6.37-6.84)	8.34 (8.05-8.63)	11.21 (10.81-11.61)	16.59 (15.85-17.34)
Lateral	1,563	2.26 (1.50-3.02)	5.88 (4.56-7.19)	8.85 (7.12-10.59)	11.61 (9.46-13.76)	13.86 (11.30-16.41)	19.67 (15.57-23.76)

UKA: unicondylar knee arthroplasty; CI: confidence interval.

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Rerevision

By type of first revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of unicondylar knee arthroplasties after a one-stage first revision by type of first revision in the Netherlands in 2007-2024 (n=4,403)

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	Number (n)	1yr	3yr	5yr	7yr	10yr
Overall	4,403	6.22 (5.49-6.95)	13.97 (12.84-15.09)	17.79 (16.48-19.11)	19.77 (18.34-21.20)	22.57 (20.86-24.28)
Major first revision	3,289	2.55 (1.99-3.10)	9.95 (8.80-11.09)	13.90 (12.50-15.30)	15.58 (14.06-17.10)	18.13 (16.32-19.95)
Minor first revision	1,080	17.02 (14.73-19.32)	25.96 (23.11-28.82)	29.22 (26.09-32.35)	32.69 (29.15-36.23)	36.75 (32.10-41.40)

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.

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Survival by component

By cemented component name

TABLE Cumulative revision percentages of primary cemented unicondylar knee arthroplasties by prosthesis component combination of patients who underwent a UKA for osteoarthritis in the Netherlands in 2007-2024 (n=29,346)

Femur component	Tibia component	Primary UKAs (n)	Hospitals (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)					Unknown	Cumulative revision percentage (95% CI)					
						Total revision	Patella addition	Only femur	Only tibia	Only insert/patella		1yr	3yr	5yr	7yr	10yr	16yr
All cemented UKAs for osteoarthritis		29,346	100	64 (58-70)	2,788	2,279	7	15	41	416	27	1.62 (1.47-1.76)	5.38 (5.07-5.62)	9.44 (9.10-9.79)	9.36 (8.97-9.75)	12.48 (11.95-12.94)	18.64 (17.94-19.35)
OXFORD PWR Cemented	OXFORD PWR Cemented	14,206	74	64 (57-70)	1,874	1,509	5	11	25	303	21	1.73 (1.53-1.94)	5.71 (5.34-6.08)	7.88 (7.43-8.32)	8.81 (8.31-9.31)	12.96 (12.50-13.59)	19.80 (18.79-21.01)
Physica ZUN	Physica ZUN	6,828	35	64 (58-70)	254	192	0	0	1	41	0	0.79 (0.57-1.00)	3.03 (2.30-3.90)	3.85 (3.27-4.42)	5.13 (4.32-5.95)	7.89 (6.26-8.92)	11.09 (8.60-13.97)
Genesis UNI	Genesis UNI	1,244	25	62 (56-69)	237	225	1	0	2	6	3	2.82 (1.90-3.74)	9.05 (7.43-10.63)	12.39 (10.74-14.05)	14.85 (12.95-16.95)	17.45 (15.50-19.60)	21.72 (19.06-24.38)
balandys UNI	balandys UNI	844	12	62 (57-70)	82	62	1	0	7	11	1	2.73 (1.60-3.86)	8.20 (6.11-10.30)	9.32 (7.04-11.61)	10.78 (8.20-13.36)	14.26 (11.00-17.52)	n.a.
Journey UNI	Journey UNI	827	9	63 (57-70)	43	38	0	2	1	1	1	1.18 (0.47-1.94)	4.64 (2.95-6.35)	6.92 (4.69-9.14)	8.49 (5.80-11.18)	n.a.	n.a.
Restoris MCK	Restoris MCK	427	3	69 (42-75)	4	2	0	0	0	2	0	1.02 (0.02-2.03)	1.02 (0.02-2.03)	n.a.	n.a.	n.a.	n.a.
TIBATHLON	TIBATHLON	194	3	60 (54-65)	26	27	0	0	0	1	0	1.53 (0.00-3.25)	7.15 (3.34-10.76)	8.22 (5.16-13.28)	10.73 (6.22-15.23)	14.18 (8.39-19.98)	n.a.
HLS uni	HLS uni	169	3	58 (53-63)	39	38	0	0	0	1	0	2.42 (0.06-4.77)	9.11 (4.72-13.51)	16.44 (10.77-22.11)	19.82 (13.45-25.99)	20.79 (14.96-27.01)	n.a.
Attagetto	Attagetto	104	4	57 (51-63)	24	20	0	0	4	0	0	6.60 (1.88-11.33)	12.26 (6.02-18.51)	17.98 (10.63-25.30)	20.05 (12.37-27.74)	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary UKAs in 2024.

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

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Only combinations with over 100 procedures and reported by at least 3 hospitals 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.

By uncemented component

TABLE Cumulative revision percentages of primary uncemented unicondylar knee arthroplasties by prosthesis component combination of patients who underwent a UKA for osteoarthritis in the Netherlands in 2007-2024 (n=32,571)

Femur component	Tibia component	Primary UKAs (n)	Hospitals (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)					Unknown	Cumulative revision percentage (95% CI)					
						Total revision	Patella addition	Only femur	Only tibia	Only insert/patella		1yr	3yr	5yr	7yr	10yr	16yr
All uncemented UKAs for osteoarthritis		32,571	82	65 (59-72)	1,539	861	2	8	35	615	9	2.05 (1.89-2.21)	4.36 (4.05-4.69)	5.96 (5.25-6.87)	7.18 (6.77-7.66)	9.71 (8.94-10.44)	15.91 (12.82-18.99)
OXFORD PKE Uncemented	OXFORD PKE Uncemented	30,164	71	65 (59-72)	1,340	730	2	6	27	567	8	2.02 (1.84-2.17)	4.20 (3.94-4.45)	5.37 (5.05-5.80)	6.62 (6.40-7.25)	9.31 (8.56-10.07)	n.a.

* Denotes prosthesis combinations with no reported use in primary UKAs in 2024.

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

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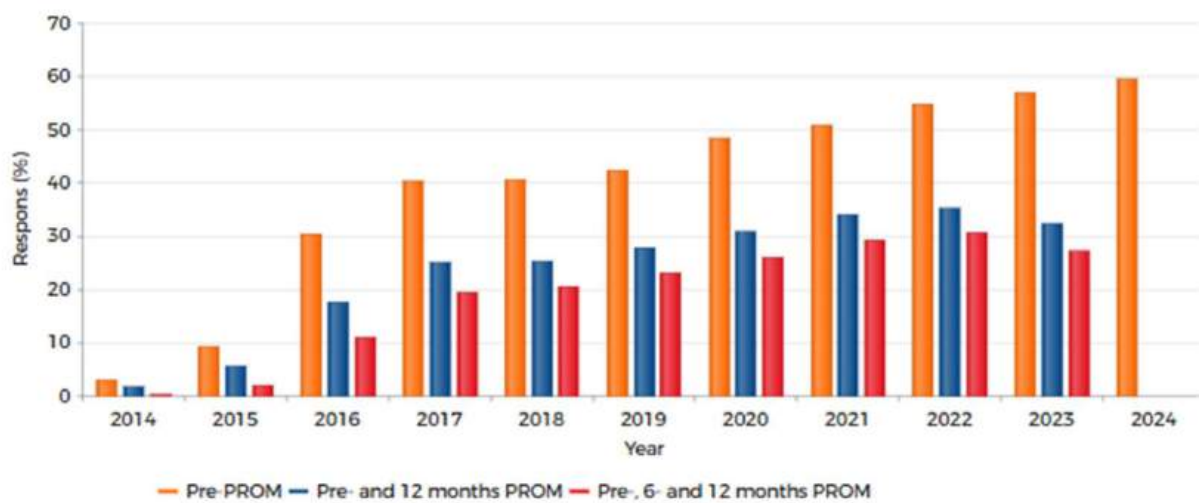
Only combinations with over 100 procedures and reported by at least 5 hospitals have been listed.

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

Per year

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a UKA for osteoarthritis in the Netherlands in 2014-2024

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	2.87	9.18	30.48	40.33	40.59	42.31	48.43	50.76	54.71	56.91	59.55
Pre- and 12 months PROM	1.77	5.55	17.62	24.95	25.21	27.78	30.78	34.04	35.31	32.43	n.a.
Pre-, 6- and 12 months PROM	0.31	1.93	10.94	19.42	20.50	23.02	26.09	29.16	30.52	27.31	n.a.
Total UKAs for osteoarthritis (n)	2,265	2,594	2,871	3,595	3,991	4,788	4,623	5,435	6,752	7,588	8,386

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

UKA: unicondylar knee arthroplasty; PROM: patient reported outcome measure.

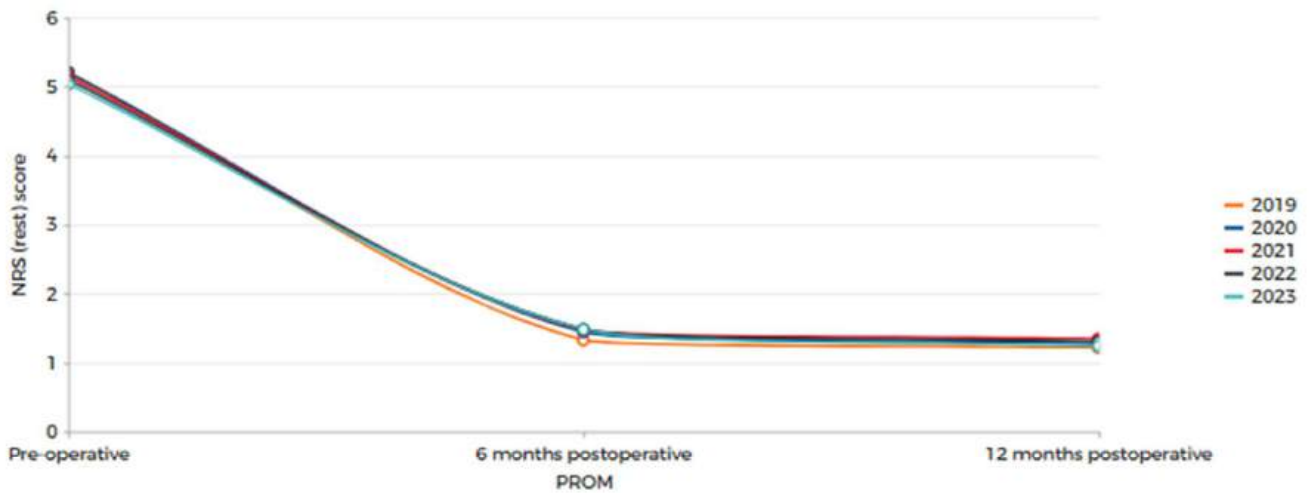
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Outcomes

NRS (rest)

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative NRS (rest) scores of patients who underwent a UKA for osteoarthritis in the Netherlands in 2014-2023



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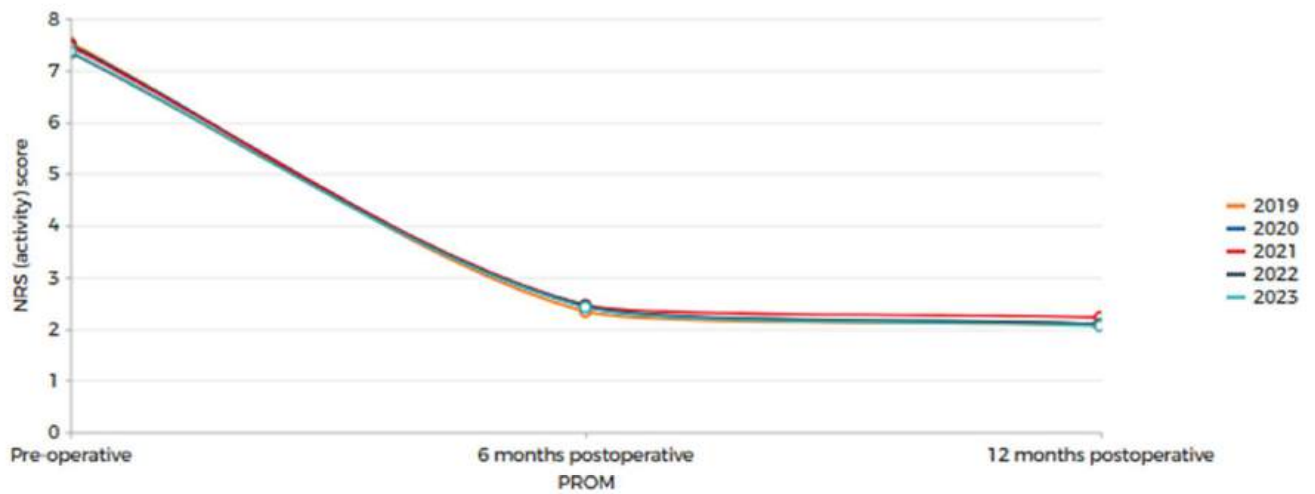
NRS (rest) score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	1,102	5.21 (5.07-5.36)	1.33 (1.21-1.44)	1.22 (1.10-1.33)
2020	1,206	5.20 (5.06-5.35)	1.45 (1.33-1.56)	1.28 (1.17-1.40)
2021	1,585	5.15 (5.03-5.27)	1.47 (1.37-1.57)	1.35 (1.25-1.45)
2022	2,061	5.10 (4.99-5.20)	1.49 (1.40-1.58)	1.31 (1.22-1.39)
2023	2,072	5.04 (4.93-5.14)	1.48 (1.39-1.57)	1.24 (1.16-1.33)
Total	8,026	5.12 (5.07-5.18)	1.45 (1.41-1.50)	1.28 (1.24-1.33)

UKA: unicompartmental knee arthroplasty; CI: confidence interval.

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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 UKA for osteoarthritis in the Netherlands in 2014-2023

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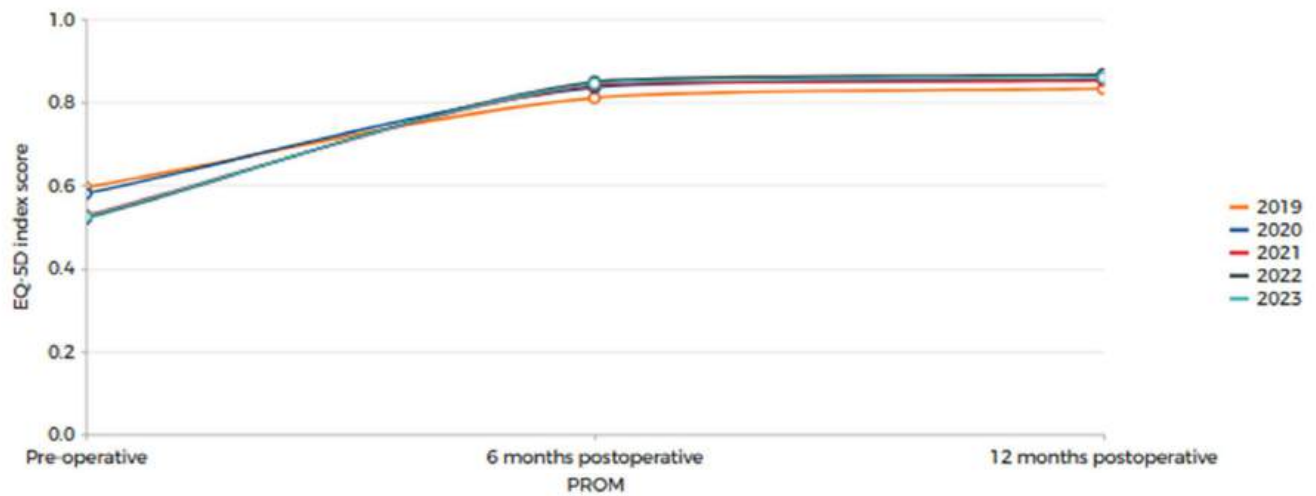
NRS (activity) score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	1,102	7.53 (7.43-7.63)	2.33 (2.19-2.47)	2.07 (1.93-2.21)
2020	1,206	7.49 (7.40-7.59)	2.42 (2.29-2.56)	2.09 (1.96-2.22)
2021	1,585	7.46 (7.38-7.54)	2.46 (2.34-2.58)	2.22 (2.10-2.34)
2022	2,061	7.34 (7.26-7.42)	2.45 (2.34-2.55)	2.09 (1.99-2.19)
2023	2,072	7.36 (7.29-7.44)	2.42 (2.31-2.52)	2.06 (1.95-2.16)
Total	8,026	7.42 (7.38-7.46)	2.42 (2.37-2.47)	2.10 (2.05-2.16)

UKA: unicondylar knee arthroplasty; CI: confidence interval.

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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.

EQ-5D Index score

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D index scores of patients who underwent a UKA for osteoarthritis in the Netherlands in 2014-2023

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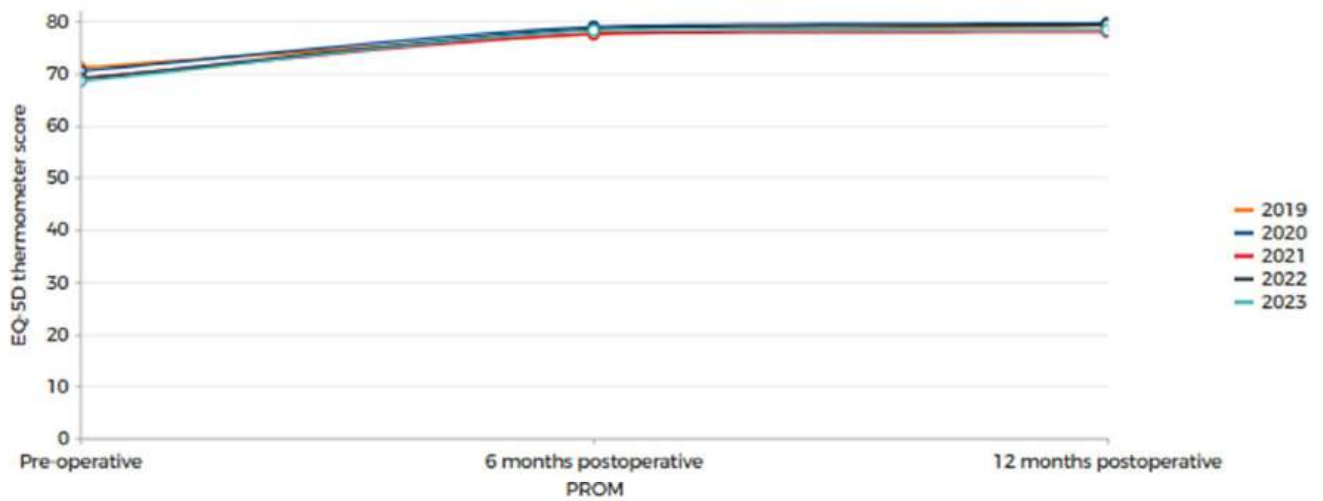
EQ-5D Index score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	1,102	0.59 (0.59-0.60)	0.81 (0.80-0.82)	0.83 (0.82-0.84)
2020	1,206	0.58 (0.57-0.59)	0.84 (0.83-0.84)	0.86 (0.85-0.86)
2021	1,585	0.53 (0.52-0.54)	0.84 (0.83-0.85)	0.85 (0.84-0.86)
2022	2,061	0.52 (0.51-0.53)	0.85 (0.84-0.86)	0.87 (0.86-0.87)
2023	2,072	0.52 (0.51-0.54)	0.85 (0.84-0.85)	0.86 (0.85-0.87)
Total	8,026	0.54 (0.54-0.55)	0.84 (0.84-0.84)	0.86 (0.85-0.86)

UKA: unicompartmental knee arthroplasty; CI: confidence interval.

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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

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a UKA for osteoarthritis in the Netherlands in 2014-2023

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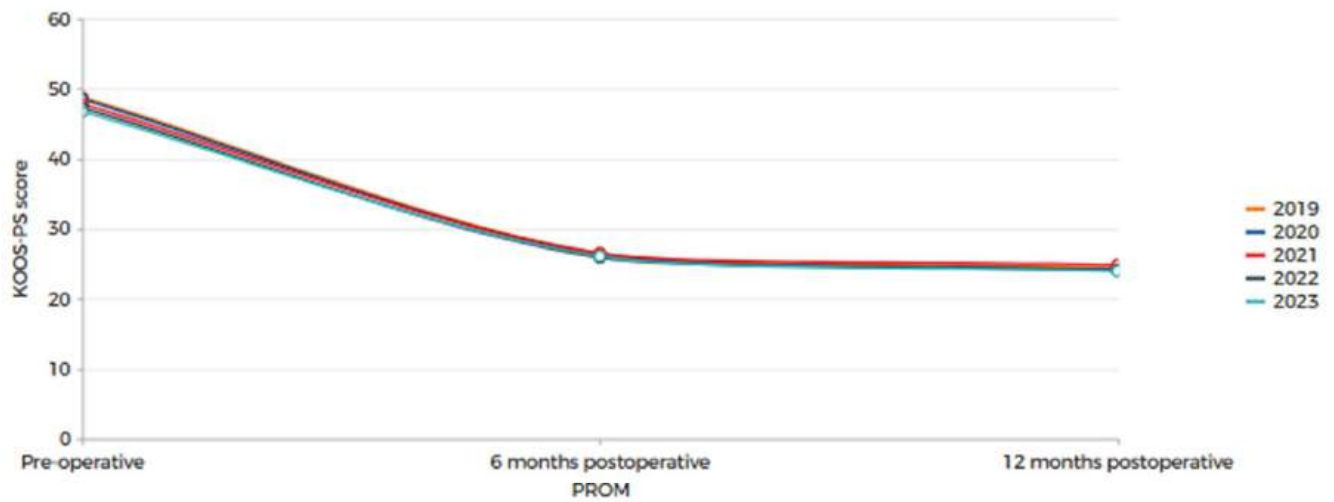
EQ-5D thermometer score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	1,102	71.09 (69.94-72.25)	77.47 (76.30-78.64)	79.14 (78.08-80.20)
2020	1,206	70.43 (69.35-71.51)	78.89 (77.93-79.85)	79.57 (78.65-80.48)
2021	1,585	69.03 (68.12-69.95)	77.58 (76.69-78.48)	77.99 (77.09-78.89)
2022	2,061	68.94 (68.09-69.79)	78.50 (77.75-79.24)	79.26 (78.55-79.97)
2023	2,072	68.45 (67.60-69.30)	78.22 (77.49-78.95)	78.30 (77.58-79.02)
Total	8,026	69.35 (68.92-69.77)	78.16 (77.77-78.55)	78.79 (78.42-79.17)

UKA: unicondylar knee arthroplasty; CI: confidence interval.

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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 UKA for osteoarthritis in the Netherlands in 2014-2023

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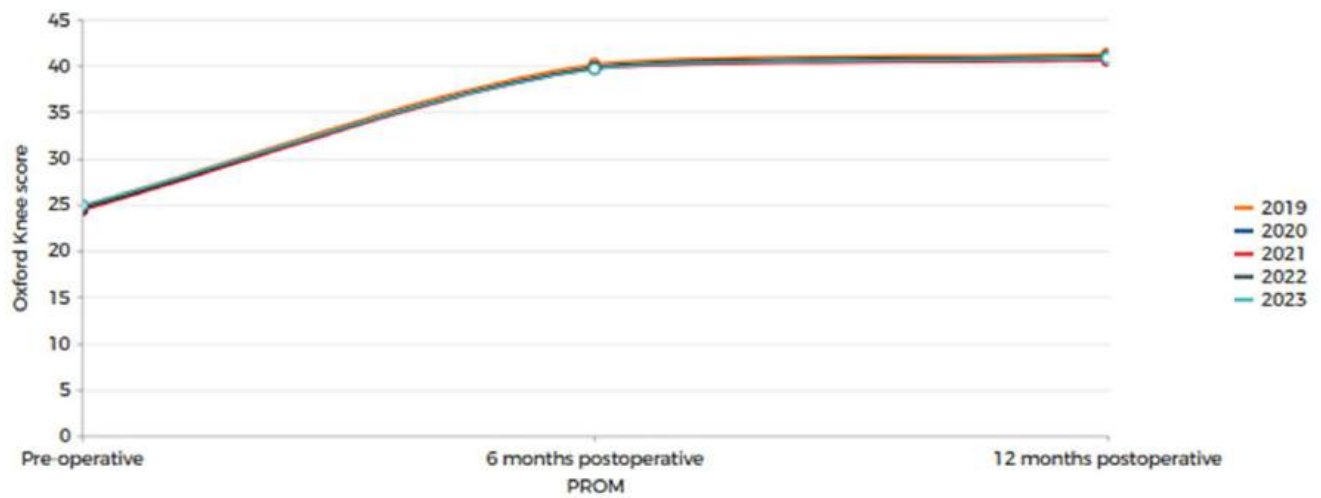
KOOS-PS score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	1,102	48.82 (47.97-49.67)	26.50 (25.69-27.30)	24.39 (23.55-25.22)
2020	1,206	48.52 (47.69-49.36)	26.31 (25.57-27.05)	24.13 (23.32-24.94)
2021	1,585	47.84 (47.17-48.51)	26.47 (25.78-27.17)	24.83 (24.11-25.55)
2022	2,061	47.28 (46.66-47.89)	25.90 (25.31-26.48)	24.13 (23.53-24.73)
2023	2,072	46.73 (46.13-47.32)	26.08 (25.49-26.67)	23.95 (23.36-24.55)
Total	8,026	47.65 (47.34-47.96)	26.21 (25.91-26.50)	24.26 (23.95-24.57)

UKA: unicompartmental knee arthroplasty; CI: confidence interval.

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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 UKA for osteoarthritis in the Netherlands in 2014-2023

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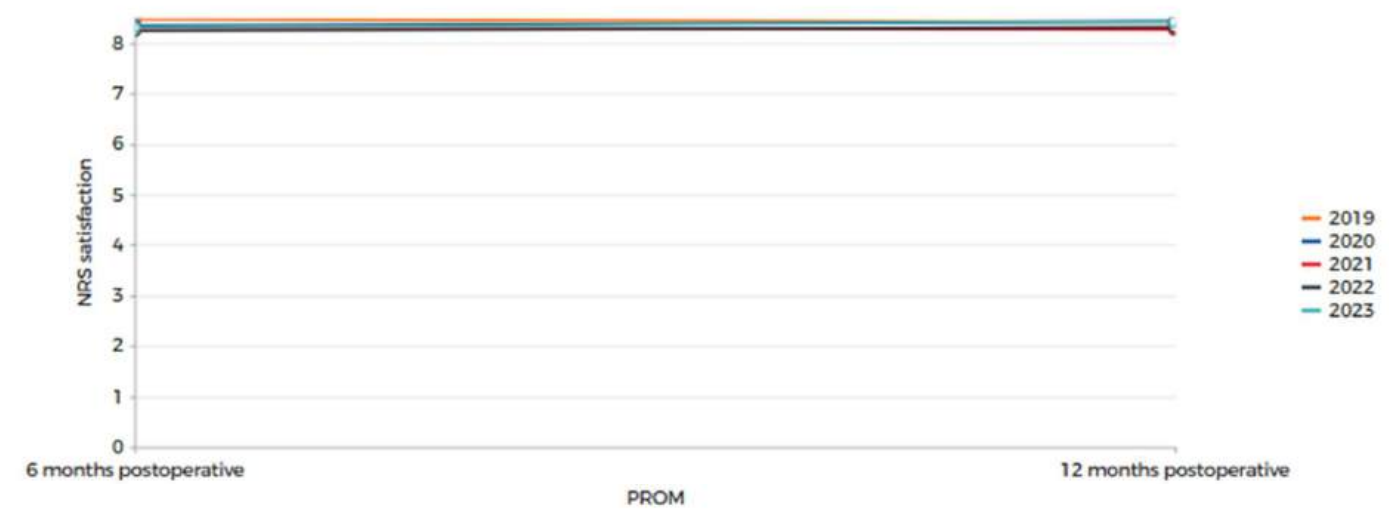
Oxford Knee score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	1,102	24.85 (24.41-25.29)	40.19 (39.77-40.61)	41.28 (40.85-41.70)
2020	1,206	24.54 (24.11-24.96)	39.78 (39.39-40.17)	40.86 (40.46-41.27)
2021	1,585	24.40 (24.04-24.75)	39.67 (39.31-40.04)	40.60 (40.24-40.96)
2022	2,061	24.64 (24.32-24.96)	39.86 (39.55-40.16)	41.02 (40.72-41.31)
2023	2,072	24.92 (24.60-25.24)	39.68 (39.36-40.00)	40.84 (40.53-41.15)
Total	8,026	24.68 (24.52-24.84)	39.80 (39.65-39.96)	40.90 (40.74-41.05)

UKA: unicompartmental knee arthroplasty; CI: confidence interval.

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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 UKA for osteoarthritis in the Netherlands in 2014-2023

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NRS satisfaction		6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)
2019	1,102	8.47 (8.27-8.67)	8.41 (8.30-8.52)
2020	1,206	8.35 (8.25-8.45)	8.43 (8.32-8.53)
2021	1,585	8.29 (8.20-8.38)	8.26 (8.17-8.36)
2022	2,061	8.24 (8.16-8.32)	8.31 (8.23-8.39)
2023	2,072	8.31 (8.22-8.39)	8.42 (8.34-8.50)
Total	8,026	8.31 (8.27-8.36)	8.36 (8.32-8.40)

UKA: unicompartmental knee arthroplasty; CI: confidence interval.

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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.

Patellofemoral knee arthroplasty

In this section you will find all the information on patellofemoral knee arthroplasty

Patient characteristics

Demographics

TABLE Patient characteristics of all patients with a registered primary patellofemoral knee arthroplasty in the Netherlands in 2024

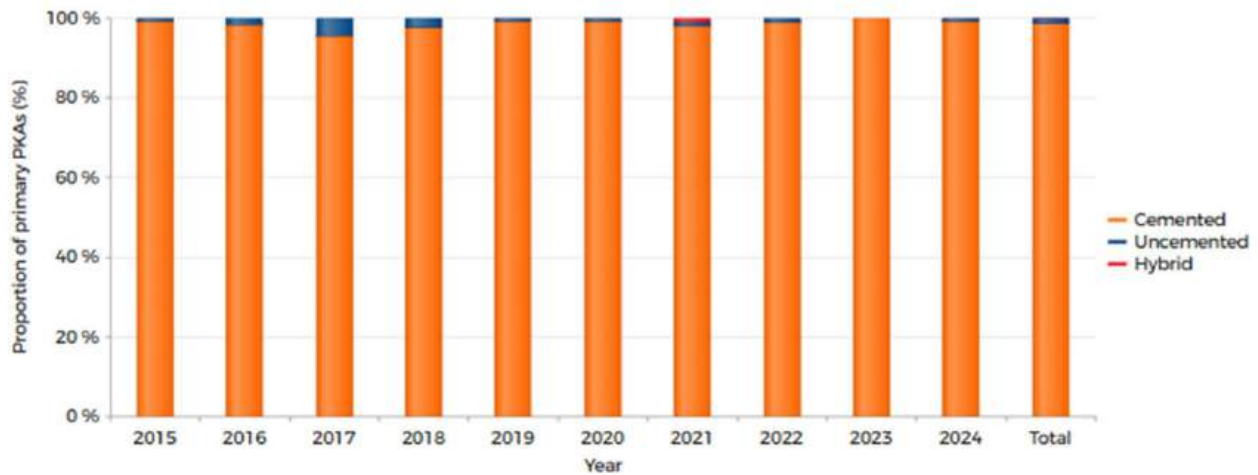
	PFA
N	155
Mean age (years) (SD)	58.5 (9.9)
Mean BMI (kg/m ²) (SD)	27.8 (3.8)
Age (years) (%)	
<50	19
50-59	36
60-69	29
70-79	13
>80	3
Gender (%)	
Women	74
Men	26
ASA score (%)	
ASA I	24
ASA II	64
ASA III-IV	12
Diagnosis (%)	
Late post-traumatic	2
Osteoarthritis	98
Type of hospital (%)	
General	58
Private	37
UMC	5
Charnley score (%)	
A One knee joint affected	39
B1 Both knee joints affected	41
B2 Contralateral knee with a TKA	16
C Multiple joints affected or chronic disease that affects quality of life	1
Mean BMI (kg/m ²) (SD)	27.8 (3.8)
BMI (kg/m ²) (%)	
Normal weight (>18.5-25)	26
Overweight (>25-30)	51
Obesity (>30-40)	23
Smoking (%)	
No	93
Yes	7

PFA: patellofemoral knee arthroplasty; General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Procedure characteristics

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary patellofemoral knee arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cemented	99.35	98.61	95.83	97.80	99.43	99.37	98.13	99.13	100	99.35	98.65
Uncemented	0.65	1.39	4.17	2.20	0.57	0.63	0.93	0.87	0	0.65	1.28
Hybrid	0	0	0	0	0	0	0.93	0	0	0	0.07
Total (n)	155	144	168	182	175	158	107	115	126	155	1,485

PKA: patellofemoral knee arthroplasty

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Most frequently registered - Patellofemoral knee prostheses

TABLE The most frequently registered primary patellofemoral knee arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Patellofemoral knee arthroplasties (n)	142	101	97	114	144
Femur name; Proportion (%)					
Gender Solutions Patello-Femoral Joint	57.75	49.50	71.13	57.89	61.11
Journey PFJ	23.94	24.75	12.37	19.30	27.08
AVON	13.38	20.79	12.37	13.16	4.86
Patellofemoral Hermes	0.00	0.00	0.00	4.39	4.17
Restoris MCK	0.00	1.98	4.12	5.26	2.78

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Most frequently registered - Bone cement

TABLE The most frequently registered bone cement used during primary patellofemoral knee arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	41	43	36	45	66
Cement name; Proportion (%)					
Palacos R+G	51.22	62.79	55.56	62.22	63.64
Refobacin Bone Cement R	34.15	25.58	30.56	31.11	36.36
Year	2020	2021	2022	2023	2024
Separately packed bone cement (n)	87	50	57	59	54
Cement name; Proportion (%)					
Palacos R+G	97.70	96.00	96.49	89.83	88.89
Subiton G	1.15	2.00	1.75	6.78	9.26
Palacos MV+G	0.00	0.00	0.00	1.69	1.85

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Survival

Short term revision

By type of revision within 3 years

TABLE Cumulative 3-year revision percentage of primary patellofemoral knee arthroplasties by type of revision in the Netherlands in 2017-2021 (n=22,894)

	Cumulative 3-year revision percentage Kaplan Meier (95% CI)
Any type of revision	6.15 (4.45-7.86)
Major revision	5.76 (4.11-7.41)
Only tibia	0.00 (0.00-0.00)
Only femur addition	0.52 (0.01-1.03)
Femur and tibia	5.24 (3.66-6.82)
Minor revision	0.39 (0.00-0.84)
DAIR	0.00 (0.00-0.00)
No DAIR	0.26 (0.00-0.62)
Only patella	0.13 (0.00-0.39)

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).

PFA: patellofemoral knee arthroplasty; CI: confidence interval

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In 2017-2021, 7 (0.9%) primary PFAs 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 patellofemoral knee arthroplasties by type of first major or minor revision in the Netherlands in 2017-2021 (n=767)

	Cumulative 3-year first revision percentage Kaplan Meier (95% CI)
First major revision	5.76 (4.11-7.41)
Tibia addition	5.24 (3.66-6.82)
Femur	5.76 (4.11-7.41)
First minor revision	0.39 (0.00-0.84)
Inlay	0.00 (0.00-0.00)
Patella	0.39 (0.00-0.84)

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

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

PFA: Patellofemoral knee arthroplasty; CI: confidence interval

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In 2017-2021, 7 (0.9%) primary PFAs were implanted in patients who died within three years after the primary procedure.

Conversion to total knee arthroplasty

TABLE Conversions from primary patellofemoral knee arthroplasty to total knee arthroplasty within 3 years in the period 2017-2021

Number of revision procedures	49
Number of conversions	35
Percentage conversions	71.4 %

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Reasons for revision by type of revision

TABLE Reasons for revision within three years of primary patellofemoral knee arthroplasties in the Netherlands in 2017-2021

Reasons for revision	Any type of revision (n=49)
	Proportion (%)
Progression of osteoarthritis	48.98
Patellar pain	28.57
Malalignment	12.24
Infection	10.20
Loosening of patella component	6.12
Patellar dislocation	4.08
Peri-prosthetic fracture	2.04
Revision after knee removal	2.04
Instability	0.00
Arthrofibrosis	0.00
Loosening of femur component	0.00
Insert wear	0.00
Other	8.16

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%.

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Time after PFA until revision

TABLE Time after primary patellofemoral knee arthroplasty until short-term revision in the Netherlands in 2017-2021 (n=767)

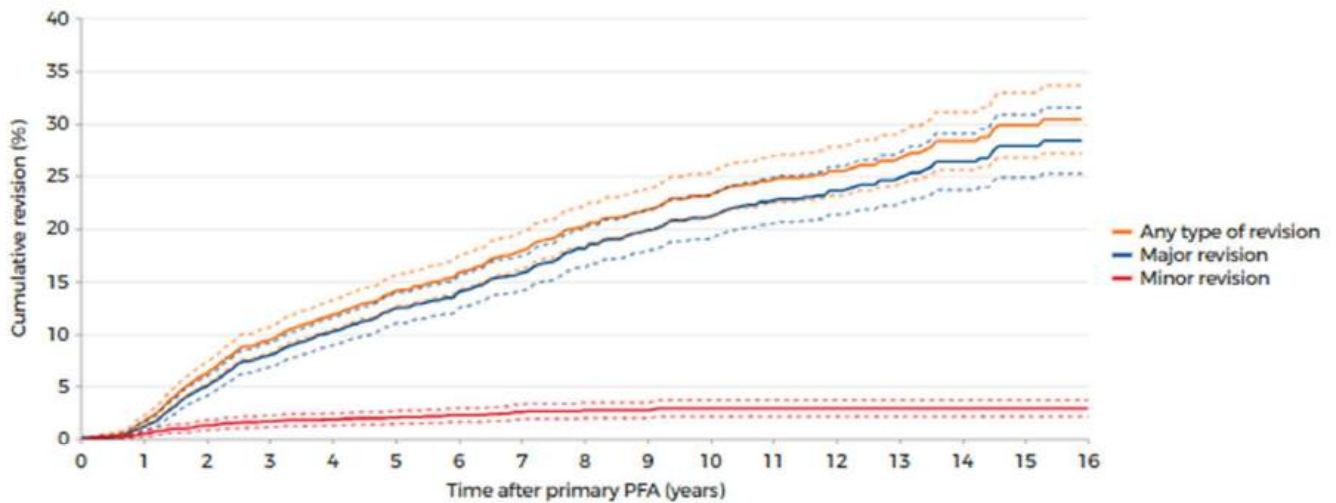
Time after primary PFA	Percentage revisions (%)
Day 0-29	0.00
Day 30-182	0.00
Day 183-364	0.65
Day 365-730 (second year)	3.26
Day 731-1095 (third year)	2.48

PFA: patellofemoral knee arthroplasty

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Long term revision

By type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of patellofemoral knee arthroplasties by type of revision in the Netherlands in 2007-2024 (n=2,390)

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	1yr	3yr	5yr	7yr	10yr	16yr
Any type of revision	1.31 (0.85-1.78)	9.25 (8.02-10.47)	13.77 (12.27-15.26)	17.67 (15.94-19.40)	23.09 (20.99-25.18)	30.37 (27.15-33.60)
Major revision	0.93 (0.53-1.32)	7.81 (6.67-8.95)	12.13 (10.70-13.55)	15.55 (13.90-17.20)	21.01 (18.98-23.05)	28.35 (25.21-31.50)
Minor revision	0.39 (0.14-0.65)	1.65 (1.11-2.18)	2.02 (1.42-2.62)	2.56 (1.86-3.26)	2.92 (2.13-3.70)	2.92 (2.13-3.70)

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. Therefore, the first three revision procedures were reviewed.

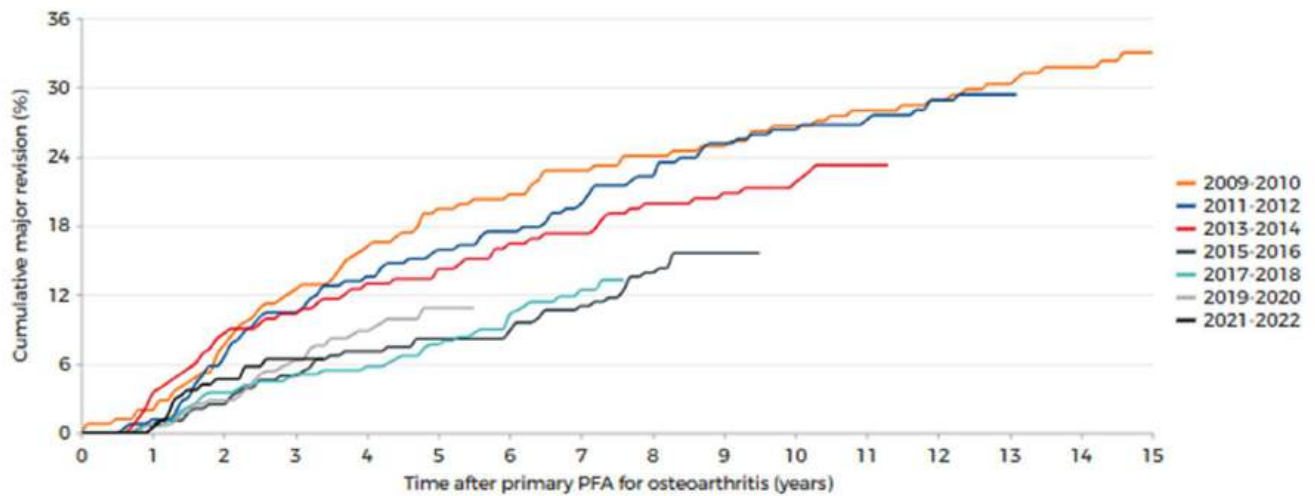
Minor revision: only insert and/or patella exchange (including patella addition).

PFA: patellofemoral knee arthroplasty; CI: confidence interval.

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In 2007-2024, 127 (5.3%) primary PFAs were implanted in patients who died within sixteen years after the primary diagnosis

By procedure year

FIGURE Cumulative major revision percentage (Kaplan-Meier; 95% CI) of patellofemoral knee arthroplasties for osteoarthritis by procedure year of primary PFA in the Netherlands in 2009-2024

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	Number (n)	1yr	3yr	5yr	7yr	10yr	15yr
2009-2010	251	2.01 (0.27-3.75)	12.06 (8.01-16.11)	19.04 (14.14-23.95)	22.79 (17.54-28.05)	26.66 (21.10-32.23)	33.04 (26.95-39.13)
2011-2012	261	0.77 (0.00-1.84)	10.46 (6.72-14.19)	15.52 (11.10-19.94)	19.49 (14.64-24.34)	26.35 (20.93-31.78)	n.a.
2013-2014	232	2.16 (0.29-4.02)	10.36 (6.43-14.28)	13.39 (9.00-17.77)	17.31 (12.43-22.18)	21.29 (16.00-26.58)	n.a.
2015-2016	284	0.71 (0.00-1.68)	4.96 (2.43-7.50)	8.16 (4.97-11.36)	10.67 (7.06-14.28)	n.a.	n.a.
2017-2018	314	0.64 (0.00-1.52)	4.79 (2.42-7.15)	7.69 (4.73-10.64)	11.84 (8.19-15.50)	n.a.	n.a.
2019-2020	319	0.63 (0.00-1.50)	6.00 (3.38-8.61)	10.86 (7.33-14.40)	n.a.	n.a.	n.a.
2021-2022	215	0.00 (0.00-0.00)	6.42 (3.02-9.82)	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. Therefore, the first three revision procedures were reviewed.

PFA: patellofemoral knee arthroplasty

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Survival by component

By component

TABLE Cumulative revision percentages of primary patellofemoral knee arthroplasties by prosthesis component combination of patients who underwent a PFA for osteoarthritis in the Netherlands in 2007-2024 (n=2,258)

Femur component	Patella component	Primary PFAs (n)	Hospitals (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)				Cumulative revision percentage (95% CI)					
						Total revision	Only femur	Only insert/patella	Unknown	1yr	3yr	5yr	7yr	10yr	15yr
All PFAs for osteoarthritis		2,258	88	55 (48-62)	408	343	16	31	8	1.26 (0.78-1.75)	9.24 (7.88-10.60)	13.63 (12.28-15.38)	17.66 (15.88-19.48)	22.92 (20.77-25.08)	30.49 (27.01-33.94)
Corder Solutions Patello-Femoral Joint	NovGen	695	37	55 (48-62)	103	96	1	5	1	0.47 (0.00-0.90)	5.68 (3.85-7.51)	10.22 (7.76-12.69)	14.37 (11.59-17.34)	20.51 (16.87-24.45)	n.a.
Journey PF2	Concise II	395	34	55 (48-62)	73	55	6	9	3	1.62 (0.53-2.90)	10.73 (7.46-14.00)	12.75 (9.18-16.53)	16.14 (13.60-22.61)	25.10 (19.52-30.68)	n.a.
AVON	AVON	253	17	52 (47-59)	38	32	3	2	1	1.20 (0.00-2.55)	7.00 (3.94-10.34)	10.33 (6.40-14.25)	11.48 (7.20-15.67)	16.99 (11.38-22.59)	n.a.
Corder Solutions Patello-Femoral Joint	Persona	172	3	54 (48-61)	10	10	0	0	0	0.00 (0.00-0.00)	6.47 (1.75-11.19)	n.a.	n.a.	n.a.	n.a.

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

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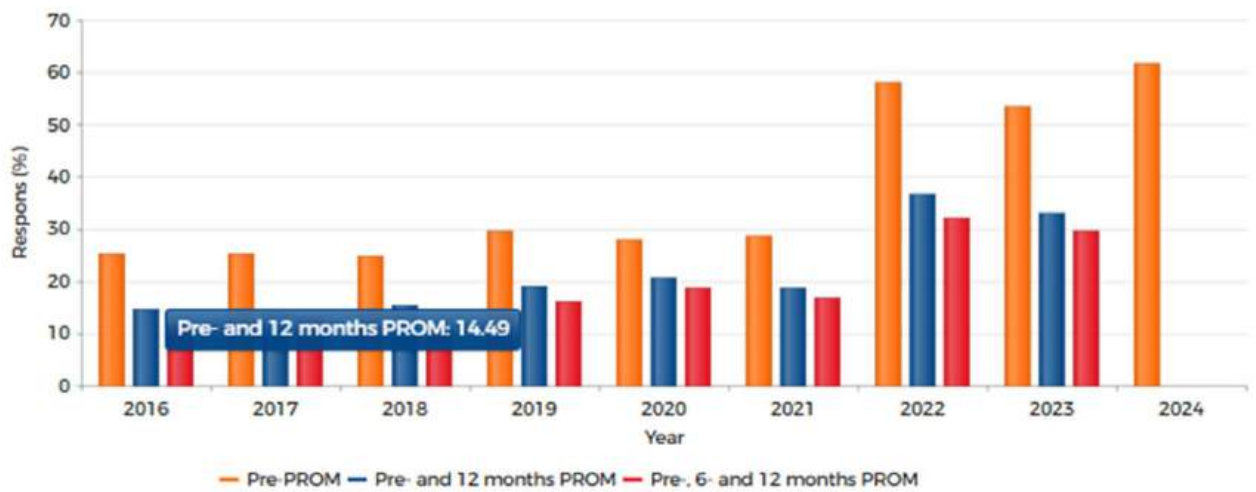
Only combinations with over 100 procedures have been listed.

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.

PROMs

Response

Per year

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a PFA for osteoarthritis in the Netherlands in 2016-2024

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	25.36	25.32	24.71	29.76	27.92	28.71	58.04	53.39	61.64
Pre- and 12 months PROM	14.49	13.92	15.29	19.05	20.78	18.81	36.61	33.05	n.a.
Pre-, 6- and 12 months PROM	11.59	13.29	11.18	16.07	18.83	16.83	32.14	29.66	n.a.
Total PFAs for osteoarthritis (n)	138	158	170	168	154	101	112	118	146

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

PFA: patellofemoral knee arthroplasty; PROM: patient reported outcome measure.

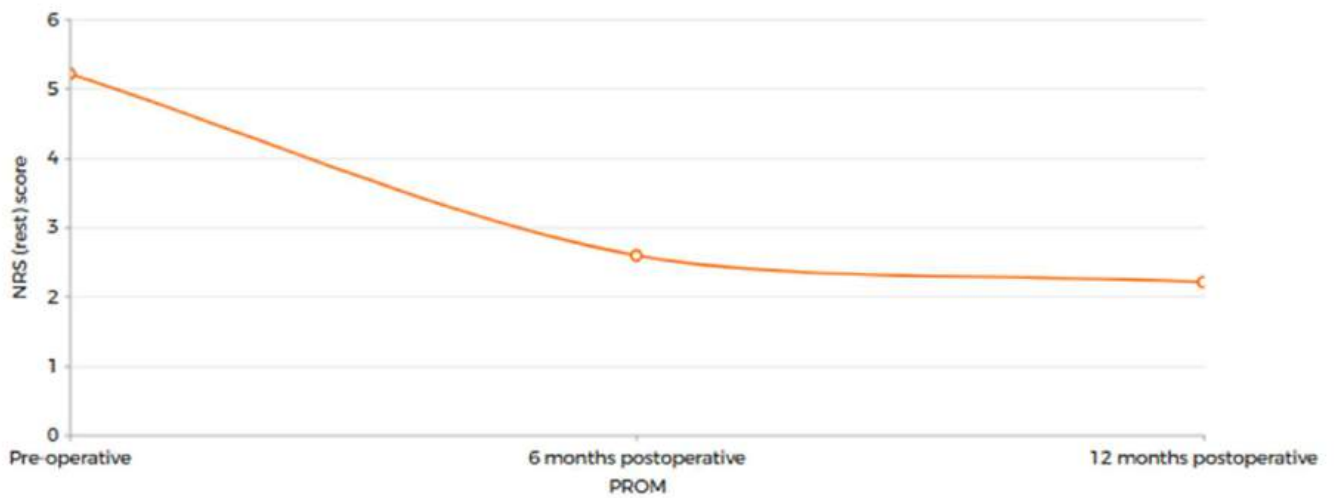
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Outcomes

NRS (rest)

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative NRS (rest) scores of patients who underwent a PFA for osteoarthritis in the Netherlands in 2016-2023



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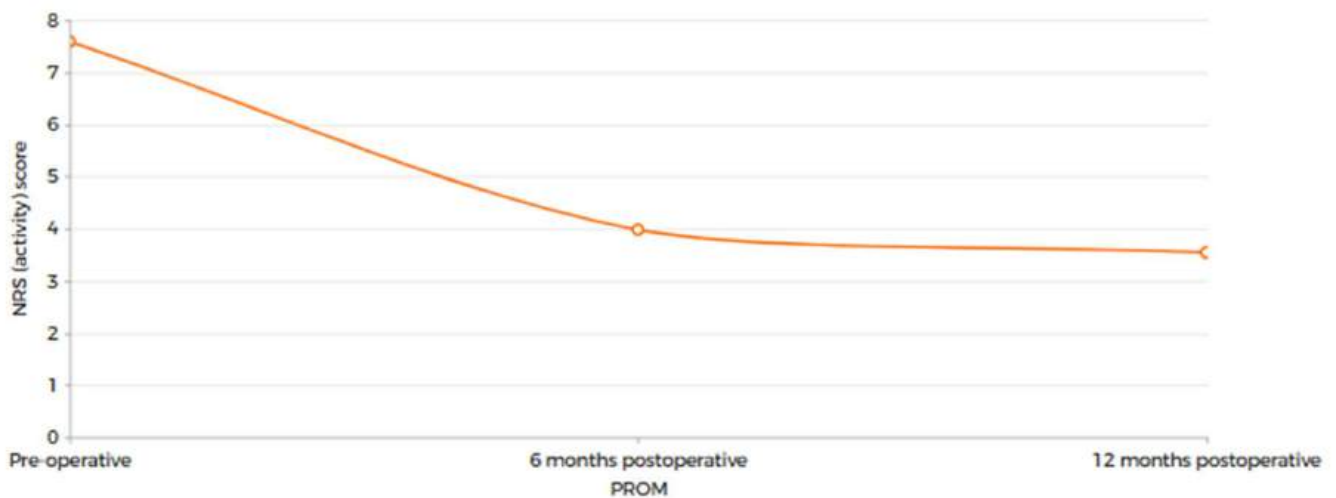
NRS (rest) score	Pre-operative	6 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
200	5.21 (4.86-5.57)	2.59 (2.24-2.94)	2.21 (1.86-2.55)

PFA: patellofemoral knee arthroplasty; CI: confidence interval.

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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 PFA for osteoarthritis in the Netherlands in 2016-2023

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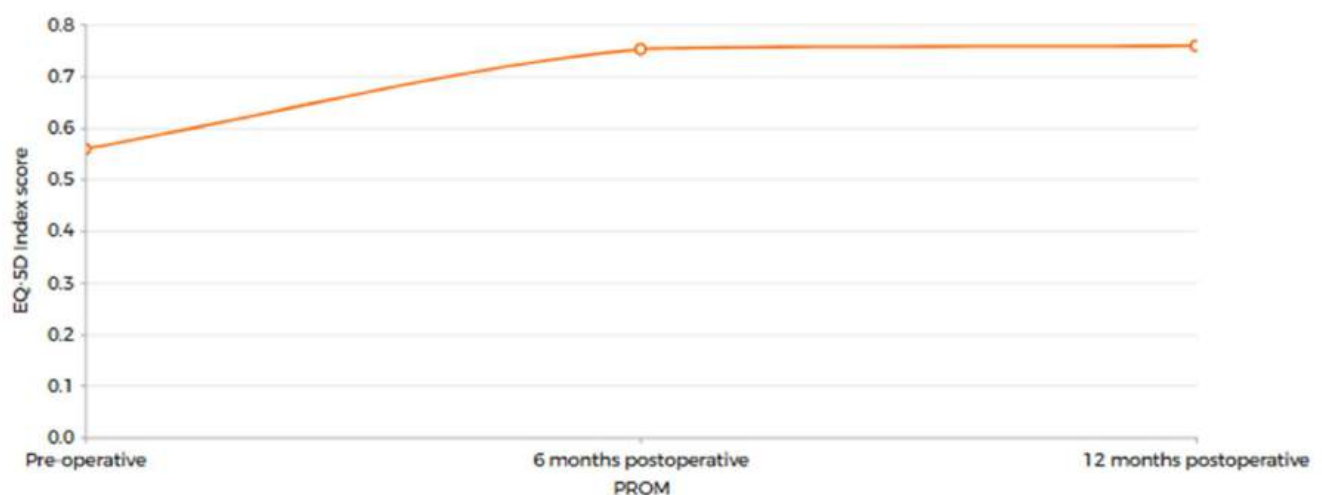
NRS (activity) score	Pre-operative	6 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
200	7.59 (7.34-7.83)	3.98 (3.61-4.35)	3.54 (3.16-3.92)

PFA: patellofemoral knee arthroplasty; CI: confidence interval.

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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.

EQ-5D Index score

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D index scores of patients who underwent a PFA for osteoarthritis in the Netherlands in 2016-2023

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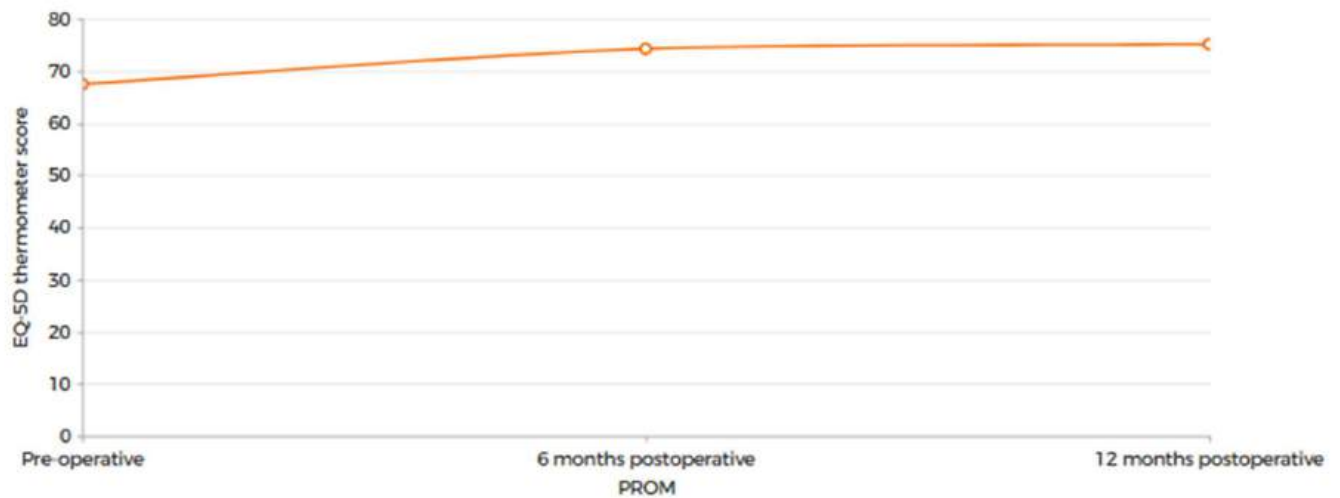
EQ-5D Index score	Pre-operative	6 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
200	0.56 (0.53-0.59)	0.75 (0.73-0.78)	0.76 (0.73-0.79)

PFA: patellofemoral knee arthroplasty; CI: confidence interval.

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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

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a PFA for osteoarthritis in the Netherlands in 2016-2023

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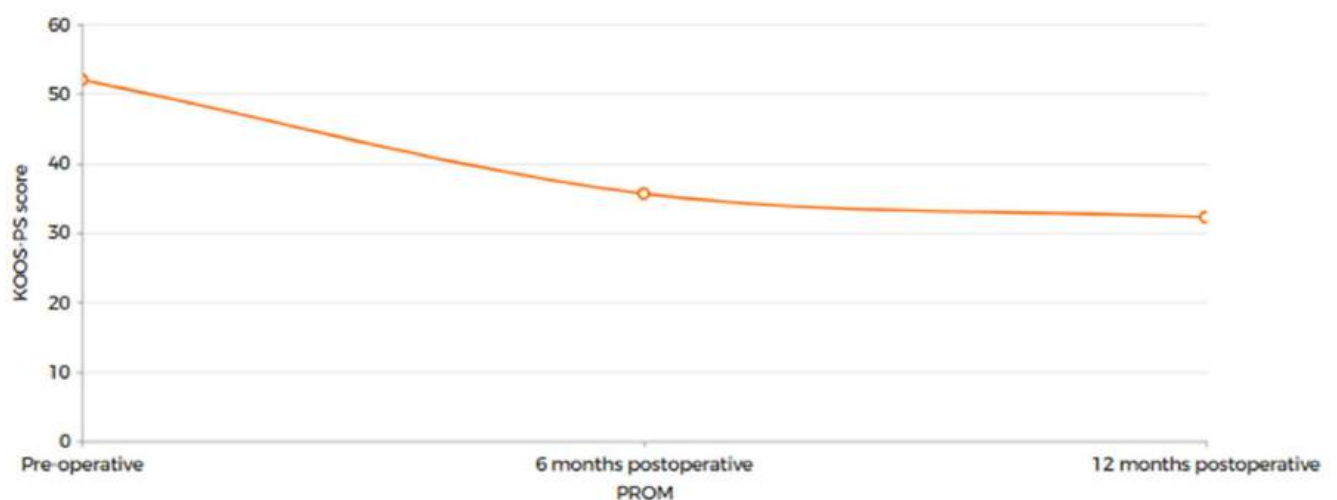
EQ-5D thermometer score	Pre-operative	6 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
200	67.47 (64.67-70.27)	74.24 (71.98-76.50)	75.13 (72.80-77.46)

PFA: patellofemoral knee arthroplasty; CI: confidence interval.

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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 PFA for osteoarthritis in the Netherlands in 2016-2023

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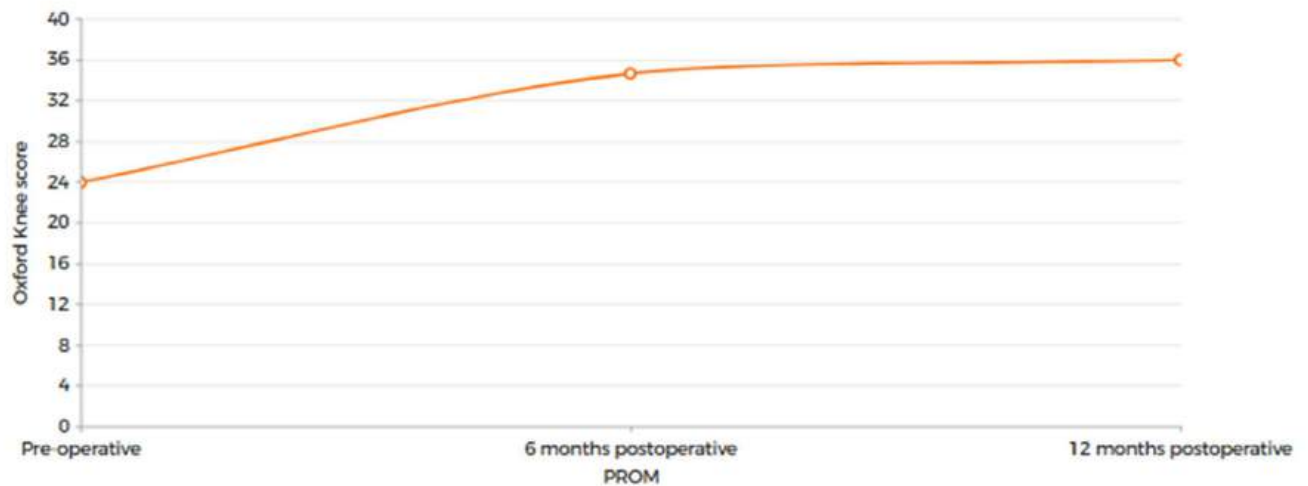
KOOS-PS score	Pre-operative	6 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
200	52.04 (50.15-53.92)	35.64 (33.59-37.70)	32.24 (30.09-34.39)

PFA: patellofemoral knee arthroplasty; CI: confidence interval.

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The KOOS-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 Knee Score

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative Oxford Knee Scores of patients who underwent a PFA for osteoarthritis in the Netherlands in 2016-2023

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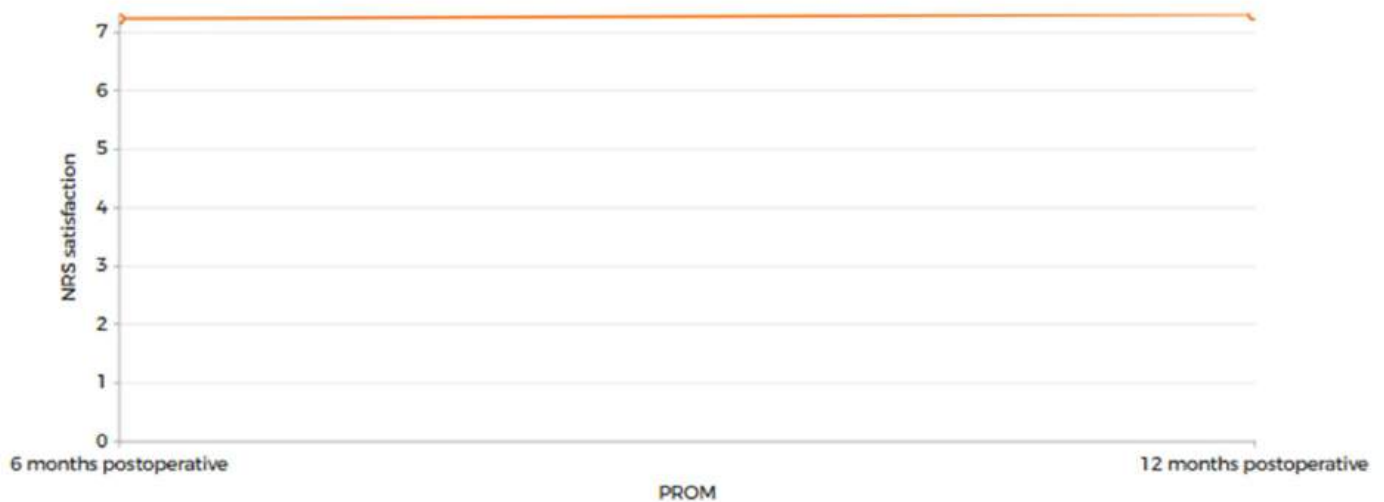
Oxford Knee Score	Pre-operative	6 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
200	23.92 (22.86-24.98)	34.59 (33.42-35.77)	35.93 (34.72-37.15)

PFA: patellofemoral knee arthroplasty; CI: confidence interval.

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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 PFA for osteoarthritis in the Netherlands in 2014-2023

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NRS satisfaction	6 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)
172	7.23 (6.90-7.55)	7.30 (6.95-7.66)

PFA: patellofemoral knee arthroplasty; CI: confidence interval.

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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.

Knee revision arthroplasty

In this section you will find all the information on knee revision arthroplasty

Revision characteristics

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a knee revision arthroplasty in the Netherlands in 2015-2024

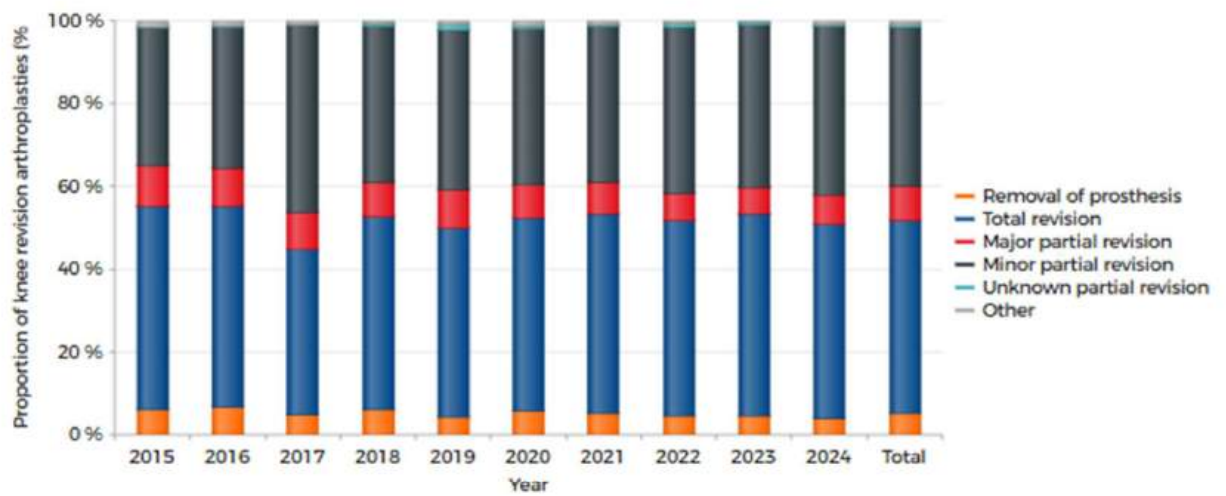
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Knee revision arthroplasty (n)	2,685	2,926	2,997	2,930	3,101	2,496	2,602	3,013	3,309	3,478	29,537
Reasons for revision; Proportion (%)											
Instability	26.44	25.12	27.66	25.80	27.38	26.28	26.25	24.63	21.82	21.28	25.13
Infection	16.46	19.58	20.25	20.82	20.15	23.68	22.02	22.93	24.66	23.86	21.53
Patellar pain	23.05	21.46	19.72	18.94	20.15	18.71	17.76	23.96	22.51	24.55	21.22
Loosening of tibia component	20.60	21.87	20.92	19.49	20.74	19.55	19.02	18.62	16.74	17.54	19.44
Malalignment	14.67	13.88	11.34	10.72	10.16	10.62	11.03	8.89	10.15	9.03	10.97
Progression of osteoarthritis	8.27	9.26	8.21	8.70	7.97	7.57	8.95	11.98	12.69	12.74	9.77
Loosening of femur component	9.50	9.02	8.91	8.36	8.58	8.01	8.80	8.46	8.43	7.71	8.56
Inlay wear	7.82	7.55	6.77	6.55	7.13	6.97	7.72	10.26	8.95	8.77	7.90
Revision after knee removal	5.74	6.25	5.57	4.88	4.16	5.05	4.27	4.81	4.38	3.13	4.78
Arthrofibrosis	5.07	4.27	4.87	4.61	5.26	3.93	4.30	3.88	4.14	4.14	4.45
Patella dislocation	2.79	2.08	2.44	2.22	2.45	2.80	2.19	2.56	1.51	2.13	2.30
Peri-prosthetic fracture	2.27	1.71	1.77	1.54	1.90	2.60	2.65	2.56	2.63	2.99	2.27
Loosening of patella component	1.53	1.91	1.77	1.43	1.74	1.76	1.73	1.59	1.96	1.27	1.67
Bearing dislocation								3.72	4.11	4.05	
Other	8.64	8.30	7.41	7.68	7.80	7.49	8.65	8.70	7.56	8.05	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.

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Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in knee revision arthroplasties in the Netherlands in 2015-2024

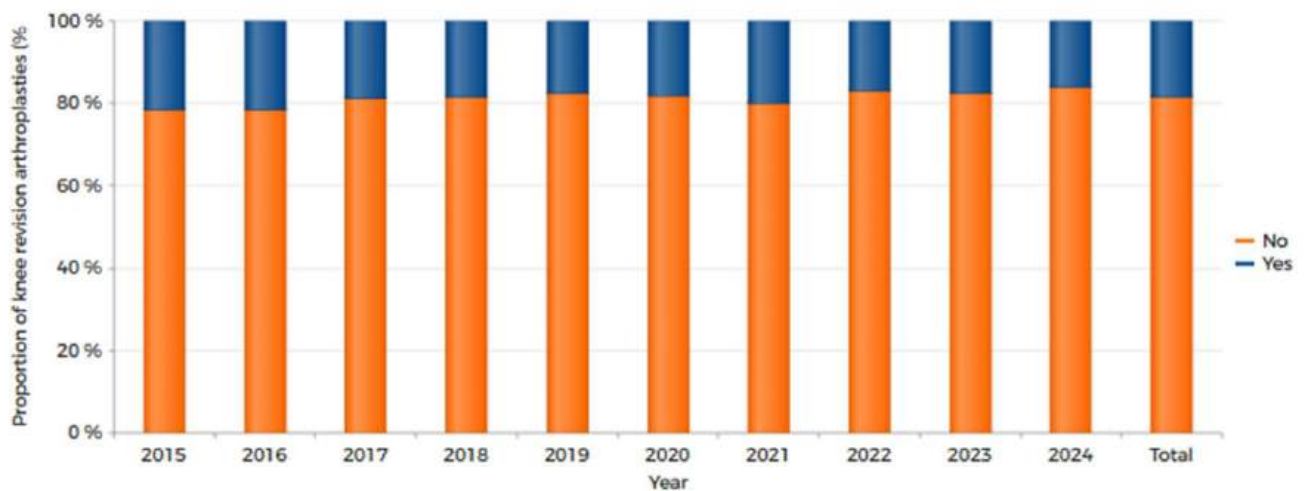
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Removal of prosthesis	6.16	6.67	4.80	6.20	4.40	5.98	5.28	4.73	4.69	4.12	5.25
Total revision	49.01	48.43	39.95	46.47	45.55	46.55	47.96	47.24	48.70	46.70	46.64
Major partial revision	9.94	9.46	8.81	8.46	9.29	8.03	7.82	6.46	6.42	7.11	8.13
Minor partial revision	33.25	34.02	45.39	37.50	38.63	37.56	37.63	40.01	39.34	40.71	38.54
Unknown partial revision	0.26	0.21	0.24	0.65	1.13	0.64	0.42	0.83	0.39	0.58	0.54
Other	1.38	1.20	0.82	0.72	1.00	1.24	0.89	0.73	0.45	0.78	0.90
Total (n)	2,677	2,907	2,939	2,920	3,091	2,492	2,596	3,002	3,302	3,473	29,399

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.

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In 142 (57%) major partial knee revision arthroplasties the tibia component was revised and in 105 (43%) major partial revision arthroplasties the femur component was revised in 2024.

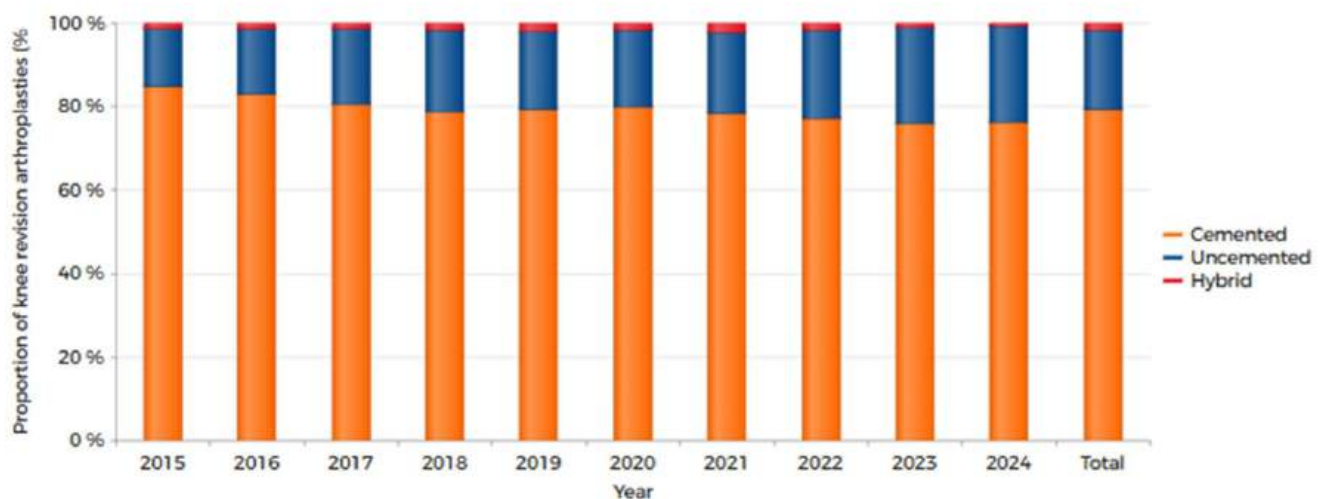
Conversion to TKA

FIGURE Trend (proportion [%] per year) in conversion of a unicondylar or patellofemoral knee arthroplasty to a total knee arthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	78.66	78.62	81.27	81.49	82.43	82.01	80.09	83.12	82.44	83.95	81.57
Yes	21.34	21.38	18.73	18.51	17.57	17.99	19.91	16.88	17.56	16.05	18.43
Total (n)	2,245	2,638	2,771	2,637	2,778	2,285	2,401	2,902	3,241	3,409	27,307

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Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in knee revision arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cemented	84.84	83.11	80.81	78.80	79.38	80.12	78.44	77.24	76.21	76.27	79.36
Uncemented	13.92	15.57	17.96	19.55	18.87	18.42	19.37	21.11	22.78	23.08	19.26
Hybrid	1.24	1.31	1.24	1.65	1.75	1.46	2.19	1.65	1.01	0.65	1.39
Total (n)	2,428	2,665	2,751	2,670	2,857	2,253	2,375	2,781	3,073	3,224	27,077

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Most frequently registered - Femur components

TABLE The most frequently registered femur components in knee revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Femur (n)	1,027	1,158	1,279	1,395	1,490
Femur name; Proportion (%)					
Legion	23.86	20.03	17.83	18.35	18.35
NexGen	18.50	18.65	19.62	17.49	17.49
Attune	2.53	4.15	8.84	10.11	10.11
Genesis II	8.67	7.51	9.70	9.46	9.46
Triathlon	8.57	8.46	7.97	8.46	8.46
Vanguard Complete Knee	5.55	7.94	6.72	7.31	7.31
Persona	0.88	2.16	3.05	5.95	5.95
Vanguard 360	6.33	6.04	6.33	4.66	4.66
PFC / SIGMA	6.04	5.53	3.99	4.16	4.16
RT Plus	3.41	3.97	3.99	3.51	3.51

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Most frequently registered - Tibia components

TABLE The most frequently registered tibia components in knee revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Tibia (n)	1,117	1,250	1,376	1,517	1,535
Tibia name; Proportion (%)					
Attune	3.04	4.72	8.36	9.56	18.50
Legion	24.08	20.24	17.59	19.97	17.72
NexGen	15.94	15.52	17.59	16.28	16.03
Genesis II	4.92	4.80	7.05	6.92	7.49
Triathlon	8.95	9.04	8.65	8.77	7.17
Vanguard 360	7.07	7.52	6.76	5.67	6.51
Persona	0.81	2.00	2.83	5.27	4.82
RT Plus	4.39	5.76	5.31	5.14	4.76
Vanguard Complete Knee	4.03	5.52	5.60	5.01	3.91
Rotation Hinged Knee	3.49	3.28	4.07	2.90	2.87

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Most frequently registered - Insert components

TABLE The most frequently registered insert components in knee revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Insert (n)	1,755	1,974	2,248	2,537	2,784
Insert name; Proportion (%)					
Genesis II	26.21	24.42	23.75	24.16	25.61
ATTUNE	2.22	3.14	5.83	7.57	12.39
NexGen	16.30	14.13	14.50	12.73	11.89
Vanguard Complete Knee	7.92	8.66	8.85	8.47	7.97
Triathlon	7.18	7.95	8.05	8.28	7.40
Oxford PKR	5.24	5.93	7.38	7.53	7.04
Persona	0.85	1.72	2.76	4.85	4.17
Vanguard SSK	4.22	4.00	4.36	3.19	3.45
RT Plus	2.91	3.50	3.47	3.74	3.16
Legion	4.44	4.61	3.47	2.96	2.77

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Most frequently registered - Patella components

TABLE The most frequently registered patella components in knee revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Patella (n)	947	945	988	1,030	1,155
Patella name; Proportion (%)					
Genesis II	50.58	44.97	44.53	49.71	51.95
Vanguard	13.20	15.03	17.51	15.05	11.26
Attune	2.64	3.81	5.97	7.77	11.00
NexGen	12.78	12.38	10.63	9.32	9.26
Persona	1.27	2.12	3.95	3.79	4.94
PFC / SIGMA	5.39	6.03	4.76	4.17	3.38
balanSys	2.01	2.75	2.33	2.62	2.77
Triathlon	5.49	7.51	4.86	4.47	2.68
LCS	2.75	2.12	1.92	1.07	0.95
ACC	0.53	0.85	0.61	0.97	0.69

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Most frequently registered - Bone cement

TABLE The most frequently registered bone cement used during knee revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	488	674	801	864	1,269
Cement name; Proportion (%)					
Palacos R+C	50.20	48.66	48.44	57.06	66.04
Refobacin Bone Cement R	39.75	41.10	43.45	38.31	31.99
Copal G+C	0.00	0.00	0.00	0.00	1.65
Refobacin Plus Bone Cement	6.15	8.01	6.62	4.63	0.24
Refobacin Revision	3.89	2.08	1.50	0.00	0.08
Year	2020	2021	2022	2023	2024
Separately packed bone cement (n)	1,009	1,007	1,012	1,053	777
Cement name; Proportion (%)					
Palacos R+C	30.62	33.76	32.51	27.26	44.14
Copal G+C	38.16	38.93	39.92	43.97	25.74
Refobacin Revision	12.69	12.31	14.23	11.78	13.13
Subiton G	4.26	4.67	4.15	3.89	6.05
Copal G+V	4.46	5.16	4.25	4.27	3.99
Cemex VancoGenx	1.09	0.89	0.79	1.61	2.19
Palacos MV+G	1.78	1.59	1.88	2.56	1.93
Refobacin Bone Cement R	6.05	1.89	1.98	3.42	1.54
Biomet Bone Cement R	0.50	0.40	0.00	0.57	0.51
Simplex ABC Tobra	0.00	0.00	0.20	0.19	0.26

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PROMs

Response

Per year

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	2024
Pre-PROM	0.53	4.03	13.55	19.21	26.09	27.35	22.65	18.69	20.75	25.02	26.05
Pre- and 12 months PROM	0.04	1.54	5.67	7.40	10.62	10.99	7.85	6.49	7.57	9.65	n.a.
Pre-, 6- and 12 months PROM	0.04	1.00	4.10	5.57	8.22	9.01	5.96	5.10	5.72	7.03	n.a.
Total knee revision arthroplasties (n)	2,459	2,604	2,804	2,853	2,833	2,984	2,433	2,510	2,921	3,214	3,359

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

PROM: patient reported outcome measure.

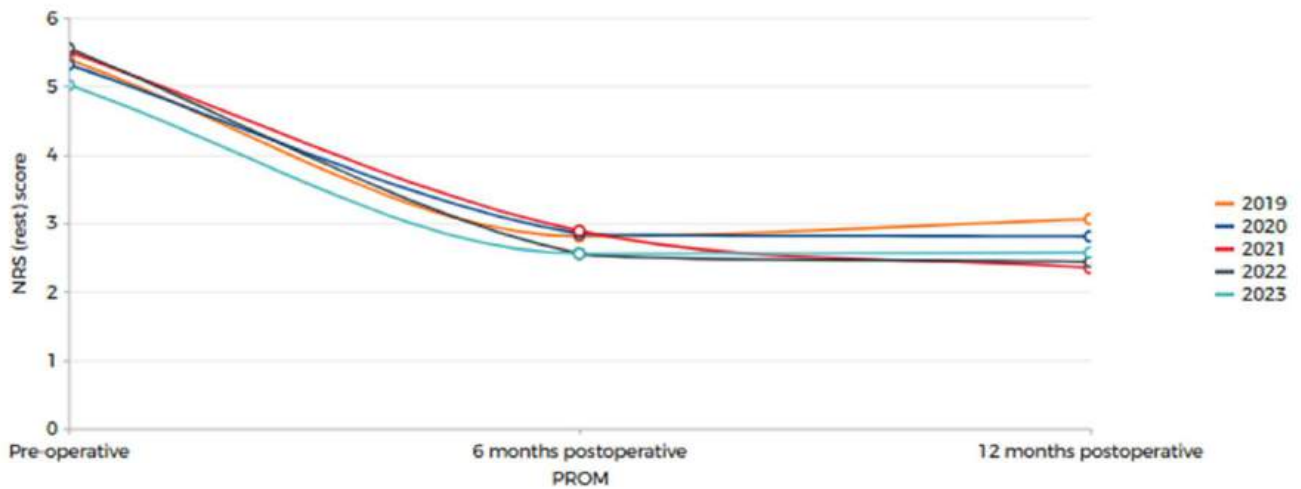
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Outcomes

NRS (rest)

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative NRS (rest) scores of patients who underwent a knee revision in the Netherlands in 2019-2023



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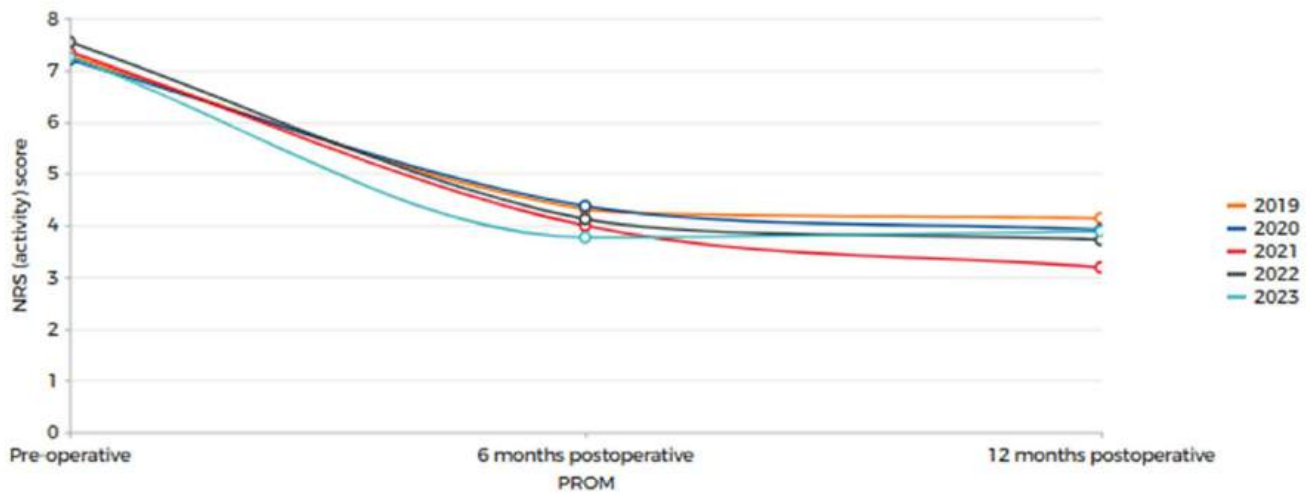
NRS (rest) score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	269	5.39 (5.10-5.69)	2.81 (2.50-3.12)	3.06 (2.73-3.39)
2020	145	5.32 (4.90-5.74)	2.85 (2.44-3.26)	2.81 (2.37-3.25)
2021	128	5.50 (5.06-5.95)	2.89 (2.40-3.38)	2.35 (1.89-2.80)
2022	167	5.56 (5.18-5.93)	2.56 (2.17-2.94)	2.43 (2.06-2.81)
2023	226	5.02 (4.68-5.36)	2.56 (2.22-2.89)	2.57 (2.21-2.94)
Total	935	5.34 (5.18-5.50)	2.72 (2.56-2.89)	2.70 (2.52-2.87)

CI: confidence interval

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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 knee revision in the Netherlands in 2014-2023

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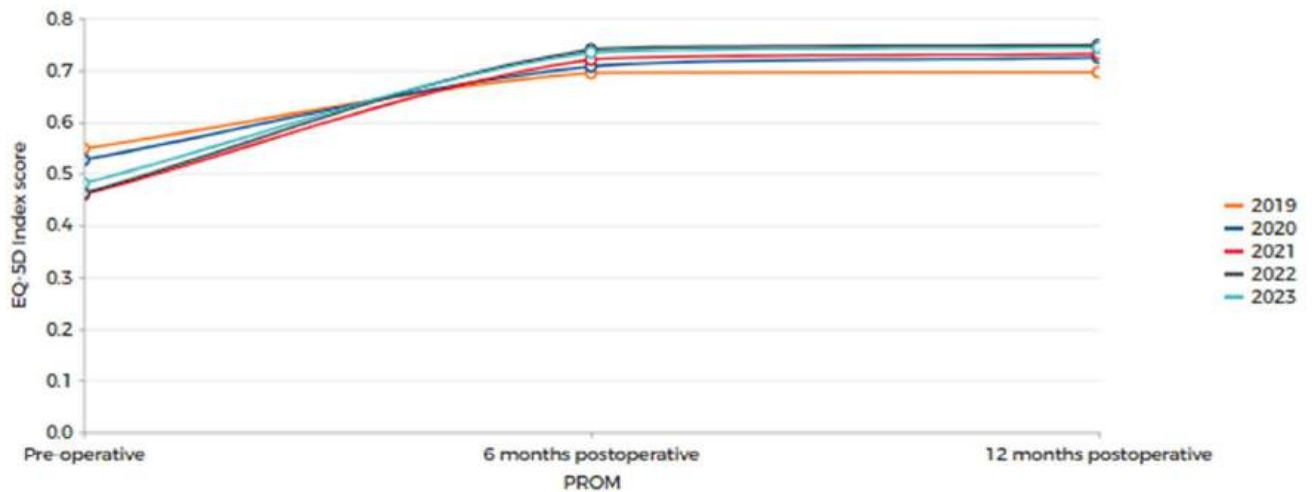
NRS (activity) score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	269	7.27 (7.02-7.53)	4.31 (3.98-4.63)	4.14 (3.80-4.48)
2020	145	7.20 (6.86-7.53)	4.37 (3.92-4.83)	3.91 (3.43-4.39)
2021	128	7.35 (7.00-7.70)	3.99 (3.48-4.50)	3.19 (2.68-3.69)
2022	167	7.54 (7.27-7.82)	4.12 (3.72-4.53)	3.72 (3.29-4.15)
2023	226	7.25 (6.97-7.53)	3.77 (3.38-4.15)	3.88 (3.49-4.28)
Total	935	7.31 (7.18-7.44)	4.11 (3.93-4.29)	3.84 (3.65-4.02)

CI: confidence interval

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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.

EQ-5D Index score

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D index scores of patients who underwent a knee revision in the Netherlands in 2014-2023

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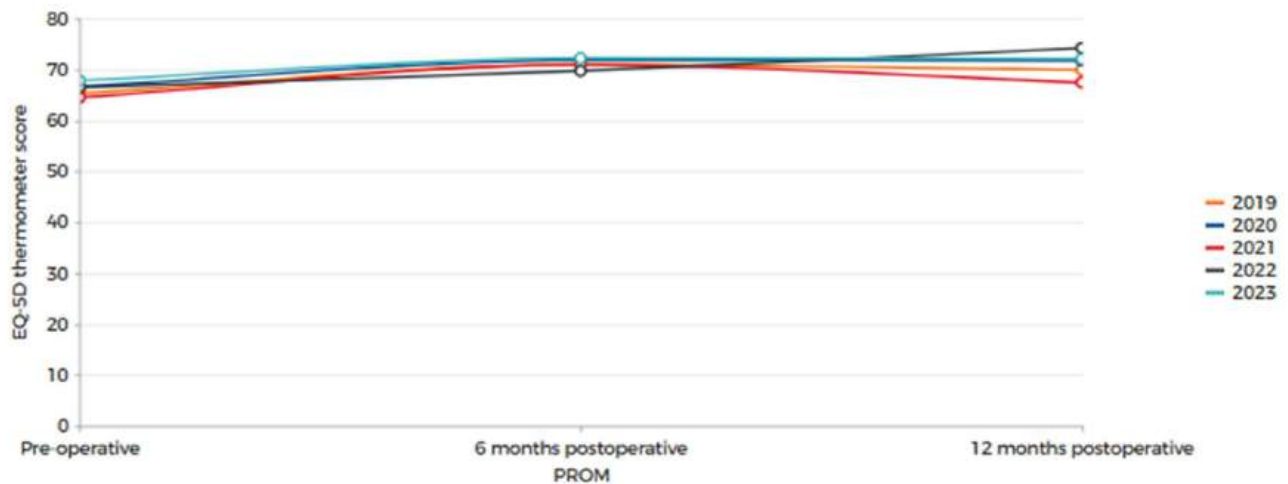
EQ-5D Index score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	269	0.55 (0.53-0.57)	0.69 (0.67-0.72)	0.70 (0.67-0.72)
2020	145	0.53 (0.49-0.56)	0.71 (0.67-0.74)	0.72 (0.69-0.76)
2021	128	0.46 (0.41-0.51)	0.72 (0.68-0.76)	0.73 (0.69-0.77)
2022	167	0.46 (0.42-0.50)	0.74 (0.71-0.77)	0.75 (0.72-0.78)
2023	226	0.48 (0.44-0.52)	0.73 (0.70-0.77)	0.74 (0.71-0.78)
Total	935	0.50 (0.49-0.52)	0.72 (0.70-0.73)	0.73 (0.71-0.74)

CI: confidence interval

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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

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a knee revision in the Netherlands in 2014-2023

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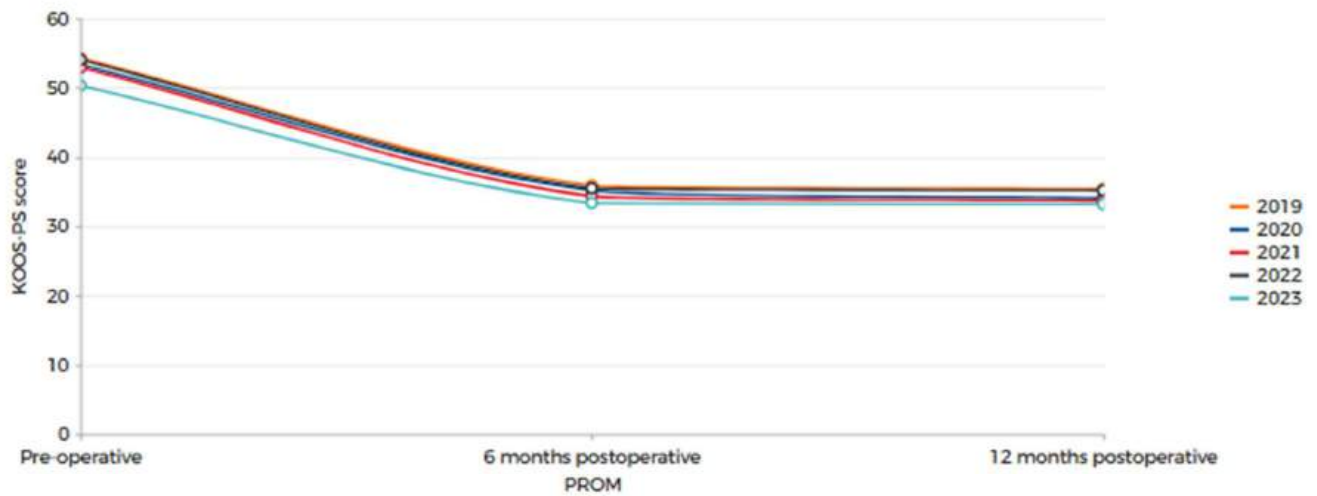
EQ-5D thermometer score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	269	65.32 (62.95-67.70)	70.95 (68.49-73.40)	69.93 (67.46-72.40)
2020	145	66.67 (63.16-70.19)	71.84 (69.03-74.64)	71.73 (68.46-75.01)
2021	128	64.50 (60.66-68.33)	70.94 (67.48-74.39)	67.46 (63.13-71.78)
2022	167	66.50 (63.36-69.65)	69.71 (66.45-72.98)	74.21 (71.24-77.17)
2023	226	67.81 (64.99-70.63)	72.22 (69.52-74.92)	72.08 (69.52-74.65)
Total	935	66.21 (64.87-67.55)	71.16 (69.87-72.44)	71.11 (69.77-72.44)

CI: confidence interval

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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 knee revision in the Netherlands in 2014-2023

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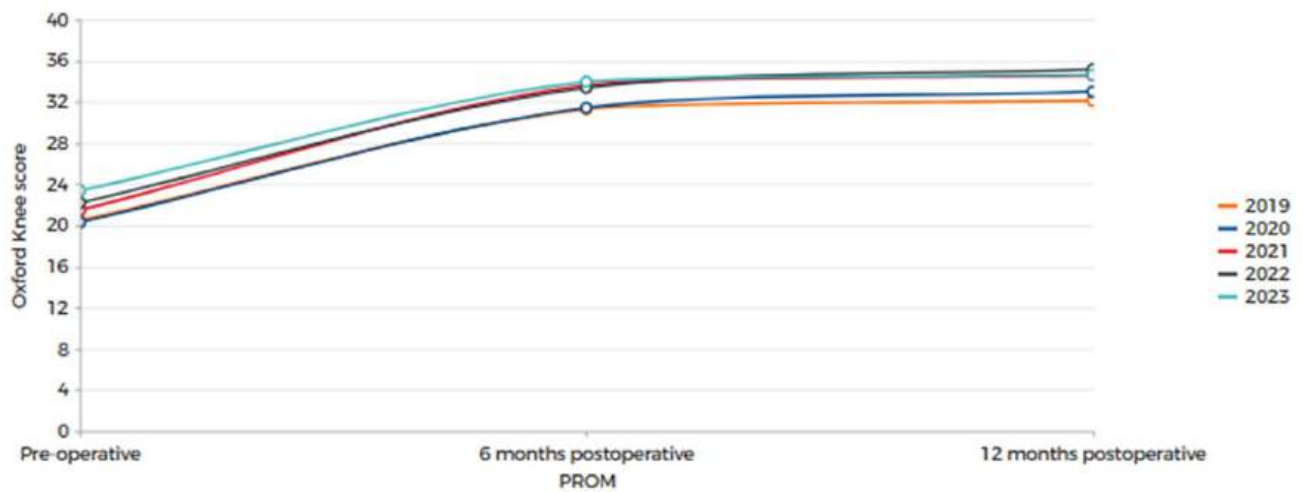
KOOS-PS score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	269	54.30 (52.31-56.28)	35.88 (34.13-37.64)	35.39 (33.21-37.58)
2020	145	53.35 (50.82-55.88)	35.18 (32.71-37.65)	34.08 (31.54-36.61)
2021	128	52.94 (50.14-55.74)	34.35 (31.50-37.19)	33.71 (30.86-36.55)
2022	167	54.07 (51.73-56.42)	35.50 (33.19-37.81)	35.18 (32.69-37.67)
2023	226	50.35 (48.39-52.31)	33.37 (31.21-35.54)	33.19 (30.93-35.44)
Total	935	53.02 (52.00-54.03)	34.91 (33.92-35.90)	34.40 (33.31-35.48)

CI: confidence interval

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The KOOS-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 Knee Score

FIGURE Mean (95% CI) pre-operative, 6 months and 12 months postoperative Oxford Knee scores of patients who underwent a knee revision in the Netherlands in 2014-2023

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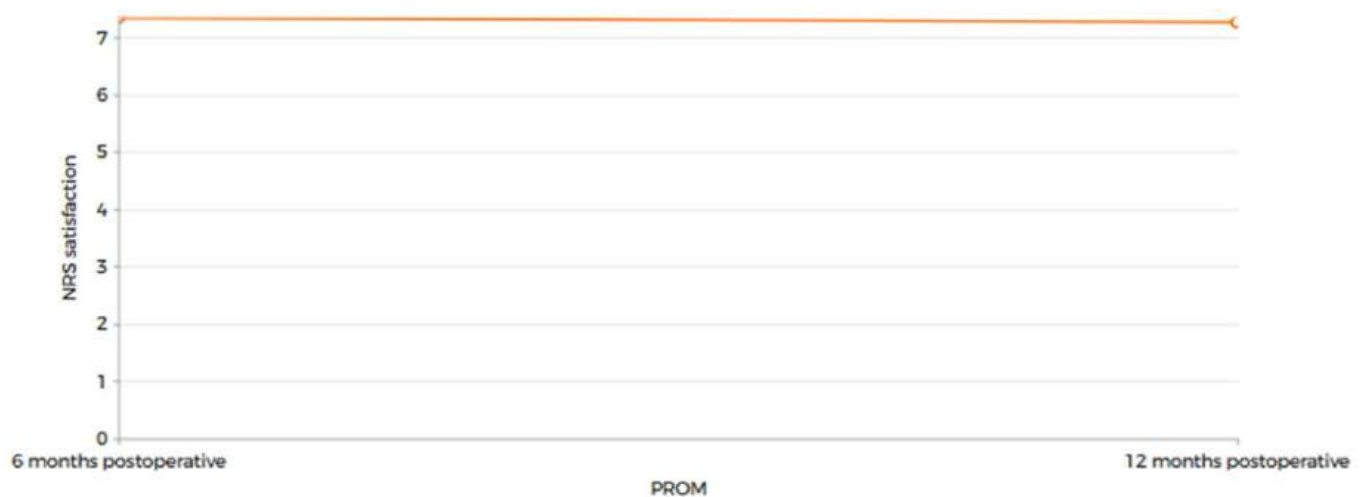
Oxford Knee score		Pre-operative	6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	269	20.49 (19.57-21.42)	31.29 (30.20-32.38)	32.12 (30.93-33.32)
2020	145	20.30 (19.04-21.57)	31.42 (29.83-33.01)	32.98 (31.33-34.64)
2021	128	21.48 (20.04-22.92)	33.63 (32.01-35.26)	34.59 (32.93-36.26)
2022	167	22.20 (21.02-23.37)	33.37 (31.97-34.77)	35.16 (33.85-36.46)
2023	226	23.37 (22.35-24.39)	33.97 (32.65-35.28)	34.63 (33.31-35.94)
Total	935	21.60 (21.09-22.11)	32.64 (32.03-33.25)	33.74 (33.11-34.37)

CI: confidence interval

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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 knee revision in the Netherlands in 2014-2023

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NRS satisfaction		6 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)
2019	269	7.16 (6.89-7.43)	7.16 (6.86-7.45)
2020	145	7.02 (6.66-7.39)	7.02 (6.60-7.43)
2021	128	7.35 (6.98-7.72)	6.92 (6.47-7.38)
2022	167	7.04 (6.67-7.40)	7.27 (6.93-7.61)
2023	226	6.99 (6.65-7.32)	7.15 (6.82-7.48)
Total	42,942	7.97 (7.95-7.99)	8.07 (8.05-8.09)

CI: confidence interval.

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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.

Ankle arthroplasty

Numbers

Registered procedures

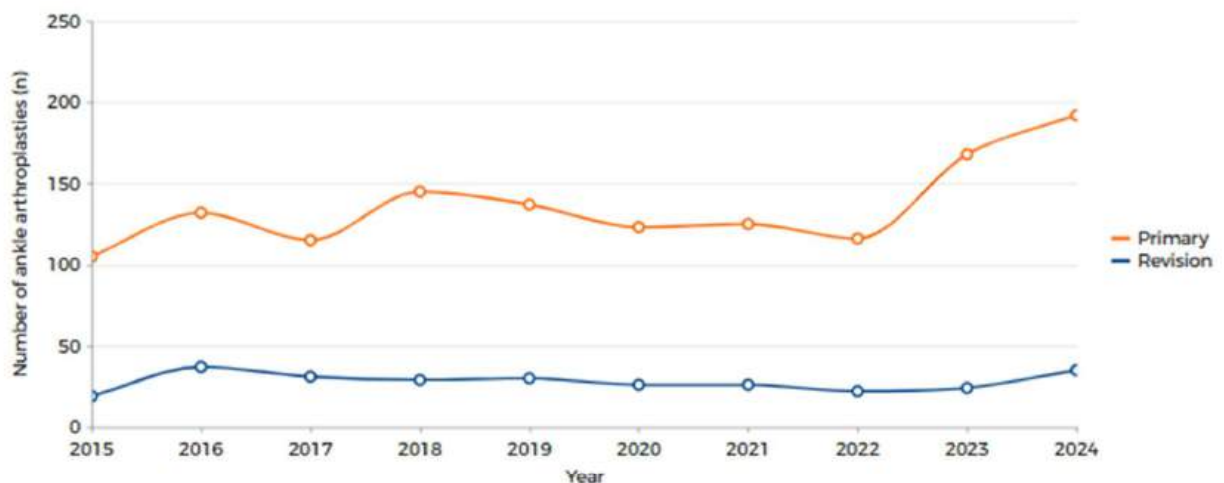
TABLE Number of registered ankle arthroplasties per year of surgery (2014-2024) in the LROI in April 2025

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	167	1	0	24	192
2024	192	0	0	35	227
Total (n)	1,441	14	6	295	1,756

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Type of procedures

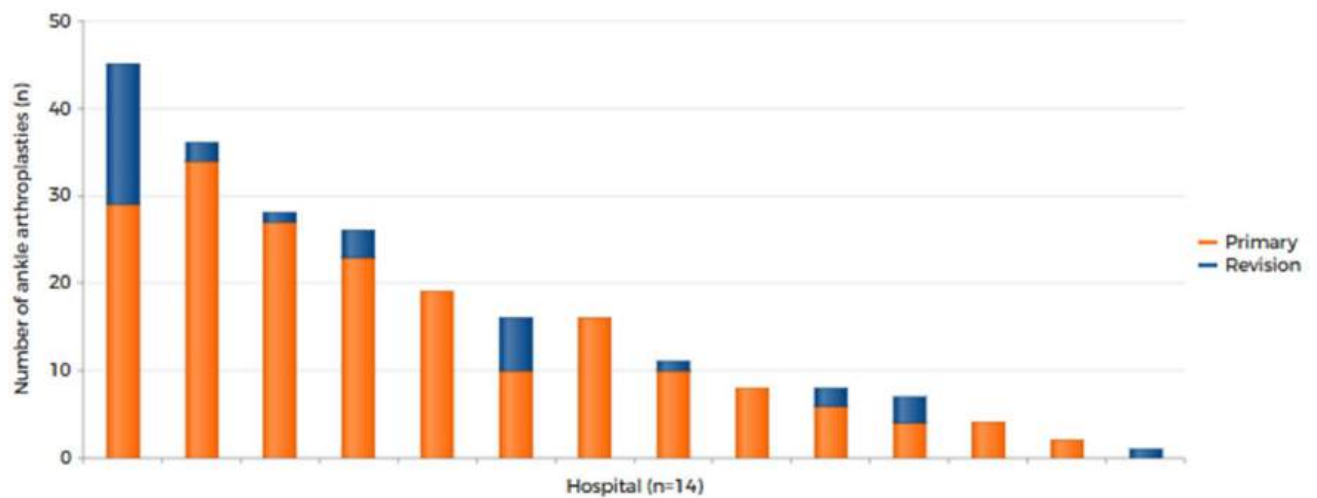
FIGURE Number of primary ankle arthroplasties and ankle revision arthroplasties registered in the LROI in the Netherlands in 2015-2024



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Primary	105	132	115	145	137	123	125	116	168	192	1,358
Revision	19	37	31	29	30	26	26	22	24	35	279
Total (n)	124	169	146	174	167	149	151	138	192	227	1,637

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Type of procedure per hospital

FIGURE Number of primary ankle arthroplasties and ankle revision arthroplasties per hospital in the Netherlands in 2024 (n=227)

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Primary ankle arthroplasty

In this section you will find all the information on primary ankle arthroplasty

Patient characteristics

By diagnosis

TABLE Patient characteristics of all patients with a registered primary ankle arthroplasty by diagnosis in the Netherlands in 2024

	Osteoarthritis	No osteoarthritis	Total
N(%)	166 (86.4)	26 (13.6)	192
Mean age (years) (SD)	70.8 (7)	67.7 (10.2)	70.4 (7.6)
Age (years) (%)			
<50	0	8	1
50-59	7	12	7
60-69	33	35	33
70-79	48	35	46
>80	13	12	13
Gender (%)			
Men	67	65	67
Women	33	35	33
ASA score (%)			
ASA I	12	4	11
ASA II	67	77	69
ASA III-IV	20	19	20
Type of hospital (%)			
General	57	85	60
UMC	6	0	5
Private	37	15	34
Charnley-score (%)			
A One ankle joint affected	69	85	71
B1 Both ankle joints affected	17	0	15
B2 Contralateral ankle joint with a total ankle prosthesis	6	0	5
C Multiple joints affected or chronic disease that affects quality of life	8	15	9
Mean BMI (kg/m²) (SD)	27.5 (4.2)	28.5 (4.5)	27.6 (4.2)
Body Mass Index (kg/m²) (%)			
Underweight (<18.5)	1	0	1
Normal weight (>18.5-25)	32	35	33
Overweight (>25-30)	39	31	38
Obesity (>30-40)	27	35	28
Morbid obesity (>40)	1	0	1
Smoking (%)			
No	92	88	94
Yes	5	12	6

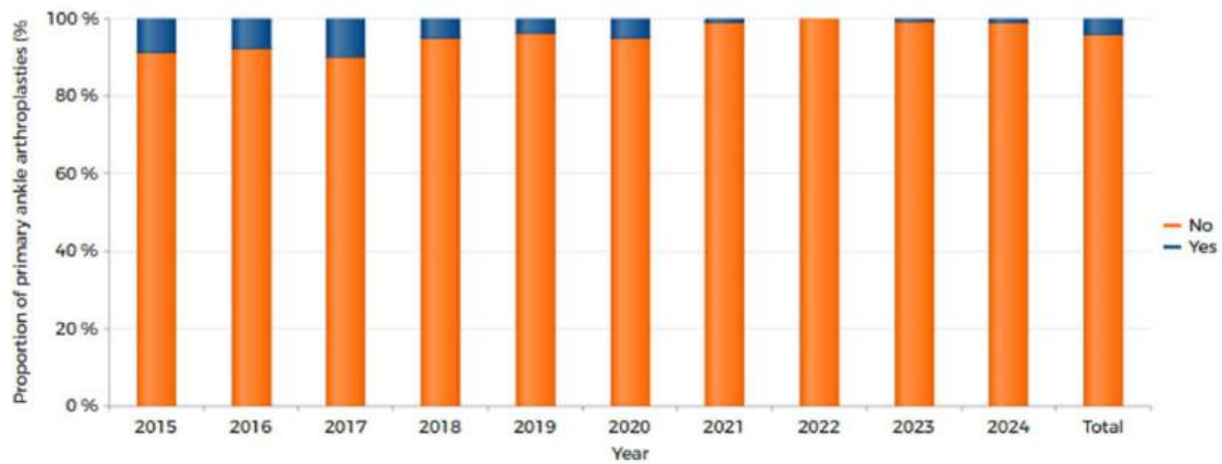
No osteoarthritis: another diagnosis than osteoarthritis registered as primary diagnosis, specifically post-traumatic (n=19) and rheumatoid arthritis (n=7).

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation

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Procedure characteristics

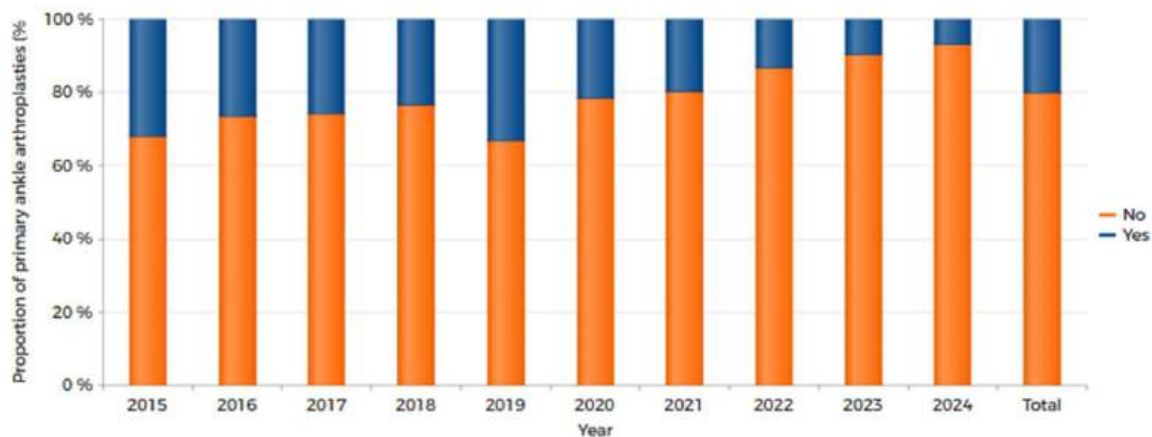
Medial malleolus osteotomy

FIGURE Trend (proportion [%] per year) in medial malleolus osteostomy in primary ankle arthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	91.26	92.31	90.18	95.07	96.32	95.04	99.19	100	99.40	98.95	96.11
Yes	8.74	7.69	9.82	4.93	3.68	4.96	0.81	0	0.60	1.05	3.89
Total (n)	103	130	112	142	136	121	124	112	168	190	1,338

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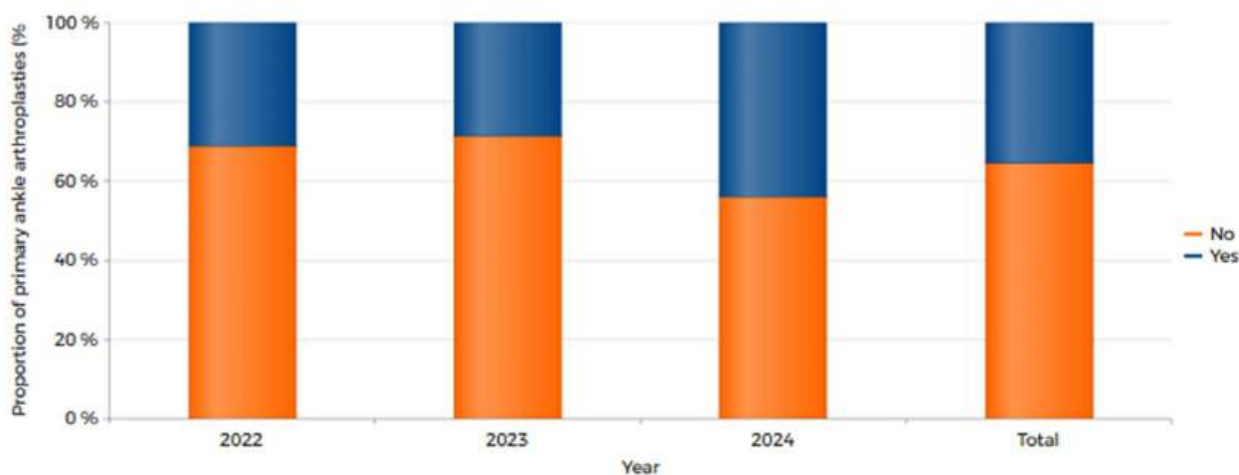
Extension heel cord

FIGURE Trend (proportion [%] per year) in heel cord extension in primary ankle arthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	67.96	73.64	74.11	76.76	66.91	78.51	80.49	86.84	90.48	93.12	79.96
Yes	32.04	26.36	25.89	23.24	33.09	21.49	19.51	13.16	9.52	6.88	20.04
Total (n)	103	129	112	142	136	121	123	114	168	189	1,337

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PSI

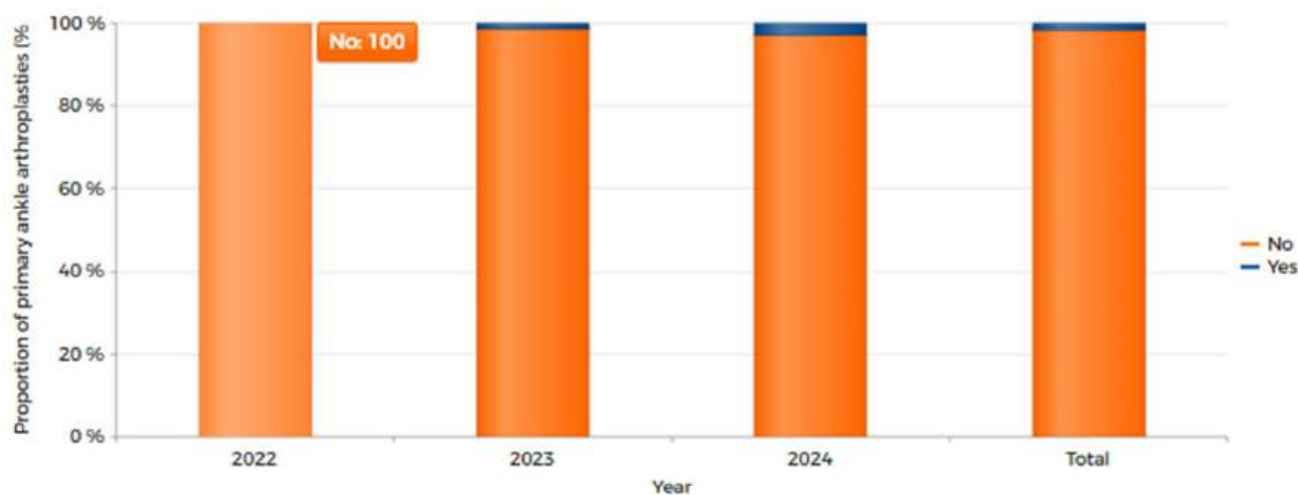
FIGURE Trend (proportion [%] per year) in PSI in primary ankle arthroplasty in the Netherlands in 2022-2024

	2022	2023	2024	Total
No	68.87	71.43	56.25	64.59
Yes	31.13	28.57	43.75	35.41
Total (n)	106	168	192	466

PSI: patient-specific instrumentation

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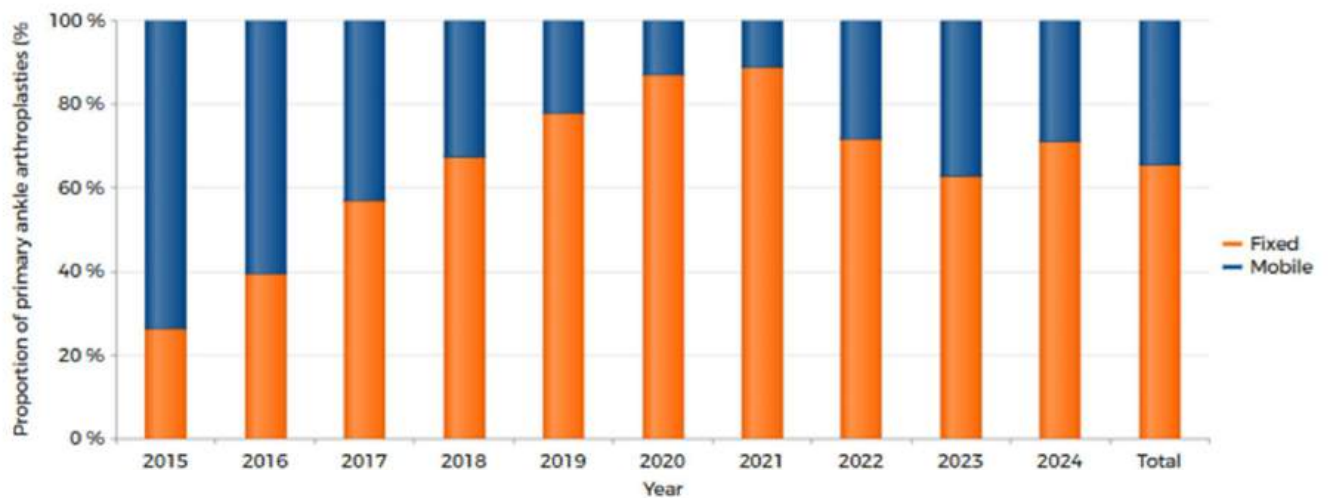
Navigation

FIGURE Trend (proportion [%] per year) in navigation in primary ankle arthroplasty in the Netherlands in 2022-2024

	2022	2023	2024	Total
No	100	98.80	97.38	98.49
Yes	0	1.20	2.62	1.51
Total (n)	106	167	191	464

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Type bearing

FIGURE Trend (proportion [%] per year) in tibial bearing type in primary ankle arthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Fixed	26.32	39.56	57.14	67.54	77.78	87.23	88.89	71.72	62.73	71.20	65.63
Mobile	73.68	60.44	42.86	32.46	22.22	12.77	11.11	28.28	37.27	28.80	34.38
Total (n)	95	91	84	114	108	94	90	99	161	184	1,120

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Most frequently registered- ankle prostheses

TABLE The most frequently registered primary ankle arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Total ankle arthroplasties (n)	116	115	110	161	179
Name; Proportion (%)					
Infinity	36.21	33.91	54.55	60.25	66.48
Hintegra Regular	0.00	0.00	0.00	16.15	20.11
Salto	51.72	59.13	39.09	19.25	6.70
Inbone	1.72	1.74	0.00	1.86	3.35
Taric	0.00	0.00	0.00	2.48	2.23
Quantum	0.00	0.00	0.00	0.00	1.12

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Survival

Short term revision

Revision within 1 year

TABLE Revision procedures within 1 year after primary ankle arthroplasty by year in the Netherlands in 2014-2023

Procedure year	Number of primary ankle arthroplasties	Number of revisions	Percentage revisions
2014	103	0	0.0%
2015	105	3	2.9%
2016	131	0	0.0%
2017	115	0	0.0%
2018	145	2	1.4%
2019	137	1	0.7%
2020	123	1	0.8%
2021	125	2	1.6%
2022	116	2	1.7%
2023	168	3	1.8%

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Time after primary ankle

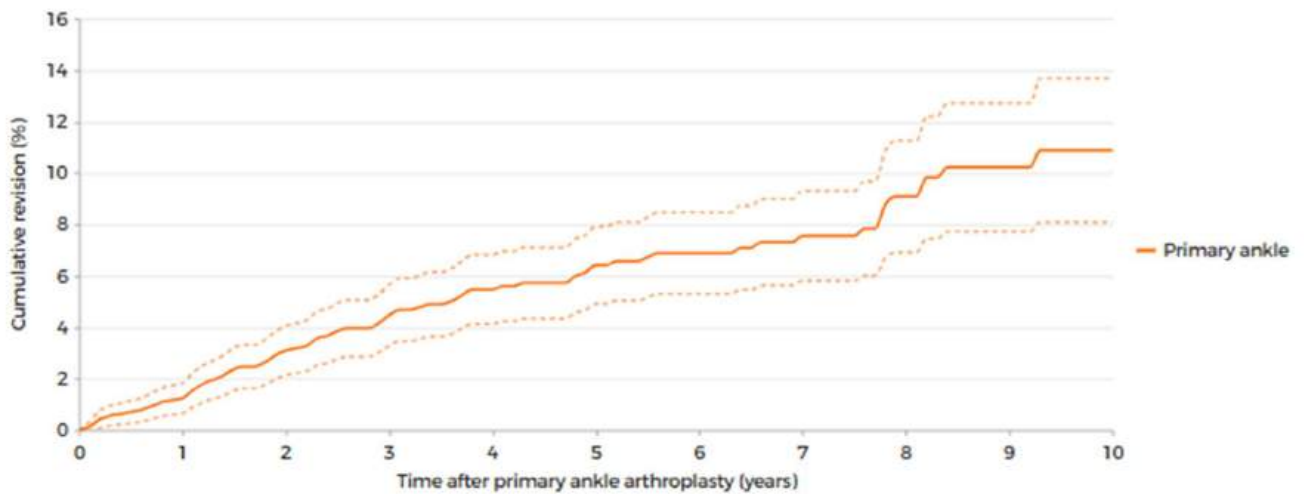
TABLE Time after primary ankle arthroplasty until short-term revision in the Netherlands in 2014-2021 (n=984)

Time after primary ankle	Percentage revisions (%)
Day 0-29	0.10
Day 30-182	0.20
Day 183-364	0.61
Day 365-730 (second year)	2.03
Day 731-1095 (third year)	1.22

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Long term revision

Overall revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary ankle arthroplasties in the Netherlands in 2014-2024 (n=1,460)

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	1yr	3yr	5yr	7yr	10yr
Primary ankle	1.16 (0.59-1.73)	4.16 (3.02-5.30)	6.13 (4.68-7.59)	7.31 (5.63-8.99)	10.89 (8.09-13.69)

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

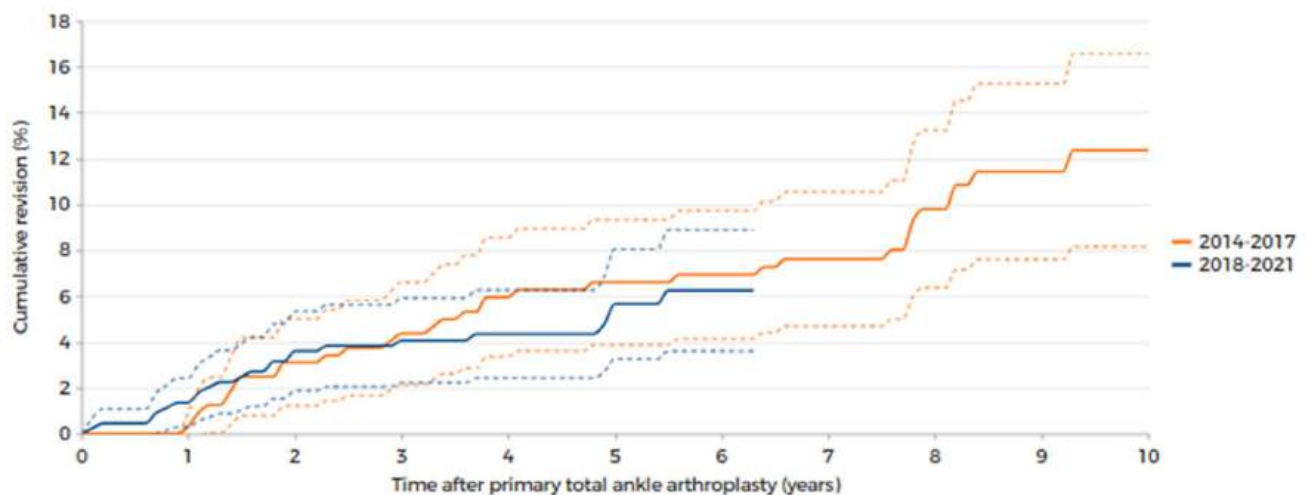
Please note: The number of registered ankle revision arthroplasties is not complete.

CI: confidence interval.

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In 2014-2024, 93 (6.4%) primary ankle arthroplasties were implanted in patients who died within ten years after the primary procedure.

By procedure year

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary total ankle arthroplasties for osteoarthritis by procedure year of primary arthroplasty in the Netherlands in 2014-2024

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	Number (n)	1yr	3yr	5yr	7yr	10yr
2014-2017	323	0.00 (0.00-0.00)	4.05 (1.89-6.21)	6.60 (3.87-9.33)	7.62 (4.69-10.55)	12.37 (8.16-16.58)
2018-2021	445	1.35 (0.28-2.42)	3.84 (2.05-5.63)	4.77 (2.69-6.84)	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.

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Ankle revision arthroplasty

In this section you will find all the information on ankle revision arthroplasty

Revision characteristics

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a ankle revision arthroplasty in the Netherlands in 2016-2024

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Ankle revision arthroplasty (n)	37	31	29	30	26	26	22	24	35	260
Reasons for revision; Proportion (%)										
Cyst formation	21.62	41.94	41.38	53.33	23.08	53.85	31.82	45.83	40.00	38.85
Inlay wear	35.14	45.16	31.03	40.00	30.77	30.77	22.73	37.50	37.14	35.00
Loosening of talus component	29.73	38.71	37.93	40.00	11.54	30.77	31.82	33.33	40.00	33.08
Loosening of tibia component	18.92	22.58	34.48	26.67	19.23	23.08	36.36	29.17	28.57	26.15
Malalignment	8.11	29.03	24.14	26.67	11.54	15.38	22.73	29.17	14.29	19.62
Instability	8.11	25.81	20.69	26.67	19.23	7.69	4.55	16.67	14.29	16.15
Infection	13.51	3.23	24.14	10.00	11.54	15.38	4.55	12.50	25.71	13.85
Peri-articular arthrofibrosis	5.41	9.68	3.45	6.67	23.08	26.92	4.55	12.50	0.00	9.62
Dislocation	5.41	9.68	6.90	10.00	7.69	3.85	0.00	0.00	0.00	
Peri-prosthetic fracture	0.00	3.23	3.45	3.33	7.69	0.00	4.55	0.00	14.29	4.23
Malposition	0.00	0.00	0.00	0.00	0.00	3.85	13.64	12.50	5.71	
Revision after ankle prosthesis removal	0.00	0.00	0.00	0.00	0.00	7.69	0.00	4.17	2.86	
Other	5.41	0.00	10.34	10.00	15.38	3.85	13.64	4.17	2.86	6.92

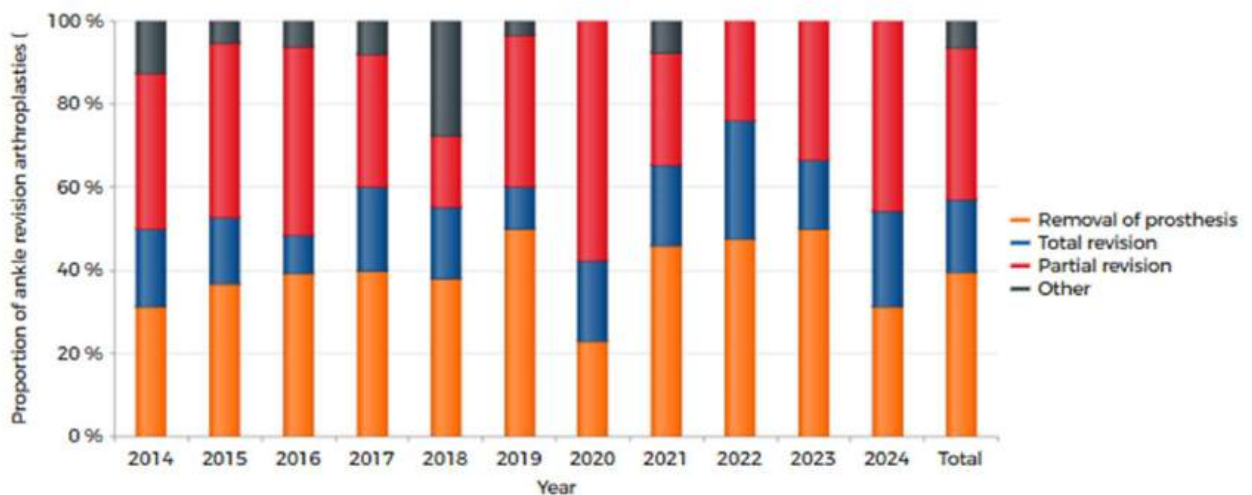
Please note: As of 2022, the registration form has changed. Malposition and removal after ankle revision were not registered before 2022, while dislocation is no longer registered from 2022 onwards.

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

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Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in ankle revision arthroplasties in the Netherlands in 2015-2024



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Removal of prosthesis	31.25	36.84	39.39	40	37.93	50	23.08	46.15	47.62	50	31.43	39.44
Total revision	18.75	15.79	9.09	20	17.24	10	19.23	19.23	28.57	16.67	22.86	17.61
Partial revision	37.50	42.11	45.45	32	17.24	36.67	57.69	26.92	23.81	33.33	45.71	36.62
Other	12.50	5.26	6.06	8	27.59	3.33	0	7.69	0	0	0	6.34
Total (n)	16	19	33	25	29	30	26	26	21	24	35	284

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

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Shoulder arthroplasty

In this section you will find all the information on shoulder arthroplasty

Numbers

Registered procedures

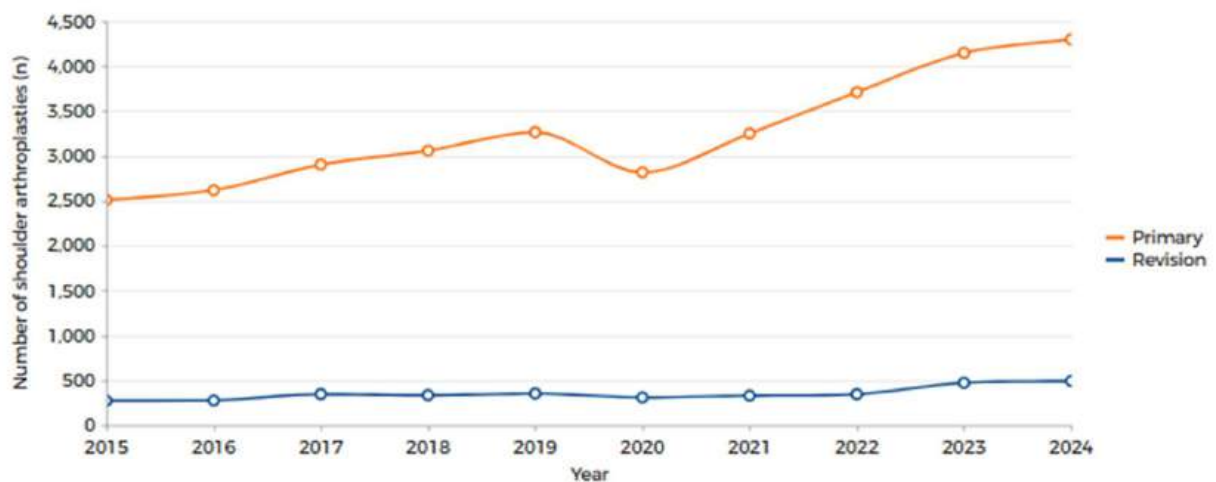
TABLE Number of registered shoulder arthroplasties per year of surgery (2014-2024) in the LROI in April 2025

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	1,991	562	304	38	0	10	346	3,251
2018	2,140	629	250	35	0	6	334	3,394
2019	2,430	600	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	628	186	14	2	1	345	4,057
2023	3,293	680	158	13	3	3	472	4,622
2024	3,508	629	143	15	4	2	492	4,793
Total (n)	25,425	6,210	2,608	361	9	100	3,734	38,447

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Type of procedures

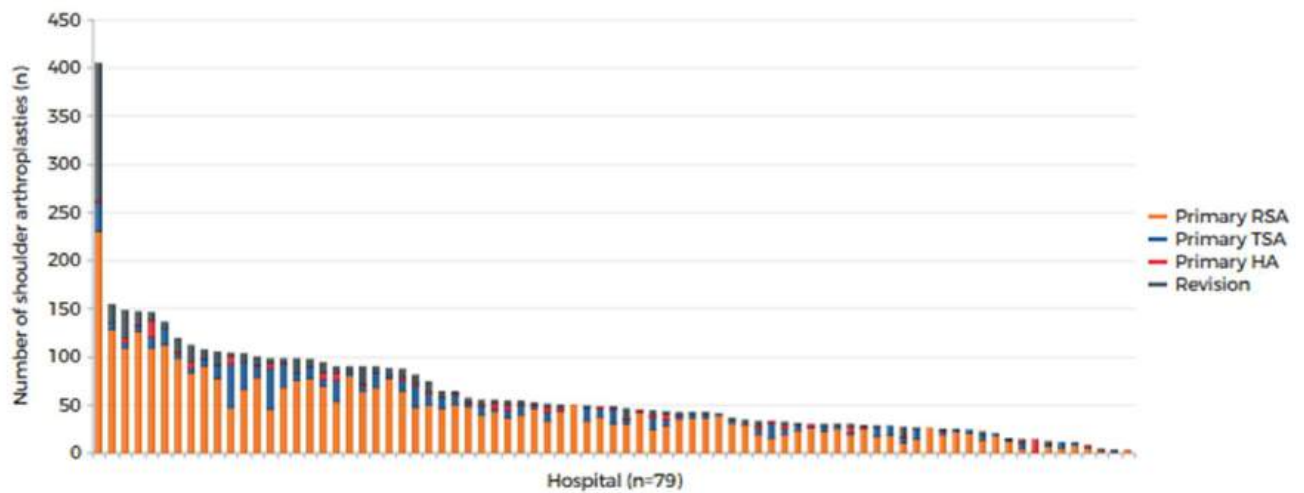
FIGURE Number of primary shoulder arthroplasties and shoulder revision arthroplasties registered in the LROI in the Netherlands 2015-2024



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Primary	2,510	2,619	2,905	3,060	3,266	2,818	3,252	3,712	4,150	4,301	32,593
Revision	272	274	346	334	353	309	329	345	472	492	3,526
Total (n)	2,782	2,893	3,251	3,394	3,619	3,127	3,581	4,057	4,622	4,793	36,119

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Type of procedure per hospital

FIGURE Number of primary shoulder arthroplasties and shoulder revision arthroplasties per hospital in the Netherlands in 2024 (n=4,772)

RSA: reversed shoulder arthroplasty; TSA: total anatomical shoulder arthroplasty; HA: hemiarthroplasty

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Reversed total shoulder arthroplasty

Patient characteristics

by diagnosis

TABLE Patient characteristics of all patients with a registered primary reverse total shoulder arthroplasty by diagnosis in the Netherlands in 2024

	Osteoarthritis	Cuff arthropathy	Fracture	Late post-traumatic	Unrecoverable cuff rupture	Other	Total
N(%)	1,233 (35.2)	803 (22.8)	699 (20)	335 (9.6)	218 (6.2)	220 (6.2)	3,508
Mean age (years) (SD)	74.3 (7.6)	74 (7.3)	72.8 (8.6)	69.7 (10.3)	71.2 (7.4)	70 (10)	73.1 (8.3)
Age (years) (%)							
<50	0	0	0	4	0	2	1
50-59	3	2	6	12	7	11	5
60-69	21	23	25	27	32	29	24
70-79	52	53	48	41	49	45	50
>80	24	22	21	16	12	14	21
Gender (%)							
Men	26	35	21	21	43	21	27
Women	74	65	79	79	57	79	73
ASA score (%)							
ASA I	4	5	5	8	5	5	5
ASA II	54	53	49	49	57	56	53
ASA III-IV	42	42	45	42	39	39	42
Type of hospital (%)							
General	91	85	98	94	88	91	91
UMC	1	1	2	2	0	1	1
Private	8	14	0	4	12	7	8
Specialism (%)							
Orthopaedic surgeon	100	100	96	99	100	98	99
Trauma surgeon	0	0	4	1	0	2	1
Walch-score (%)							
A1	21	52	83	60	82	43	42
A2	36	28	7	22	11	31	30
B1	12	10	1	10	5	7	11
B2	16	6	1	4	1	6	10
B3	9	2	1	2	1	4	5
C	3	0	0	1	0	3	2
Mean BMI (kg/m²) (SD)	28.5 (5.4)	28 (4.8)	27.6 (5.7)	28 (5.5)	28.4 (5.1)	28 (5)	28.1 (5.3)
Body Mass Index (kg/m²) (%)							
Underweight (<18.5)	1	1	2	1	0	1	1
Normal weight (>18.5-25)	26	30	33	31	27	26	29
Overweight (>25-30)	40	39	35	37	41	42	39
Obesity (>30-40)	30	28	24	28	27	25	28
Morbid obesity (>40)	2	2	3	2	3	3	2
Smoking (%)							
No	94	91	89	83	94	88	92
Yes	6	8	10	16	6	11	8

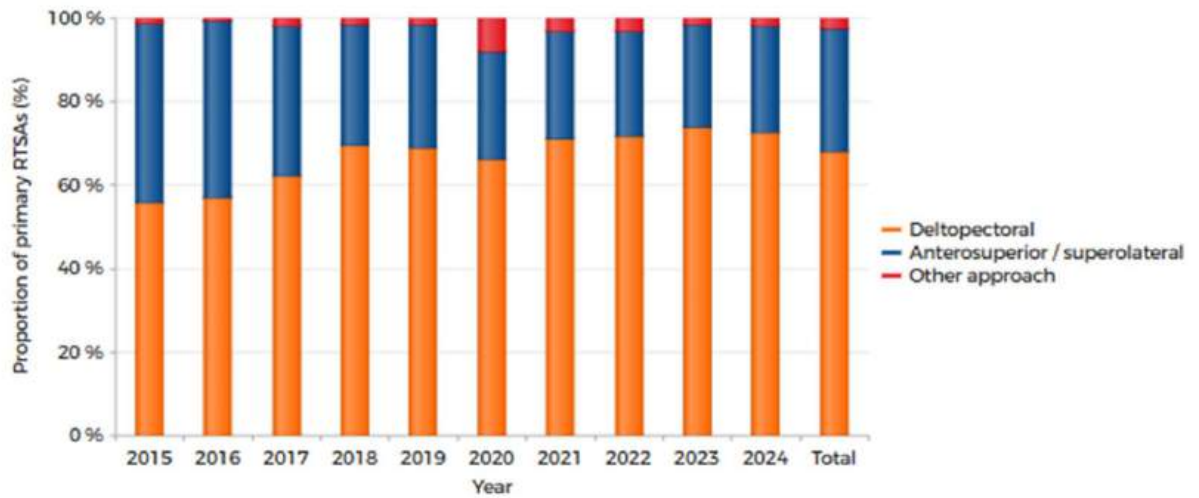
Please note: diagnosis 'Other' (220; 6.2%) includes other (81), rheumatoid arthritis (39), osteonecrosis (29), chronic (sub)dislocation (27), inflammatory arthritis (5), tumour (7), and 32 primary reverse total shoulder arthroplasties where the diagnosis was not registered.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Procedure characteristics

Surgical approach

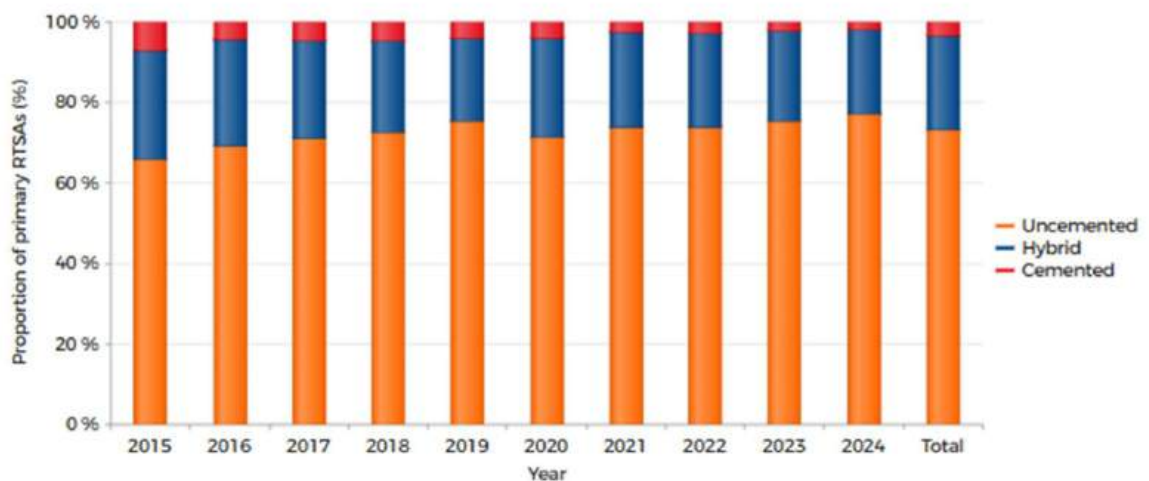
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary reverse total shoulder arthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Deltpectoral	55.73	56.95	62.18	69.55	69.15	66.28	71.24	71.65	73.87	72.84	68.25
Anterosuperior / superolateral	43.18	42.36	36.06	28.77	29.28	25.62	25.74	25.22	24.72	25.32	29.32
Other approach	1.08	0.69	1.76	1.68	1.57	8.10	3.03	3.13	1.41	1.84	2.44
Total (n)	1,570	1,747	1,991	2,138	2,425	2,147	2,444	2,843	3,253	3,361	23,919

RTSA: reverse total shoulder arthroplasty

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Fixation

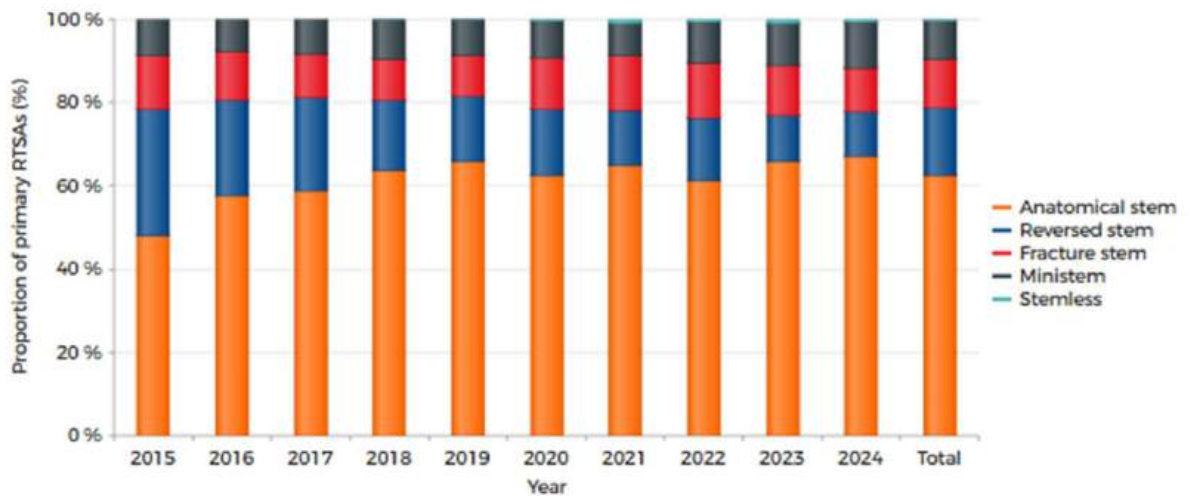
FIGURE Trend (proportion [%] per year) in type of fixation in primary reverse total shoulder arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Uncemented	66.09	69.40	71.18	72.77	75.49	71.46	73.98	73.96	75.49	77.28	73.41
Hybrid	26.83	26.36	24.25	22.51	20.63	24.50	23.45	23.40	22.44	21.00	23.17
Cemented	7.07	4.24	4.58	4.73	3.87	4.04	2.57	2.64	2.07	1.71	3.42
Total (n)	1,569	1,745	1,988	2,137	2,428	2,151	2,448	2,880	3,289	3,504	24,139

RTSA: reverse total shoulder arthroplasty

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Type humeral stem

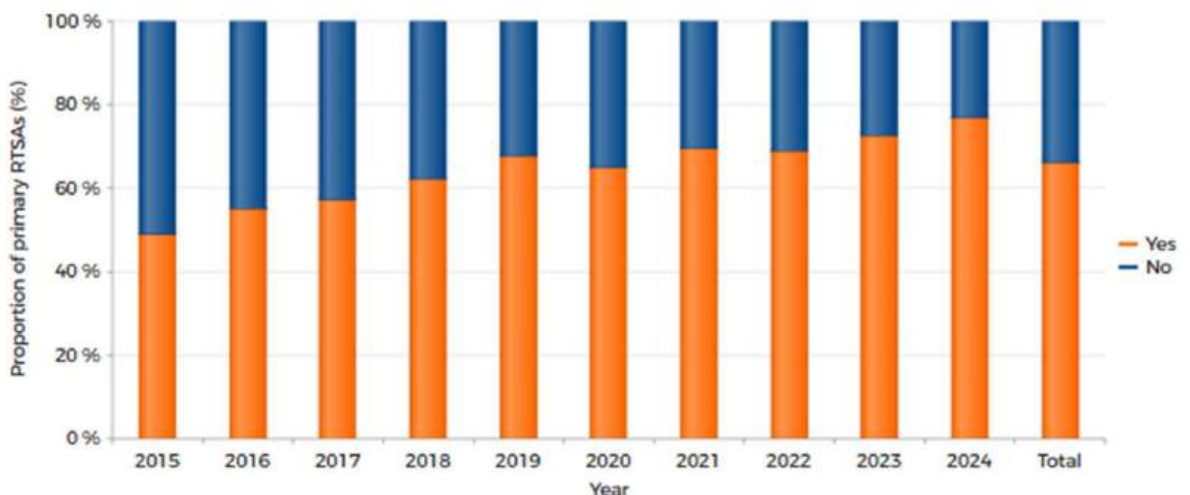
FIGURE Trend (proportion [%] per year) in type of humeral stem in primary reverse total shoulder arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Anatomical stem	48.19	57.64	58.89	63.84	66.00	62.54	65.11	61.44	65.84	67.25	62.65
Reversed stem	30.44	23.14	22.46	16.73	15.60	15.91	13.18	15.03	11.18	10.62	16.19
Fracture stem	12.76	11.60	10.25	10.07	9.94	12.44	13.18	13.00	11.80	10.44	11.53
Ministem	8.61	7.61	8.40	9.31	8.42	8.91	7.75	9.92	10.37	11.12	9.27
Stemless	0	0	0	0.05	0.04	0.21	0.77	0.60	0.81	0.56	0.37
Total (n)	1,544	1,655	1,834	1,966	2,244	1,930	2,336	2,661	3,077	3,371	22,618

RTSA: reverse total shoulder arthroplasty

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Modular humeral stem

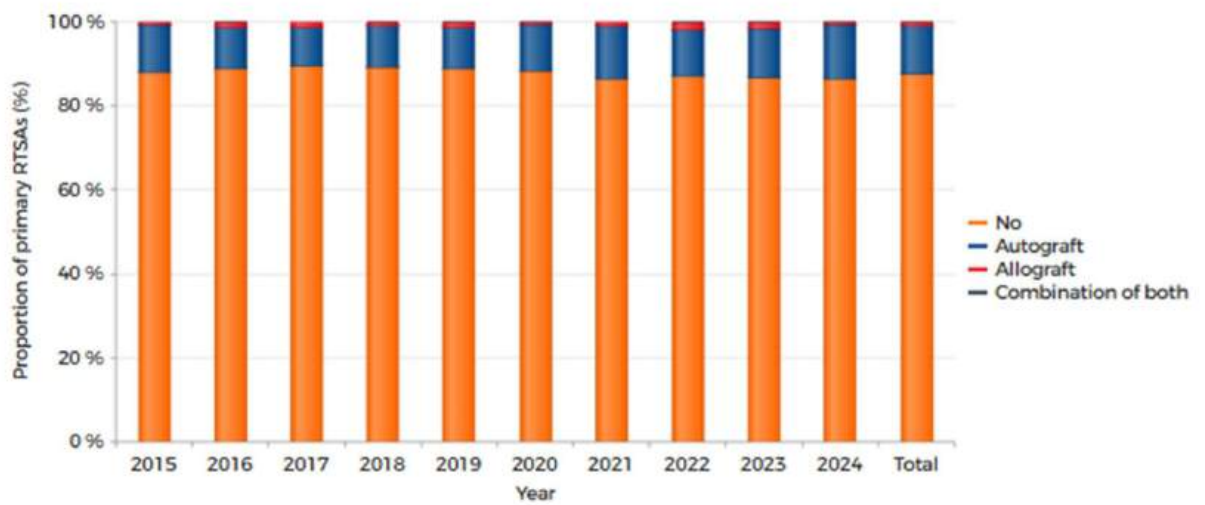
FIGURE Trend (proportion [%] per year) in modular humeral stem in primary reverse total shoulder arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Yes	49.19	55.18	57.35	62.13	67.91	64.89	69.66	68.91	72.62	76.85	66.35
No	50.81	44.82	42.65	37.87	32.09	35.11	30.34	31.09	27.38	23.15	33.65
Total (n)	1,541	1,660	1,836	1,967	2,244	1,931	2,340	2,663	3,079	3,369	22,630

RTSA: reverse total shoulder arthroplasty

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Bonegraft

FIGURE Trend (proportion [%] per year) in type of bonegraft in primary reverse total shoulder arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	88.10	88.88	89.66	89.32	88.82	88.21	86.37	87.21	86.94	86.64	87.82
Autograft	11.44	9.90	9.17	9.81	9.98	11.09	12.64	11.06	11.67	12.78	11.13
Allograft	0.46	1.11	1.17	0.82	1.07	0.65	0.99	1.62	1.32	0.55	1.00
Combination of both	0	0.12	0	0.05	0.13	0.05	0	0.11	0.06	0.03	0.05
Total (n)	1,512	1,717	1,963	2,069	2,335	2,138	2,421	2,838	3,255	3,473	23,721

RTSA: reverse total shoulder arthroplasty

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Most frequently registered humeral stems, humeral liners, glenospheres, metaphyses and glenoid baseplates

TABLE The most frequently registered humeral stems, humeral liners, glenospheres, metaphyses and glenoid baseplates in primary reverse total shoulder arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Humeral stem (n)	1,931	2,340	2,663	3,080	3,372
Name; Proportion (%)					
Delta X-tend	30.81	27.48	30.34	28.44	27.19
Aequalis Ascend Flex	14.09	16.07	13.63	17.21	18.95
Comprehensive Mini	8.91	7.74	9.91	10.36	11.12
SMR stem Cementless	3.73	4.66	3.27	5.55	7.38
Global Unite	3.42	4.27	5.56	5.81	6.58
Aequalis Reversed Fractuur	7.20	7.05	6.68	6.36	5.31
Univers Revers	2.28	1.62	2.33	2.50	4.03
Affinis Inverse	3.63	3.55	4.96	3.73	3.71
Equinox	3.94	4.53	5.26	5.26	3.50
Comprehensive Fracture	3.31	3.25	3.30	3.05	3.05
Year	2020	2021	2022	2023	2024
Humeral liner (n)	1,900	2,274	2,549	2,940	3,234
Name; Proportion (%)					
Delta X-tend	34.26	31.88	37.03	35.82	34.76
Aequalis Ascend Flex	15.37	20.23	15.69	19.69	21.34
Comprehensive	13.26	12.09	14.87	14.93	15.46
SMR reversed liner	4.00	5.32	3.22	5.41	8.10
Aequalis Reversed Fractuur	6.53	6.60	6.24	5.68	4.61
Univers Revers	2.16	1.63	2.31	2.65	4.21
Equinox	5.00	5.10	5.49	5.54	3.71
Affinis Inverse	3.26	3.30	4.98	3.47	3.49
Aequalis Reversed II	7.32	6.07	5.34	3.98	1.95
TM Reverse shoulder	3.05	2.11	2.47	0.99	1.05
Year	2020	2021	2022	2023	2024
Glenosphere (n)	1,841	2,245	2,664	3,097	3,377
Name; Proportion (%)					
Delta X-tend	28.73	27.71	35.36	33.58	33.05
Aequalis Reversed II	26.94	26.19	20.68	22.76	20.25
Comprehensive	13.53	12.43	14.68	13.92	14.72
Perform Reversed	5.11	9.58	7.06	8.49	10.16
SMR reversed head	4.40	5.61	4.32	6.62	9.09
Univers Revers	2.34	1.69	2.21	2.45	3.79
Equinox	5.38	5.17	5.26	5.30	3.46
Affinis Inverse Vitamys	2.39	1.78	3.72	1.81	2.75
TM Reverse Glenoid Heads	8.37	6.77	3.68	1.81	1.36
Affinis Inverse	2.12	2.49	2.70	3.04	1.21

Year	2020	2021	2022	2023	2024
Metaphysis (n)	1,487	1,782	2,049	2,419	2,758
Name; Proportion (%)					
Delta X-tend	29.32	28.28	34.50	31.71	30.42
Aequalis Ascend Flex	19.10	24.35	18.25	23.11	26.36
Comprehensive	16.27	14.42	17.96	17.40	16.97
SMR reversed body	5.72	6.68	4.25	6.95	8.96
Global Unite Fracture	3.16	3.93	4.88	4.09	4.71
Univers Revers	2.69	1.52	2.44	3.14	4.57
Equinox	6.86	6.51	6.78	6.74	4.28
Aequalis Reversed II	9.15	7.58	6.78	4.75	2.21
Affinis Fracture Inverse	1.34	0.45	1.76	0.87	0.87
Anatomical Inverse Humeral Cups	6.32	6.17	2.05	1.07	0.47
Year	2020	2021	2022	2023	2024
Glenoid baseplate (n)	1,934	2,258	2,599	2,971	3,319
Name; Proportion (%)					
Delta X-tend	33.61	29.76	36.44	34.87	33.75
Aequalis Reversed II	25.59	26.13	21.59	24.07	20.70
Comprehensive	12.72	12.36	15.12	14.74	15.06
Perform Reversed	4.65	9.39	7.23	7.91	10.09
SMR uncemented glenoid	4.08	5.36	3.12	5.02	7.98
Equinox	3.93	4.87	5.16	5.35	3.56
Universal Glenoid	2.28	1.68	2.08	0.98	2.08
Affinis Fracture Inverse	0.00	0.58	2.73	1.41	2.05
Univers Revers	0.00	0.00	0.15	1.58	1.87
Trabecular Metal Baseplate	8.01	6.64	3.89	1.88	1.42

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Most frequently registered bone cement

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 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	307	385	427	420	409
Cement name; Proportion (%)					
Palacos R+G	57.33	58.96	48.01	68.57	63.33
Refobacin Bone Cement R	31.92	34.29	45.67	29.29	36.19
Refobacin Plus Bone Cement	10.75	6.75	6.32	2.14	0.49
Year	2020	2021	2022	2023	2024
Separately packed bone cement components (n)	218	183	242	250	248
Cement name; Proportion (%)					
Palacos R+G	59.17	80.87	69.01	62.80	56.45
Copal G+C	3.21	2.73	12.81	16.80	18.95
Palacos MV+G	7.80	4.37	5.79	8.00	10.48
Refobacin Bone Cement R	14.68	3.28	3.31	9.20	7.66
Simplex ABC EC	5.05	0.55	0.00	1.20	2.82
Palacos LV+G	2.75	4.92	4.13	0.80	1.21
Biomet Bone Cement R	0.92	2.19	2.48	0.40	1.21
Biomet Plus Bone Cement	1.38	0.00	0.00	0.00	0.40
Copal G+V	0.00	0.00	0.41	0.40	0.40
Refobacin Revision	0.00	0.55	0.41	0.40	0.40

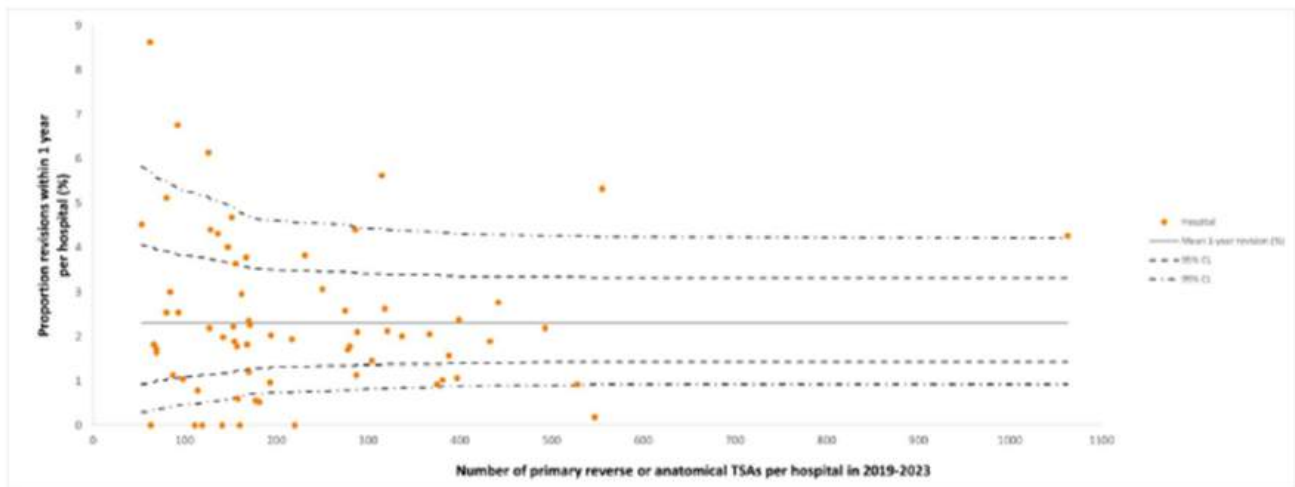
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Survival

Short term revision

Overall revision per hospital

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 2019-2023 (n=16,133)



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 2.31 in the Netherlands in 2019-2023.

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 reverse total shoulder arthroplasties by type of revision in the Netherlands in 2019-2023 (n=13,169)

	Cumulative 1-year revision percentage - Kaplan Meier (95% CI)
Any type of revision	2.47 (2.20-2.73)
Major revision	1.05 (0.87-1.22)
Only humeral stem	0.21 (0.13-0.28)
Only glenoid baseplate	0.39 (0.28-0.50)
Humeral stem and glenoid baseplate	0.31 (0.22-0.41)
Minor revision	1.38 (1.18-1.58)
DAIR	0.39 (0.28-0.50)
No DAIR	0.99 (0.82-1.16)

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 component.

Minor revision: Only liner and/or metaphysis exchange (including DAIR procedures).

CI: confidence interval.

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In 2019-2023, 242 (1.8%) primary reverse total shoulder arthroplasties were implanted in patients who died within one year after the primary procedure.

Time after primary reversed TSA

TABLE Time after primary reverse total shoulder arthroplasty until short-term revision in the Netherlands in 2016-2021 (n=11,134)

Time after primary reverse TSA	Percentage revisions (%)
Day 0-29	0.57
Day 30-182	1.39
Day 183-364	0.62
Day 365-730 (second year)	0.94
Day 731-1095 (third year)	0.56

TSA: total shoulder arthroplasty

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Reasons for revision

TABLE Reasons for revision within one year in patients that underwent a shoulder revision arthroplasty after a primary reverse total shoulder arthroplasty in the Netherlands in 2019-2023 (n=582)

Reasons for revision	Proportion (%)
Instability	42.23
Infection	29.91
Loosening of glenoid component	12.02
Malalignment	7.62
Peri-prosthetic fracture	6.45
Loosening of humeral component	4.99
Progression of osteoarthritis	0.59
Cuff arthropathy	n.a.
Cuff rupture	n.a.
Other	11.73

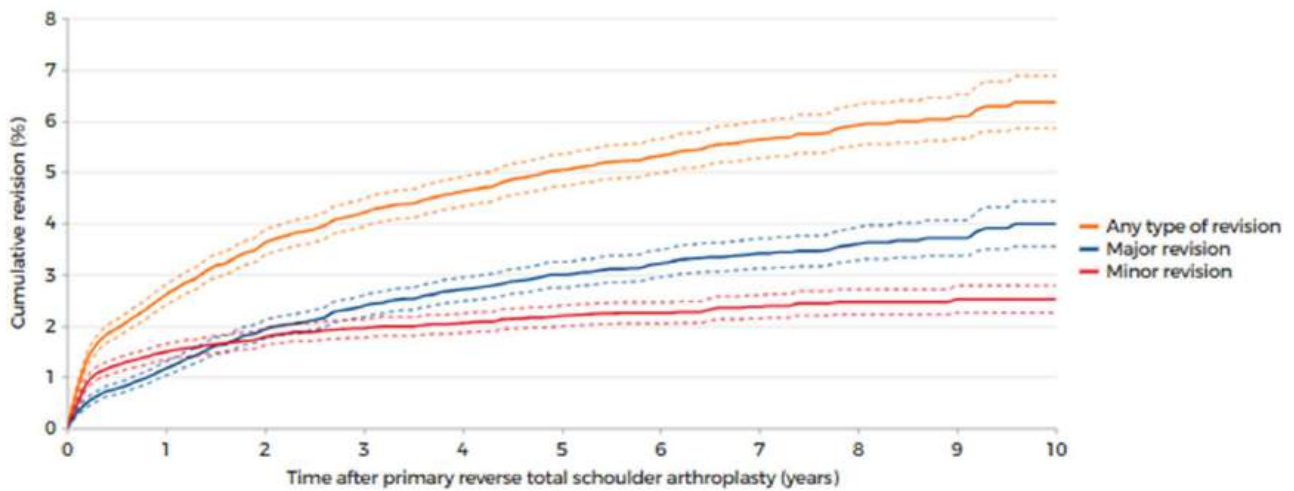
Please note: After a reverse total shoulder arthroplasty, the rotator cuff is no longer present.

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

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Long term revision

By type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary reverse total shoulder arthroplasties by type of revision in the Netherlands in 2014-2024 (n=25,340)

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	1yr	3yr	5yr	7yr	10yr
Any type of revision	2.47 (2.27-2.66)	4.16 (3.89-4.42)	5.02 (4.70-5.33)	5.61 (5.25-5.97)	6.37 (5.85-6.88)
Major revision	1.07 (0.94-1.20)	2.33 (2.13-2.54)	2.99 (2.74-3.24)	3.39 (3.10-3.68)	3.99 (3.55-4.43)
Minor revision	1.45 (1.30-1.60)	1.94 (1.76-2.12)	2.17 (1.97-2.37)	2.37 (2.14-2.59)	2.52 (2.25-2.78)

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: Revision of at least the humeral stem or glenoid baseplate component.

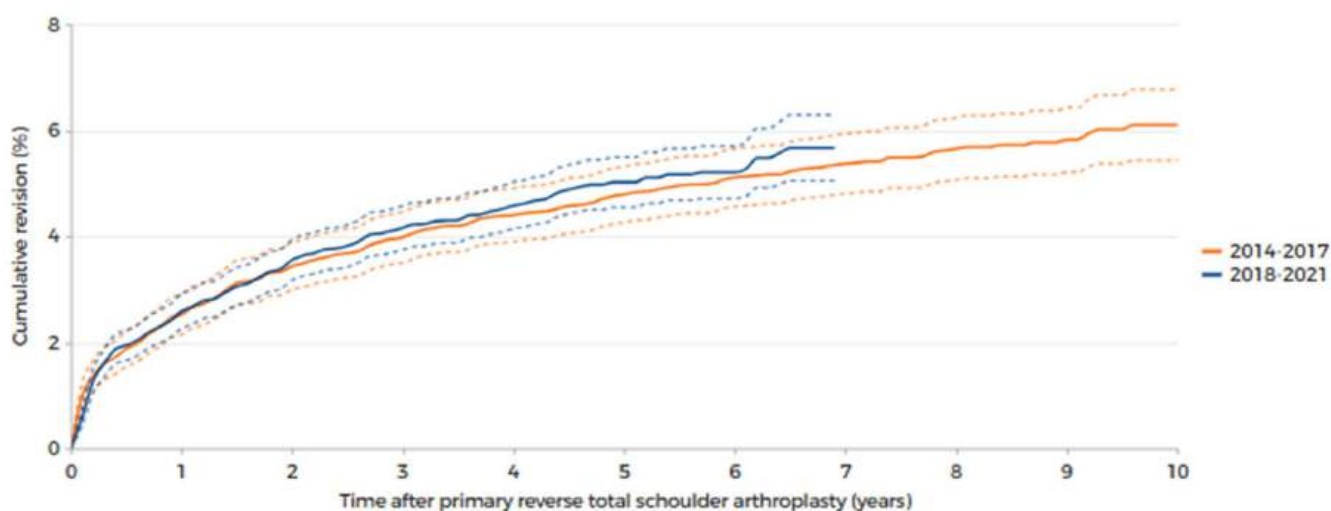
Minor revision: Only liner and/or metaphysis exchange (including DAIR procedures).

RTSA: reverse total shoulder arthroplasty; CI: confidence interval.

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In 2007-2024, 3,772 (14.9%) primary RTSAs were implanted in patients who died within ten years after the primary diagnosis

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 (n=15,683)

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	Number (n)	1yr	3yr	5yr	7yr	10yr
2014-2017	6,536	2.46 (2.09-2.84)	3.95 (3.47-4.43)	4.76 (4.23-5.28)	5.35 (4.79-5.91)	6.10 (5.44-6.77)
2018-2021	9,147	2.41 (2.09-2.72)	4.10 (3.69-4.51)	5.02 (4.55-5.50)	5.67 (5.05-6.29)	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.

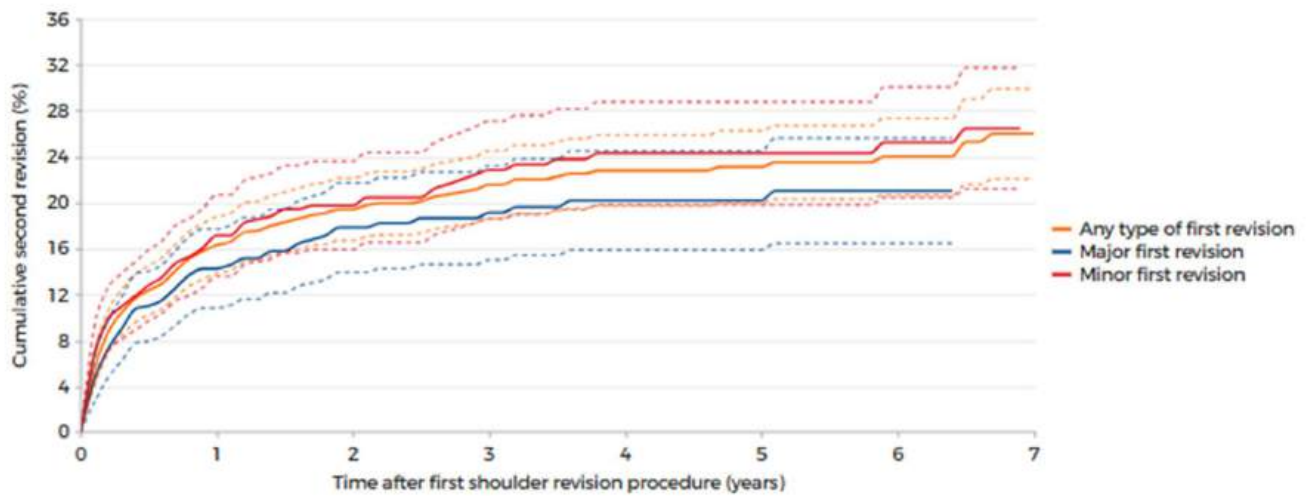
CI: confidence interval.

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Re-revision

By type of first revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties after a one-stage first revision by type of first revision in the Netherlands in 2014-2024 (n=922)



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	Number (n)	1yr	3yr	5yr	7yr
Any type of first revision	922	15.79 (13.36-18.21)	21.15 (18.27-24.03)	23.14 (20.01-26.27)	26.01 (22.08-29.93)
Major first revision	427	14.28 (10.83-17.72)	18.66 (14.64-22.68)	20.20 (15.90-24.51)	n.a.
Minor first revision	466	16.08 (12.64-19.52)	22.44 (18.25-26.63)	24.31 (19.84-28.78)	26.48 (21.21-31.75)

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.

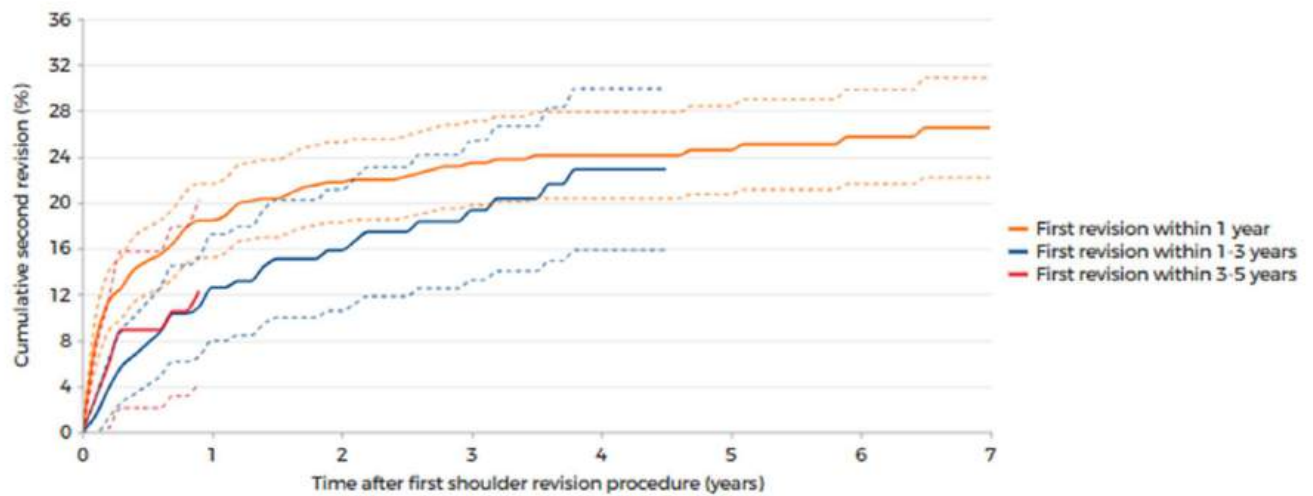
Major revision: Revision of at least the humeral stem or glenoid baseplate component.

Minor revision: Only liner and/or metaphysis exchange (including DAIR procedures).

CI: confidence interval.

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By time to first revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of reverse total shoulder arthroplasties after a one-stage first revision by time to first revision in the Netherlands in 2014-2024 (n=872)

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	Number (n)	1yr	3yr	5yr	7yr
First revision within 1 year	588	18.43 (15.22-21.64)	23.15 (19.51-26.79)	24.58 (20.74-28.42)	26.54 (22.18-30.89)
First revision within 1-3 years	219	10.90 (6.58-15.21)	18.36 (12.52-24.19)	n.a.	n.a.
First revision within 3-5 years	70	12.25 (4.27-20.24)	n.a.	n.a.	n.a.

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.

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Reasons for second revision

TABLE Reasons for second revision in patients who underwent a second revision after a one-stage first revision of a reverse total shoulder arthroplasty in the Netherlands in 2014-2024

Reasons for second revision	Second revision (n=186)
	Proportion (%)
Instability	44.62
Infection	38.71
Malalignment	8.06
Loosening of glenosphere component	8.06
Loosening of humeral stem component	3.23
Peri-prosthetic fracture	5.38
Other	9.68

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

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

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Survival by component

By 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 2014-2024 (n=8,166)

Humeral stem component	Glenosphere component	Primary RTSAs (n)	Hospital (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)					Cumulative revision percentage (95% CI)				
						Total revision	Partial major	Partial minor	Other		1yr	3yr	5yr	7yr	10yr
All RTSAs for osteoarthritis		8,166	89	76 (71 - 80)	258	77	81	82	13		1.65 (1.37-1.94)	3.12 (2.70-3.54)	4.02 (3.51-4.53)	4.35 (3.78-4.93)	4.67 (3.92-5.43)
Delta X-tend	Delta X-tend	2,295	29	75 (71 - 80)	44	11	11	15	5		0.70 (0.41-1.15)	1.88 (1.26-2.49)	2.28 (1.57-2.99)	2.47 (1.67-3.26)	2.68 (1.70-3.57)
Acqualis Ascend Flex	Acqualis Reversed II	978	29	76 (70 - 80)	43	16	14	12	1		2.66 (1.61-3.72)	3.91 (2.56-5.27)	6.31 (4.26-8.35)	7.44 (4.89-9.98)	n.a.
Acqualis Reversed II	Acqualis Reversed II	842	30	76 (72 - 80)	33	10	9	15	1		2.27 (1.26-3.28)	3.61 (2.32-4.91)	5.93 (2.50-5.29)	4.14 (2.72-5.57)	4.90 (2.86-6.95)
COMPREHENSIVE MINI	COMPREHENSIVE	830	28	76 (71 - 80)	13	3	7	3	0		0.76 (0.15-1.36)	1.83 (0.78-2.88)	2.23 (0.92-3.53)	2.23 (0.92-3.53)	n.a.
Acqualis Ascend Flex	Perform Reversed	431	23	76 (71 - 81)	21	4	10	6	1		4.04 (2.09-5.98)	4.89 (2.63-7.16)	7.30 (3.82-10.78)	n.a.	n.a.
Equinox	Equinox	423	5	76 (71 - 81)	19	4	6	9	0		1.26 (0.16-2.36)	4.45 (2.23-6.67)	5.92 (3.17-8.67)	6.96 (3.57-10.36)	n.a.
SMR stem Cementless	SMR reversed head	297	11	77 (73 - 80)	6	3	1	0	1		0.76 (0.00-1.80)	2.47 (0.29-4.69)	3.72 (0.44-6.99)	n.a.	n.a.
Global Unite	Delta X-tend	245	12	75 (70 - 79)	4	1	1	2	0		1.40 (0.00-2.98)	2.50 (0.00-5.14)	n.a.	n.a.	n.a.
Anatomical Shoulder Stems	TM Reverse Glenoid Heads	240	3	75 (71 - 80)	17	7	4	6	0		2.52 (0.53-4.50)	4.34 (1.70-6.97)	8.26 (4.25-12.26)	9.16 (4.82-13.51)	n.a.
Affinis Inverse	Affinis Inverse	183	10	76 (72 - 79)	6	3	2	1	0		1.72 (0.00-3.65)	3.84 (0.80-6.88)	3.84 (0.80-6.88)	n.a.	n.a.
Affinis Inverse	Affinis Inverse Vitamys	159	6	75 (71 - 79)	4	1	1	2	0		1.48 (0.00-3.52)	4.11 (0.00-8.21)	n.a.	n.a.	n.a.
UNIVERS REVERS	UNIVERS REVERS	111	4	75 (69 - 80)	3	0	1	2	0		1.82 (0.00-4.32)	1.82 (0.00-4.32)	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.

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Only combinations with over 50 procedures and reported by at least 3 hospitals 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.

By 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 2014-2024 (n=4,670)

Humeral stem component	Glenosphere component	Primary RTSAs (n)	Hospital (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)					Cumulative revision percentage (95% CI)				
						Total revision	Partial major	Partial minor	Other		1yr	3yr	5yr	7yr	10yr
All RTSAs for fracture		4,670	80	74 (69 - 79)	178	35	49	79	10		2.76 (2.28-3.24)	3.97 (3.37-4.58)	4.51 (3.82-5.21)	5.04 (4.21-5.88)	5.04 (4.21-5.88)
Acqualis Reversed Fracture	Acqualis Reversed II	1,056	31	75 (69 - 79)	16	3	2	9	2		1.48 (0.74-2.23)	1.61 (0.82-2.39)	1.61 (0.82-2.39)	1.61 (0.82-2.39)	n.a.
Delta X-tend	Delta X-tend	980	27	74 (69 - 80)	52	10	10	27	3		3.88 (2.65-5.11)	5.50 (3.99-7.01)	5.91 (4.30-7.52)	6.31 (4.53-8.08)	n.a.
COMPREHENSIVE FRACTURE	COMPREHENSIVE	518	18	75 (70 - 80)	13	2	4	5	1		1.58 (0.49-2.67)	2.77 (1.18-4.35)	3.53 (1.41-5.24)	3.53 (1.41-5.24)	n.a.
Global Unite	Delta X-tend	350	14	74 (70 - 80)	9	3	1	3	2		1.93 (0.39-3.47)	2.47 (0.61-4.32)	n.a.	n.a.	n.a.
Equinox	Equinox	230	4	73 (69 - 78)	9	2	3	4	0		2.19 (0.29-4.09)	3.42 (0.89-5.95)	5.07 (1.01-9.13)	n.a.	n.a.
Acqualis Flex Revise	Perform Reversed	229	3	75 (67 - 77)	15	3	3	9	0		6.04 (2.71-9.37)	8.65 (4.26-13.05)	n.a.	n.a.	n.a.
SMR stem Cementless	SMR reversed head	145	8	75 (67 - 78)	4	0	1	3	0		1.72 (0.00-4.10)	n.a.	n.a.	n.a.	n.a.
Anatomical Shoulder Stems	TM Reverse Glenoid Heads	125	3	75 (67 - 77)	12	0	9	3	0		8.18 (3.32-13.03)	9.15 (5.99-14.32)	n.a.	n.a.	n.a.
COMPREHENSIVE MINI	COMPREHENSIVE	86	13	74 (67 - 80)	4	1	3	0	0		3.82 (0.00-8.07)	n.a.	n.a.	n.a.	n.a.
Affinis Fracture	Affinis Inverse	50*	5	77 (73 - 82)	1	0	0	1	0		n.a.	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary RTSAs in 2024.

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

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Only combinations with over 50 procedures and reported by at least 3 hospitals 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.

By cuff arthropathy

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 2014-2024 (n=6,495)

Humeral stem component	Glenosphere component	Primary RTSAs (n)	Hospital (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)					Cumulative revision percentage (95% CI)				
						Total revision	Partial major	Partial minor	Other		1yr	3yr	5yr	7yr	10yr
All RTSAs for cuff arthropathy		6,495	89	75 (70 - 79)	289	73	82	113	20		2.30 (1.93-2.67)	3.97 (3.46-4.48)	4.91 (4.31-5.51)	5.77 (5.06-6.47)	6.66 (5.72-7.60)
Delta X-tend	Delta X-tend	1,929	30	74 (69 - 78)	70	13	10	41	5		2.11 (1.45-2.77)	3.25 (2.41-4.10)	3.81 (2.86-4.77)	4.34 (3.20-5.42)	5.37 (3.86-6.88)
Acqualis Reversed II	Acqualis Reversed II	875	26	75 (71 - 79)	44	9	14	16	4		2.31 (1.31-3.30)	3.70 (2.42-4.98)	4.59 (3.14-6.04)	5.63 (3.93-7.34)	6.51 (4.41-8.61)
COMPREHENSIVE MINI	COMPREHENSIVE	772	22	75 (71 - 79)	14	5	5	4	0		0.67 (0.06-1.26)	1.86 (0.81-2.91)	2.40 (1.11-3.68)	2.40 (1.11-3.68)	n.a.
Acqualis Ascend Flex	Acqualis Reversed II	724	29	74 (69 - 78)	37	7	17	12	1		3.02 (1.75-4.30)	3.99 (2.47-5.50)	5.69 (3.57-7.80)	7.66 (4.83-10.48)	n.a.
Acqualis Ascend Flex	Perform Reversed	289	12	74 (70 - 79)	22	6	8	4	4		6.17 (3.23-9.11)	8.77 (5.12-12.41)	n.a.	n.a.	n.a.
Equinox	Equinox	192	4	76 (70 - 80)	13	4	5	4	0		1.60 (0.00-3.40)	3.37 (0.71-6.03)	6.84 (2.62-11.07)	n.a.	n.a.
Affinis Inverse	Affinis Inverse	186	7	75 (72 - 79)	12	3	3	6	0		3.26 (0.69-5.82)	5.02 (1.82-8.23)	6.64 (2.79-10.49)	7.67 (3.36-11.97)	n.a.
SMR stem Cementless	SMR reversed head	182	8	76 (70 - 79)	3	0	2	1	0		0.56 (0.00-1.65)	1.48 (0.00-3.59)	1.48 (0.00-3.59)	n.a.	n.a.
Anatomical Shoulder Stems	TM Reverse Glenoid Heads	163	3	76 (71 - 80)	11	5	2	4	0		1.89 (0.00-4.00)	5.12 (1.66-8.57)	6.71 (2.66-10.76)	n.a.	n.a.
UNIVERS REVERS	UNIVERS REVERS	160	4	74 (70 - 78)	11	2	3	2	3		5.33 (1.72-8.93)	6.46 (2.27-10.65)	8.15 (2.89-13.41)	n.a.	n.a.
Global Unite	Delta X-tend	101	10	74 (69 - 79)	2	0	1	0	1		0.00 (0.00-0.00)	n.a.	n.a.	n.a.	n.a.
Affinis Inverse	Affinis Inverse Vitamys	86	6	75 (68 - 80)	4	2	1	1	0		4.33 (0.00-9.15)	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.

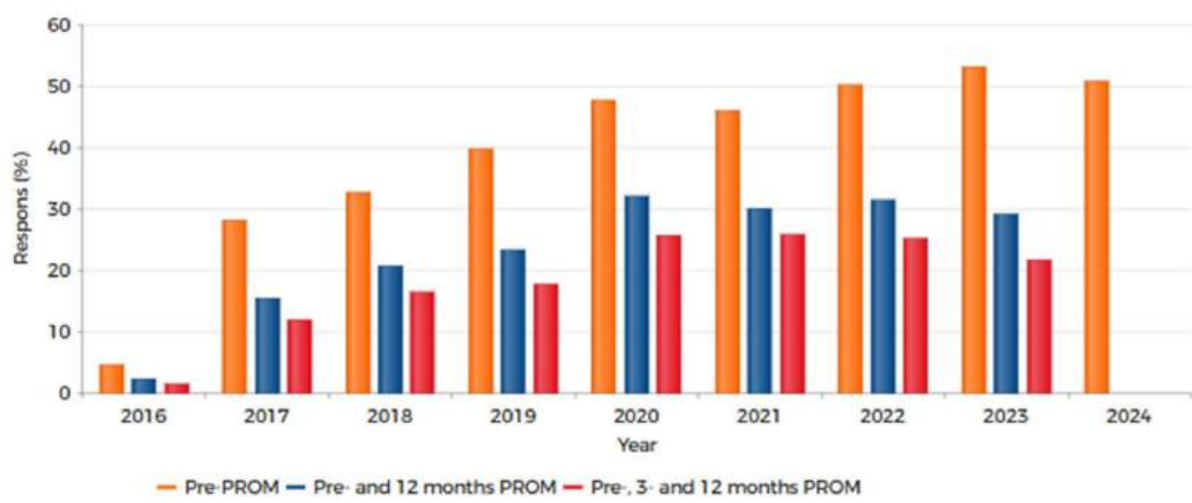
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Only combinations with over 50 procedures and reported by at least 3 hospitals have been listed.

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
Per year

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a primary reverse total shoulder arthroplasty for osteoarthritis in the Netherlands in 2016-2024



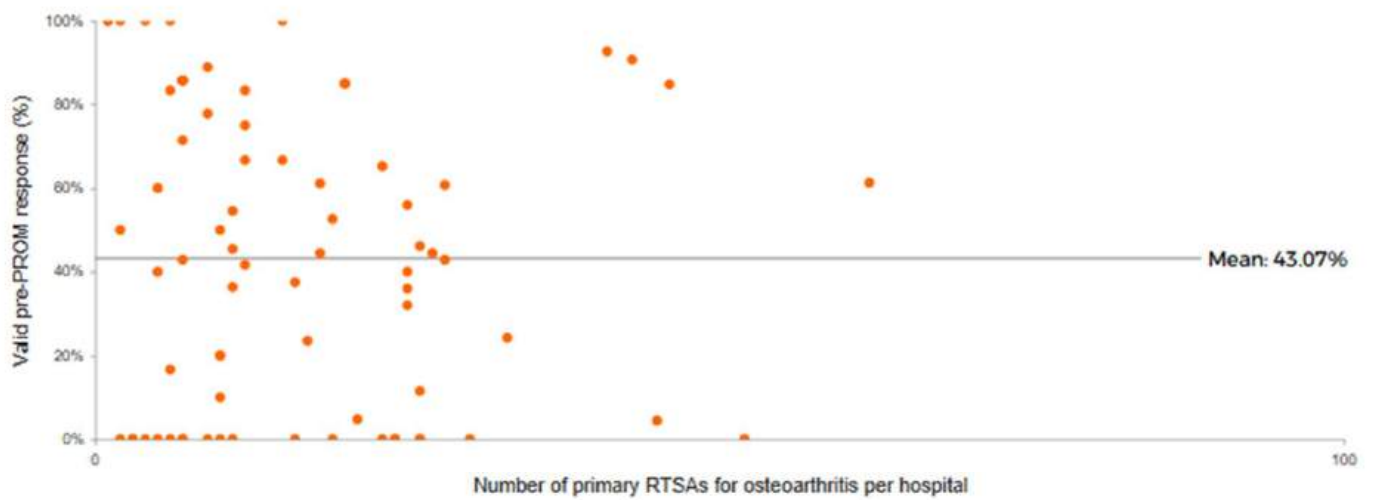
	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	4.52	28.13	32.62	39.78	47.73	46.00	50.25	53.20	50.86
Pre- and 12 months PROM	2.26	15.38	20.57	23.37	32.17	30.00	31.38	29.22	n.a.
Pre-, 3- and 12 months PROM	1.51	11.87	16.49	17.80	25.70	25.86	25.13	21.77	n.a.
Reverse total shoulder arthroplasty for osteoarthritis (n)	398	455	564	646	572	700	800	859	987

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.
PROM: patient reported outcome measure.

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Per pre-PROM per hospital

FIGURE Scatterplot of pre-operative response percentage of patients who underwent a primary reverse total shoulder arthroplasty for osteoarthritis per hospital in the Netherlands in 2024



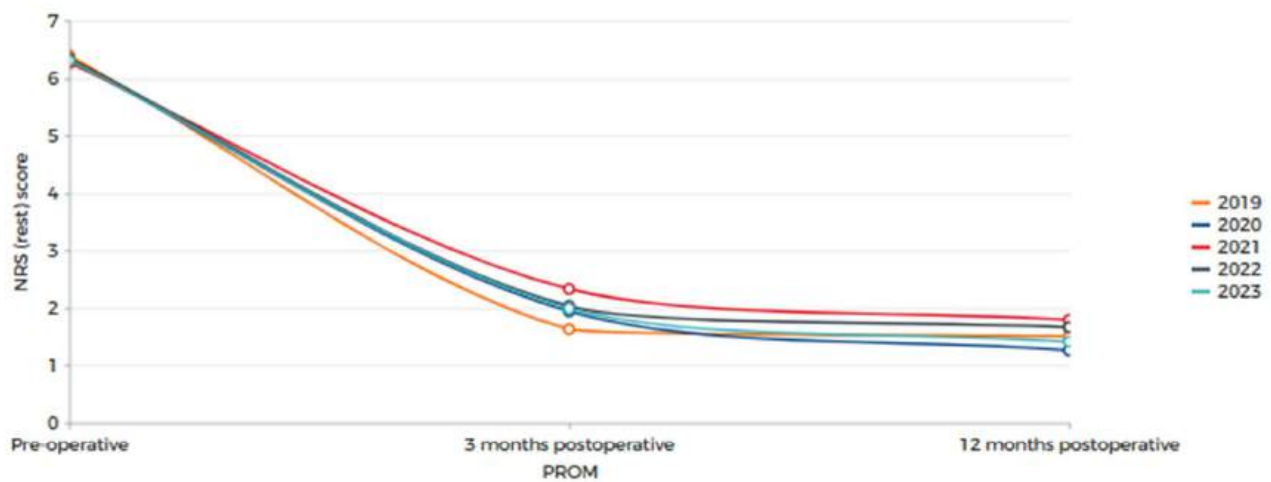
PROM: patient reported outcome measure; RTSA: reverse total shoulder arthroplasty
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The mean pre-operative response rate is 43.1% in the Netherlands in 2024.
Of the 75 hospitals, 28 (37%) scored above the 60% response rate.

Outcomes

NRS (rest)

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a primary reverse total shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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NRS (rest) score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	115	6.39 (5.96-6.82)	1.63 (1.28-1.99)	1.51 (1.09-1.93)
2020	147	6.31 (5.94-6.67)	1.95 (1.56-2.33)	1.27 (0.92-1.61)
2021	182	6.26 (5.94-6.59)	2.33 (1.95-2.72)	1.79 (1.44-2.15)
2022	201	6.34 (6.03-6.64)	2.04 (1.73-2.34)	1.67 (1.34-2.00)
2023	189	6.31 (6.00-6.61)	1.99 (1.66-2.33)	1.41 (1.10-1.73)
Total	834	6.32 (6.17-6.47)	2.02 (1.86-2.18)	1.54 (1.39-1.70)

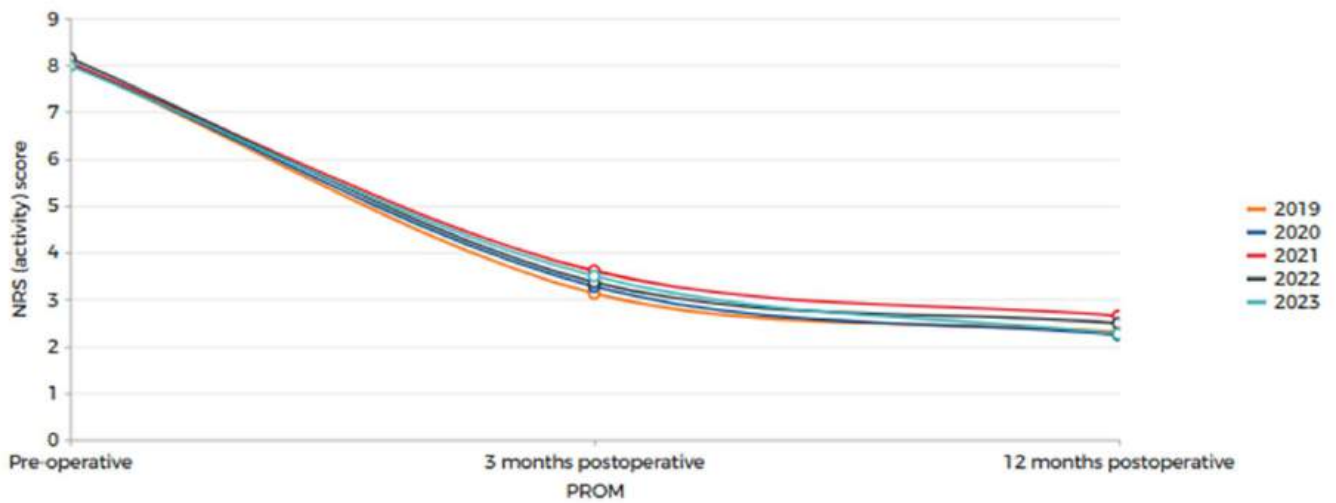
CI: confidence interval

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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 reverse total shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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NRS (activity) score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	115	8.05 (7.74-8.37)	3.13 (2.64-3.61)	2.30 (1.83-2.77)
2020	147	8.05 (7.78-8.32)	3.27 (2.84-3.71)	2.24 (1.82-2.66)
2021	182	8.04 (7.83-8.25)	3.61 (3.23-3.99)	2.64 (2.25-3.04)
2022	201	8.15 (7.97-8.33)	3.37 (3.01-3.72)	2.49 (2.11-2.87)
2023	189	7.99 (7.76-8.22)	3.50 (3.14-3.85)	2.26 (1.90-2.63)
Total	834	8.06 (7.95-8.16)	3.40 (3.22-3.57)	2.40 (2.22-2.58)

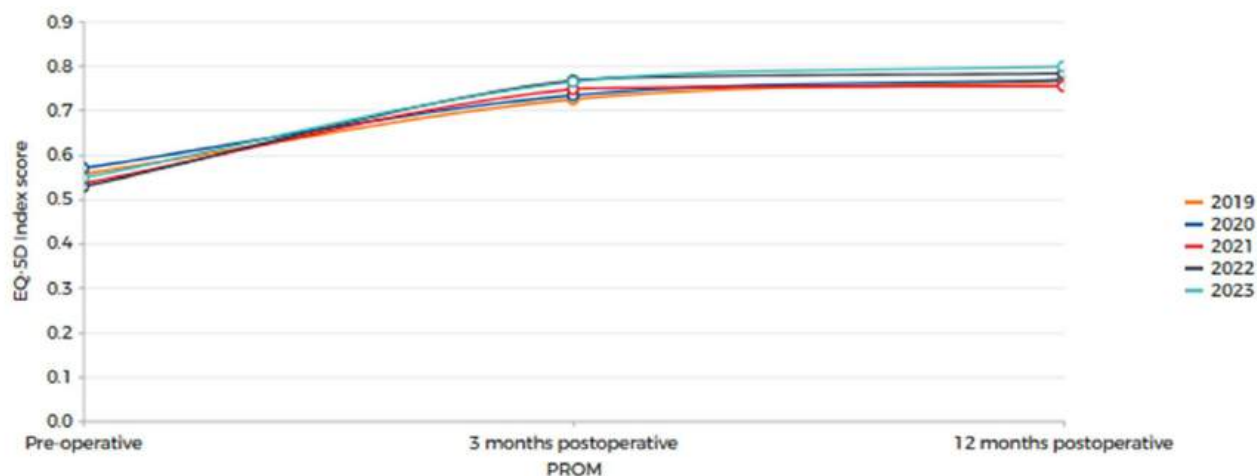
CI: confidence interval

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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.

EQ-5D index score

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D Index scores of patients who underwent a primary reverse total shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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EQ-5D index score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	115	0.56 (0.52-0.60)	0.72 (0.69-0.76)	0.77 (0.73-0.80)
2020	147	0.57 (0.54-0.60)	0.73 (0.70-0.77)	0.77 (0.73-0.80)
2021	182	0.54 (0.50-0.57)	0.75 (0.72-0.77)	0.75 (0.72-0.79)
2022	201	0.53 (0.49-0.56)	0.77 (0.74-0.79)	0.78 (0.75-0.81)
2023	189	0.55 (0.51-0.58)	0.76 (0.74-0.79)	0.80 (0.77-0.82)
Total	834	0.54 (0.53-0.56)	0.75 (0.74-0.76)	0.78 (0.76-0.79)

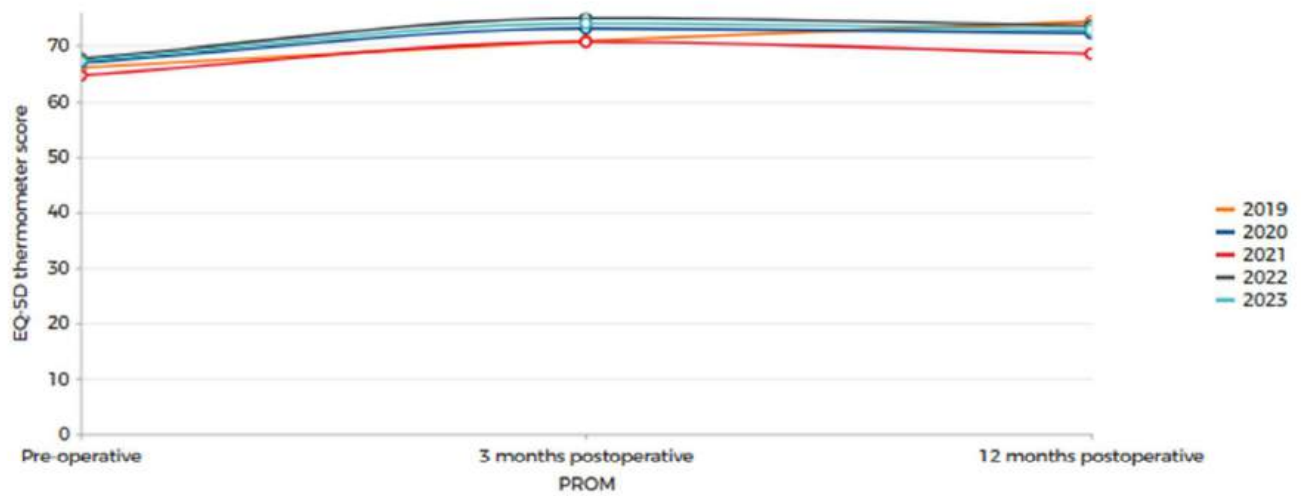
CI: confidence interval

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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

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a primary reverse total shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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EQ-5D thermometer score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	115	66.05 (62.78-69.32)	70.90 (67.03-74.77)	74.32 (70.83-77.82)
2020	147	66.93 (64.11-69.75)	73.13 (70.07-76.19)	72.28 (68.98-75.59)
2021	182	64.64 (61.57-67.72)	70.69 (67.86-73.53)	68.55 (65.02-72.09)
2022	201	67.70 (65.05-70.35)	74.99 (72.50-77.48)	73.62 (70.74-76.49)
2023	189	67.25 (64.39-70.10)	74.05 (71.60-76.49)	72.92 (70.16-75.68)
Total	834	66.55 (65.24-67.87)	72.96 (71.69-74.23)	72.20 (70.77-73.62)

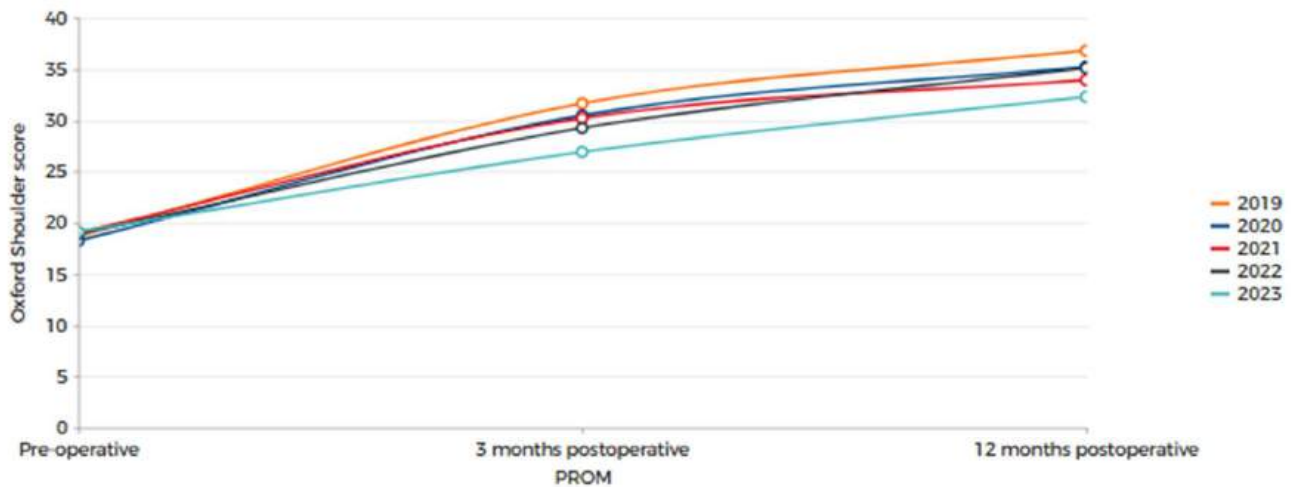
CI: confidence interval

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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 reverse total shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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Oxford Shoulder score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	115	18.71 (17.09-20.33)	31.65 (29.72-33.58)	36.80 (34.84-38.77)
2020	147	18.26 (16.87-19.64)	30.49 (28.60-32.38)	35.25 (33.31-37.19)
2021	182	19.06 (18.00-20.13)	30.22 (28.76-31.67)	33.94 (32.24-35.63)
2022	201	18.90 (17.86-19.93)	29.26 (27.67-30.85)	35.13 (33.43-36.82)
2023	189	19.13 (18.00-20.26)	26.92 (25.28-28.57)	32.30 (30.38-34.23)
Total	834	18.85 (18.31-19.38)	29.47 (28.72-30.23)	34.48 (33.65-35.30)

CI: confidence interval

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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.

Total anatomical shoulder arthroplasty

In this section you will find information on total anatomical shoulder arthroplasty:

Patient characteristics

By diagnosis

TABLE Patient characteristics of all patients with a registered primary total anatomical shoulder arthroplasty by diagnosis in the Netherlands in 2024

	Osteoarthritis	Other	Total
N(%)	568 (90.4)	61 (9.6)	629
Mean age (years) (SD)	65.5 (8.4)	64.6 (10.2)	65.4 (8.6)
Age (years) (%)			
<50	4	10	4
50-59	21	21	21
60-69	42	36	41
70-79	31	28	30
>80	3	5	3
Gender (%)			
Men	38	46	39
Women	62	54	61
ASA score (%)			
ASA I	11	10	11
ASA II	63	51	62
ASA III-IV	26	36	27
Type of hospital (%)			
General	75	87	76
UMC	2	0	2
Private	23	13	22
Specialism (%)			
Orthopaedic surgeon	99	100	100
Trauma surgeon	0	0	0
Walch-score (%)			
A1	34	54	36
A2	37	27	36
B1	15	6	15
B2	10	8	10
B3	2	0	2
C	1	2	1
Mean BMI (kg/m²) (SD)	28.6 (5.2)	28.2 (5.1)	28.5 (5.2)
Body Mass Index (kg/m²) (%)			
Underweight (<=18.5)	0	0	0
Normal weight (>18.5-25)	27	28	28
Overweight (>25-30)	36	36	38
Obesity (>30-40)	30	21	31
Morbid obesity (>40)	3	3	3
Smoking (%)			
No	88	75	87
Yes	11	25	13

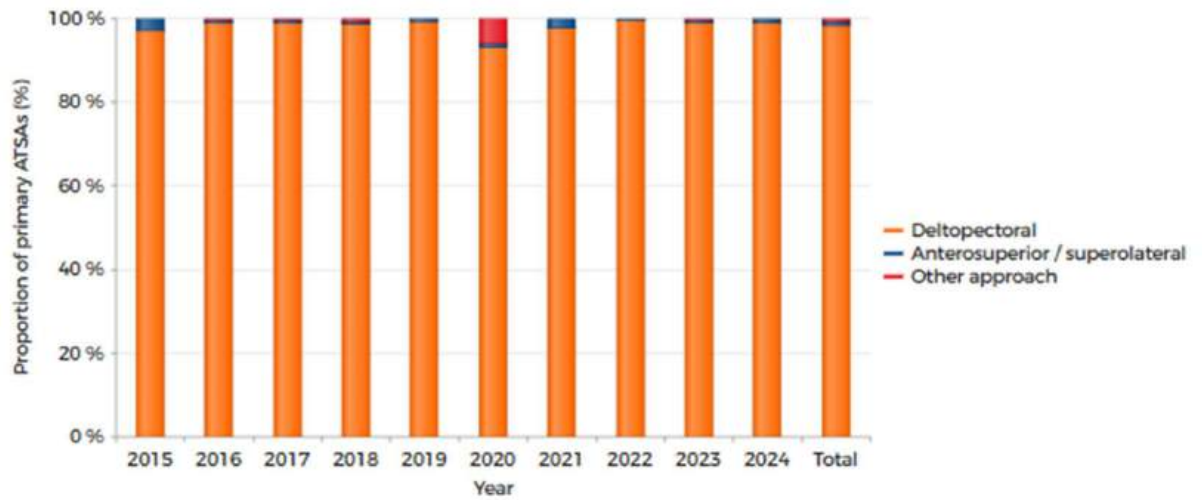
Please note: diagnosis 'Other' (61; 9.6%) includes late post-traumatic (22), osteonecrosis (11), cuff arthropathy (10), other (5), rheumatoid arthritis (4), fracture (1) and 8 primary total anatomical shoulder arthroplasties where the diagnosis was not registered.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Procedure characteristics

Surgical approach

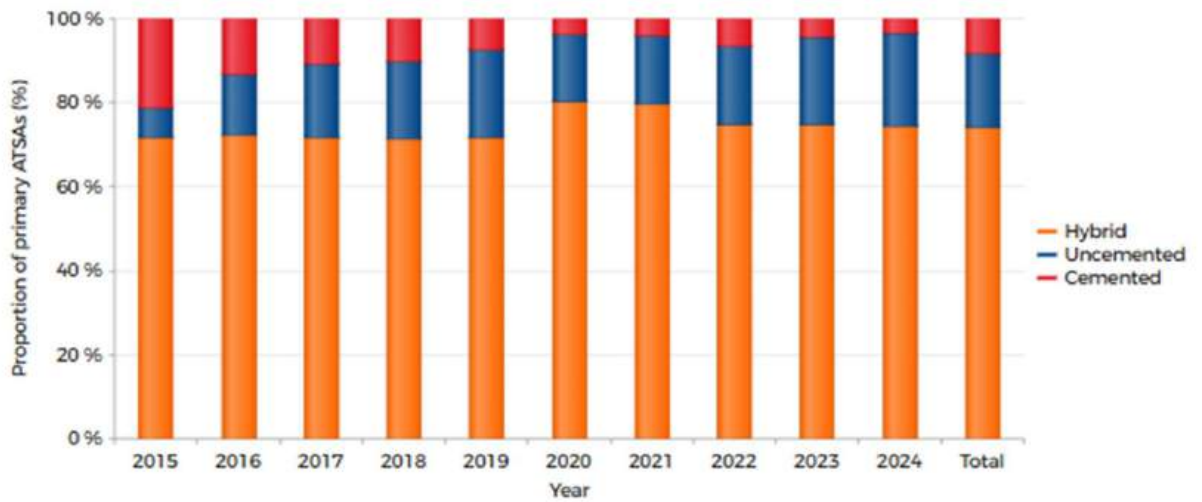
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary total anatomical shoulder arthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Deltopectoral	97.38	99.04	99.11	98.73	99.33	93.18	97.91	99.67	99.10	99.16	98.39
Anterosuperior / superolateral	2.62	0.77	0.71	0.64	0.67	0.85	2.09	0.33	0.60	0.84	0.98
Other approach	0	0.19	0.18	0.64	0	5.97	0	0	0.30	0	0.63
Total (n)	496	519	561	629	597	469	574	608	670	593	5,716

ATSA: total anatomical shoulder arthroplasty

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Fixation

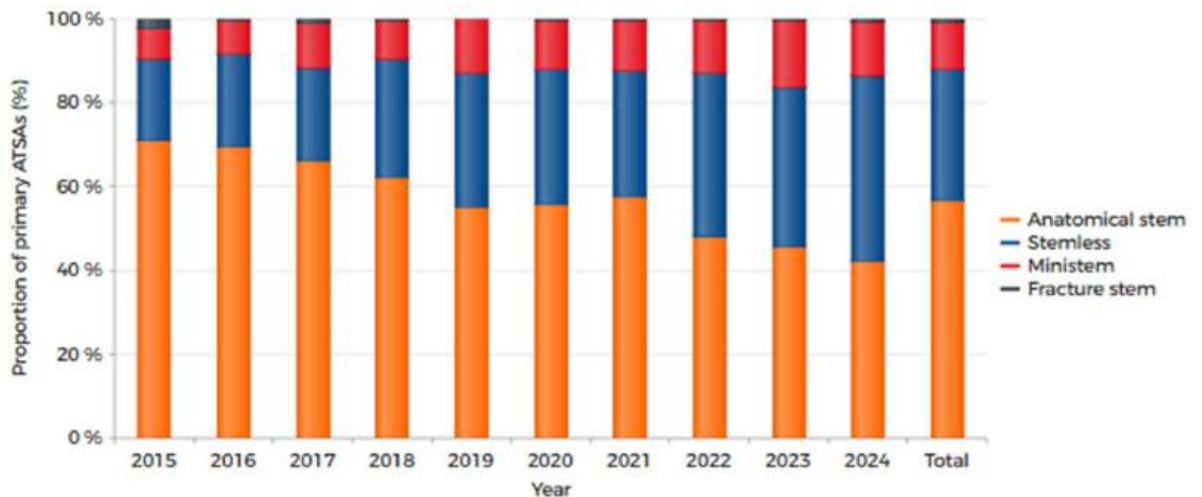
FIGURE Trend (proportion [%] per year) in type of fixation in primary total anatomical shoulder arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Hybrid	71.69	72.45	71.71	71.50	71.67	80.46	79.66	74.96	74.78	74.44	74.27
Uncemented	7.23	14.26	17.44	18.31	21	15.97	16.41	18.50	20.80	22.04	17.52
Cemented	21.08	13.29	10.85	10.19	7.33	3.57	3.93	6.54	4.42	3.51	8.21
Total (n)	498	519	562	628	600	476	585	627	678	626	5,799

ATSA: total anatomical shoulder arthroplasty

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Type humeral stem

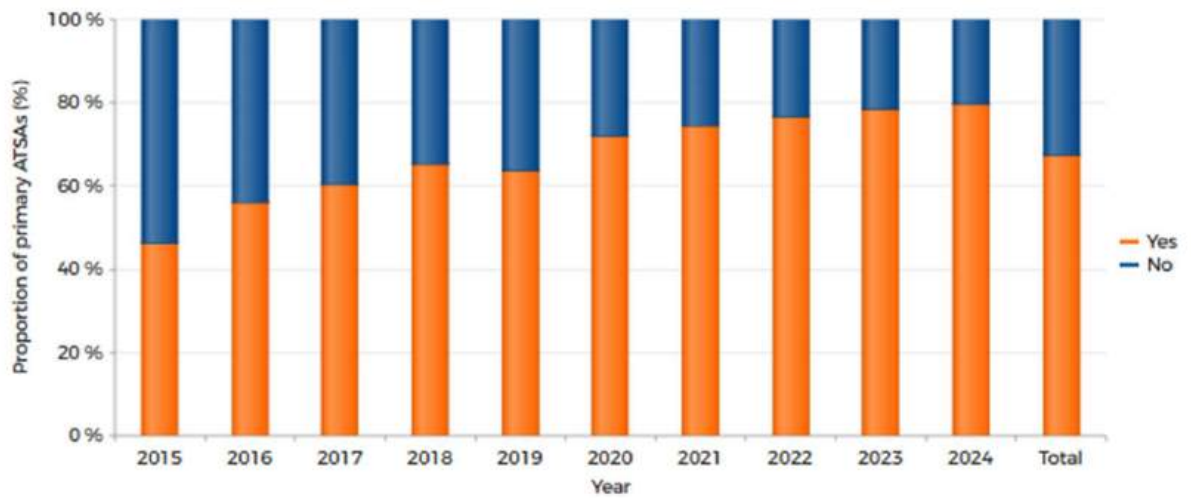
FIGURE Trend (proportion [%] per year) in type of humeral stem in primary total anatomical shoulder arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Anatomical stem	71.10	69.58	66.11	62.38	55.21	55.79	57.75	48.11	45.85	42.44	56.66
Stemless	19.27	22.08	22.25	28.17	31.85	32.11	30.04	39.14	38.04	43.99	31.31
Ministern	7.34	8.13	10.60	9.26	12.93	11.84	12.02	12.57	15.95	13.06	11.55
Fracture stem	2.29	0.21	1.04	0.19	0	0.26	0.19	0.18	0.17	0.52	0.47
Total (n)	436	480	481	529	518	380	516	557	602	582	5,081

ATSA: total anatomical shoulder arthroplasty

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Modular humeral stem

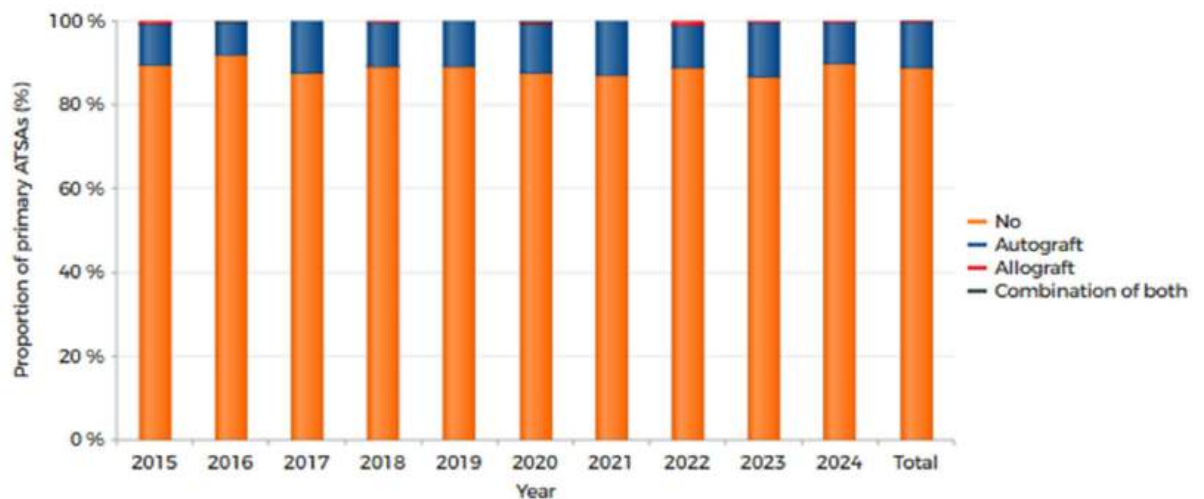
FIGURE Trend (proportion [%] per year) in modular humeral stem in primary total anatomical shoulder arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Yes	46.33	56.16	60.29	65.28	63.79	72.24	74.64	76.65	78.49	79.82	67.44
No	53.67	43.84	39.71	34.72	36.21	27.76	25.36	23.35	21.51	20.18	32.56
Total (n)	436	479	481	504	486	353	481	484	516	451	4,671

ATSA: total anatomical shoulder arthroplasty

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Bonegraft

FIGURE Trend (proportion [%] per year) in type of bonegraft in primary total anatomical shoulder arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	89.71	92.11	87.59	89.20	89.24	87.61	87.25	89.05	86.95	89.97	88.84
Autograft	9.67	7.69	12.41	10.63	10.76	11.73	12.75	10.12	12.59	9.71	10.84
Allograft	0.62	0	0	0.17	0	0.44	0	0.83	0.46	0.32	0.29
Combination of both	0	0.20	0	0	0	0.22	0	0	0	0	0.04
Total (n)	486	507	556	602	567	452	557	603	659	618	5,607

ATSA: total anatomical shoulder arthroplasty

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Most frequently registered humeral stem, humeral head, glenoid

TABLE The most frequently registered humeral stems, humeral heads and glenoid components in primary total anatomical shoulder arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Humeral stem (n)	380	516	557	602	582
Name; Proportion (%)					
Aequalis Ascend Flex	33.95	36.82	33.57	34.55	30.76
Global Icon	7.11	6.59	12.57	13.46	20.10
SMR Stemless	7.63	5.04	9.52	10.80	12.89
Affinis Short	8.68	7.75	9.87	13.62	10.82
Global Unite	11.58	8.33	7.90	7.31	7.73
Comprehensive Nano	7.37	10.47	10.95	9.63	5.84
Eclipse	1.32	1.74	0.90	0.33	2.41
Comprehensive Mini	3.16	4.26	2.69	2.33	2.23
Equinox	0.79	3.49	2.69	1.66	2.06
Simpliciti Shoulder System	3.68	1.36	2.33	2.49	1.89
Year	2020	2021	2022	2023	2024
Humeral head (n)	393	531	571	606	575
Name; Proportion (%)					
Aequalis Ascend Flex	35.37	36.91	33.80	34.49	31.13
Global Icon	6.62	6.59	12.78	13.20	20.00
SMR head	8.40	7.53	9.11	10.73	12.87
Affinis Short	7.89	7.34	8.93	13.20	10.43
Comprehensive	10.43	14.50	13.13	12.21	8.52
Global Unite/ Global AP	16.03	12.62	10.86	8.09	8.17
Simpliciti Shoulder System	4.58	2.45	2.63	3.30	3.13
Eclipse	3.31	3.01	3.33	2.15	2.43
Equinox	1.78	3.39	2.45	1.65	2.09
Sidus Heads	4.33	5.08	2.63	0.66	0.87
Year	2020	2021	2022	2023	2024
Glenoid (n)	392	541	573	613	581
Name; Proportion (%)					
Aequalis Perform Keeled	27.55	27.73	26.00	27.08	20.83
Global APG+	23.47	17.93	24.78	21.53	27.88
Comprehensive	11.22	14.97	13.79	13.05	7.75
Aequalis Perform Pegged	9.44	10.54	9.77	11.09	13.77
SMR TT hybrid glenoid	2.55	4.99	5.76	7.99	11.36
Affinis Vitamys	2.81	5.18	4.71	6.53	5.85
Affinis	5.87	2.40	4.36	5.38	3.61
SMR uncemented glenoid	4.34	4.44	1.40	1.96	1.89
Equinox Cage	1.79	3.33	2.62	1.63	2.24
Affinis Vitamys uncemented	0.00	0.00	0.52	1.47	1.38

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Most frequently registered bone cement

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 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	182	284	325	308	278
Cement name; Proportion (%)					
Palacos R+C	53.85	44.01	40.31	48.05	51.08
Refobacin Bone Cement R	36.81	49.30	49.85	45.78	46.40
Refobacin Plus Bone Cement	9.34	6.69	9.85	6.17	2.52
Year	2020	2021	2022	2023	2024
Separately packed bone cement components (n)	134	129	121	123	106
Cement name; Proportion (%)					
Palacos R+C	61.94	78.29	46.28	41.46	48.11
Copal G+C	0.00	0.00	24.79	23.58	25.47
Simplex ABC EC	12.69	6.98	14.05	11.38	11.32
Subiton G	2.24	2.33	3.31	4.88	6.60
Refobacin Bone Cement R	19.40	5.43	4.13	15.45	5.66
Biomet Bone Cement R	2.24	3.88	3.31	2.44	1.89
COPAL G+V	0.00	0.00	0.00	0.00	0.94

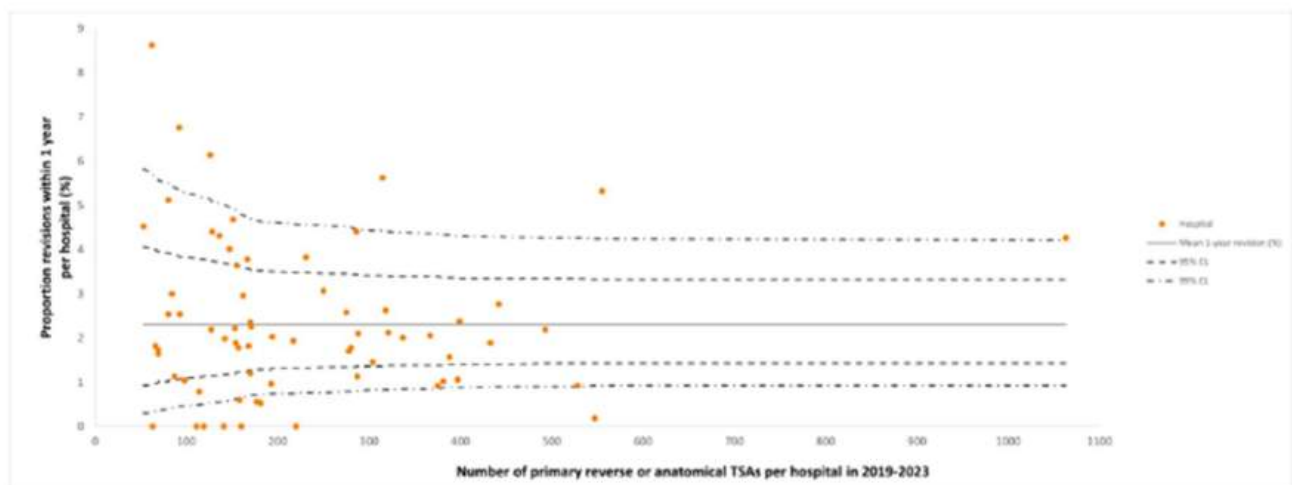
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Survival

Short term revision

Overall revision per hospital

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 2019-2023 (n=16,133)



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 2.31 in the Netherlands in 2019-2023.
Control limits indicate the plausible range of outcome if all hospitals perform equally well.

By type of revision within 1 year

TABLE Time after primary total anatomical shoulder arthroplasty until short-term revision in the Netherlands in 2016-2021 (n=2,842)

Time after primary anatomical TSA	Percentage revisions (%)
Day 0-29	0.14
Day 30-182	0.49
Day 183-364	0.74
Day 365-730 (second year)	1.97
Day 731-1095 (third year)	0.95

TSA: total shoulder arthroplasty

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Time after primary anatomical TSA

TABLE Time after primary total anatomical shoulder arthroplasty until short-term revision in the Netherlands in 2016-2021 (n=2,842)

Time after primary anatomical TSA	Percentage revisions (%)
Day 0-29	0.14
Day 30-182	0.49
Day 183-364	0.74
Day 365-730 (second year)	1.97
Day 731-1095 (third year)	0.95

TSA: total shoulder arthroplasty

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Reasons for revision by type of revision

TABLE Reasons for revision within one year in patients that underwent a shoulder revision arthroplasty after a primary total anatomical shoulder arthroplasty in the Netherlands in 2019-2023 (n=56)

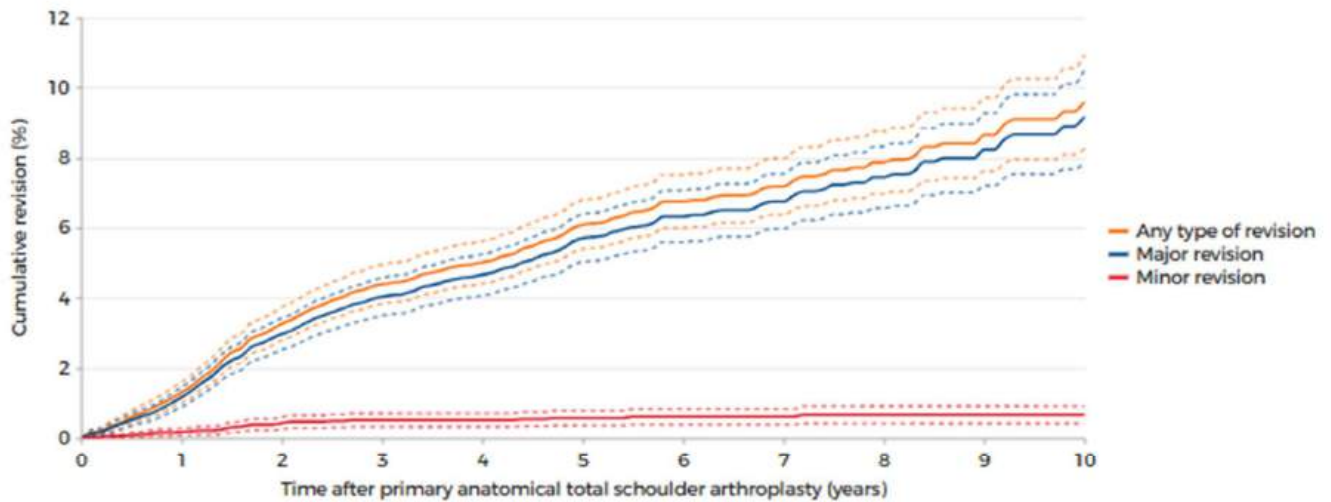
Reasons for revision	Proportion (%)
Cuff rupture	41.94
Instability	16.13
Loosening of glenoid component	16.13
Malalignment	12.90
Peri-prosthetic fracture	9.68
Loosening of humeral component	6.45
Cuff arthropathy	6.45
Infection	3.23
Progression of osteoarthritis	0.00
Other	12.90

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

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Long term revision

By type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary anatomical total shoulder arthroplasties by type of revision in the Netherlands in 2014-2024 (n=6,193)

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	1yr	3yr	5yr	7yr	10yr
Any type of revision	1.14 (0.87-1.41)	4.32 (3.76-4.87)	5.99 (5.30-6.68)	7.18 (6.37-7.98)	9.32 (8.09-10.55)
Major revision	1.00 (0.75-1.26)	3.96 (3.43-4.49)	5.61 (4.93-6.28)	6.75 (5.97-7.54)	8.89 (7.67-10.11)
Minor revision	0.15 (0.05-0.25)	0.51 (0.32-0.70)	0.57 (0.36-0.78)	0.61 (0.38-0.83)	0.66 (0.42-0.91)

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: Revision of at least the humeral stem or glenoid component.

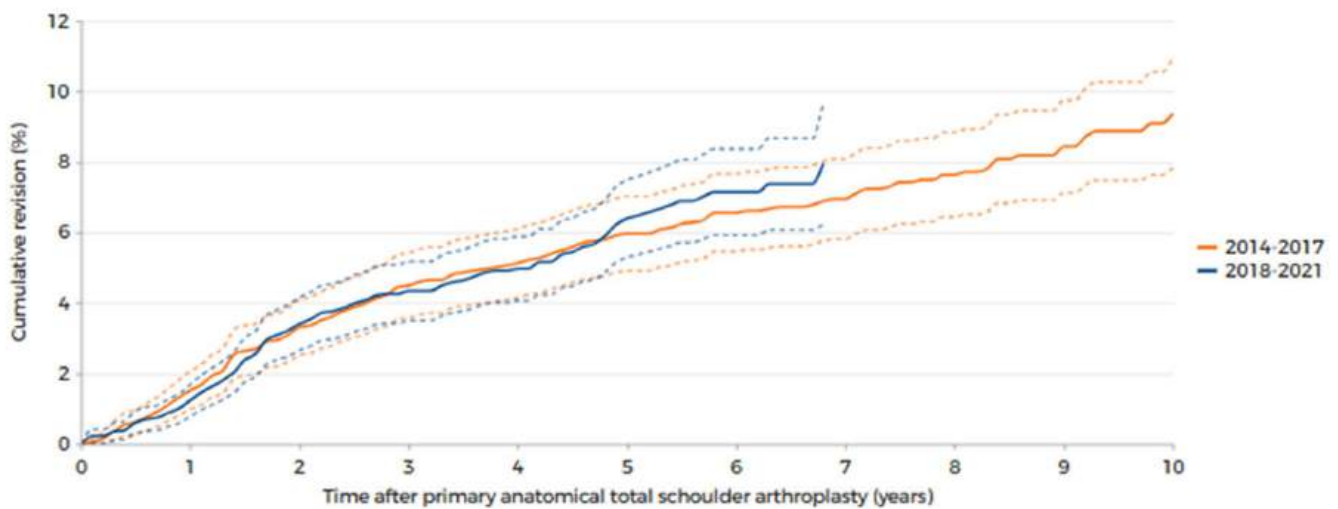
Minor revision: Only liner and/or metaphysis exchange (including DAIR procedures).

ATSA: anatomical total shoulder arthroplasty; CI: confidence interval.

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In 2007-2024, 403 (6.5%) primary ATSAs were implanted in patients who died within ten years after the primary diagnosis

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 2014-2024 (n=4,257)

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	Number (n)	1yr	3yr	5yr	7yr	10yr
2014-2017	1,976	1.32 (0.81-1.82)	4.44 (3.53-5.36)	5.91 (4.87-6.96)	6.95 (5.81-8.08)	9.09 (7.64-10.55)
2018-2021	2,281	1.01 (0.60-1.42)	4.25 (3.42-5.08)	6.22 (5.15-7.30)	n.a.	n.a.

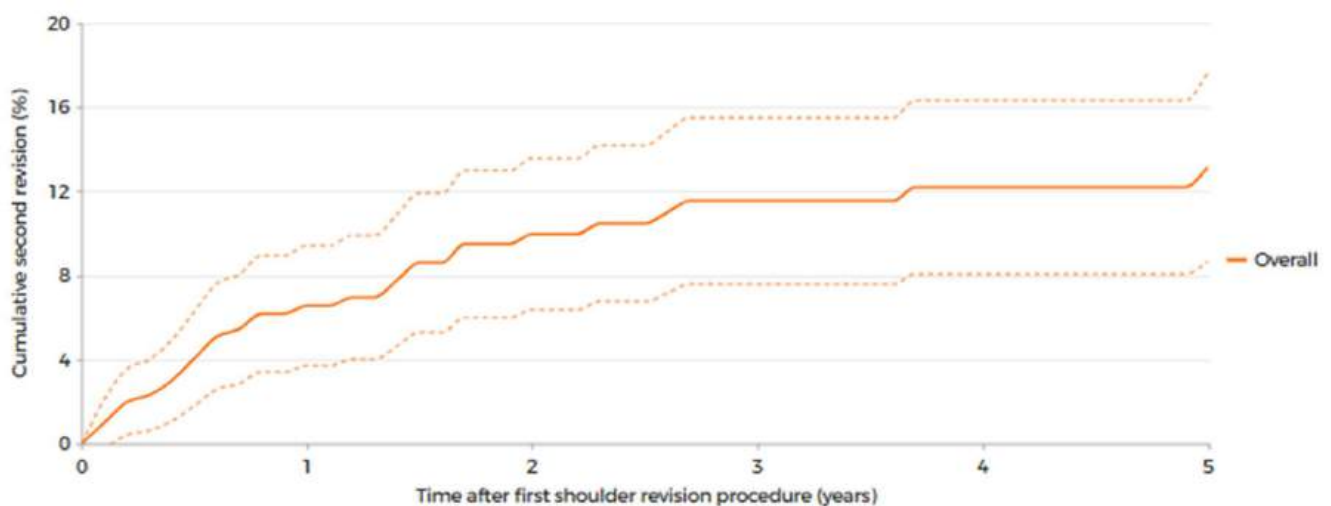
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

CI: confidence interval.

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Re-revision

Second revision

FIGURE Cumulative second revision percentage (Kaplan-Meier; 95% CI) of total anatomical shoulder arthroplasties after a one-stage first revision in the Netherlands in 2014-2024 (n=310)

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	Number (n)	1yr	3yr	5yr
Overall	310	6.18 (3.41-8.95)	11.55 (7.59-15.50)	12.20 (8.07-16.33)

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.

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Reasons for second revision

TABLE Reasons for second revision in patients who underwent a second revision after a one-stage first revision of a total anatomical shoulder arthroplasty in the Netherlands in 2014-2024

Second revision (n=35)	
Reasons for second revision	Proportion (%)
Infection	31.43
Loosening of glenoid component	20.00
Instability	17.14
Cuff rupture	11.43
Peri-prosthetic fracture	11.43
Loosening of humeral stem component	5.71
Other	17.14

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

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

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Survival by component

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 2014-2024 (n=5,455)

Humeral stem component	Glenoid component	Primary ATSAs (n)	Hospital (n)	Median (IQR) age (yr)	Revisions (n)	Type of revision (n)				Cumulative revision percentage (95% CI)				
						Total revision	Partial major	Partial minor	Other	1yr	3yr	5yr	7yr	10yr
All ATSAs for osteoarthritis		5,455	89	67 (60 - 72)	272	160	78	12	20	0.99 (0.72-1.26)	3.83 (3.27-4.39)	5.58 (4.67-6.08)	6.60 (5.77-7.44)	8.58 (7.61-10.35)
Aequalis Ascend Flex	Aequalis Perform Keeled	628	25	68 (62 - 73)	16	7	6	1	0	0.38 (0.00-0.81)	1.82 (0.79-2.85)	1.82 (0.79-2.85)	3.19 (1.00-5.37)	n.a.
Global Unite	Global APG+	454	19	67 (61 - 73)	20	9	7	2	2	1.62 (0.42-2.81)	3.94 (2.04-5.85)	4.67 (2.53-6.80)	5.09 (2.81-7.37)	n.a.
COMPREHENSIVE NANO	COMPREHENSIVE	432	21	66 (61 - 72)	17	12	3	0	2	1.17 (0.15-2.10)	2.63 (1.17-4.49)	5.12 (2.69-7.56)	5.12 (2.69-7.56)	n.a.
Global AP	Global APG+	381	17	66 (60 - 71)	23	18	2	1	1	1.05 (0.03-2.08)	3.45 (1.61-5.30)	5.22 (2.93-7.51)	5.96 (3.46-8.45)	7.59 (4.24-10.95)
GLOBAL ICON	Global APG+	358	14	65 (58 - 70)	12	9	1	0	0	0.61 (0.00-1.44)	4.82 (1.81-7.84)	n.a.	n.a.	n.a.
Aequalis Ascend Flex	Aequalis Perform Pegged	353	23	68 (62 - 73)	18	8	7	2	1	0.91 (0.00-1.94)	5.26 (2.55-7.97)	5.93 (2.94-8.93)	8.43 (4.39-12.47)	n.a.
Affinis Short	Affinis	219	7	70 (65 - 75)	2	1	1	0	0	0.00 (0.00-0.00)	1.18 (0.00-2.81)	1.18 (0.00-2.81)	1.18 (0.00-2.81)	n.a.
Aequalis Ascend Flex	Aequalis Spherical Glenoid	170*	16	67 (60 - 73)	17	5	9	1	2	0.00 (0.00-0.00)	4.17 (1.15-7.20)	7.25 (3.30-11.20)	9.24 (4.77-13.70)	n.a.
Affinis Short	Affinis Vitarnys	156	7	61 (56 - 67)	4	2	0	1	1	2.22 (0.00-4.70)	3.36 (0.05-6.66)	n.a.	n.a.	n.a.
SMR Stemless	SMR TT hybrid glenoid	140	9	66 (60 - 73)	0	0	0	0	0	0.00 (0.00-0.00)	n.a.	n.a.	n.a.	n.a.
COMPREHENSIVE MINI	COMPREHENSIVE	126	18	65 (61 - 72)	9	2	4	2	1	2.40 (0.00-5.08)	5.90 (1.65-10.15)	7.04 (2.29-11.79)	n.a.	n.a.
Aequalis Primair	Aequalis Spherical Glenoid	113*	13	69 (63 - 75)	6	5	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)	n.a.
Aequalis Press-fit	Aequalis Spherical Glenoid	111*	8	70 (65 - 76)	5	4	1	0	0	0.90 (0.00-2.66)	2.73 (0.00-5.78)	3.69 (0.14-7.23)	5.00 (0.67-9.34)	n.a.
Sidus Baseplate	Anatomical Shoulder Glenoids	104	6	63 (55 - 68)	13	11	1	1	0	0.99 (0.00-2.92)	9.34 (3.52-15.15)	n.a.	n.a.	n.a.
SMR Stemless	SMR uncemented glenoid	81*	8	61 (56 - 67)	12	1	9	0	2	3.70 (0.00-7.82)	12.75 (5.35-20.15)	15.61 (7.46-23.76)	n.a.	n.a.
Equinox	Equinox Cage	70	4	66 (59 - 71)	4	1	3	0	0	1.54 (0.00-4.53)	n.a.	n.a.	n.a.	n.a.
SMR stem Cementless	SMR uncemented glenoid	56*	5	69 (62 - 73)	9	1	8	0	0	1.79 (0.00-5.25)	9.03 (1.48-16.58)	n.a.	n.a.	n.a.
Simplicity Shoulder System	Aequalis Perform Pegged	55	7	67 (61 - 72)	3	2	0	0	1	n.a.	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary ATSAs in 2024.

Please note: n.a. if <50 cases were at risk; ATSA: anatomical total shoulder arthroplasty; CI: confidence interval; IQR: Interquartile range.

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Only combinations with over 50 procedures and reported by at least 3 hospitals have been listed.

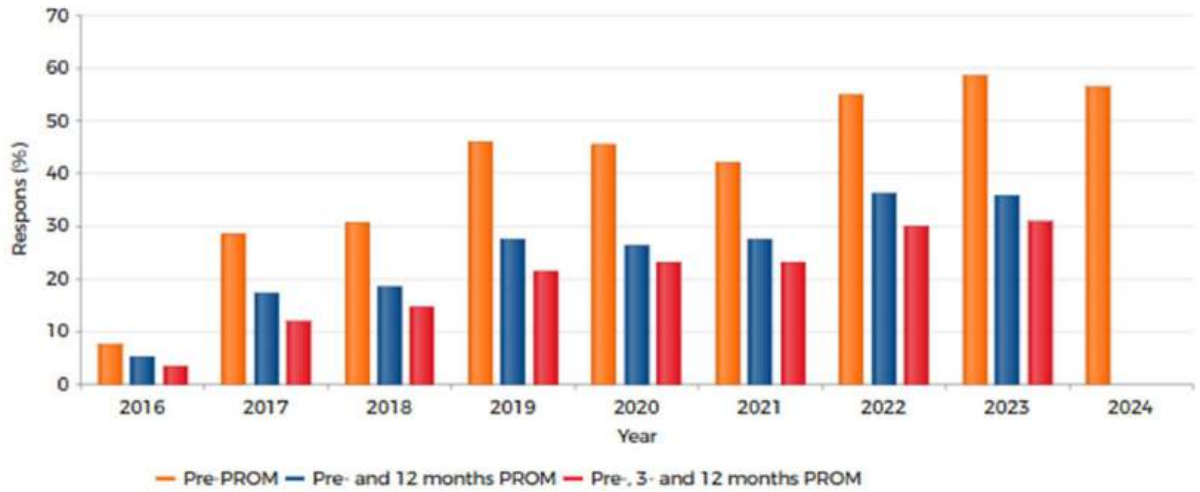
Results must be interpreted with caution. Patient characteristics like age and diagnosis, as well as procedure characteristics like the experience of the surgeon performing the procedure of the prosthesis may have influenced the cumulative revision percentages.

PROMs

Response

Per year

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a primary total anatomical shoulder arthroplasty for osteoarthritis in the Netherlands in 2016-2024



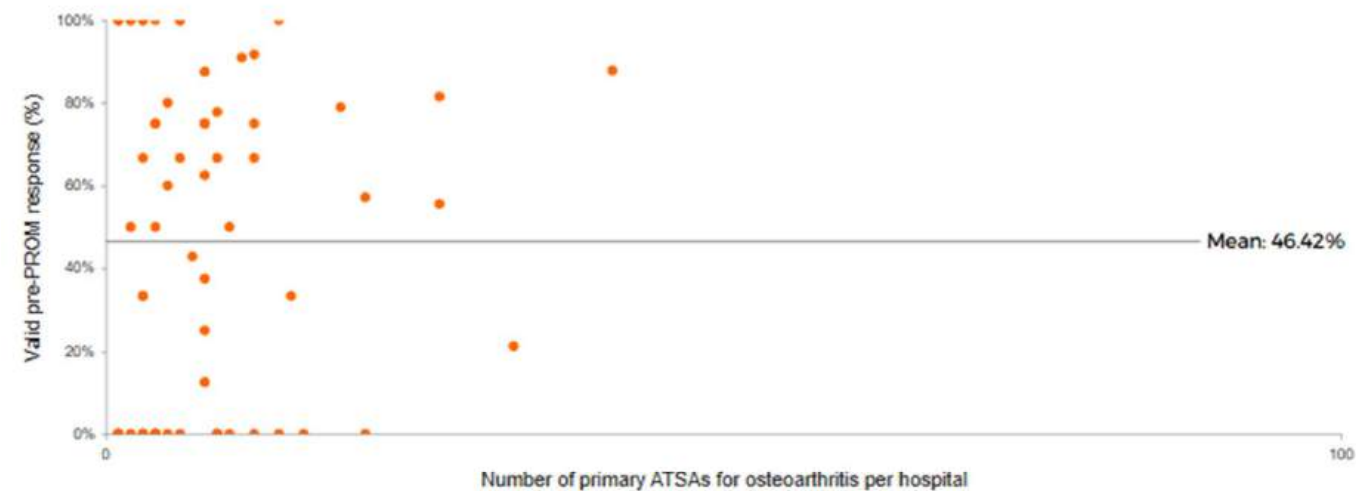
	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	7.61	28.35	30.63	45.85	45.52	42.01	55.02	58.68	56.39
Pre- and 12 months PROM	5.08	17.19	18.46	27.39	26.37	27.35	36.14	35.85	n.a.
Pre-, 3- and 12 months PROM	3.30	11.83	14.60	21.37	23.13	22.98	29.92	30.75	n.a.
Total anatomical shoulder arthroplasty for osteoarthritis (n)	394	448	493	482	402	457	498	530	493

Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.
PROM: patient reported outcome measure.

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Per pre-PROM per hospital

FIGURE Scatterplot of pre-operative response percentage of patients who underwent a primary total anatomical shoulder arthroplasty for osteoarthritis per hospital in the Netherlands in 2024



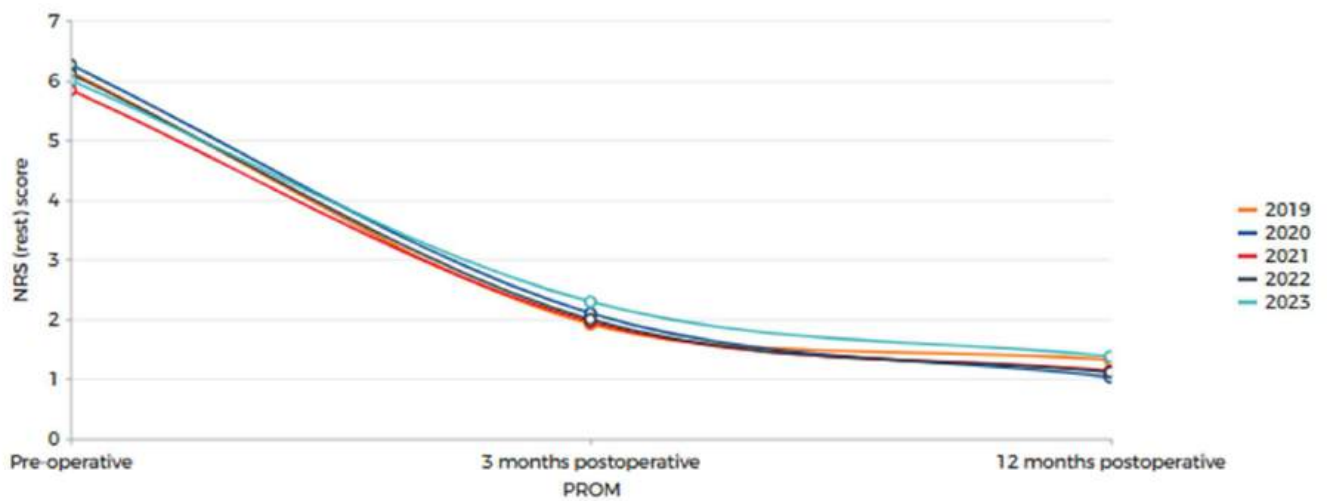
PROM: patient reported outcome measure; ATSA: total anatomical shoulder arthroplasty
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The mean pre-operative response rate is 46.4% in the Netherlands in 2024.
Of the 72 hospitals, 33 (46%) scored above the 60% response rate.

Outcomes

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 shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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NRS (rest) score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	103	6.14 (5.69-6.59)	1.92 (1.47-2.37)	1.32 (0.89-1.76)
2020	94	6.26 (5.82-6.70)	2.10 (1.61-2.59)	1.03 (0.66-1.40)
2021	105	5.84 (5.37-6.31)	1.96 (1.54-2.39)	1.14 (0.75-1.52)
2022	149	6.11 (5.76-6.46)	2.00 (1.66-2.34)	1.12 (0.79-1.44)
2023	163	6.00 (5.65-6.35)	2.29 (1.90-2.69)	1.38 (1.02-1.74)
Total	614	6.06 (5.88-6.24)	2.07 (1.89-2.26)	1.21 (1.05-1.38)

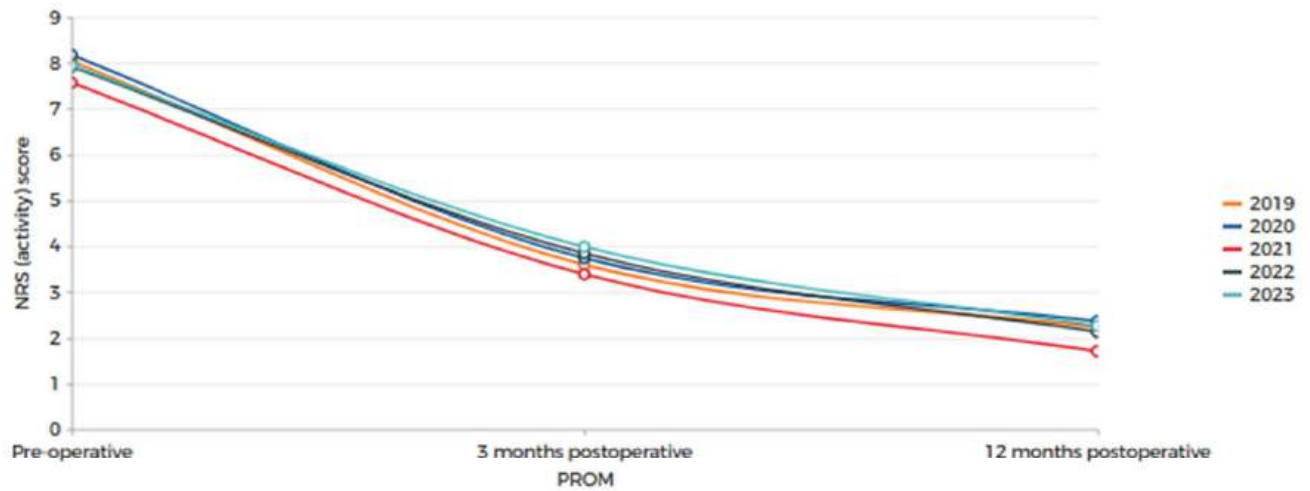
CI: confidence interval

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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 shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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NRS (activity) score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	103	8.04 (7.69-8.39)	3.60 (3.07-4.13)	2.23 (1.70-2.77)
2020	94	8.18 (7.87-8.49)	3.74 (3.23-4.25)	2.36 (1.85-2.87)
2021	105	7.57 (7.19-7.95)	3.39 (2.90-3.87)	1.71 (1.26-2.16)
2022	149	7.92 (7.66-8.18)	3.84 (3.44-4.25)	2.13 (1.75-2.51)
2023	163	7.94 (7.70-8.19)	3.99 (3.57-4.41)	2.26 (1.87-2.66)
Total	614	7.93 (7.79-8.06)	3.75 (3.54-3.95)	2.14 (1.95-2.34)

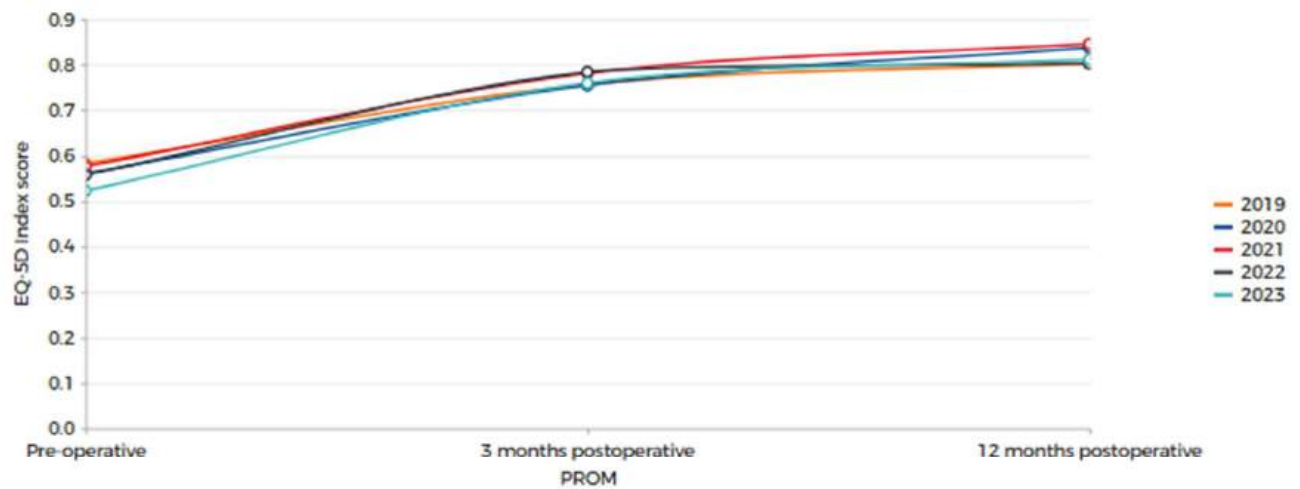
CI: confidence interval

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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.

EQ-5D 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 shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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EQ-5D Index score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	103	0.58 (0.55-0.62)	0.76 (0.73-0.79)	0.80 (0.77-0.84)
2020	94	0.56 (0.52-0.60)	0.76 (0.72-0.79)	0.84 (0.80-0.87)
2021	105	0.58 (0.53-0.62)	0.78 (0.75-0.82)	0.85 (0.82-0.87)
2022	149	0.56 (0.52-0.60)	0.78 (0.76-0.81)	0.80 (0.77-0.84)
2023	163	0.52 (0.48-0.56)	0.76 (0.73-0.79)	0.81 (0.78-0.84)
Total	614	0.56 (0.54-0.57)	0.77 (0.76-0.78)	0.82 (0.80-0.83)

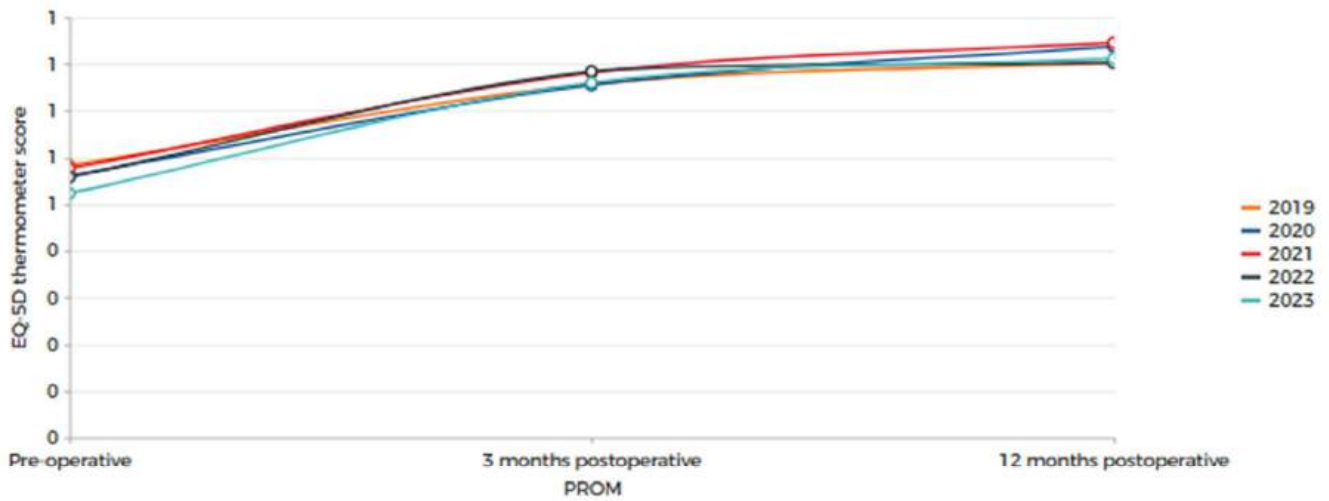
CI: confidence interval

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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

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a primary total anatomical shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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EQ-5D thermometer score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	103	0.58 (0.55-0.62)	0.76 (0.73-0.79)	0.80 (0.77-0.84)
2020	94	0.56 (0.52-0.60)	0.76 (0.72-0.79)	0.84 (0.80-0.87)
2021	105	0.58 (0.53-0.62)	0.78 (0.75-0.82)	0.85 (0.82-0.87)
2022	149	0.56 (0.52-0.60)	0.78 (0.76-0.81)	0.80 (0.77-0.84)
2023	163	0.52 (0.48-0.56)	0.76 (0.73-0.79)	0.81 (0.78-0.84)
Total	614	0.56 (0.54-0.57)	0.77 (0.76-0.78)	0.82 (0.80-0.83)

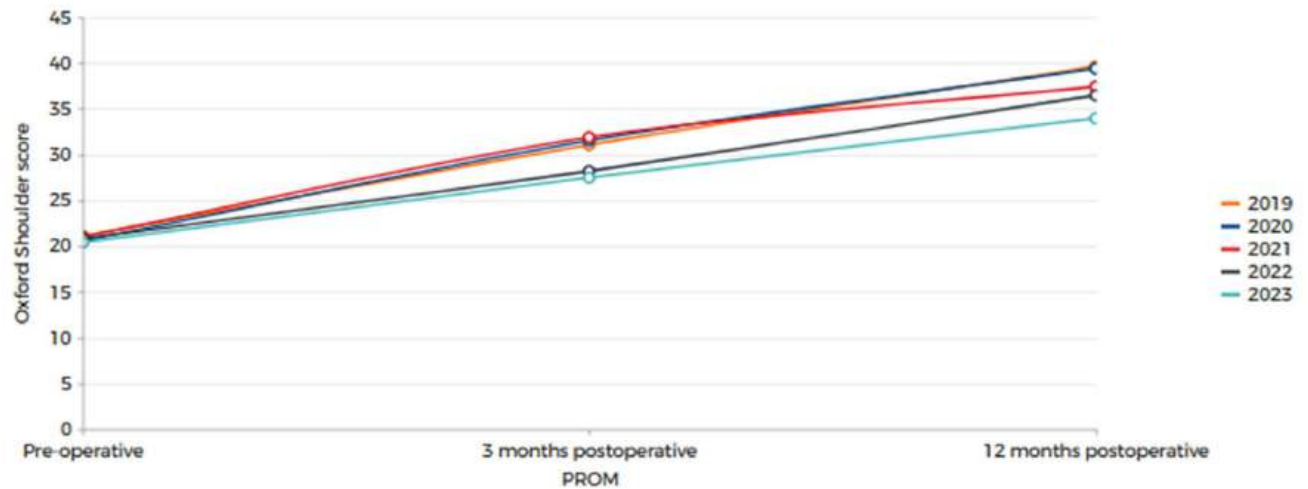
CI: confidence interval

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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 shoulder arthroplasty for osteoarthritis in the Netherlands in 2019-2023



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Oxford Shoulder Score		Pre-operative	3 months postoperative	12 months postoperative
Procedure year	n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
2019	103	21.09 (19.47-22.71)	31.07 (28.99-33.14)	39.63 (37.93-41.32)
2020	94	20.56 (19.11-22.02)	31.54 (29.58-33.50)	39.40 (37.70-41.10)
2021	105	21.04 (19.52-22.56)	31.89 (29.99-33.78)	37.42 (35.19-39.65)
2022	149	20.83 (19.64-22.01)	28.19 (26.39-29.99)	36.48 (34.84-38.12)
2023	163	20.40 (19.25-21.56)	27.48 (25.83-29.13)	33.96 (31.94-35.99)
Total	614	20.75 (20.15-21.35)	29.66 (28.82-30.50)	36.97 (36.10-37.84)

CI: confidence interval

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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.

Hemi shoulder arthroplasty

Patient characteristics

By diagnosis

TABLE Patient characteristics of all patients with a registered shoulder hemiarthroplasty by diagnosis in the Netherlands in 2024

	Osteoarthritis	Fracture	Other	Total
N(%)	67 (46.8)	29 (20.2)	47 (32.8)	143
Mean age (years) (SD)	62.5 (11)	62.3 (10.7)	59.2 (14.7)	61.4 (12.3)
Age (years) (%)				
<50	9	10	17	12
50-59	28	31	32	30
60-69	40	28	34	36
70-79	15	28	4	14
>80	7	3	13	8
Gender (%)				
Men	37	41	53	43
Women	63	59	47	57
ASA score (%)				
ASA I	16	10	2	10
ASA II	58	45	64	57
ASA III-IV	25	45	34	32
Type of hospital (%)				
General	81	90	66	78
UMC	1	10	28	12
Private	18	0	6	10
Specialism (%)				
Orthopaedic surgeon	100	83	100	97
Trauma surgeon	0	17	0	3
Walch-score (%)				
A1	36	100	59	49
A2	34	0	26	32
B1	6	0	4	5
B2	10	0	0	7
B3	3	0	0	2
C	4	0	4	4
Mean BMI (kg/m ²) (SD)	29.5 (5.4)	29.3 (6.6)	26.3 (4.7)	28.4 (5.6)
Body Mass Index (kg/m ²) (%)				
Underweight (<=18.5)	1	0	6	3
Normal weight (>18.5-25)	9	31	32	22
Overweight (>25-30)	52	31	40	46
Obesity (>30-40)	25	24	17	23
Morbid obesity (>40)	7	7	2	6
Smoking (%)				
No	82	66	81	79
Yes	18	31	19	21

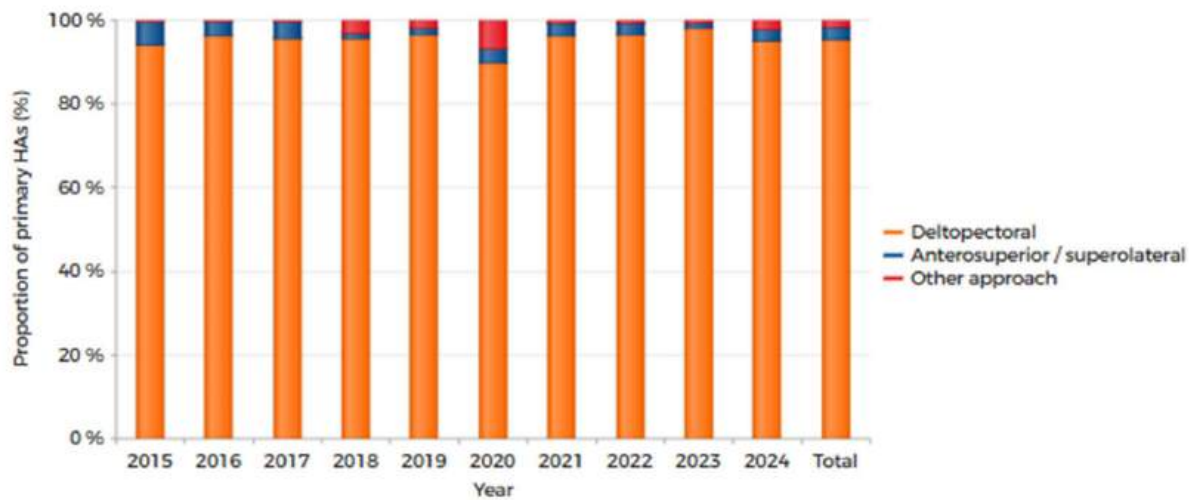
Please note: diagnosis 'Other' (47; 32.8%) includes osteonecrosis (18), late post-traumatic (12), other (5), rheumatoid arthritis (4), tumor (3), cuff arthropathy (1), inflammatory arthritis (1) and 3 primary shoulder hemiarthroplasties where the diagnosis was not registered.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Procedure characteristics

Surgical approach

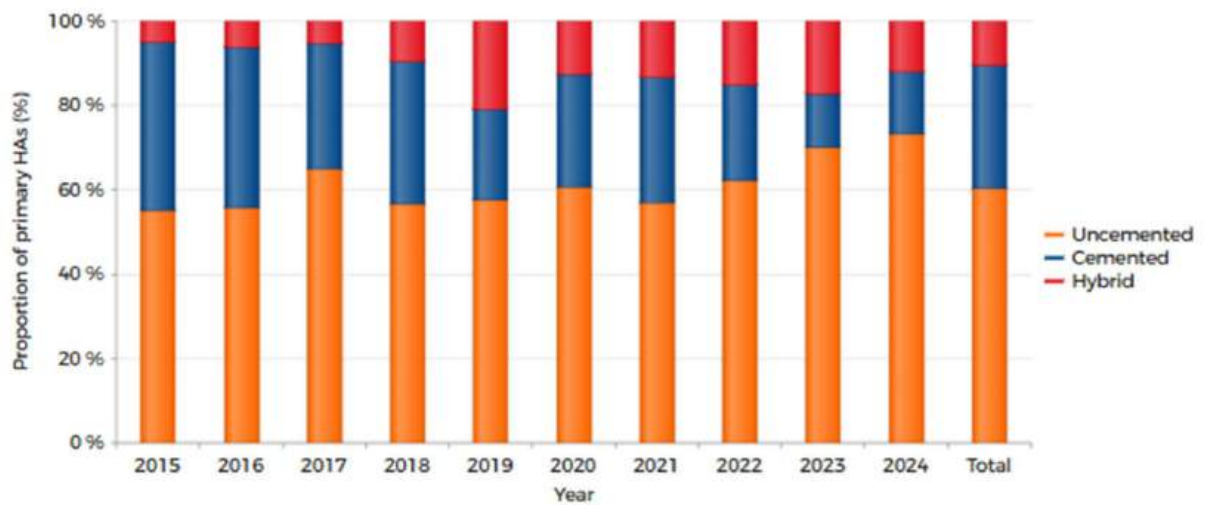
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary shoulder hemiarthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Deltopectoral	94.30	96.32	95.72	95.60	96.68	90	96.41	96.65	98.09	94.96	95.49
Anterosuperior / superolateral	5.41	3.34	3.95	1.20	1.42	3.13	2.99	2.79	1.27	2.88	3.07
Other approach	0.28	0.33	0.33	3.20	1.90	6.88	0.60	0.56	0.64	2.16	1.44
Total (n)	351	299	304	250	211	160	167	179	157	139	2,217

HA: shoulder hemiarthroplasty

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Fixation

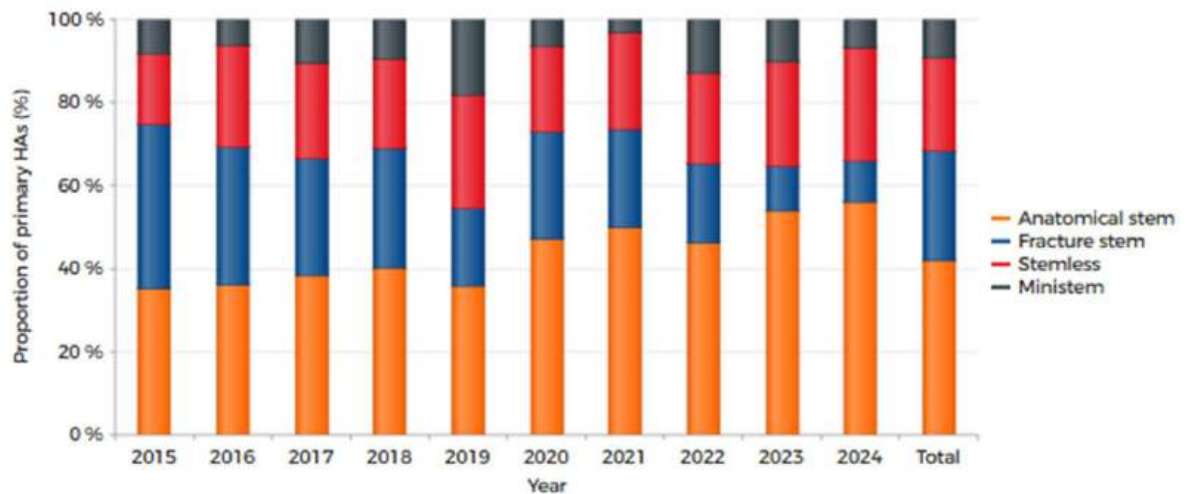
FIGURE Trend (proportion [%] per year) in type of fixation in primary shoulder hemiarthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Uncemented	55.11	55.89	65.02	56.80	57.82	60.63	57.14	62.37	70.25	73.24	60.40
Cemented	40.06	38.05	29.70	33.60	21.33	26.88	29.76	22.58	12.66	14.79	29.14
Hybrid	4.83	6.06	5.28	9.60	20.85	12.50	13.10	15.05	17.09	11.97	10.46
Total (n)	352	297	303	250	211	160	168	186	158	142	2,227

HA: shoulder hemiarthroplasty

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Type humeral stem

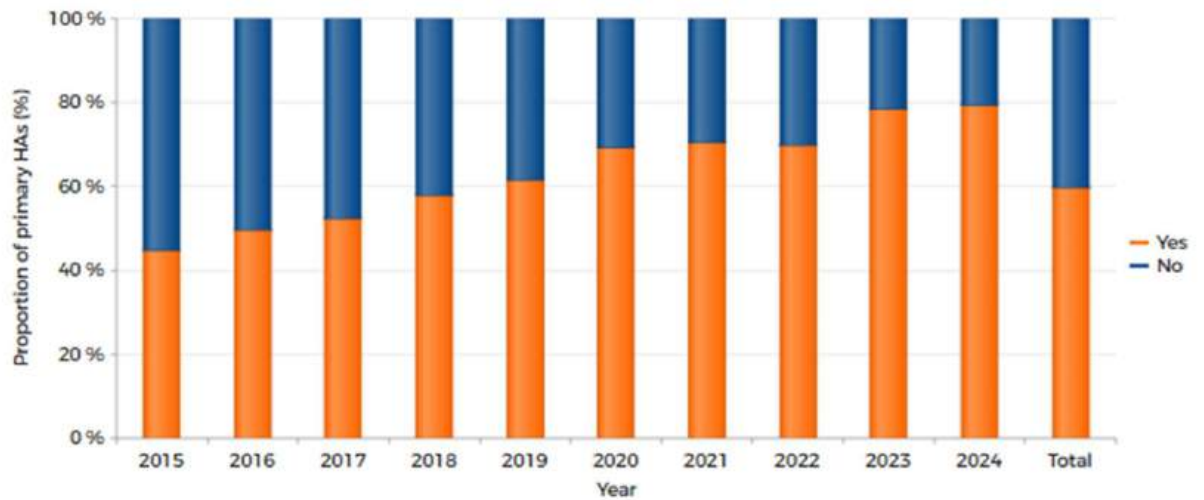
FIGURE Trend (proportion [%] per year) in type of humeral stem in primary shoulder hemiarthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Anatomical stem	35.33	36.16	38.31	40.09	35.93	47.14	50	46.30	54	56.06	42.09
Fracture stem	39.52	33.21	28.23	28.77	18.56	25.71	23.72	19.14	10.67	9.85	26.22
Stemless	16.77	24.35	22.98	21.70	27.54	20.71	23.08	21.60	25.33	27.27	22.57
Ministern	8.38	6.27	10.48	9.43	17.96	6.43	3.21	12.96	10	6.82	9.13
Total (n)	334	271	248	212	167	140	156	162	150	132	1,972

HA: shoulder hemiarthroplasty

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Modular humeral stem

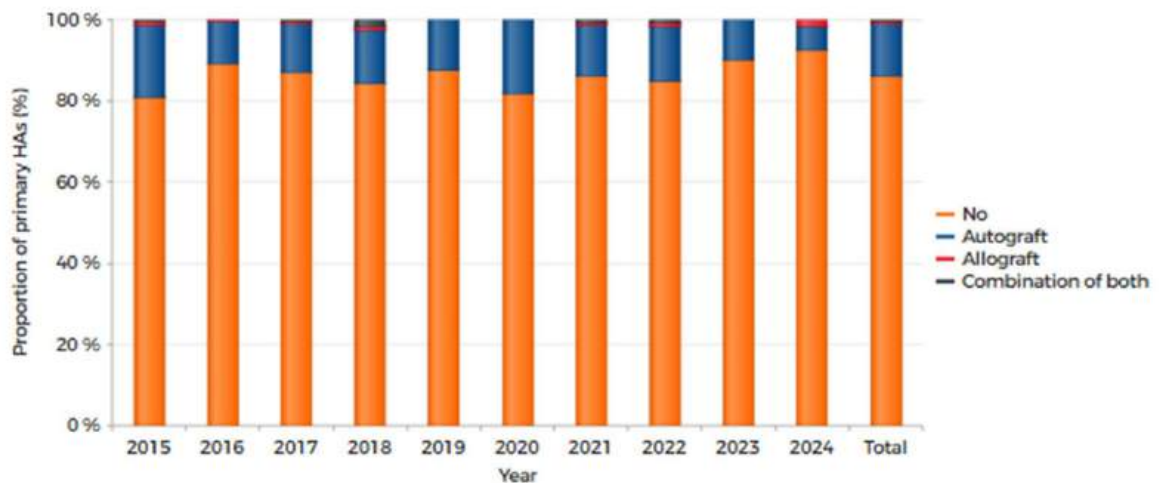
FIGURE Trend (proportion [%] per year) in modular humeral stem in primary shoulder hemiarthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Yes	44.78	49.63	52.44	57.97	61.59	69.40	70.67	69.81	78.62	79.53	59.83
No	55.22	50.37	47.56	42.03	38.41	30.60	29.33	30.19	21.38	20.47	40.17
Total (n)	335	270	246	207	164	134	150	159	145	127	1,937

HA: shoulder hemiarthroplasty

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Bonegraft

FIGURE Trend (proportion [%] per year) in type of bonegraft in primary shoulder hemiarthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	81.07	89.26	87.17	84.21	87.80	82.05	86.34	84.83	90.32	92.65	86.18
Autograft	17.75	10.40	11.84	13.36	12.20	17.95	12.42	13.48	9.68	5.88	12.86
Allograft	0.89	0.34	0.66	0.81	0	0	0.62	1.12	0	1.47	0.60
Combination of both	0.30	0	0.33	1.62	0	0	0.62	0.56	0	0	0.37
Total (n)	338	298	304	247	205	156	161	178	155	136	2,178

HA: shoulder hemiarthroplasty

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*Most frequently registered humeral stem and humeral liner***TABLE** The most frequently registered humeral stems and humeral heads in primary shoulder hemiarthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Humeral stem (n)	140	157	163	150	133
Name; Proportion (%)					
Aequalis Ascend Flex	27.14	23.57	22.70	30.67	29.32
SMR Stemless	5.00	3.82	5.52	12.00	16.54
SMR stem Cementless	5.71	5.73	4.91	2.00	9.77
Aequalis Fractuur hemi	14.29	10.19	5.52	4.67	5.26
Affinis Short	2.86	2.55	9.20	5.33	4.51
Simpliciti Shoulder System	3.57	3.82	3.07	1.33	4.51
Aequalis Flex Revive	2.86	3.18	3.68	11.33	3.76
Global Unite	3.57	6.37	7.98	4.00	3.76
Sidus Baseplate	4.29	7.01	7.36	4.67	3.01
Comprehensive Mini	3.57	0.64	3.68	4.67	2.26
Year	2020	2021	2022	2023	2024
Humeral head (n)	143	150	151	141	127
Name; Proportion (%)					
SMR head	10.49	12.00	11.92	14.18	30.71
Aequalis pyrocarbon humeral head	25.17	16.67	14.57	25.53	21.26
Aequalis Ascend Flex	5.59	10.67	14.57	17.02	14.96
Comprehensive	11.19	19.33	12.58	9.22	5.51
Simpliciti Shoulder System	3.50	4.00	3.31	1.42	5.51
Global Unite/ Global AP	4.20	6.67	8.61	4.96	3.94
Aequalis humerus kop	13.99	10.00	6.62	4.96	3.94
Affinis Short	2.80	2.67	7.95	5.67	3.94
Sidus Heads	4.20	7.33	7.95	4.96	3.15
Global AP	2.10	0.67	0.00	0.71	2.36

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*Most frequently registered bone cement***TABLE** The most frequently registered types of bone cement used during primary shoulder hemiarthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement pre-packed in a vacuum mixing system (n)	29	52	34	20	16
Cement name; Proportion (%)					
Palacos R+G	27.59	46.15	20.59	60.00	68.75
Refobacin Bone Cement R	31.03	38.46	50.00	35.00	31.25
Year	2020	2021	2022	2023	2024
Separately packed bone cement components (n)	28	12	28	13	11
Cement name; Proportion (%)					
Refobacin Bone Cement R	7.14	0.00	10.71	38.46	36.36
Palacos R+G	67.86	83.33	42.86	38.46	27.27
Simplex ABC EC	7.14	0.00	25.00	0.00	18.18
Copal G+C	0.00	0.00	7.14	15.38	9.09
Copal G+V	0.00	0.00	0.00	0.00	9.09

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Survival

Short term revision

By type of revision within 1 year

TABLE Cumulative 1-year revision percentage of primary shoulder hemiarthroplasties by type of revision in the Netherlands in 2019-2023 (n=882)

	Cumulative 1-year revision percentage - Kaplan Meier (95% CI)
Any type of revision	2.75 (1.67-3.84)
Major revision	0.80 (0.21-1.39)
Only humeral stem	0.00 (0.00-0.00)
Minor revision	1.95 (1.03-2.87)
DAIR	0.46 (0.01-0.90)
No DAIR	1.49 (0.69-2.30)

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.

Minor revision: Only humeralhead (including DAIR procedures).

CI: confidence interval.

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In 2019-2023, 19 (2.2%) primary shoulder hemiarthroplasties were implanted in patients who died within one year after the primary procedure.

Time after primary hemi arthroplasty

TABLE Time after primary shoulder hemiarthroplasty until short-term revision in the Netherlands in 2016-2021 (n=1,085)

Time after primary hemi	Percentage revisions (%)
Day 0-29	0.46
Day 30-182	0.65
Day 183-364	1.66
Day 365-730 (second year)	2.76
Day 731-1095 (third year)	1.29

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Reasons for revision

TABLE Reasons for revision within one year in patients that underwent a shoulder revision arthroplasty after a primary shoulder hemiarthroplasty in the Netherlands in 2019-2023 (n=48)

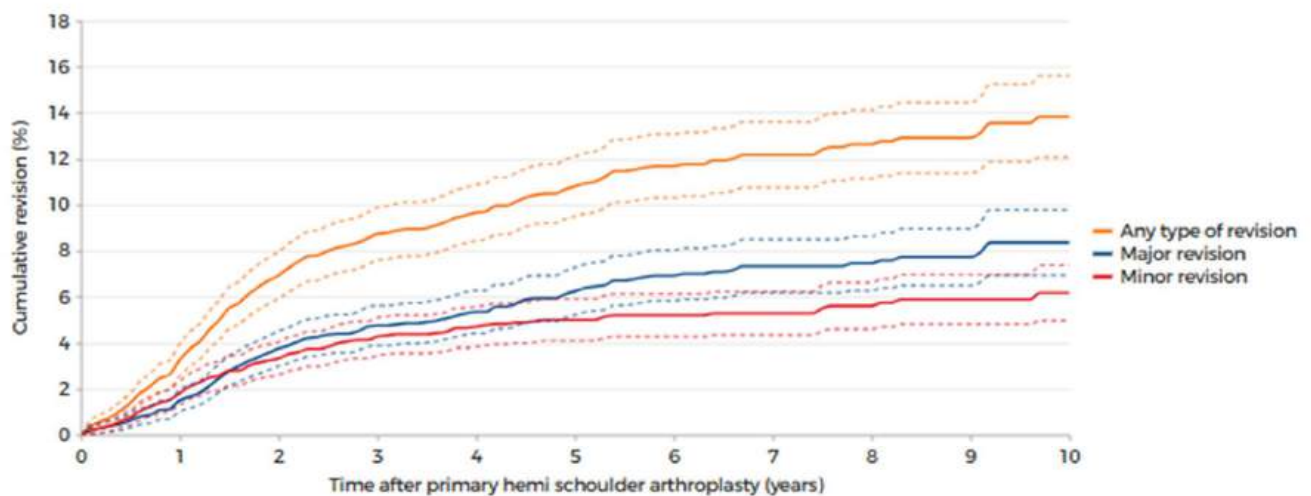
Reasons for revision	Proportion (%)
Cuff rupture	27.59
Infection	24.14
Malalignment	24.14
Cuff arthropathy	17.24
Instability	10.34
Loosening of humeral component	6.90
Progression of osteoarthritis	6.90
Loosening of glenoid component	3.45
Peri-prosthetic fracture	0.00
Other	17.24

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

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Long term revision

By type of revision

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary shoulder hemiarthroplasties by type of revision in the Netherlands in 2014-2024 (n=2,592)

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	1yr	3yr	5yr	7yr	10yr
Any type of revision	2.63 (2.01-3.26)	8.54 (7.40-9.67)	10.67 (9.38-11.97)	12.18 (10.75-13.61)	13.84 (12.07-15.61)
Major revision	1.12 (0.70-1.53)	4.69 (3.83-5.56)	6.12 (5.10-7.13)	7.33 (6.18-8.49)	8.36 (6.94-9.78)
Minor revision	1.52 (1.04-2.00)	4.12 (3.31-4.92)	5.00 (4.09-5.90)	5.28 (4.33-6.22)	6.17 (4.96-7.38)

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: Revision of at least the humeral stem.

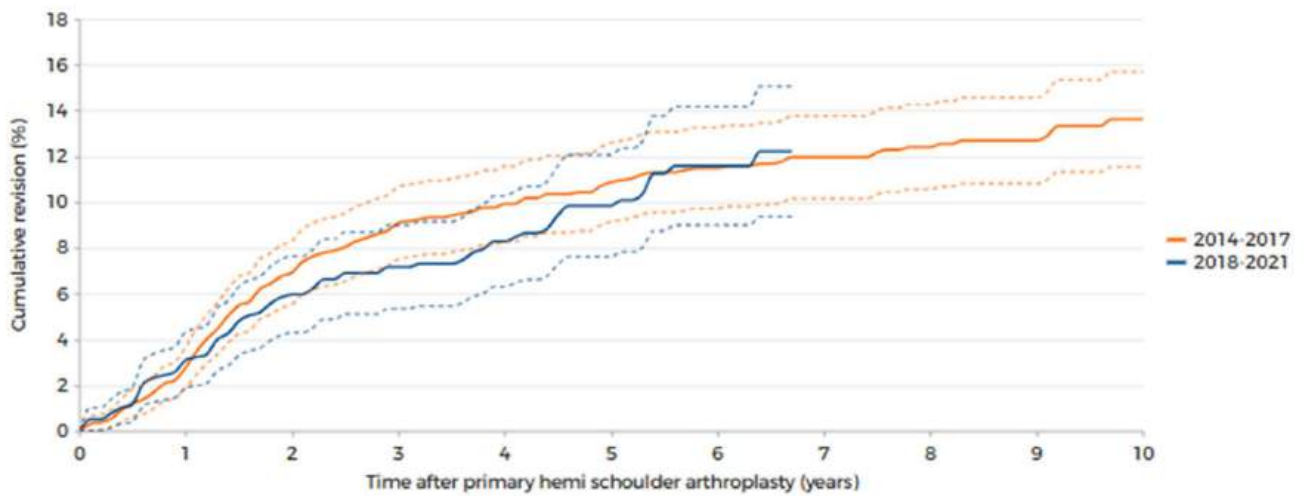
Minor revision: Only humeral head (including DAIR procedures).

CI: confidence interval.

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In 2007-2024, 439 (16.9%) primary shoulder hemiarthroplasties were implanted in patients who died within ten years after the primary diagnosis

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 2014-2024 (n=2,106)

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	Number (n)	1yr	3yr	5yr	7yr	10yr
2014-2017	1,322	2.22 (1.42-3.02)	8.77 (7.21-10.32)	10.70 (8.99-12.40)	11.96 (10.15-13.77)	13.62 (11.54-15.70)
2018-2021	784	2.58 (1.46-3.69)	7.17 (5.34-9.00)	9.84 (7.62-12.07)	n.a.	n.a.

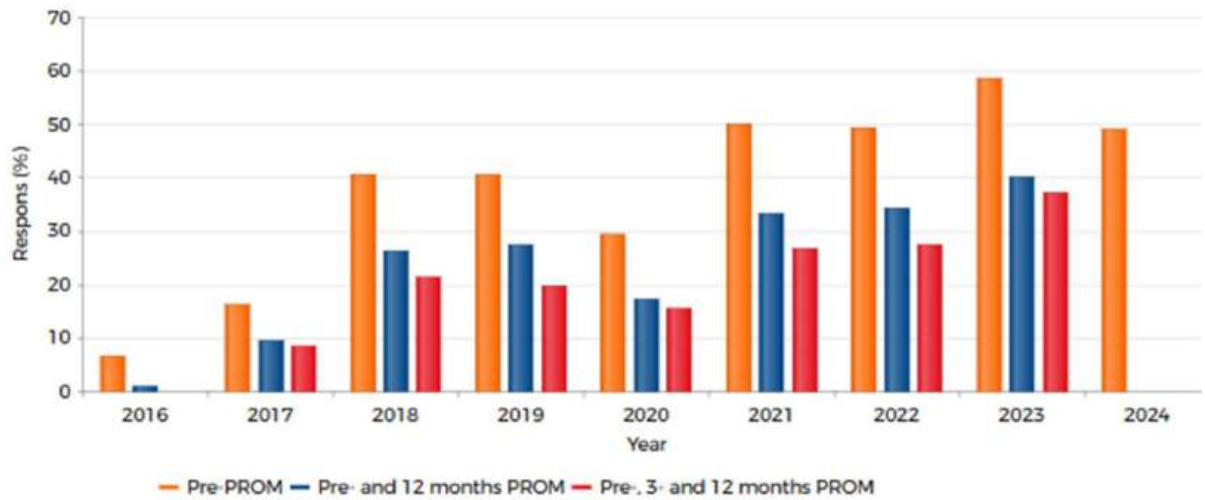
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval; n.a. if <50 cases were at risk.

CI: confidence interval.

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PROMs

Response

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a primary shoulder hemiarthroplasty for osteoarthritis in the Netherlands in 2016-2024

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	6.54	16.38	40.48	40.66	29.31	50.00	49.32	58.57	49.12
Pre- and 12 months PROM	0.93	9.48	26.19	27.47	17.24	33.33	34.25	40.00	n.a.
Pre-, 3- and 12 months PROM	0.00	8.62	21.43	19.78	15.52	26.67	27.40	37.14	n.a.
Shoulder hemiarthroplasty for osteoarthritis (n)	107	116	84	91	58	60	73	70	57

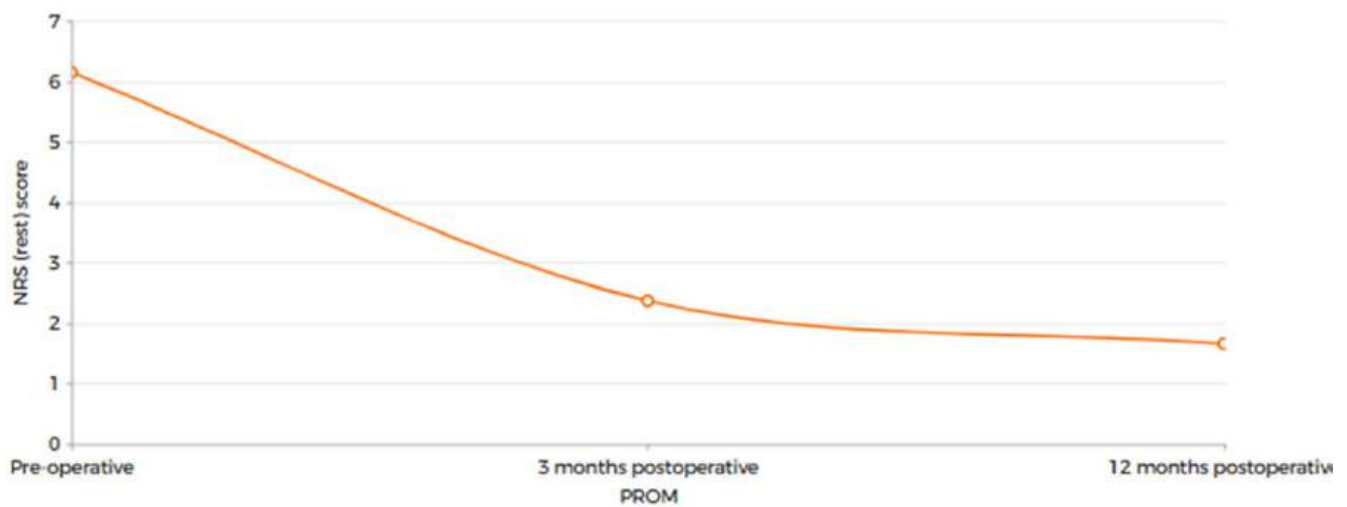
Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

PROM: patient reported outcome measure.

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NRS (rest)

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a primary shoulder hemiarthroplasty for osteoarthritis in the Netherlands in 2016-2023

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NRS (rest) score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
117	6.15 (5.79-6.52)	2.37 (1.93-2.81)	1.66 (1.24-2.08)

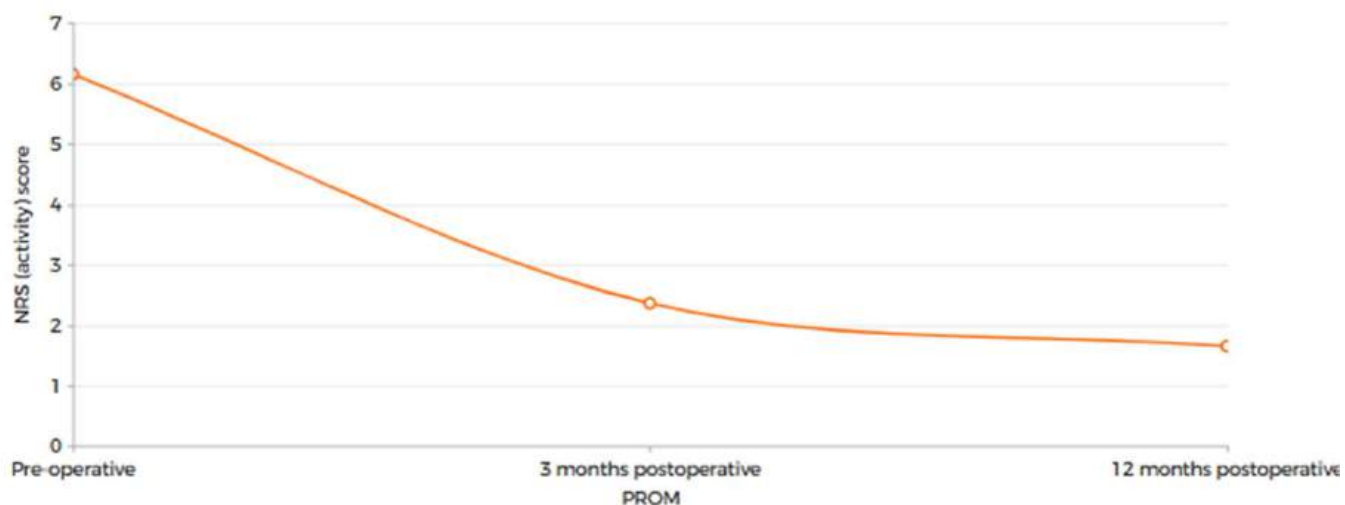
CI: confidence interval

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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 shoulder hemiarthroplasty for osteoarthritis in the Netherlands in 2019-2023



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NRS (activity) score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
117	6.15 (5.79-6.52)	2.37 (1.93-2.81)	1.66 (1.24-2.08)

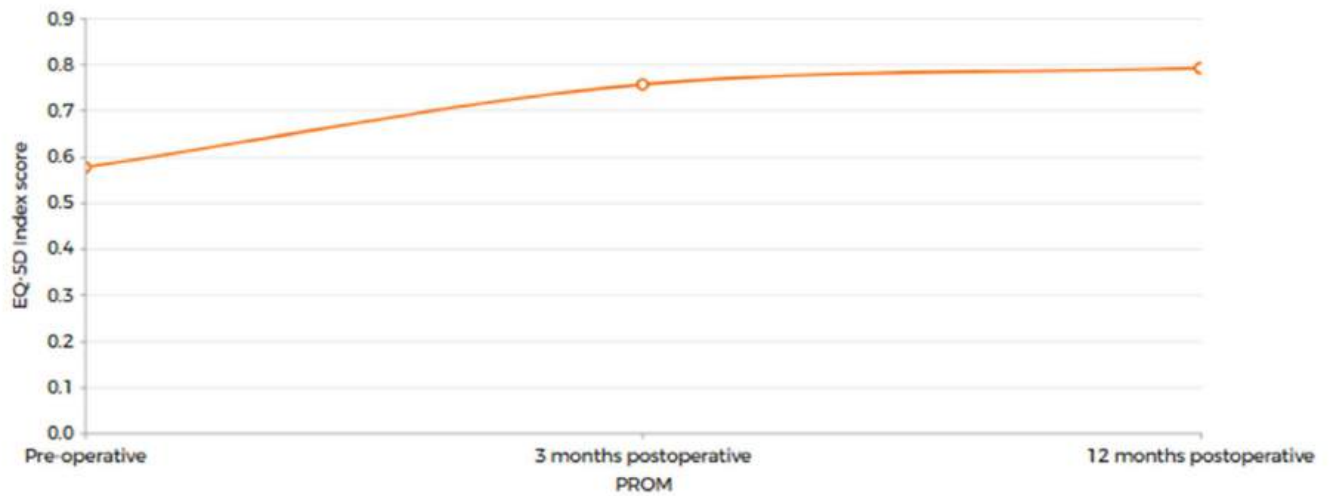
CI: confidence interval

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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.

EQ-5D index score

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D Index scores of patients who underwent a primary shoulder hemiarthroplasty for osteoarthritis in the Netherlands in 2019-2023



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EQ-5D index score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
117	0.58 (0.54-0.61)	0.76 (0.73-0.78)	0.79 (0.75-0.83)

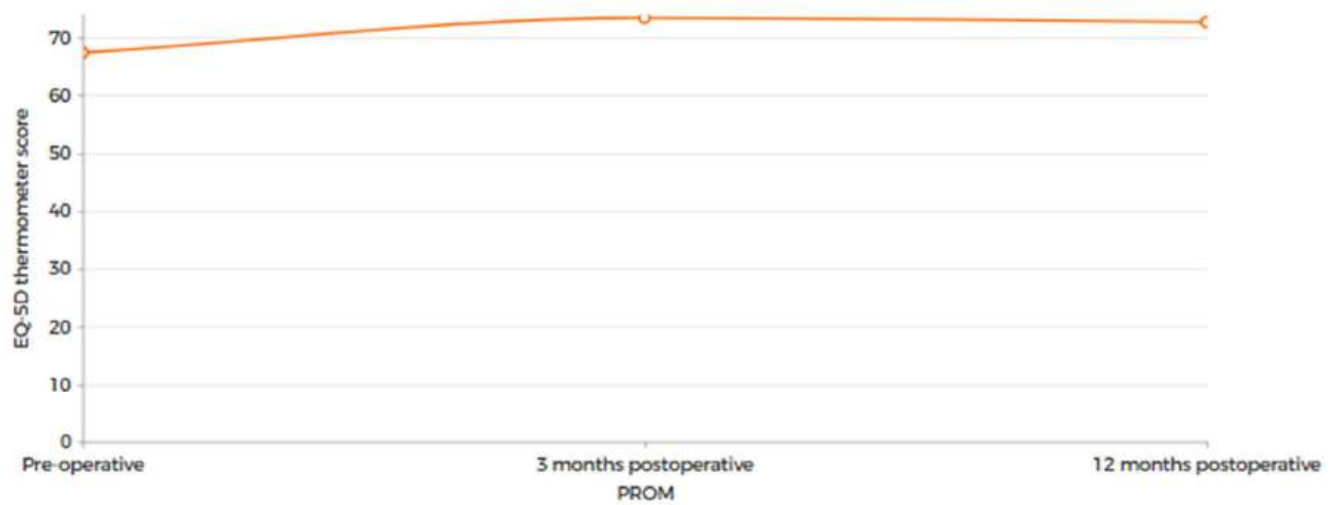
CI: confidence interval

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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

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a primary shoulder hemiarthroplasty for osteoarthritis in the Netherlands in 2019-2023



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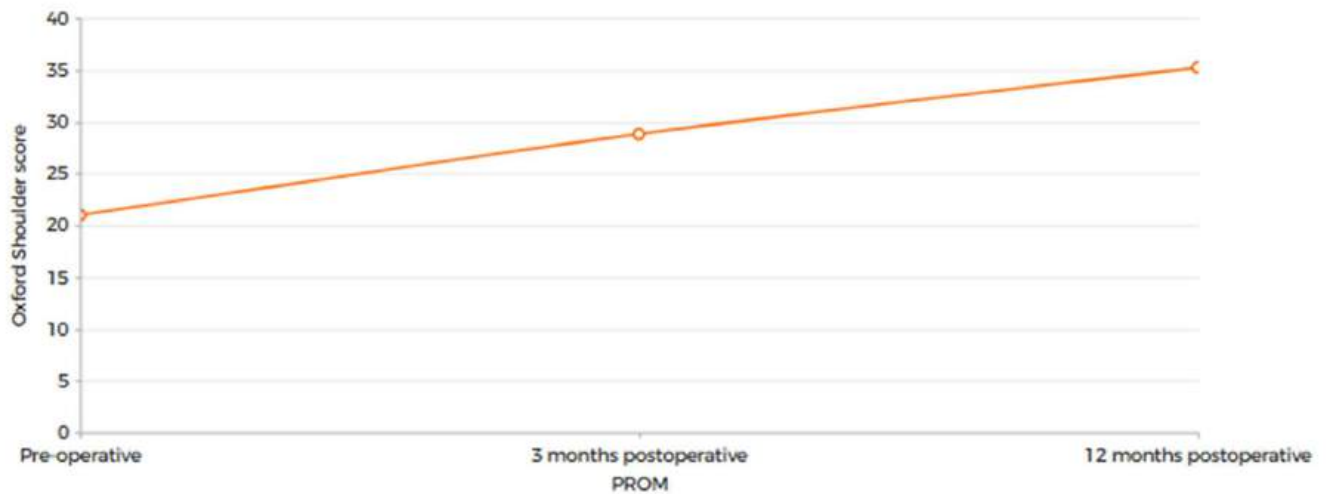
EQ-5D thermometer score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
117	67.39 (63.90-70.88)	73.42 (69.51-77.34)	72.67 (68.03-77.31)

CI: confidence interval

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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 shoulder hemiarthroplasty for osteoarthritis in the Netherlands in 2019-2023

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Oxford Shoulder score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
117	20.98 (19.60-22.37)	28.80 (26.96-30.65)	35.23 (33.20-37.26)

CI: confidence interval

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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.

Shoulder revision arthroplasty

Revision characteristics

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a shoulder revision arthroplasty in the Netherlands in 2015-2024

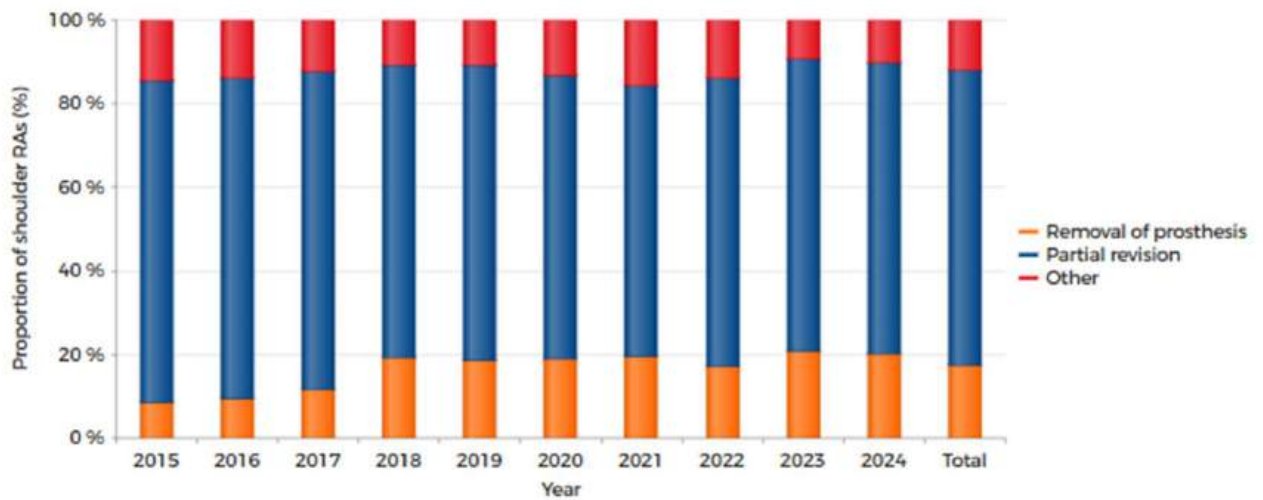
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Shoulder revision arthroplasty (n)	272	274	346	334	353	309	329	345	472	492	3526
Reasons for revision; Proportion (%)											
Infection	16.54	22.26	21.39	24.85	28.05	28.80	32.22	30.72	28.18	36.38	27.65
Instability	15.44	23.36	26.30	22.16	22.66	23.95	19.76	20.58	21.19	21.14	21.70
Progression of osteoarthritis	24.63	16.79	16.76	14.97	12.18	10.36	11.25	11.01	8.69	7.11	12.68
Loosening of glenoid component	13.24	10.58	13.01	11.08	11.33	10.36	14.59	18.26	17.16	12.80	13.44
Cuff rupture	15.07	10.95	14.45	11.98	11.33	10.03	10.94	10.72	9.53	8.74	11.15
Cuff arthropathy	13.24	13.50	11.85	9.58	11.61	9.71	7.60	4.35	7.84	5.69	9.13
Other	12.87	8.39	8.38	5.99	6.23	9.39	5.78	9.86	9.75	9.35	8.59
Loosening of humeral component	7.72	10.95	4.62	7.19	5.38	8.74	7.90	8.70	8.90	9.15	7.94
Peri-prosthetic fracture	5.88	5.11	4.62	6.59	6.23	5.83	8.81	7.83	6.57	6.50	6.44
Revision after shoulder removal								4.93	5.93	9.15	
Other	11.76	12.04	9.25	12.57	11.90	17.48	12.77	11.88	13.77	9.15	12.14

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%.

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Type of revision

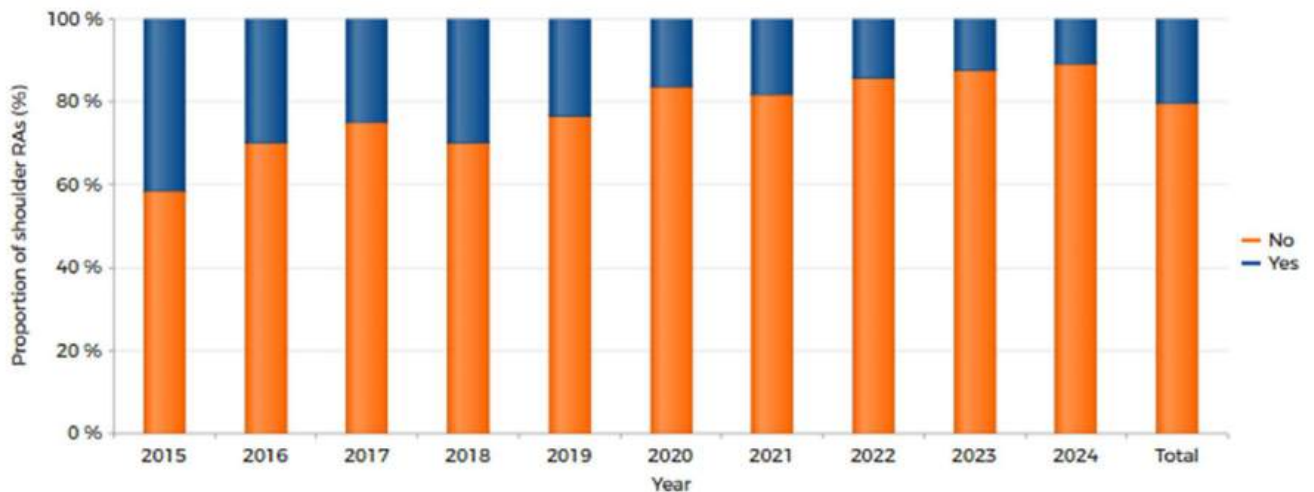
FIGURE Trend (proportion [%] per year) in type of revision in shoulder revision arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Removal of prosthesis	4.62	5.70	6.33	11.21	12.36	13.77	13.41	10.53	13.56	14.14	11.04
Partial revision	41.15	46.77	41.27	40.50	46.55	48.85	44.51	41.81	45.76	48.57	44.81
Other	7.69	8.37	6.63	6.23	7.18	9.51	10.67	8.48	5.93	6.97	7.63
Total (n)	139	160	180	186	230	220	225	208	308	340	2,196

RA: revision arthroplasty

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Conversion to TSA

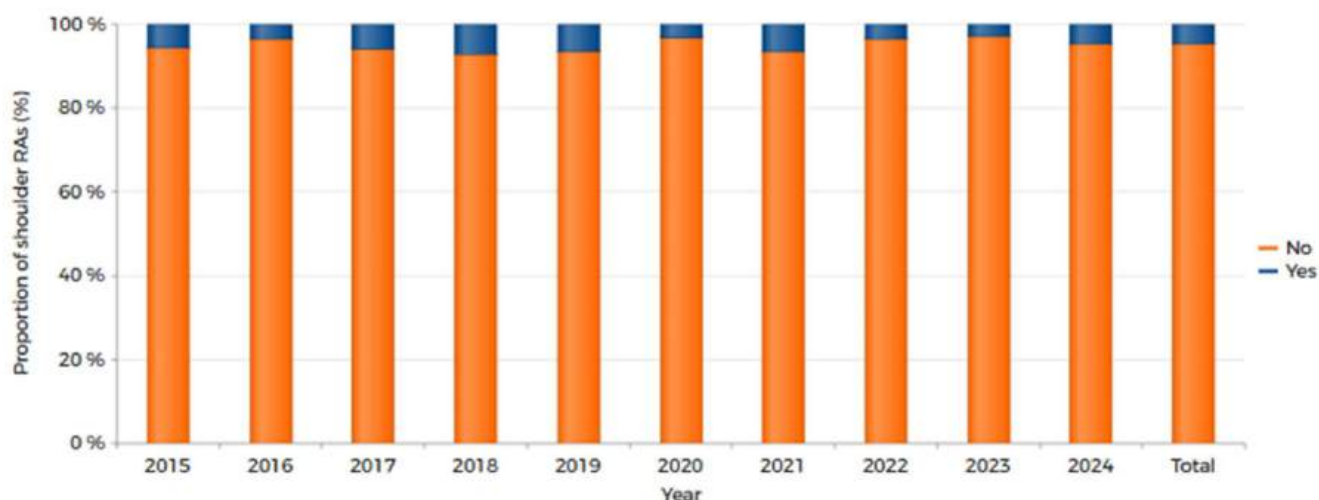
FIGURE Trend (proportion [%] per year) in conversion of a shoulder hemiprosthesis to a total (anatomical or reverse) shoulder arthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	58.68	70.24	75.23	70.13	76.67	83.89	82.05	86.01	87.87	89.24	79.61
Yes	41.32	29.76	24.77	29.87	23.33	16.11	17.95	13.99	12.13	10.76	20.39
Total (n)	242	252	323	298	330	298	312	336	470	474	3,335

RA: revision arthroplasty

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Conversion to hemi

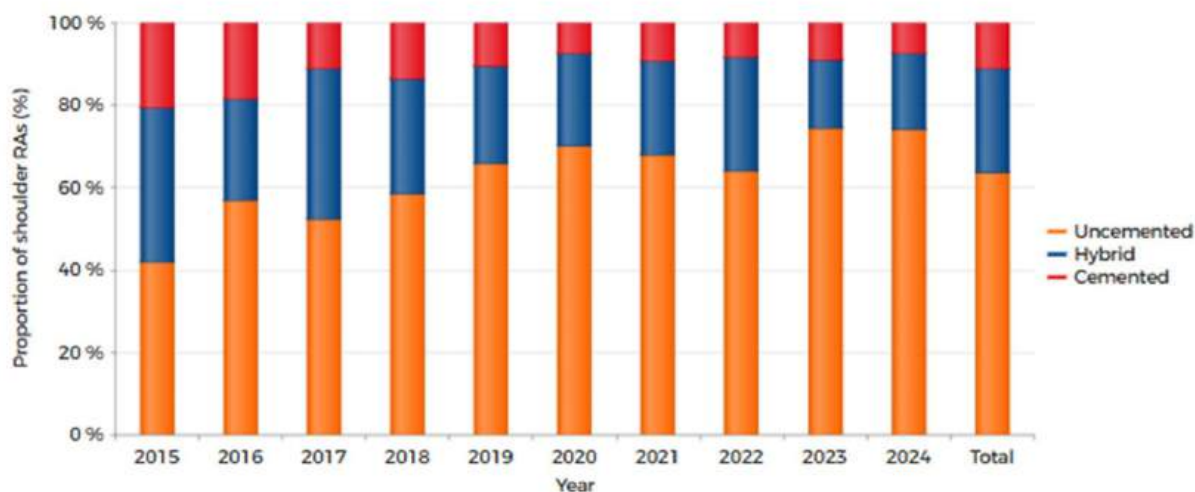
FIGURE Trend (proportion [%] per year) in conversion of a total (anatomical or reverse) shoulder arthroplasty to a shoulder hemiprosthesis in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	94.44	96.76	94.29	92.81	93.58	96.94	93.55	96.71	97.22	95.35	95.26
Yes	5.56	3.24	5.71	7.19	6.42	3.06	6.45	3.29	2.78	4.65	4.74
Total (n)	234	247	315	292	327	294	310	334	468	473	3,294

RA: revision arthroplasty

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Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in shoulder revision arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Uncemented	42	57.03	52.50	58.64	65.80	70.23	68.20	64.14	74.45	74.35	63.85
Hybrid	37.60	24.50	36.56	27.80	23.78	22.52	22.61	27.63	16.71	18.29	25.15
Cemented	20.40	18.47	10.94	13.56	10.42	7.25	9.19	8.22	8.85	7.36	11.01
Total (n)	250	249	320	295	307	262	283	304	407	421	3,098

RA: revision arthroplasty

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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 2020-2024

Year	2020	2021	2022	2023	2024
Humeral stem (n)	105	128	145	182	177
Name; Proportion (%)					
Delta X-tend	41.90	36.72	42.07	36.26	37.85
Aequalis Flex Revive	4.76	10.16	5.52	14.84	10.73
Aequalis Ascend Flex Cemented	0.00	3.91	8.97	8.24	9.60
Aequalis Ascend Flex	8.57	7.03	13.79	10.44	7.34
Comprehensive Mini	8.57	4.69	4.14	4.40	7.34
Global Unite	0.95	7.81	7.59	4.40	6.78
Univers Revers	2.86	1.56	1.38	3.30	3.95
Affinis Inverse	1.90	3.13	2.76	0.55	2.82
Aequalis Reversed Fractuur	6.67	1.56	3.45	2.20	2.82
SMR stem	0.00	0.00	1.38	0.00	2.26
Year	2020	2021	2022	2023	2024
Humeral head (n)	26	33	31	35	35
Name; Proportion (%)					
Global AP	15.38	18.18	19.35	25.71	37.14
SMR head	3.85	12.12	3.23	0.00	11.43
Aequalis Ascend Flex	26.92	27.27	41.94	22.86	11.43
Comprehensive	3.85	0.00	6.45	8.57	8.57
Aequalis humerus kop	15.38	6.06	0.00	5.71	8.57
Global Icon	0.00	0.00	0.00	2.86	5.71
Global Unite/ Global AP	7.69	6.06	6.45	5.71	5.71
Affinis Fracture	7.69	3.03	3.23	2.86	2.86
SMR CTA head	0.00	3.03	6.45	8.57	2.86
Affinis Short	3.85	0.00	0.00	5.71	2.86
Year	2020	2021	2022	2023	2024
Humeral liner (n)	189	198	226	287	317
Name; Proportion (%)					
Delta X-tend	37.57	51.52	53.54	43.90	46.06
Aequalis Ascend Flex	12.70	16.67	19.91	24.39	21.45
Comprehensive	11.11	9.09	8.41	7.67	11.36
Univers Revers	1.59	2.02	0.88	2.79	4.73
SMR reversed liner	5.82	2.53	0.88	5.57	4.10
Affinis Inverse	2.65	1.52	1.77	1.05	3.47
Equinox	6.35	3.03	3.54	3.48	2.84
Aequalis Reversed II	5.82	5.05	4.42	2.09	2.21
Aequalis Reversed Fractuur	5.82	3.03	3.10	3.83	1.89
Anatomical Inverse Humeral Poly Inlays	5.82	3.03	2.21	1.74	1.26

Year	2020	2021	2022	2023	2024
Glenosphere (n)	141	165	180	262	287
Name; Proportion (%)					
Delta X-tend	26.95	38.79	43.89	37.40	41.11
Perform Reversed	6.38	10.30	12.78	17.94	13.94
Aequalis Reversed II	17.02	13.33	18.89	15.27	12.89
Comprehensive	11.35	9.70	7.22	9.16	12.89
SMR reversed head	11.35	3.64	2.78	6.11	5.92
Univers Revers	2.13	3.64	2.22	3.82	4.18
TM Reverse Glenoid Heads	7.80	5.45	1.11	2.29	2.44
Affinis Inverse Vitamys	2.13	0.61	1.11	0.38	2.44
Equinox	6.38	2.42	2.22	2.67	1.39
Affinis Inverse	3.55	3.64	1.11	1.15	1.05
Year	2020	2021	2022	2023	2024
Metaphysis (n)	99	115	127	163	190
Name; Proportion (%)					
Aequalis Ascend Flex	16.16	27.83	31.50	37.42	37.89
Delta X-tend	17.17	25.22	27.56	23.93	22.11
Comprehensive	19.19	17.39	15.75	14.72	20.00
Univers Revers	2.02	1.74	1.57	4.91	5.26
SMR reversed body	9.09	5.22	2.36	7.98	3.16
SMR reversed body extender	1.01	0.00	0.00	1.84	3.16
Equinox	12.12	5.22	3.15	3.68	2.63
Anatomical inverse Humeral Cups	10.10	5.22	3.94	3.07	2.11
Global Unite	0.00	0.87	1.57	0.00	1.05
Global Unite Fracture	1.01	0.87	3.15	0.00	1.05
Year	2020	2021	2022	2023	2024
Glenoid baseplate (n)	93	117	128	162	168
Name; Proportion (%)					
Delta X-tend	43.01	45.30	50.78	40.74	41.67
Perform Reversed	3.23	9.40	9.38	19.75	17.26
Comprehensive	15.05	11.97	8.59	12.96	16.67
Aequalis Reversed II	15.05	13.68	17.97	14.81	9.52
Univers Revers	0.00	0.00	1.56	2.47	4.17
SMR uncemented glenoid	5.38	5.13	1.56	1.85	2.98
Equinox	2.15	1.71	2.34	2.47	1.79
SMR Axioma baseplate	0.00	0.00	0.00	1.23	1.79
Affinis Inverse	6.45	4.27	3.13	0.62	1.19
Universal Glenoid	3.23	2.56	0.78	1.23	1.19

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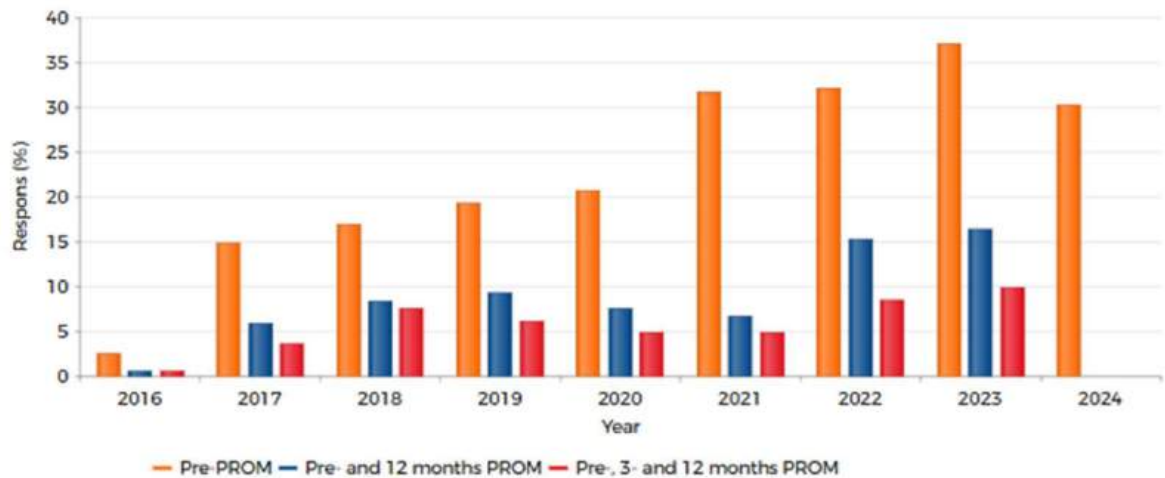
*Most frequently registered bone cement***TABLE** The most frequently registered types of bone cement by type of mixing system used during shoulder revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement used (n)	60	76	91	86	85
Cement name; Proportion (%)					
Copal G+C	38.33	43.42	39.56	44.19	38.82
Palacos R+G	28.33	32.89	27.47	31.40	34.12
Refobacin Bone Cement R	11.67	15.79	14.29	15.12	11.76
Copal G+V	0.00	2.63	3.30	4.65	10.59
Refobacin Revision	10.00	3.95	4.40	2.33	2.35
Biomet Bone Cement R	0.00	0.00	0.00	0.00	1.18
Palacos MV+G	0.00	0.00	3.30	1.16	1.18

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PROMs

Response

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a shoulder revision in the Netherlands in 2016-2024

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pre-PROM	2.55	14.80	17.00	19.29	20.75	31.73	32.03	37.06	30.33
Pre- and 12 months PROM	0.51	5.78	8.30	9.29	7.55	6.64	15.30	16.35	n.a.
Pre-, 3- and 12 months PROM	0.51	3.61	7.51	6.07	4.91	4.80	8.54	9.81	n.a.
Shoulder revision (n)	196	277	253	280	265	271	281	367	399

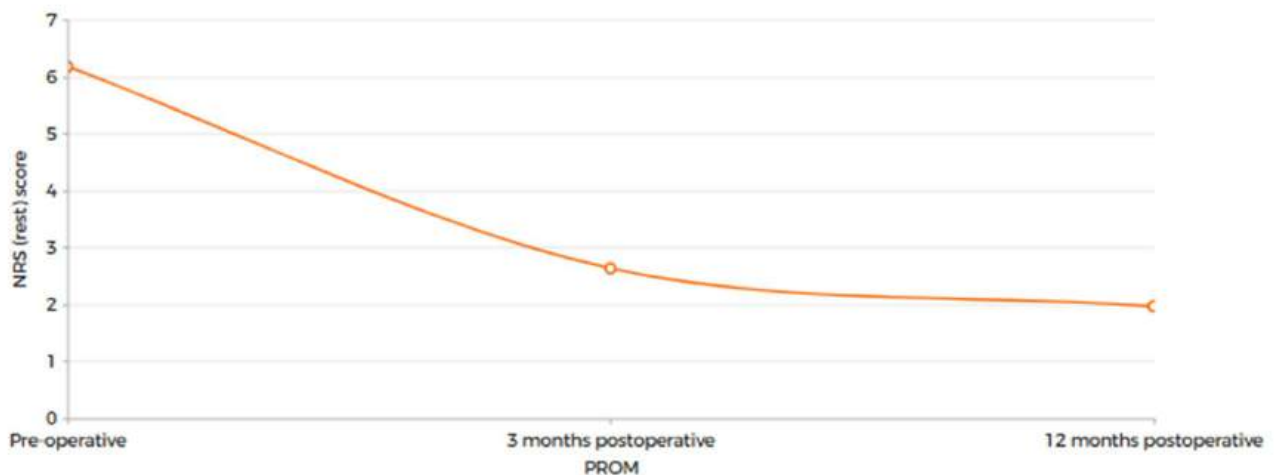
Please note: The 12 months postoperative PROMs response percentage is not (yet) available for 2024.

PROM: patient reported outcome measure.

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NRS (rest)

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a shoulder revision in the Netherlands in 2016-2023

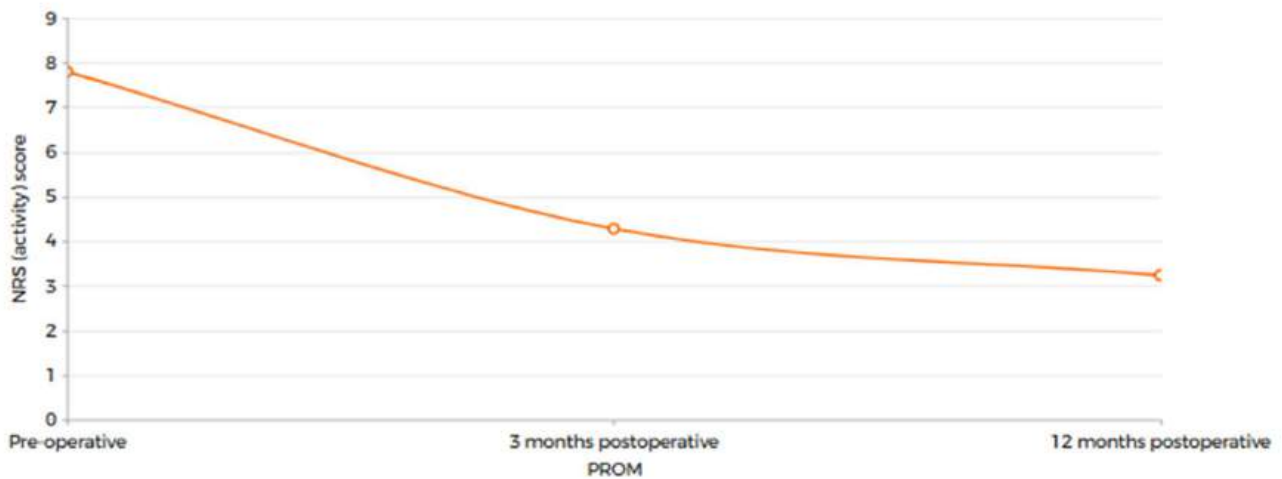
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NRS (rest) score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
133	6.18 (5.73-6.62)	2.63 (2.20-3.06)	1.97 (1.58-2.35)

CI: confidence interval

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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 shoulder revision in the Netherlands in 2019-2023

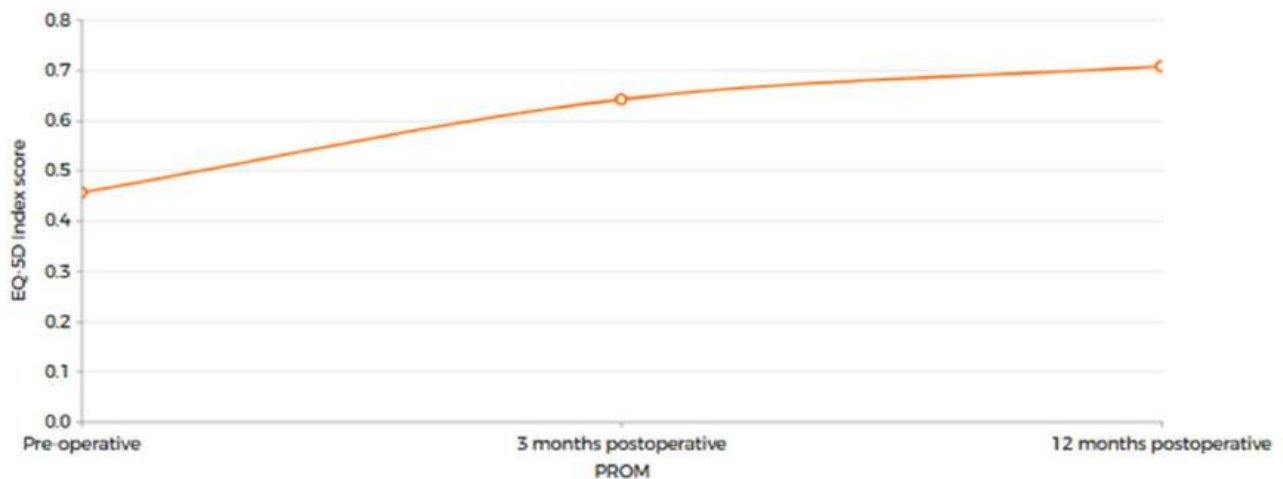
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NRS (activity) score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
133	7.80 (7.44-8.17)	4.28 (3.81-4.75)	3.24 (2.77-3.70)

CI: confidence interval

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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.

*EQ-5D index score***FIGURE** Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D Index scores of patients who underwent a shoulder revision in the Netherlands in 2019-2023

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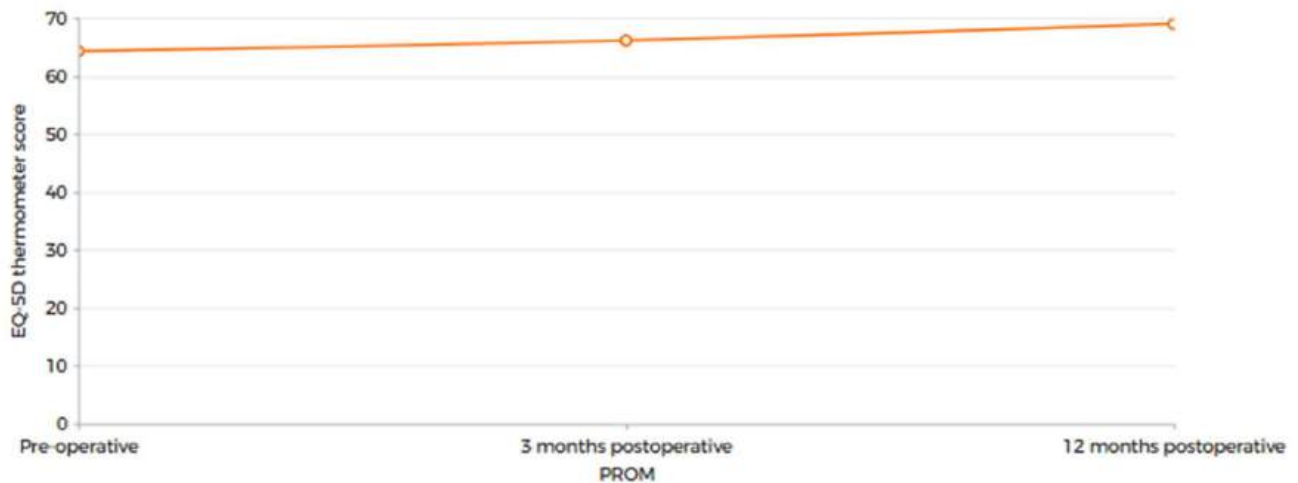
EQ-5D index score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
133	0.46 (0.41-0.50)	0.64 (0.60-0.68)	0.71 (0.67-0.75)

CI: confidence interval

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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

FIGURE Mean (95% CI) pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a shoulder revision in the Netherlands in 2019-2023

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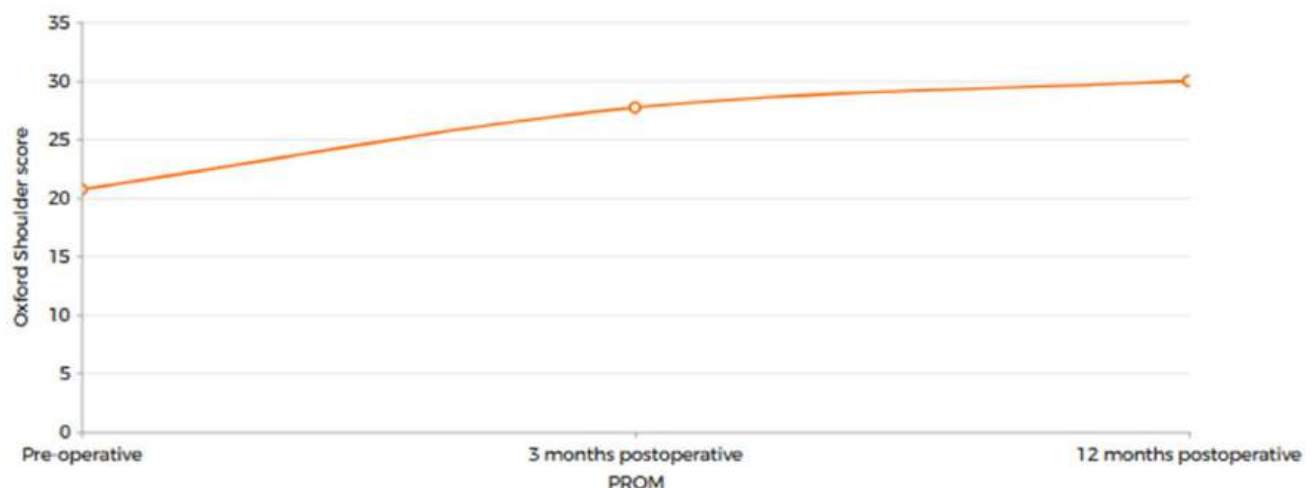
EQ-5D thermometer score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
133	64.30 (60.79-67.81)	66.14 (62.55-69.72)	69.00 (65.17-72.83)

CI: confidence interval

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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 shoulder revision in the Netherlands in 2019-2023

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Oxford Shoulder Score	Pre-operative	3 months postoperative	12 months postoperative
n	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
133	20.71 (18.90-22.53)	27.70 (25.79-29.61)	29.98 (27.96-32.01)

CI: confidence interval

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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.

Elbow arthroplasty

Numbers

Registered procedures

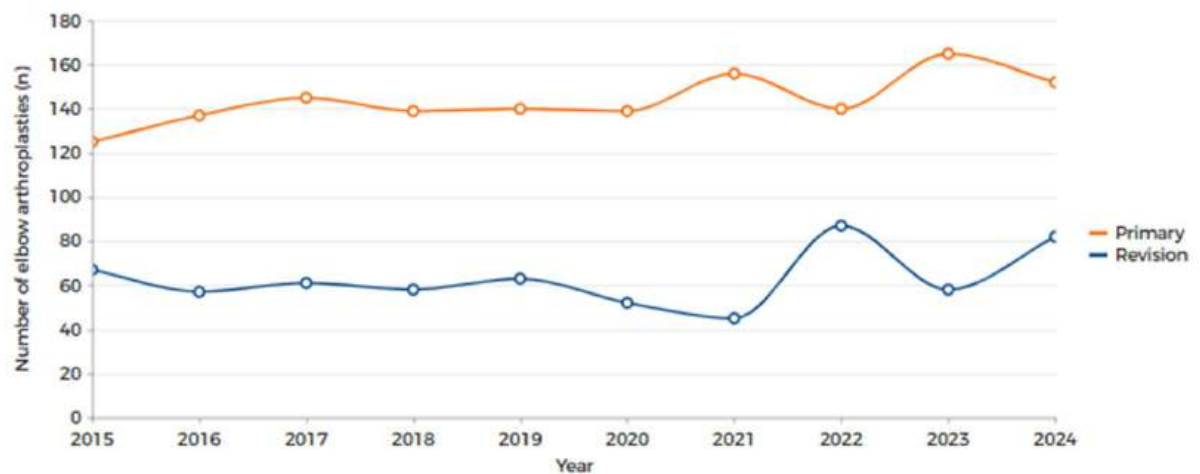
TABLE Number of registered elbow arthroplasties per year of surgery (2014-2024) in the LROI in April 2025

Year of surgery	Total elbow arthroplasty	Distal hemihumeral arthroplasty	Radial head arthroplasty	Radiocapitellar arthroplasty	Other	Unknown/missing	Revision arthroplasty	Total
2014	72	5	23	4	0	4	38	146
2015	78	4	41	1	0	1	67	192
2016	67	2	46	12	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	75	0	0	0	45	201
2022	74	2	63	1	0	0	87	227
2023	85	9	69	0	2	0	58	223
2024	69	4	75	0	2	2	82	234
Total (n)	816	44	599	33	10	44	668	2,214

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Type of procedures

FIGURE Number of primary elbow arthroplasties and elbow revision arthroplasties registered in the LROI in the Netherlands in 2015-2024

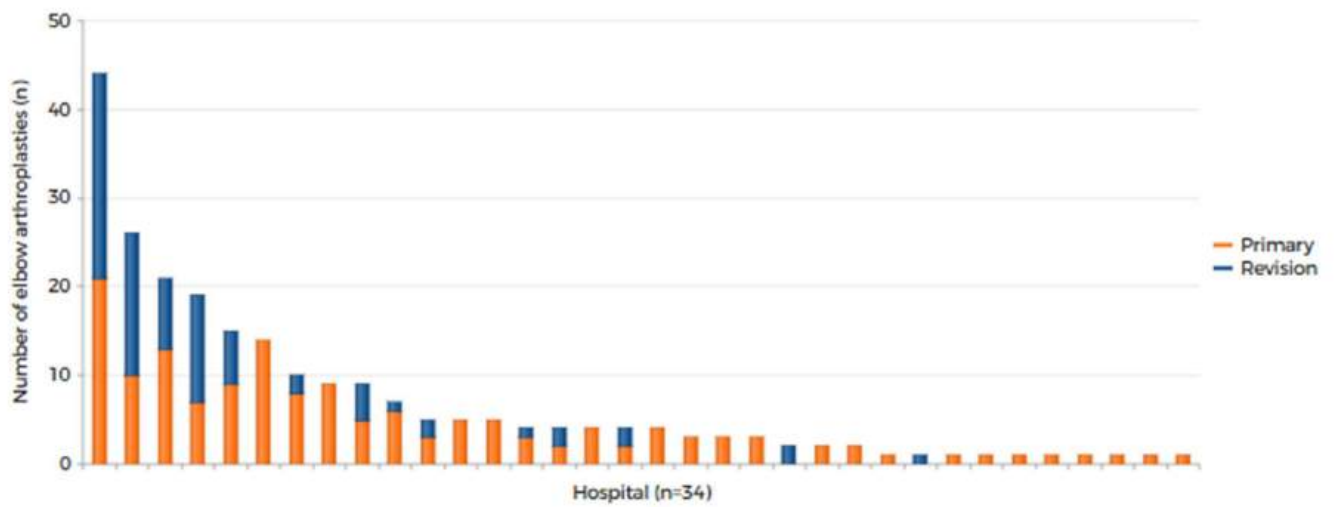


	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Primary	125	137	145	139	140	139	156	140	165	152	1,438
Revision	67	57	61	58	63	52	45	87	58	82	630
Total (n)	192	194	206	197	203	191	201	227	223	234	2,068

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Type of procedure per hospital

FIGURE Number of primary elbow arthroplasties and elbow revision arthroplasties per hospital in the Netherlands in 2024 (n=234)



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Primary elbow arthroplasty

Patient characteristics

By prosthesis

TABLE Patient characteristics of all patients with a registered primary elbow arthroplasty by type of elbow arthroplasty in the Netherlands in 2024

	Total arthroplasty	Radial head arthroplasty	Total
N(%)	73 (49.4)	75 (50.6)	152
Mean age (years) (SD)	67.5 (11.9)	59.7 (13.0)	63.3 (13.7)
Age (years) (%)			
<50	10	19	15
50-59	10	29	19
60-69	30	31	30
70-79	37	17	27
>80	14	4	9
Gender (%)			
Men	25	35	30
Women	75	65	70
ASA score (%)			
ASA I	8	19	15
ASA II	63	67	64
ASA III-IV	29	15	21
Type of hospital (%)			
General	82	89	84
UMC	18	11	16
Private	0	0	0
Diagnosis (%)			
Fracture	27	76	51
Late posttraumatic	22	17	21
Osteoarthritis	21	3	11
Rheumatoid arthritis	19	0	9
Inflammatory arthritis	0	0	0
Osteonecrosis	0	0	0
Hemophilic arthropathy	0	0	0
Tumour	1	0	0
Other	10	4	7
Mean BMI (kg/m²) (SD)	27.5 (5.6)	28.6 (6.8)	28 (6.2)
Body Mass Index (kg/m²) (%)			
Underweight (<=18.5)	1	1	1
Normal weight (>18.5-25)	32	31	31
Overweight (>25-30)	47	36	42
Obesity (>30-40)	15	23	19
Morbid obesity (>40)	5	8	7
Smoking (%)			
No	82	87	87
Yes	15	11	13

Total arthroplasty includes distal hemihumeral prostheses (n=4).

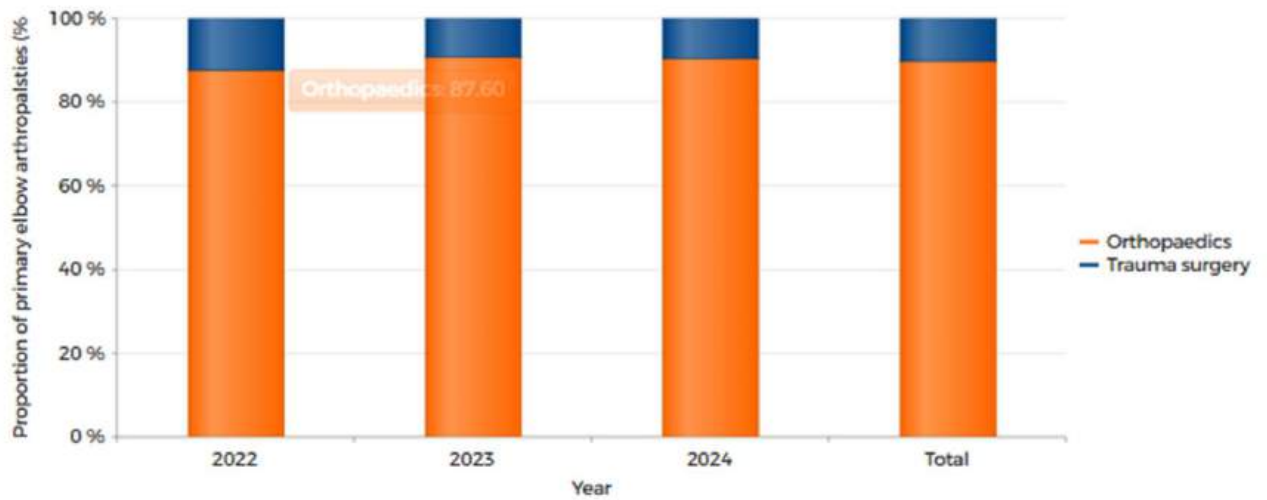
Two primary elbow arthroplasties were registered as other.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Procedure characteristics

Specialism

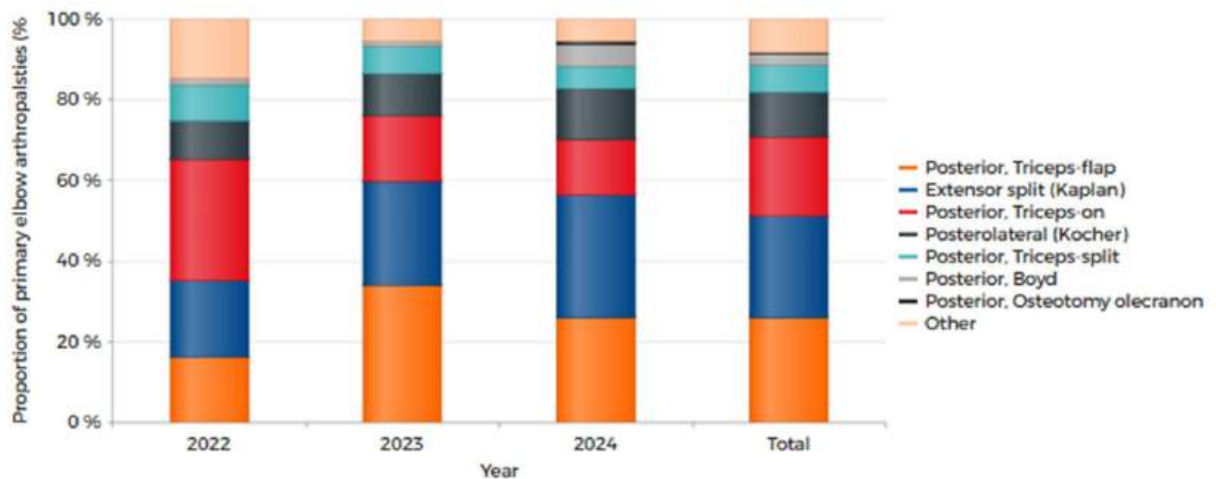
FIGURE Trend (proportion [%] per year) in specialism for performing a primary elbow arthroplasty in the Netherlands in 2022-2024

	2022	2023	2024	Total
Orthopaedics	87.60	90.91	90.44	89.81
Trauma surgery	12.40	9.09	9.56	10.19
Total (n)	121	165	136	422

Please note: Specialism was not registered before 2022.

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Surgical approach

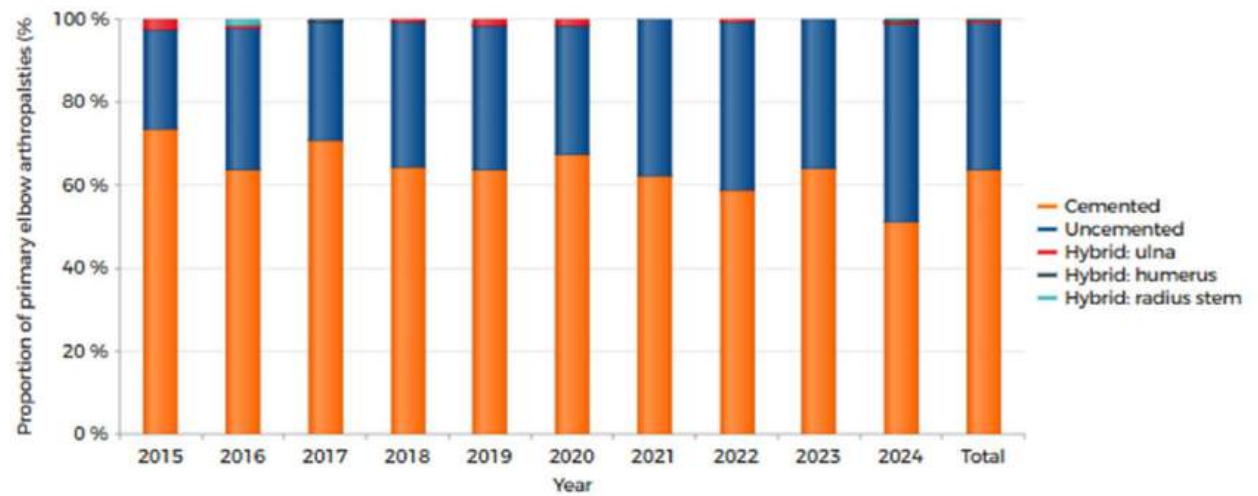
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary elbow arthroplasty in the Netherlands in 2022-2024

	2022	2023	2024	Total
Posterior, Triceps-flap	16.18	34.15	26.21	26.07
Extensor split (Kaplan)	19.12	25.61	30.34	25.17
Posterior, Triceps-on	30.15	16.46	13.79	19.78
Posterolateral (Kocher)	9.56	10.37	12.41	10.79
Posterior, Triceps-split	8.82	6.71	5.52	6.97
Posterior, Boyd	1.47	1.22	5.52	2.70
Posterior, Osteotomy olecranon	0	0	0.69	0.22
Other	14.71	5.49	5.52	8.31
Total (n)	136	164	145	445

Please note: The registration form was changed in 2022. Therefore, trends are shown for the period 2022-2024 only.

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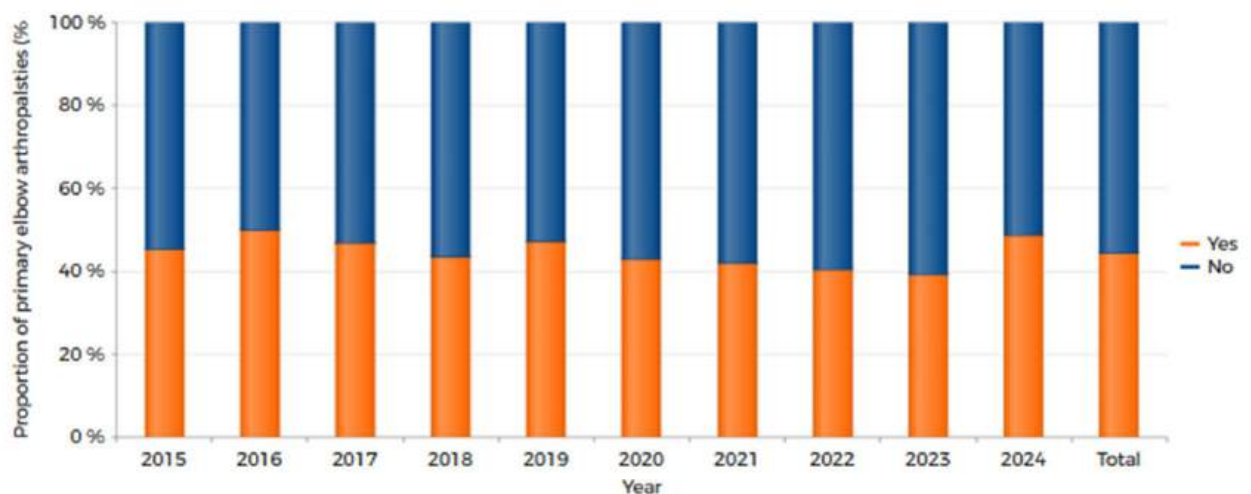
Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary elbow arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cemented	73.77	63.91	70.92	64.44	63.77	67.39	62.34	58.82	64.02	51.35	63.88
Uncemented	23.77	33.83	28.37	34.81	34.78	31.16	37.66	40.44	35.98	47.30	35.06
Hybrid: ulna	2.46	0.75	0	0.74	1.45	1.45	0	0.74	0	0.68	0.78
Hybrid: humerus	0	0	0.71	0	0	0	0	0	0	0.68	0.14
Hybrid: radius stem	0	1.50	0	0	0	0	0	0	0	0	0.14
Total (n)	122	133	141	135	138	138	154	136	164	148	1,409

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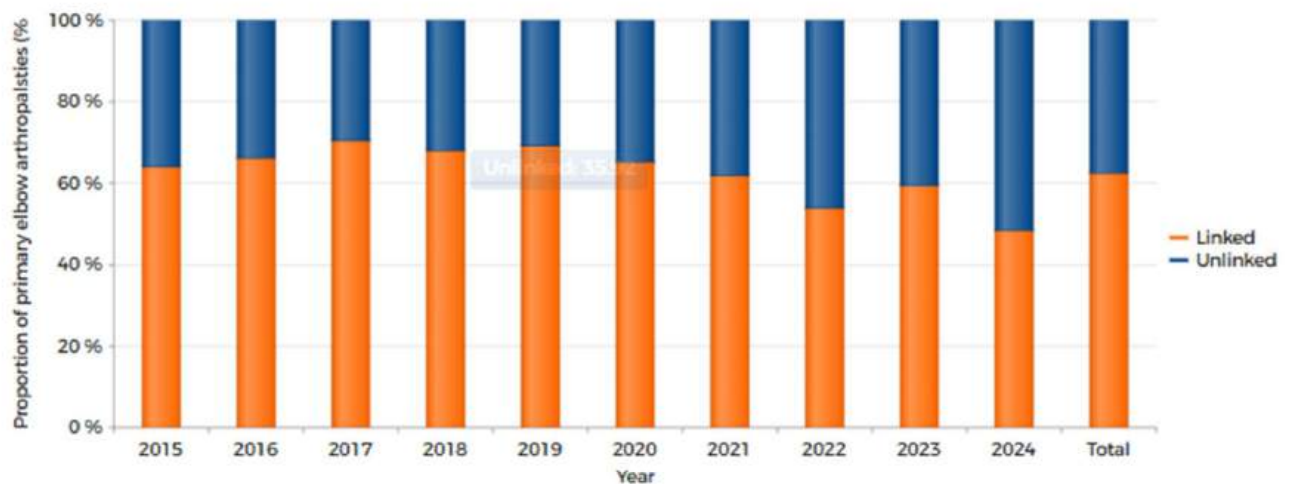
Implantation of radial head

FIGURE Trend (proportion [%] per year) in implantation of radial head component in primary elbow arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Yes	45.38	50	46.88	43.59	47.33	42.86	42	40.60	39.13	48.65	44.41
No	54.62	50	53.13	56.41	52.67	57.14	58	59.40	60.87	51.35	55.59
Total (n)	119	118	96	117	131	133	150	133	161	148	1,306

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Linked prosthesis

FIGURE Trend (proportion [%] per year) of linked versus unlinked prostheses in primary elbow arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Linked	64.08	66.13	70.43	68.07	69.42	65.25	61.90	54.05	59.57	48.51	62.53
Unlinked	35.92	33.87	29.57	31.93	30.58	34.75	38.10	45.95	40.43	51.49	37.47
Total (n)	103	124	115	119	121	118	147	111	141	134	1,233

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Most frequently registered - total elbow

TABLE The most frequently registered total elbow arthroplasties in primary elbow arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Total elbow arthroplasty (n)	58	70	67	84	66
Name; Proportion (%)					
Latitude EV	51.72	60.00	46.27	63.10	53.03
Latitude	15.52	12.86	11.94	10.71	28.79
Coonrad/Morrey	20.69	17.14	23.88	21.43	13.64
Discovery	8.62	2.86	5.97	3.57	3.03
Mutars	0.00	0.00	1.49	0.00	1.52

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Most frequently registered - radial head

TABLE The most frequently registered radial head arthroplasties in primary elbow arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Radial head arthroplasty (n)	45	62	51	60	65
Name; Proportion (%)					
RHS	80.00	62.90	39.22	41.67	55.38
Anatomic Radial Head	4.44	6.45	33.33	26.67	26.15
Evolve Radial Head	2.22	1.61	3.92	6.67	9.23
Explor	8.89	17.74	9.80	13.33	6.15
Radial Head Replacement System	0.00	3.23	1.96	8.33	3.08

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Most frequently registered - types of bone cement

TABLE The registered types of bone cement used during primary elbow arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement used (n)	83	84	79	92	76
Cement name; Proportion (%)					
Palacos R+C	24.39	29.27	36.71	43.48	47.30
Copal G+C	0.00	0.00	17.72	25.00	25.68
Palacos LV+C	6.10	13.41	11.39	11.96	10.81
Simplex ABC Tobra	4.88	24.39	10.13	5.43	8.11
Refobacin Bone Cement R	13.41	19.51	7.59	7.61	6.76
Simplex ABC EC	30.49	8.54	10.13	4.35	1.35

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Survival

Short term revision

By type of revision within 1 year

TABLE Revision procedures within 1 year after primary elbow arthroplasty by year in the Netherlands in 2014-2023

Procedure year	Number of primary elbow arthroplasties	Number of revisions	Percentage revisions
2014	107	6	5.6%
2015	125	2	1.6%
2016	135	3	2.2%
2017	145	5	3.4%
2018	138	7	5.1%
2019	140	4	2.9%
2020	139	1	0.7%
2021	154	9	5.8%
2022	137	8	5.8%
2023	165	10	6.1%

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Conversion to total elbow arthroplasty

TABLE Conversions from primary non-total elbow arthroplasty to total elbow arthroplasty within 1 year in the period 2014-2023 (n=642)

Number of revision procedures	27
Number of conversions	6
Percentage conversions	22.2 %

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Time after primary elbow arthroplasty

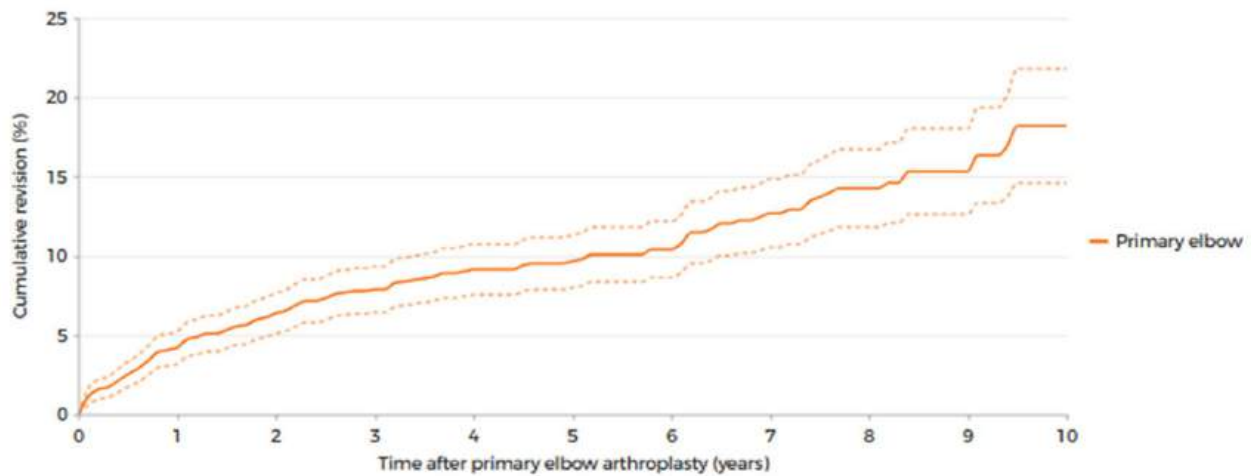
TABLE Time after primary elbow arthroplasty until short-term revision in the Netherlands in 2014-2021 (n=1,083)

Time after primary elbow	Percentage revisions (%)
Day 0-29	0.74
Day 30-182	1.39
Day 183-364	1.29
Day 365-730 (second year)	2.31
Day 731-1095 (third year)	1.57

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Long term revision

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary elbow arthroplasties in the Netherlands in 2014-2024 (n=1,534)

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	1yr	3yr	5yr	7yr	10yr
Primary elbow	4.07 (3.06-5.07)	7.79 (6.35-9.22)	9.52 (7.88-11.17)	12.47 (10.36-14.58)	18.21 (14.60-21.81)

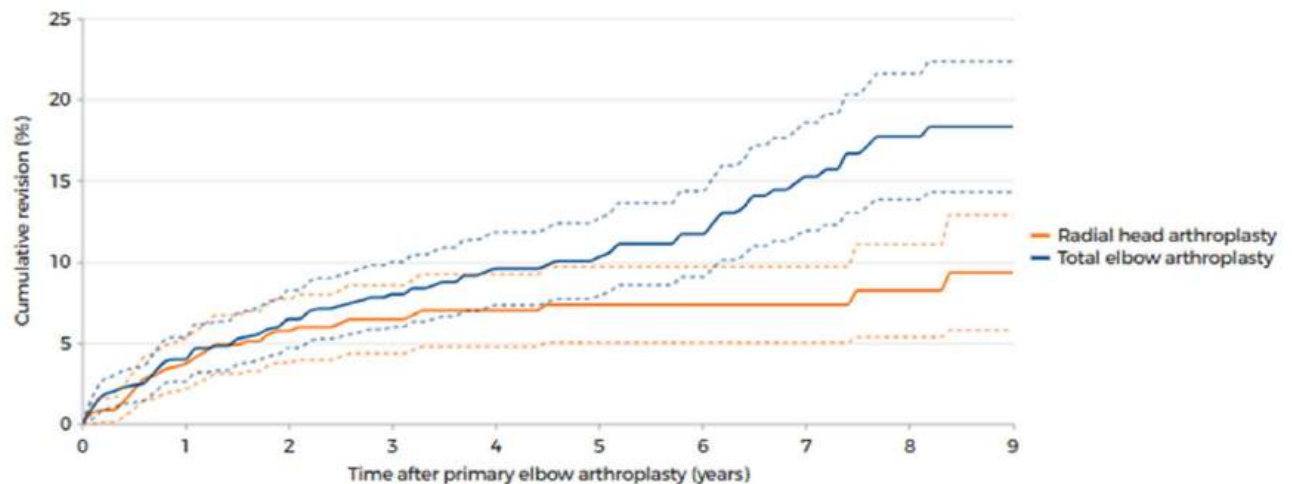
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

CI: confidence interval.

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In 2014-2024, 158 (10.3%) primary elbow arthroplasties were implanted in patients who died within ten 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 2014-2024 (n=1,405)

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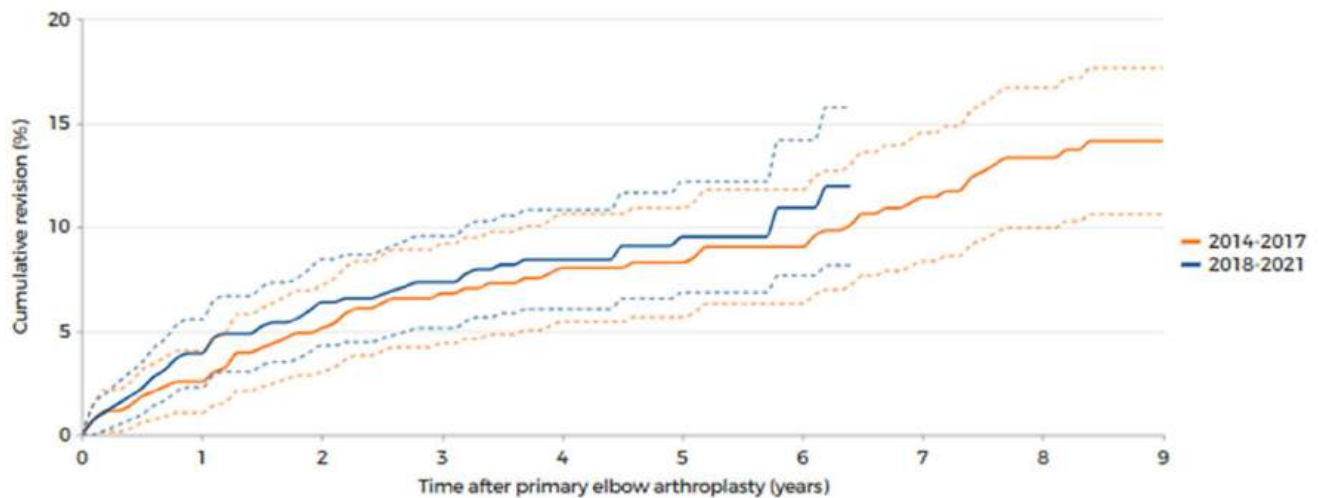
	1yr	3yr	5yr	7yr	9yr
Total elbow arthroplasty	3.97 (2.60-5.34)	7.80 (5.82-9.78)	10.04 (7.70-12.37)	14.84 (11.59-18.09)	18.32 (14.30-22.35)
Radial head arthroplasty	3.53 (2.01-5.04)	6.44 (4.33-8.55)	7.36 (5.02-9.69)	7.36 (5.02-9.69)	9.32 (5.77-12.88)

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

CI: confidence interval.

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By procedure year

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary elbow arthroplasties fo by procedure year of primary arthroplasty in the Netherlands in 2014-2024

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	Number (n)	1yr	3yr	5yr	7yr	9yr
2014-2017	434	2.55 (1.06-4.04)	6.56 (4.21-8.91)	8.28 (5.65-10.91)	11.17 (8.12-14.22)	14.12 (10.61-17.64)
2018-2021	542	3.91 (2.27-5.55)	7.34 (5.12-9.56)	9.10 (6.55-11.64)	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.

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Elbow revision arthroplasty

In this section you will find all the information on elbow revision arthroplasty:

Revision characteristics

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent an elbow revision arthroplasty in the Netherlands in 2016-2024

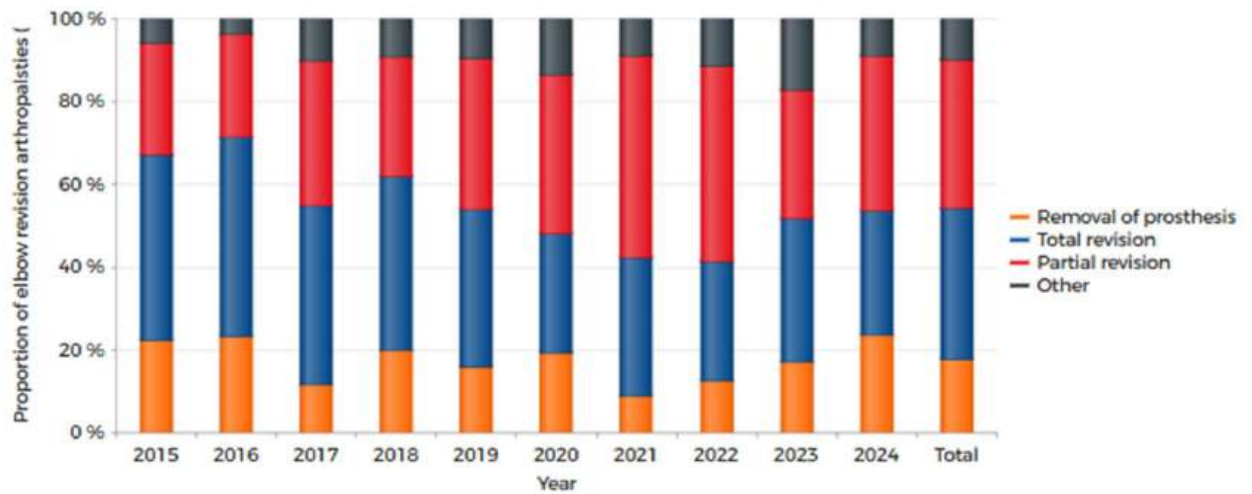
Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Elbow revision arthroplasty (n)	57	61	58	63	52	45	87	58	82	563
Reasons for revision; Proportion (%)										
Polyethylene wear	28.07	27.87	27.59	22.22	15.38	15.56	18.39	15.52	14.63	20.43
Infection	14.04	3.28	15.52	15.87	23.08	17.78	24.14	24.14	25.61	18.65
Metallosis	22.81	22.95	22.41	23.81	13.46	22.22	12.64	18.97	10.98	18.29
Instability or dislocation	21.05	40.98	15.52	20.63	5.77	22.22	11.49	18.97	9.76	17.94
Loosening of ulnar component	15.79	18.03	17.24	17.46	23.08	13.33	18.39	15.52	19.51	17.76
Loosening of humeral component	15.79	14.75	15.52	12.70	30.77	20.00	12.64	18.97	19.51	17.41
Mechanical complication or loosening of radial component	21.05	18.03	20.69	15.87	15.38	13.33	9.20	15.52	10.98	15.10
Peri-prosthetic fracture	3.51	18.03	18.97	19.05	17.31	17.78	9.20	12.07	10.98	13.68
Malposition or malalignment							9.20	10.34	6.10	
Revision after elbow removal							2.30	1.72	0.00	
Other	12.28	24.59	10.34	14.29	13.46	15.56	16.09	8.62	17.07	14.92

Please note: Malalignment and Removal after elbow revision have been registered since 2022.

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

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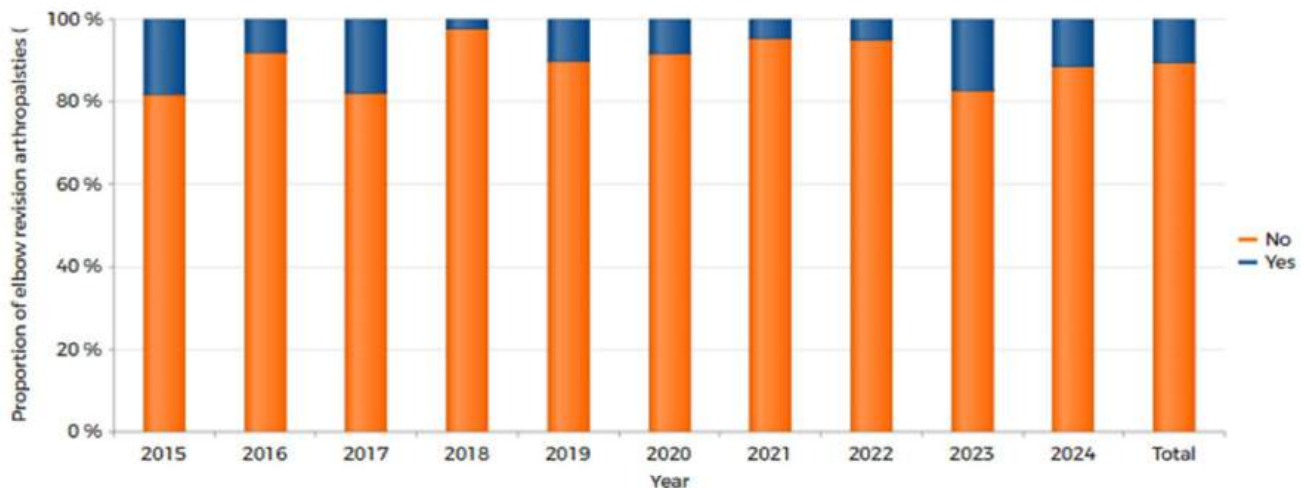
Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in elbow revision arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Removal of prosthesis	22.39	23.21	11.67	20	15.87	19.23	8.89	12.64	17.24	23.75	17.66
Total revision	44.78	48.21	43.33	41.82	38.10	28.85	33.33	28.74	34.48	30	36.76
Partial revision	26.87	25	35	29.09	36.51	38.46	48.89	47.13	31.03	37.50	35.79
Other	5.97	3.57	10	9.09	9.52	13.46	8.89	11.49	17.24	8.75	9.79
Total (n)	67	56	60	55	63	52	45	87	58	80	623

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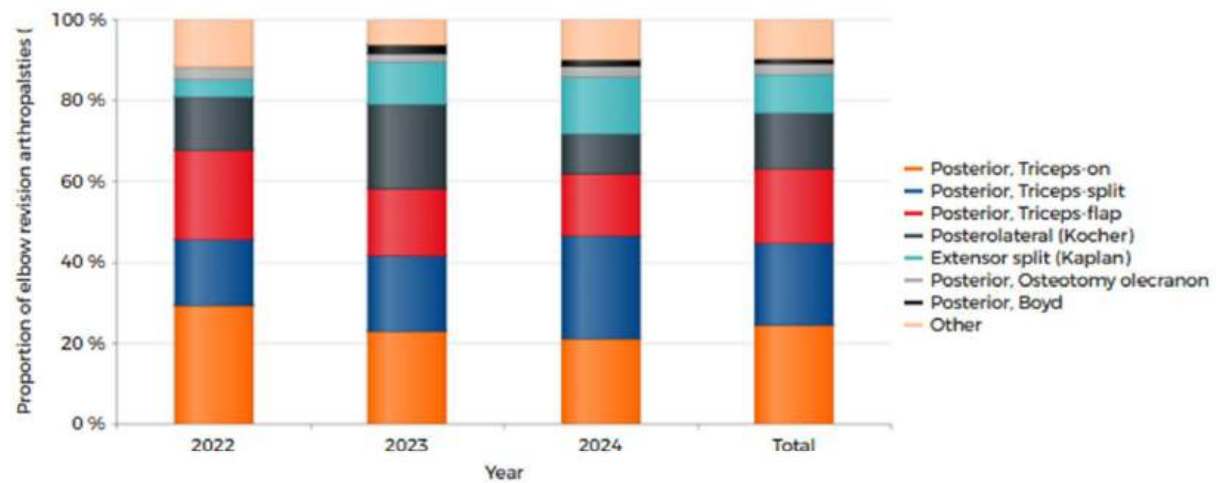
Conversion to total elbow arthroplasty

FIGURE Trend (proportion [%] per year) in conversion of a radial head arthroplasty to a total elbow arthroplasty in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
No	81.82	92	82.14	97.96	90	91.84	95.35	95.18	82.76	88.61	89.69
Yes	18.18	8	17.86	2.04	10	8.16	4.65	4.82	17.24	11.39	10.31
Total (n)	55	50	56	49	60	49	43	83	58	79	582

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Surgical approach

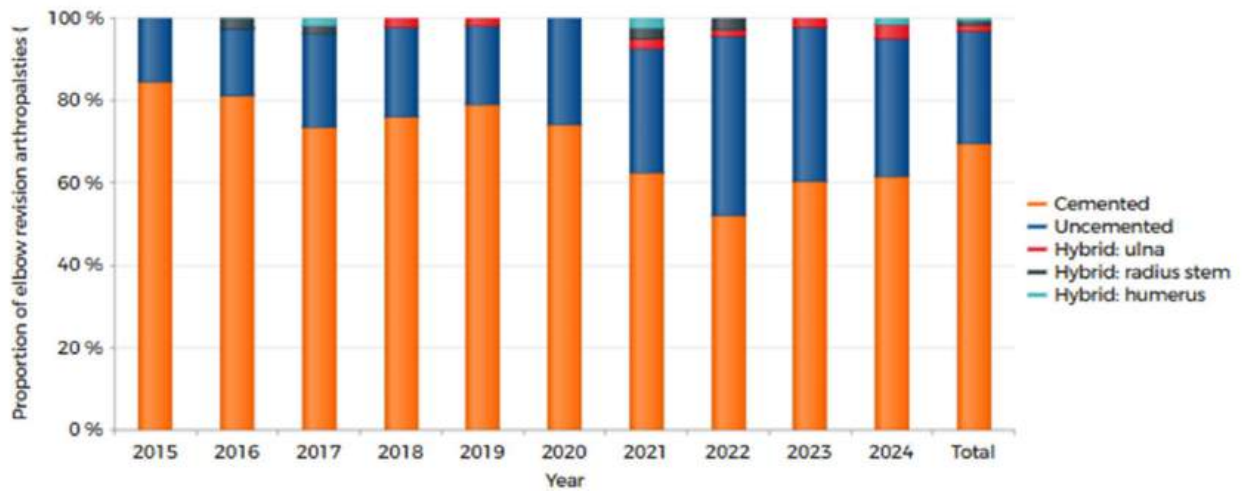
FIGURE Trend (proportion [%] per year) in surgical approach for performing a elbow revision arthroplasty in the Netherlands in 2022-2024

	2022	2023	2024	Total
Posterior, Triceps-on	29.41	22.92	21.13	24.60
Posterior, Triceps-split	16.18	18.75	25.35	20.32
Posterior, Triceps-flap	22.06	16.67	15.49	18.18
Posterolateral (Kocher)	13.24	20.83	9.86	13.90
Extensor split (Kaplan)	4.41	10.42	14.08	9.63
Posterior, Osteotomy olecranon	2.94	2.08	2.82	2.67
Posterior, Boyd	0	2.08	1.41	1.07
Other	11.76	6.25	9.86	9.63
Total (n)	68	48	71	187

Please note: The registration form was changed in 2022. Therefore, trends are shown for the period 2022-2024 only.

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Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in elbow revision arthroplasties in the Netherlands in 2015-2024

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Cemented	84.62	81.40	73.58	76.09	79.25	74.36	62.50	52.11	60.42	61.67	69.70
Uncemented	15.38	16.28	22.64	21.74	18.87	25.64	30	43.66	37.50	33.33	27.33
Hybrid: ulna	0	0	0	2.17	1.89	0	2.50	1.41	2.08	3.33	1.39
Hybrid: radius stem	0	2.33	1.89	0	0	0	2.50	2.82	0	0	0.99
Hybrid: humerus	0	0	1.89	0	0	0	2.50	0	0	1.67	0.59
Total (n)	52	43	53	46	53	39	40	71	48	60	505

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Most frequently registered – components

TABLE The most frequently registered humerus and ulna components in elbow revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Humerus (n)	15	15	24	19	19
Humerus name; Proportion (%)					
Latitude EV	53.33	40.00	33.33	26.32	52.17
Latitude	6.67	0.00	4.17	21.05	17.39
Coonrad/Morrey	26.67	26.67	25.00	36.84	13.04
Discovery	13.33	0.00	0.00	0.00	8.70
Nes	0.00	20.00	25.00	10.53	4.35
Mutars	0.00	13.33	4.17	5.26	4.35
Year	2020	2021	2022	2023	2024
Ulna (n)	18	13	30	21	27
Ulna name; Proportion (%)					
Latitude EV	66.67	46.15	70.00	66.67	70.37
Coonrad/Morrey	22.22	38.46	16.67	28.57	7.41
Discovery	5.56	0.00	0.00	0.00	7.41
Mutars	0.00	15.38	3.33	0.00	7.41
Latitude	5.56	0.00	0.00	0.00	3.70
Nes	0.00	0.00	10.00	4.76	3.70

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*Most frequently registered - type of bone cement***TABLE** The registered types of bone cement used during elbow revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Bone cement used (n)	23	23	25	25	35
Cement name; Proportion (%)					
Copal C+C	4.35	0.00	32.00	40.00	48.57
Palacos R+G	30.43	21.74	12.00	24.00	22.86
Palacos LV+G	0.00	4.35	4.00	4.00	11.43
Simplex ABC TOBRA	21.74	30.43	12.00	16.00	8.57
Refobacin Bone Cement R	13.04	17.39	20.00	8.00	2.86
Copal G+V	0.00	0.00	8.00	4.00	2.86
Palamed G	0.00	0.00	0.00	0.00	2.86

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Wrist arthroplasty

Numbers

Registered procedures

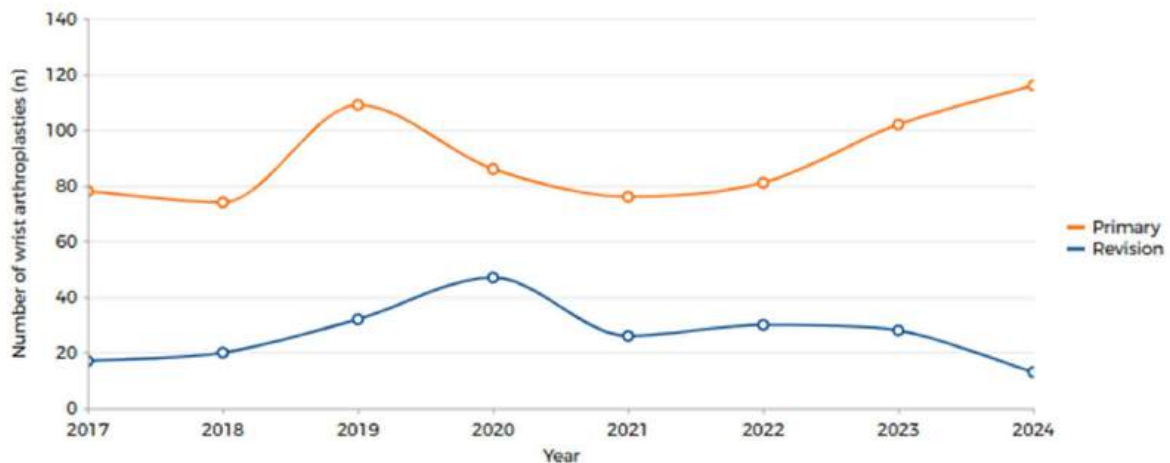
TABLE Number of registered wrist arthroplasties per year of surgery (2017-2024) in the LROI in April 2025

Year of surgery	Total wrist arthroplasty	Ulnar head arthroplasty	DRU arthroplasty	Hemi arthroplasty	Other	Unknown/missing	Revision arthroplasty	Total
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	36	2	28	16	13	7	28	130
2024	50	2	12	12	38	2	13	129
Total (n)	286	51	147	85	115	38	213	935

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Type of procedures

FIGURE Number of primary wrist arthroplasties and wrist revision arthroplasties registered in the LROI in the Netherlands in 2016-2024

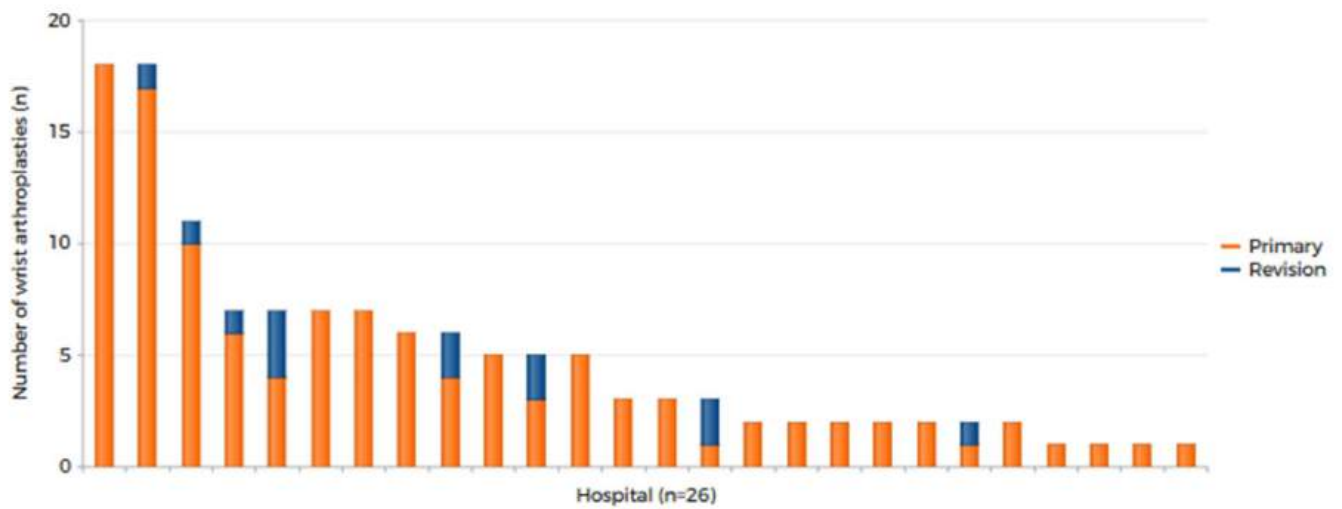


	2017	2018	2019	2020	2021	2022	2023	2024	Total
Primary	78	74	109	86	76	81	102	116	722
Revision	17	20	32	47	26	30	28	13	213
Total (n)	95	94	141	133	102	111	130	129	935

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Type of procedure per hospital

FIGURE Number of primary wrist arthroplasties and wrist revision arthroplasties per hospital in the Netherlands in 2024 (n=129)



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Primary wrist arthroplasty

Patient characteristics

Demographics

By specialism

TABLE Patient characteristics of all patients with a registered primary wrist arthroplasty in the Netherlands in 2024

	Plastic surgery	Orthopaedic surgery	Total
N(%)	66 (57.4)	47 (40.8)	116
Mean age (years) (SD)	62.2 (9.4)	65.2 (11.2)	63.3 (10.9)
Age (years) (%)			
<50	5	9	7
50-59	36	17	28
60-69	38	36	36
70-79	20	23	22
>80	2	15	7
Gender (%)			
Men	35	38	36
Women	65	62	64
ASA score (%)			
ASA I	24	9	18
ASA II	62	64	63
ASA III-IV	14	28	19
Type of hospital (%)			
General	77	96	84
UMC	5	4	4
Private	18	0	11
Diagnosis (%)			
Osteoarthritis	74	53	66
Post-traumatic	6	23	13
Rheumatoid arthritis	3	19	10
Osteonecrosis	2	0	1
Inflammatory arthritis	0	2	1
Other	14	2	10
Mean BMI (kg/m²) (SD)	27.7 (5.2)	26.8 (4.9)	27.3 (5)
Body Mass Index (kg/m²) (%)			
Underweight (<=18.5)	0	4	2
Normal weight (>18.5-25)	30	36	35
Overweight (>25-30)	27	34	34
Obesity (>30-40)	24	26	26
Morbid obesity (>40)	5	0	3
Smoking (%)			
No	91	87	91
Yes	5	13	9

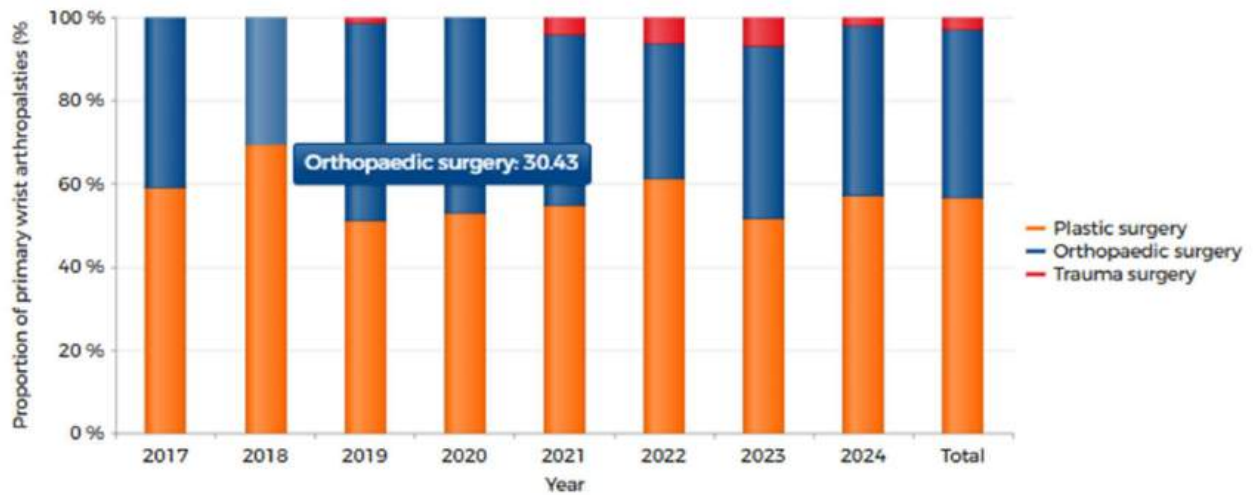
Total primary wrist arthroplasties includes two procedures performed by trauma surgeons and one procedure with missing specialism.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Procedure characteristics

Specialism

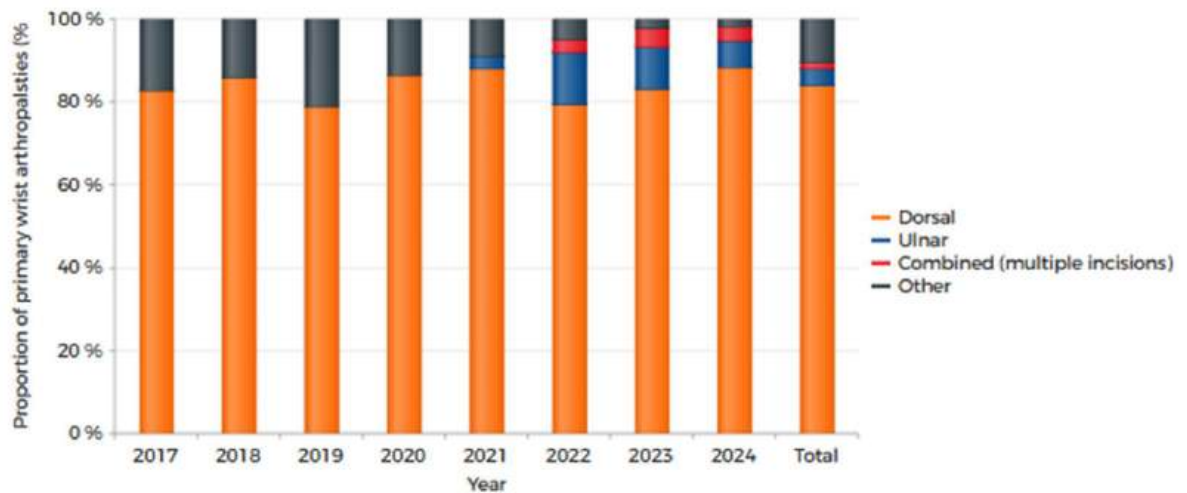
FIGURE Trend (proportion [%] per year) in specialism for performing a primary wrist arthroplasty in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Plastic surgery	59.21	69.57	51.11	52.94	54.79	61.25	51.96	57.39	56.81
Orthopaedic surgery	40.79	30.43	47.78	47.06	41.10	32.50	41.18	40.87	40.58
Trauma surgery	0	0	1.11	0	4.11	6.25	6.86	1.74	2.61
Total (n)	76	69	90	85	73	80	102	115	690

Please note: the specialism of trauma surgery has been registered since 2022

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Surgical approach

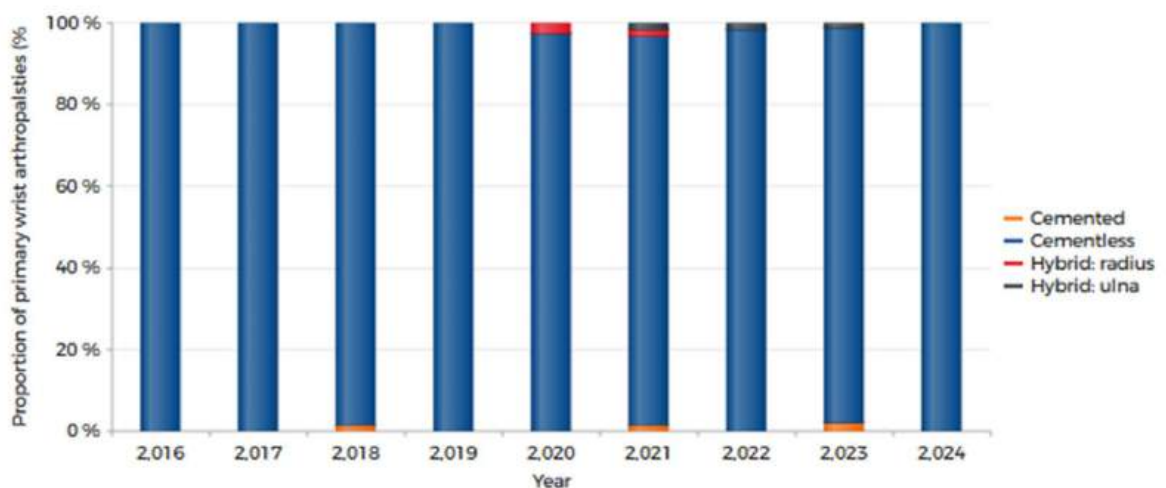
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary wrist arthroplasty in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Dorsal	82.86	85.92	78.85	86.42	88.06	79.37	83.15	88.50	84.19
Ulnar	0	0	0	0	2.99	12.70	10.11	6.19	3.95
Combined (multiple incisions)	0	0	0	0	0	3.17	4.49	3.54	1.52
Other	17.14	14.08	21.15	13.58	8.96	4.76	2.25	1.77	10.33
Total (n)	70	71	104	81	67	63	89	113	658

Please note: the combined and ulnar surgical approaches have been registered since 2022

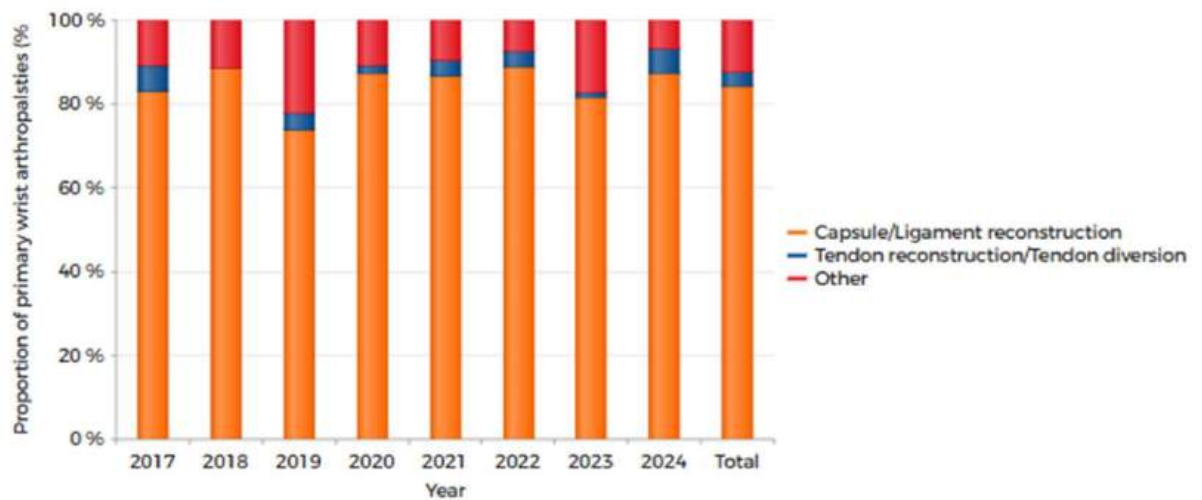
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Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary wrist arthroplasties in the Netherlands in 2017-2024

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cemented	0	0	1.41	0	0	1.54	0	2.17	0
Cementless	100	100	98.59	100	97.40	95.38	98.48	96.74	100
Hybrid: radius	0	0	0	0	2.60	1.54	0	0	0
Hybrid: ulna	0	0	0	0	0	1.54	1.52	1.09	0
Total (n)	16	71	71	103	77	65	66	92	113

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*Soft tissue stabilisation***FIGURE** Trend (proportion [%] per year) in type of stabilisation in primary wrist arthroplasties in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Capsule/Ligament reconstruction	82.98	88.71	74.07	87.50	86.79	88.89	81.58	87.50	84.33
Tendon reconstruction/Tendon diversion	6.38	0	3.70	1.79	3.77	3.70	1.32	5.68	3.29
Other	10.64	11.29	22.22	10.71	9.43	7.41	17.11	6.82	12.38
Total (n)	47	62	81	56	53	54	76	88	517

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*Most frequently registered components***TABLE** The most frequently registered carpal and radial stem components in primary wrist arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Carpal (n)	30	23	35	48	50
Carpal name; Proportion (%)					
RCPI	20.00	26.09	57.14	50.00	48.00
Remotion	10.00	4.35	8.57	33.33	30.00
Motec	3.33	4.35	8.57	6.25	22.00
Year	2020	2021	2022	2023	2024
Radial stem (n)	34	30	22	37	0.00
Radial stem name; Proportion (%)					
Motec	0.00	3.33	13.64	5.41	50.00
Remotion	8.82	6.67	13.64	37.84	30.43
Distal radioulnar joint	23.53	30.00	36.36	48.65	19.57

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Survival

Short term revision

Revision rates within 1 year

TABLE Revision procedures within 1 year after primary wrist arthroplasty by year in the Netherlands in 2017-2023

Procedure year	Number of primary wrist arthroplasties	Number of revisions	Percentage revisions
2017	78	3	3.8%
2018	74	3	4.1%
2019	109	3	2.8%
2020	86	3	3.5%
2021	76	0	0.0%
2022	81	1	1.2%
2023	102	3	2.9%

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Time after primary wrist

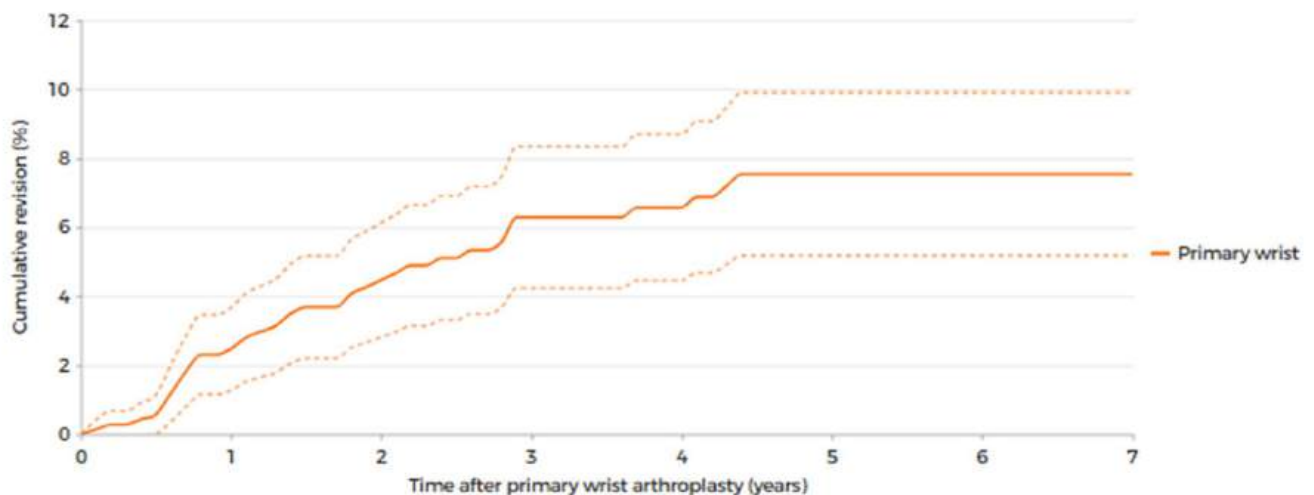
TABLE Time after primary wrist arthroplasty until short-term revision in the Netherlands in 2017-2021 (n=423)

Time after primary wrist	Percentage revisions (%)
Day 1-29	0.00
Day 30-182	0.71
Day 183-364	2.13
Day 365-730 (second year)	1.89
Day 731-1095 (third year)	1.89

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Long term revision

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary wrist arthroplasties in the Netherlands in 2017-2024 (n=772)

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	1yr	3yr	5yr	7yr
Primary wrist	2.31 (1.15-3.46)	6.29 (4.24-8.34)	7.54 (5.18-9.91)	7.54 (5.18-9.91)

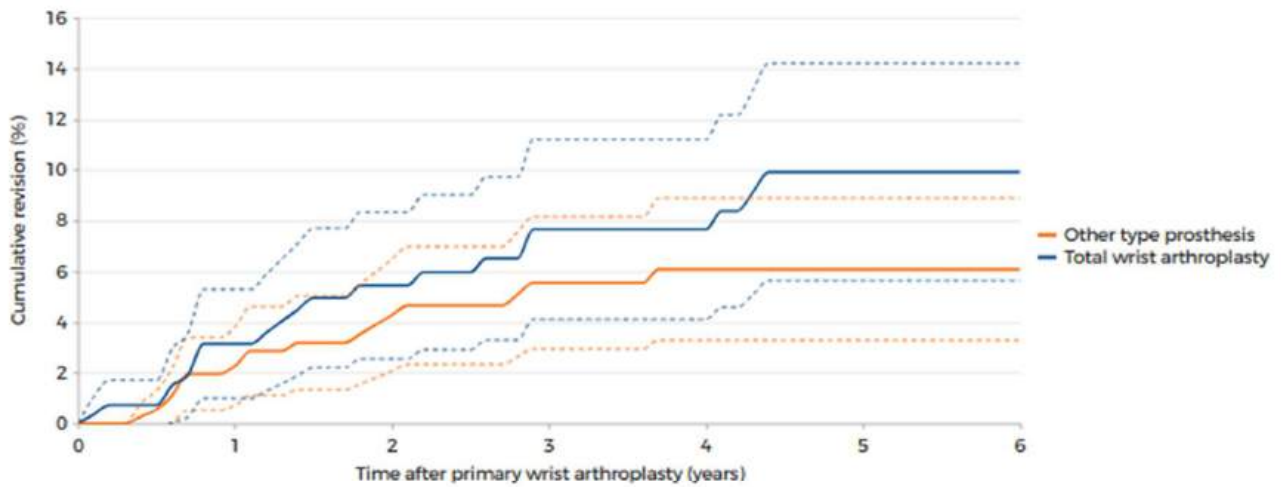
Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.

CI: confidence interval.

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In 2017-2024, 28 (3.9%) primary wrist arthroplasties were implanted in patients who died within seven years after the primary procedure.

By type of wrist arthroplasty

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary wrist arthroplasties by type of wrist arthroplasty in the Netherlands in 2017-2024

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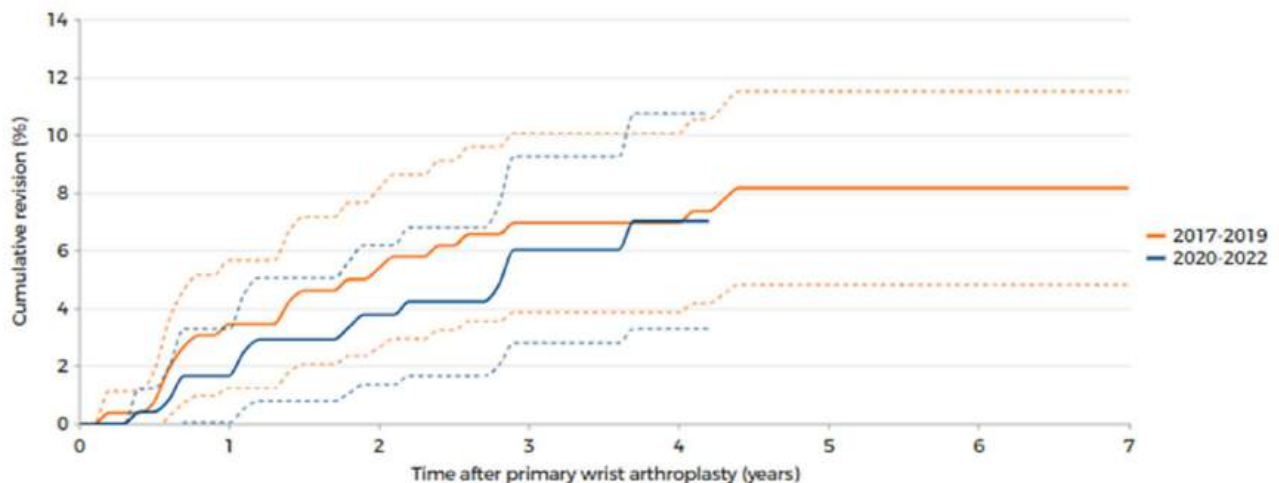
	Number (n)	1yr	3yr	5yr	6yr
Total wrist arthroplasty	284	3.14 (0.99-5.29)	7.65 (4.11-11.20)	9.92 (5.63-14.20)	9.92 (5.63-14.20)
Other type prosthesis	400	1.95 (0.52-3.39)	5.54 (2.94-8.15)	6.09 (3.29-8.88)	6.09 (3.29-8.88)

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

CI: confidence interval.

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By procedure year

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary wrist arthroplasties by procedure year of primary arthroplasty in the Netherlands in 2017-2024

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	Number (n)	1yr	3yr	5yr	7yr
2017-2019	261	3.07 (0.97-5.16)	6.96 (3.86-10.06)	8.16 (4.81-11.51)	8.16 (4.81-11.51)
2020-2022	243	1.66 (0.05-3.28)	6.02 (2.80-9.25)	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.

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Wrist revision arthroplasty

In this section you will find all the information on revision wrist arthroplasty

Revision characteristics

Reasons for revision

TABLE Reasons for revision in patients who underwent a wrist revision arthroplasty in the Netherlands in 2017-2024

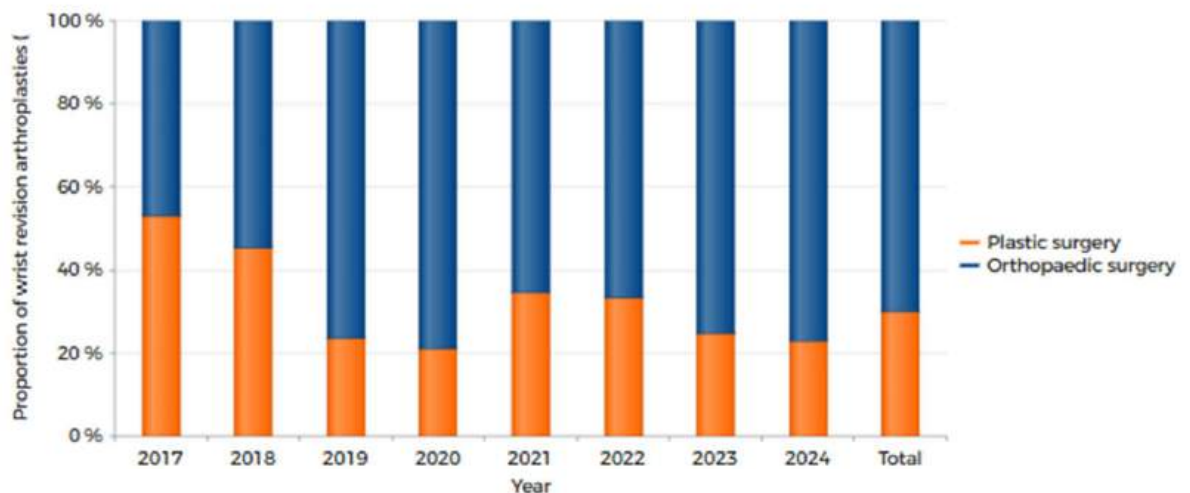
Year	2017	2018	2019	2020	2021	2022	2023	2024	Total
Wrist revision arthroplasty (n)	17	20	32	47	26	30	28	13	213
Reasons for revision; Proportion (%)									
Loosening of carpal component	11.76	25.00	25.00	19.15	34.62	43.33	28.57	46.15	28.17
Bone resorption of carpal component						30.00	32.14	38.46	
Instability	17.65	25.00	21.88	21.28	23.08	20.00	21.43	46.15	23.00
Dislocation	17.65	15.00	9.38	14.89	23.08	16.67	7.14	23.08	15.02
Loosening of radial component	5.88	5.00	15.63	17.02	23.08	10.00	10.71	0.00	12.68
Bone resorption of radial component						10.00	17.86	30.77	
Infection	0.00	5.00	12.50	6.38	3.85	13.33	17.86	0.00	8.45
Revision after wrist removal						6.67	10.71	7.69	
Implant fracture	17.65	0.00	3.13	6.38	7.69	3.33	10.71	7.69	6.57
Peri-prosthetic fracture	5.88	0.00	0.00	0.00	11.54	3.33	3.57	15.38	3.76
Loosening of ulnar component	0.00	0.00	0.00	2.13	3.85	6.67	3.57	7.69	2.82
Bone resorption of ulnar component							14.29		
Other	29.41	25.00	31.25	27.66	26.92	16.67	7.14	15.38	23.00

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.

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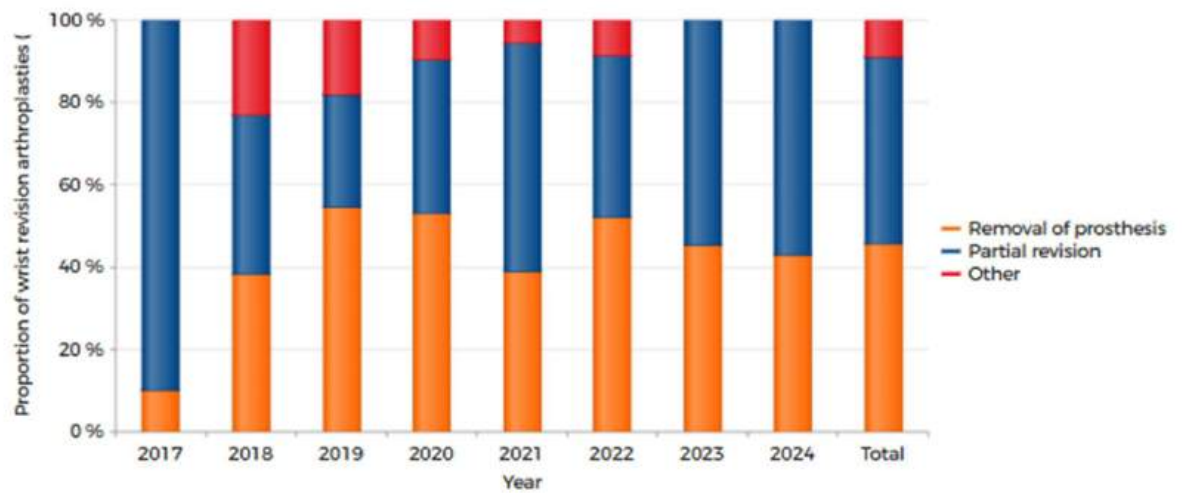
Specialism

FIGURE Trend (proportion [%] per year) in specialism for performing a wrist revision arthroplasty in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Plastic surgery	52.94	45.45	23.53	21.28	34.62	33.33	25	23.08	30.16
Orthopaedic surgery	47.06	54.55	76.47	78.72	65.38	66.67	75	76.92	69.84
Total (n)	17	11	17	47	26	30	28	13	189

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Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in wrist revision arthroplasties in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Removal of prosthesis	6.25	26.32	37.50	36.17	26.92	41.38	37.04	23.08	32.06
Partial revision	56.25	26.32	18.75	25.53	38.46	31.03	44.44	30.77	32.06
Other	0	15.79	12.50	6.38	3.85	6.90	0	0	6.22
Total (n)	10	13	22	32	18	23	22	7	147

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Most frequently registered components

TABLE The most frequently registered carpal and radial stem components in wrist revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Carpal (n)	13	11	7	9	4
Carpal name; Number (n)					
Remotion	0	1	1	3	2
Motec	0	2	1	2	2
Freedom	10	6	3	3	0
Universal2	3	2	2	1	0
Year	2020	2021	2022	2023	2024
Radial stem (n)	10	7	3	3	1
Radial stem name; Number (n)					
Remotion	0	0	0	1	1
Distal radioulnar joint	3	3	1	1	0
Motec	0	1	1	1	0

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Finger arthroplasty

In this section you will find all the information on finger arthroplasty:

Numbers

Registered procedures

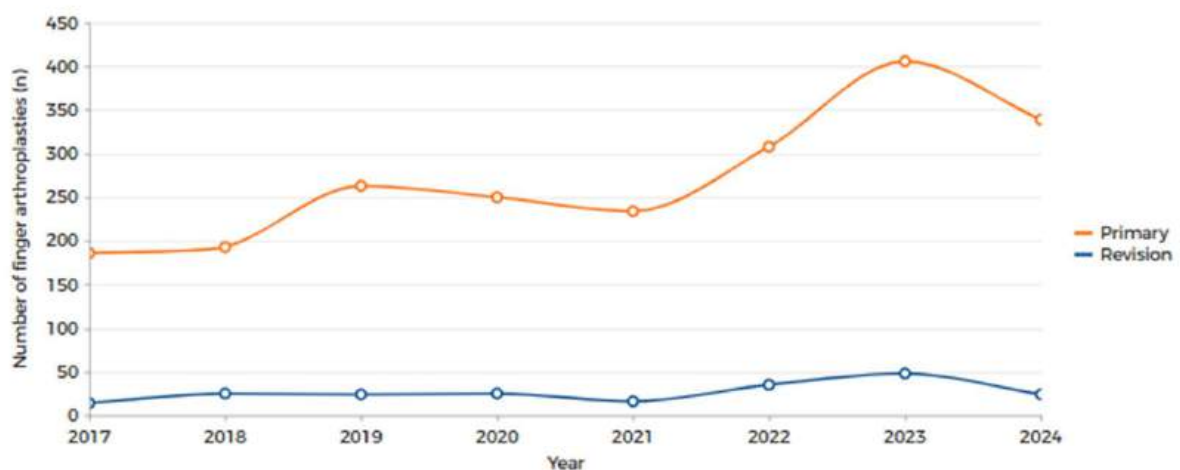
TABLE Number of registered finger arthroplasties per year of surgery (2017-2024) in the LROI in April 2025

Year of surgery	Total finger arthroplasty	Revision arthroplasty	Total
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	406	48	454
2024	339	24	363
Total (n)	2,179	211	2,390

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Type of procedures

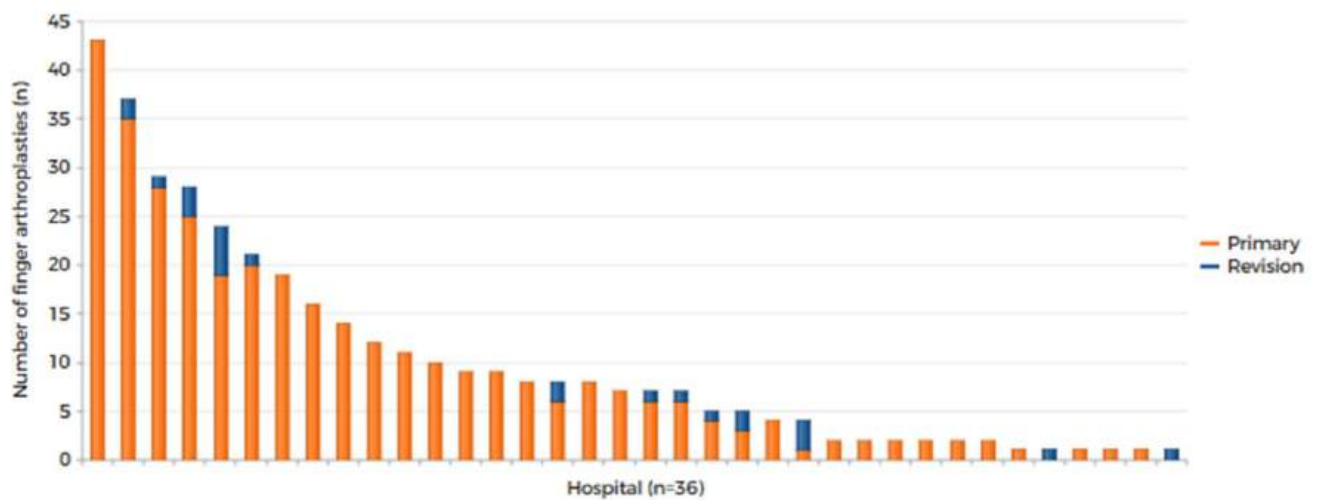
FIGURE Number of primary finger arthroplasties and finger revision arthroplasties registered in the LROI in the Netherlands in 2017-2024



	2017	2018	2019	2020	2021	2022	2023	2024	Total
Primary	186	193	263	250	234	308	406	339	2,179
Revision	14	25	24	25	16	35	48	24	211
Total (n)	200	218	287	275	250	343	454	363	2,390

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Type of procedure per hospital

FIGURE Number of primary finger arthroplasties and finger revision arthroplasties per hospital in the Netherlands in 2024 (n=363)

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Type of primary finger prosthesis

TABLE Type of primary finger prosthesis in primary finger arthroplasties in the Netherlands in 2024 (n=339)

Finger joint	Thumb (n)	Index (n)	Middle (n)	Ring (n)	Small (n)	Total (n)
CMC	45	n.a.	n.a.	n.a.	n.a.	45
MCP	2	32	27	7	8	76
PIP	n.a.	43	76	61	31	211
DIP	2	3	0	1	1	7
Total (n)	49	78	103	69	40	339

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Primary finger arthroplasty

In this section you will find all the information on primary finger arthroplasty:

Patient characteristics

Demographics

Patient characteristics by specialism

TABLE Patient characteristics of all patients with a registered primary finger arthroplasty in the Netherlands in 2024

	Plastic surgery	Orthopaedic surgery	Total
N(%)	256 (76.6)	77 (23)	339
Mean age (years) (SD)	65.1 (10.5)	65.8 (7.8)	65.4 (9.9)
Age (years) (%)			
<50	6	0	4
50-59	23	19	22
60-69	32	45	36
70-79	35	31	34
>80	4	4	4
Gender (%)			
Men	27	19	26
Women	73	81	74
ASA score (%)			
ASA I	18	10	16
ASA II	70	64	70
ASA III-IV	9	26	14
Type of hospital (%)			
General	24	78	37
UMC	6	6	6
Private	70	16	57
Diagnosis (%)			
Osteoarthritis	86	83	86
Post-traumatic	2	1	2
Rheumatoid arthritis	10	12	10
Osteonecrosis	0	0	0
Inflammatory arthritis	0	1	0
Other	1	1	1
Mean BMI (kg/m²) (SD)	26.5 (6.0)	26.6 (4.0)	26.5 (5.3)
Body Mass Index (kg/m²) (%)			
Underweight (<=18.5)	0	0	0
Normal weight (>18.5-25)	20	42	45
Overweight (>25-30)	13	38	34
Obesity (>30-40)	9	16	18
Morbid obesity (>40)	1	1	2
Smoking (%)			
No	88	91	94
Yes	5	9	6

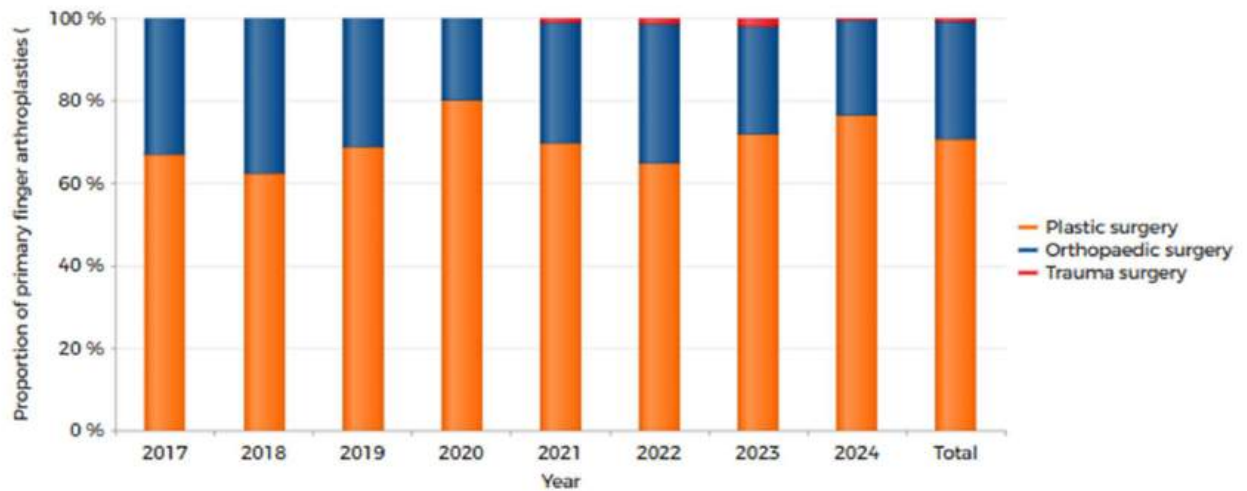
Total primary finger arthroplasties includes one procedure performed by trauma surgeons and five procedures with missing specialism.

General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Procedure characteristics

Specialism

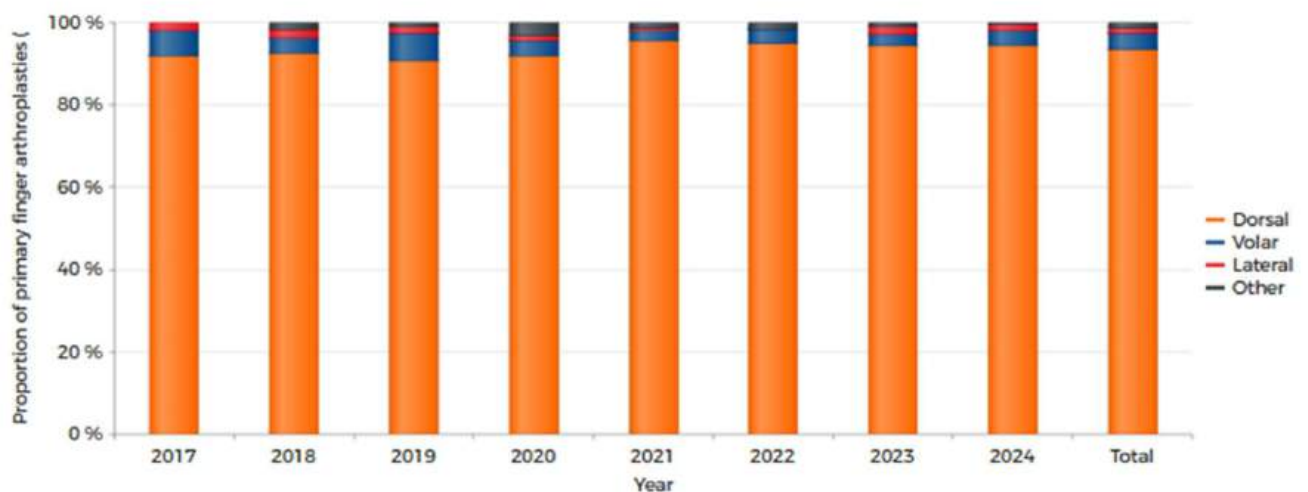
FIGURE Trend (proportion [%] per year) in specialism for performing a primary finger arthroplasty in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Plastic surgery	67.04	62.63	68.90	80.40	69.87	64.90	72.14	76.65	70.89
Orthopaedic surgery	32.96	37.37	31.10	19.60	29.26	33.77	26.12	23.05	28.46
Trauma surgery	0	0	0	0	0.87	1.32	1.74	0.30	0.65
Total (n)	179	190	254	250	229	302	402	334	2,140

Please note: the specialism of trauma surgery has been registered since 2022

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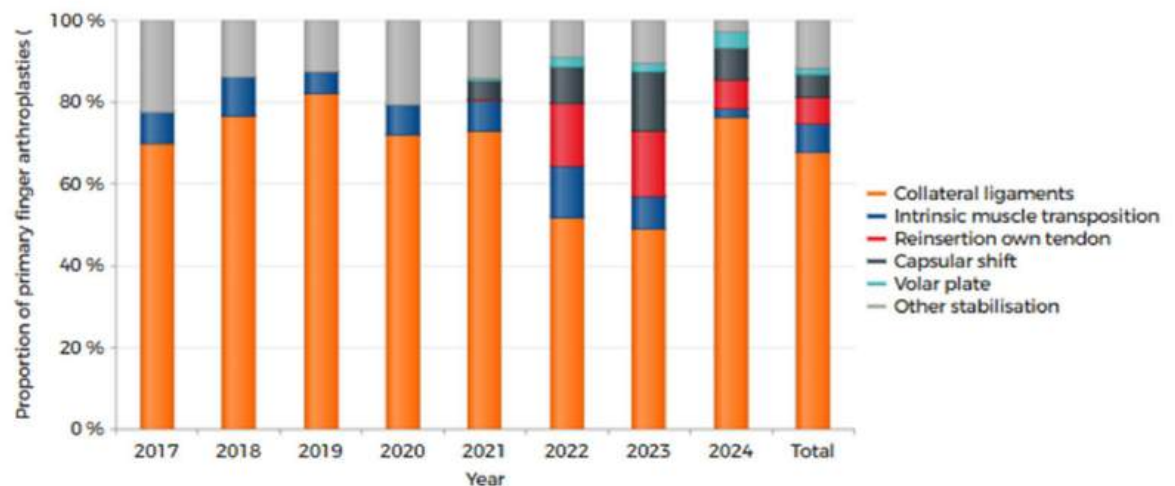
Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary finger arthroplasty in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Dorsal	92.05	92.67	90.83	91.95	95.63	95.06	94.44	94.61	93.59
Volar	6.25	3.66	6.67	3.81	2.62	3.42	2.92	3.59	3.98
Lateral	1.70	2.09	1.67	1.27	0.44	0	1.75	1.50	1.29
Other	0	1.57	0.83	2.97	1.31	1.52	0.88	0.30	1.14
Total (n)	176	191	240	236	229	263	342	334	2,011

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Soft tissue stabilisation

FIGURE Trend (proportion [%] per year) in type of stabilisation in primary finger arthroplasty in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Collateral ligaments	70	76.61	82.16	72.19	72.88	51.72	49.22	76.49	67.92
Intrinsic muscle transposition	7.50	9.68	5.41	7.28	7.34	12.81	7.81	1.99	7.05
Reinsertion own tendon	0	0	0	0	0.56	15.27	16.02	6.95	6.19
Capsular shift	0	0	0	0	4.52	8.87	14.45	7.95	5.73
Volar plate	0	0	0	0	0.56	2.46	1.95	3.97	1.52
Other stabilisation	22.50	13.71	12.43	20.53	14.12	8.87	10.55	2.65	11.59
Total (n)	120	124	185	151	177	203	256	302	1,518

Please note: Capsular shift, reinsertion own tendon and volar plate have been resgistered since 2022

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Most frequently registered components

TABLE The most frequently registered proximal components in primary finger arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Proximal component (n)	168	176	245	331	289
Proximal name; Proportion (%)					
Silicone PIP	52.38	60.80	39.18	32.02	28.37
Swanson	5.95	7.95	11.43	14.80	24.57
KeriFlex PIP	0.00	0.00	1.63	17.22	17.30
KeriMedical Touch	0.00	0.00	1.22	4.53	7.27
MCP Implant	14.29	7.39	20.41	15.11	5.88
KeriFlex MCP	0.00	0.00	2.86	8.16	5.54
Cap Flex PIP prothese	0.60	2.27	1.63	3.02	5.19
Maia	0.00	0.00	1.22	0.00	3.11
Pyrocardan	1.19	1.14	1.22	1.51	2.08
PIP Implant	4.17	3.41	0.00	0.00	0.35

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Survival

Short term revision

Revision rates within 1 year

TABLE Revision procedures within 1 year after primary finger arthroplasty by year in the Netherlands in 2017-2023

Procedure year	Number of primary finger arthroplasties	Number of revisions	Percentage revisions
2017	186	2	1.1%
2018	193	3	1.6%
2019	262	0	0.0%
2020	249	3	1.2%
2021	234	2	0.9%
2022	306	6	2.0%
2023	404	11	2.7%

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Time after primary finger arthroplasty

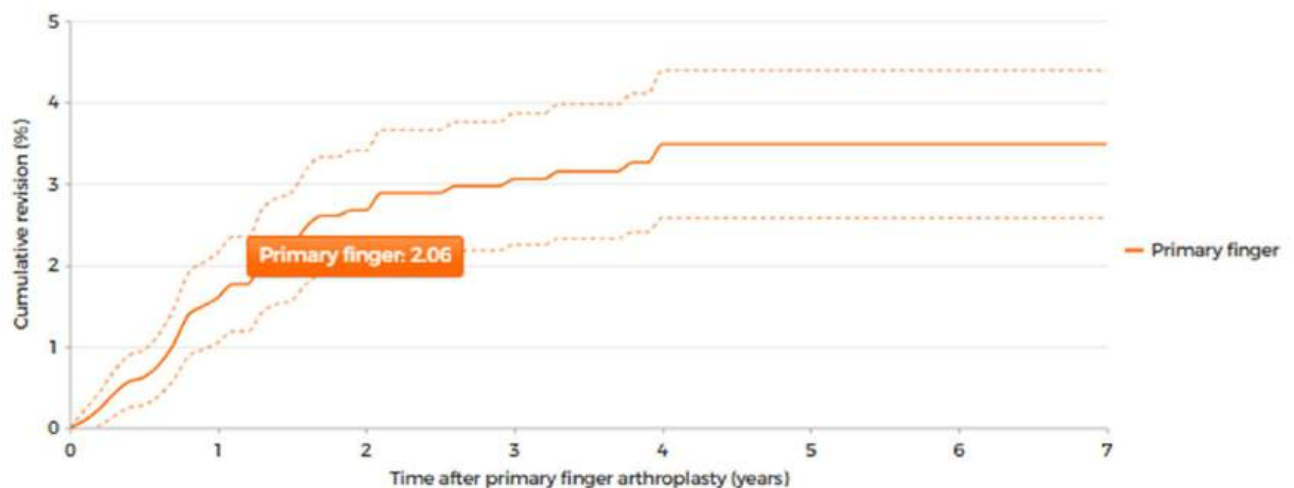
TABLE Time after primary finger arthroplasty until short-term revision in the Netherlands in 2017-2021 (n=1,124)

Time after primary finger	Percentage revisions (%)
Day 0-29	0.09
Day 30-182	0.44
Day 183-364	0.36
Day 365-730 (second year)	0.98
Day 731-1095 (third year)	0.44

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Long term revision

Overall

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary finger arthroplasties in the Netherlands in 2017-2024 (n=2,173)

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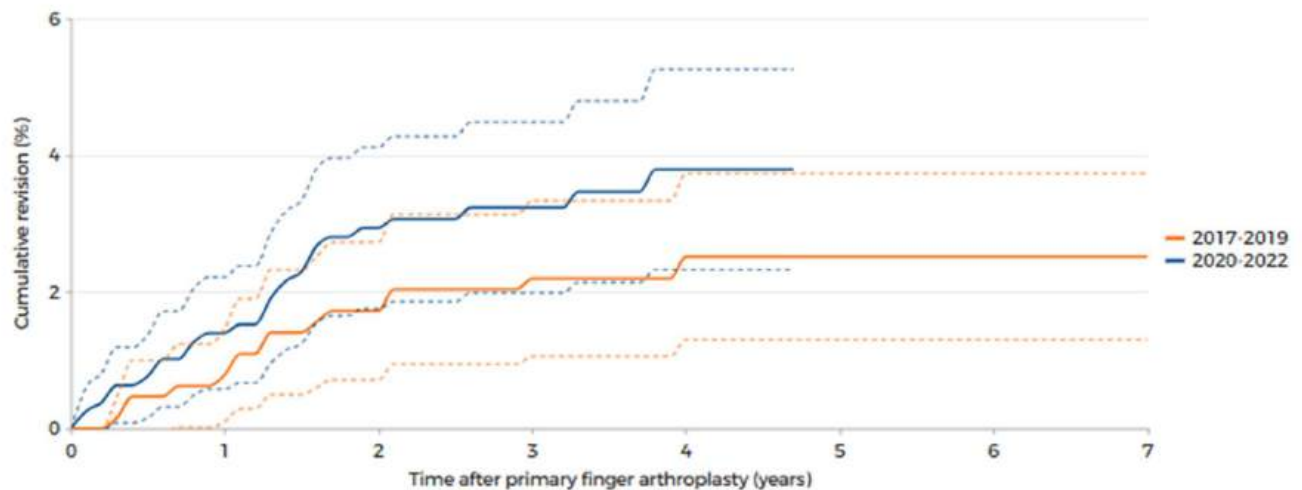
	1yr	3yr	5yr	7yr
Primary finger	1.50 (0.96-2.03)	2.97 (2.18-3.76)	3.49 (2.58-4.39)	3.49 (2.58-4.39)

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

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In 2017-2024, 80 (3.7%) primary finger arthroplasties were implanted in patients who died within seven years after the primary procedure.

By procedure year

FIGURE Cumulative revision percentage (Kaplan-Meier; 95% CI) of primary finger arthroplasties by procedure year of primary arthroplasty in the Netherlands in 2017-2024

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	Number (n)	1yr	3yr	5yr	7yr
2017-2019	641	0.62 (0.01-1.23)	2.04 (0.94-3.13)	2.52 (1.30-3.73)	2.52 (1.30-3.73)
2020-2022	789	1.40 (0.58-2.22)	3.23 (1.98-4.48)	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.

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Finger revision arthroplasty

In this section you will find all the information on revision finger arthroplasty:

Revision characteristics

Reasons for revision

TABLE Reasons for revision in patients who underwent a finger revision arthroplasty in the Netherlands in 2017-2024

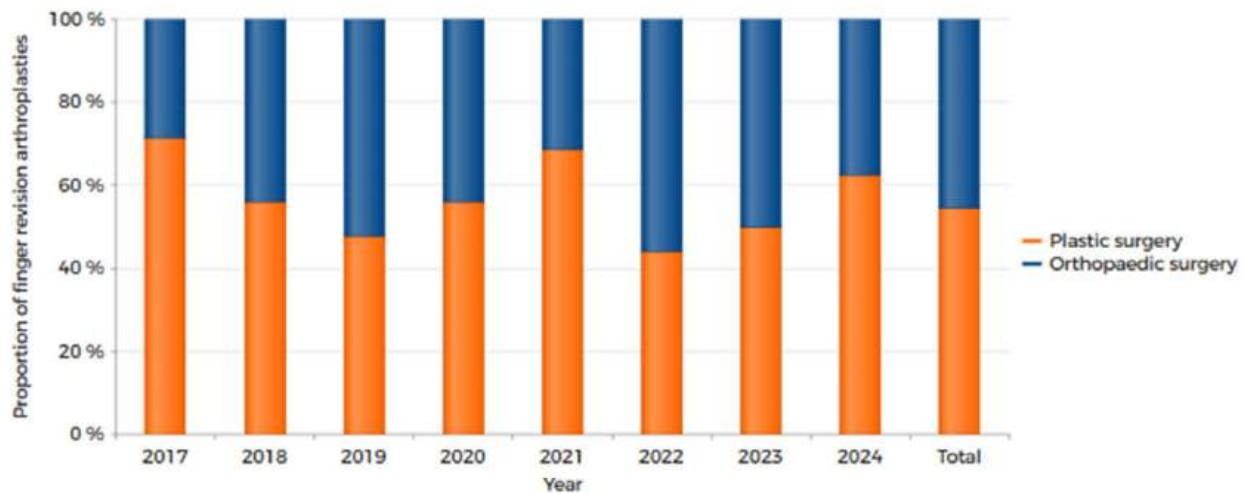
Year	2017	2018	2019	2020	2021	2022	2023	2024	Total
Finger revision arthroplasty (n)	14	25	24	25	16	35	48	24	211
Reasons for revision; Proportion (%)									
Implant fracture	0.00	36.00	37.50	28.00	56.25	42.86	43.75	8.33	34.12
Instability or dislocation	0.00	36.00	29.17	20.00	37.50	31.43	10.42	12.50	21.80
Luxation	28.57	20.00	25.00	8.00	31.25	28.57	0.00	4.17	15.64
Malposition or malalignment						20.00	18.75	45.83	
Bone resorption of proximal component	14.29	4.00	20.83	0.00	12.50	14.29	0.00	12.50	8.53
Bone resorption of distal component	0.00	4.00	20.83	4.00	6.25	14.29	0.00	4.17	6.64
Infection	14.29	0.00	25.00	4.00	0.00	2.86	4.17	12.50	
Loosening of proximal component	28.57	0.00	20.83	4.00	0.00	2.86	2.08	8.33	7.11
Loosening of distal component	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	6.64
Revision after finger removal						2.86	2.08	0.00	
Periprosthetic fracture	7.14	0.00	0.00	0.00	0.00				
Other	57.14	20.00	33.33	24.00	43.75	8.57	25.00	25.00	26.07

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

Please note: Malposition or malalignment and revision after finger removal have been registered since 2022. Periprosthetic fractures have not been registered since 2022.

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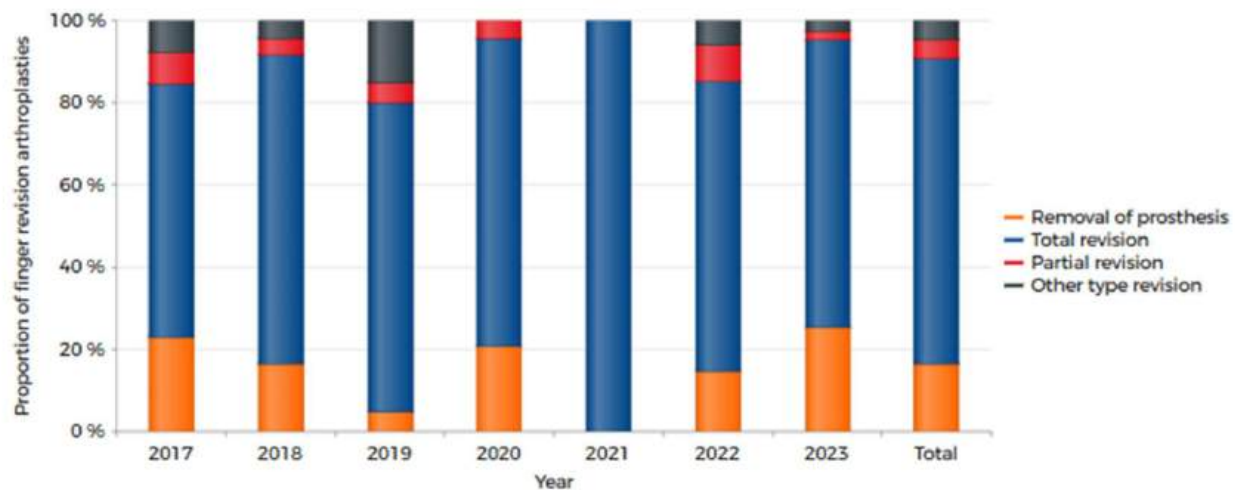
Specialism

FIGURE Trend (proportion [%] per year) in specialism for performing a finger revision arthroplasty in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	2024	Total
Plastic surgery	71.43	56	47.83	56	68.75	44.12	50	62.50	54.55
Orthopaedic surgery	28.57	44	52.17	44	31.25	55.88	50	37.50	45.45
Total (n)	14	25	23	25	16	34	48	24	209

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Type of revision

FIGURE Type of revision arthroplasty of finger revision arthroplasties in the Netherlands in 2017-2024

	2017	2018	2019	2020	2021	2022	2023	Total
Removal of prosthesis	23.08	16.67	5	20.83	0	14.71	25.58	16.67
Total revision	61.54	75	75	75	100	70.59	69.77	74.14
Partial revision	7.69	4.17	5	4.17	0	8.82	2.33	4.60
Other type revision	7.69	4.17	15	0	0	5.88	2.33	4.60
Total (n)	13	24	20	24	16	34	43	174

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*Most frequently registered components***TABLE** The most frequently registered proximal components in finger revision arthroplasties in the Netherlands in 2020-2024

Year	2020	2021	2022	2023	2024
Proximal component (n)	15	15	27	35	16
Proximal name; Proportion (%)					
Swanson	13.33	0.00	3.70	5.71	50.00
Silicone PIP	20.00	46.67	40.74	42.86	25.00
KeriFlex PIP	0.00	0.00	0.00	17.14	12.50
KeriFlex MCP	0.00	0.00	0.00	14.29	6.25
KeriMedical Touch	0.00	0.00	0.00	0.00	6.25

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Clubfoot

In this section you will find all the information on clubfoot treatments:

Numbers

Registered treatments

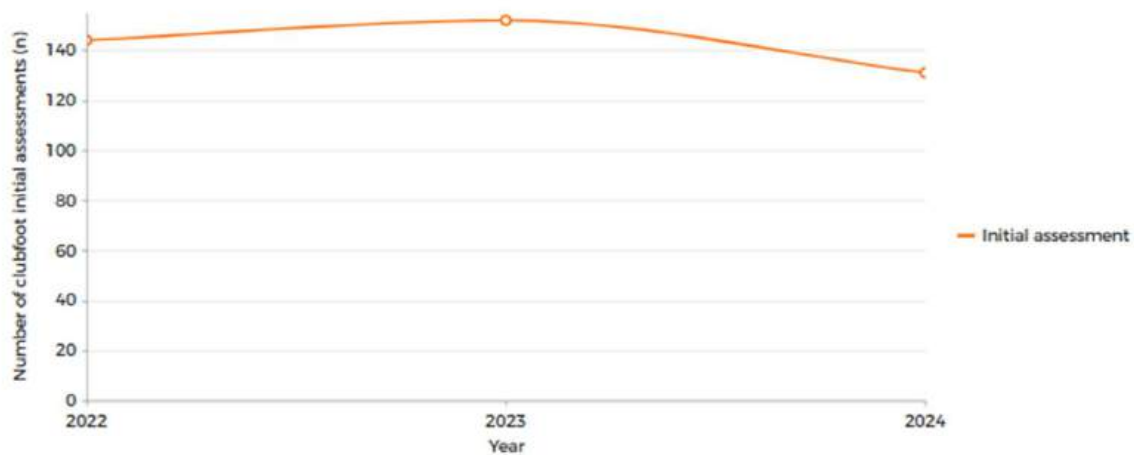
TABLE Number of registered clubfoot treatments per year (2022-2024) in the LROI in April 2025

Year of treatment	Initial assessment	Termination of cast treatment	Relapse	Follow up at 1 year
2022	144	118	4	25
2023	152	136	15	82
2024	131	99	8	67
Total (n)	427	353	27	174

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Initial assessments per year

FIGURE Number of patients with initial assessment clubfoot registered in the LROI in the Netherlands in 2022-2024

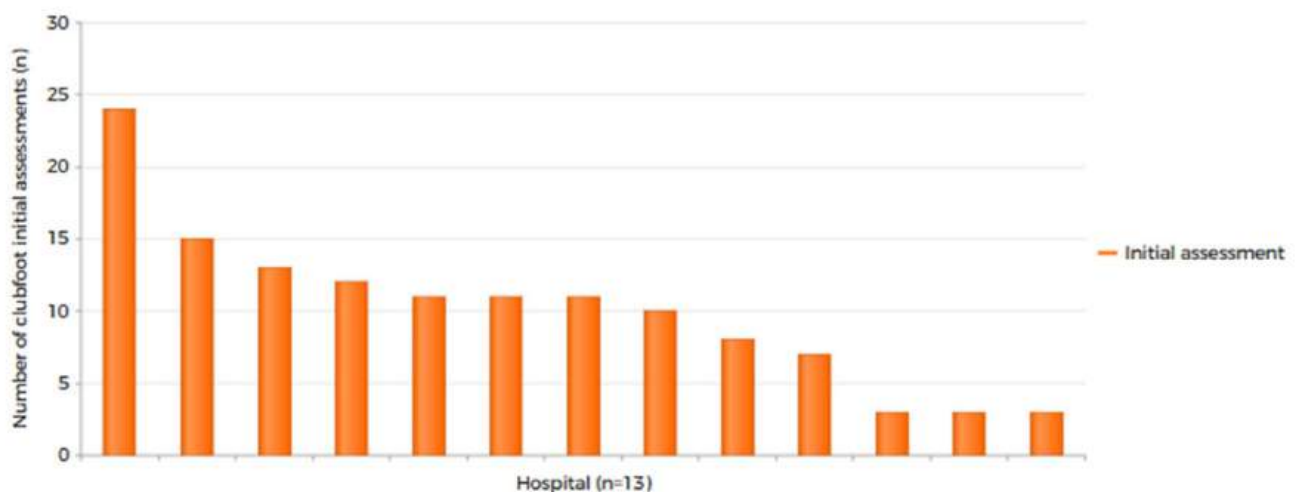


	2022	2023	2024
Initial assessment	144	152	131
Total (n)	144	152	131

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Initial assessments per hospital

FIGURE Number of patients with initial assessment clubfoot per hospital in the Netherlands in 2024 (n=131)



Initial assessment
Demographics

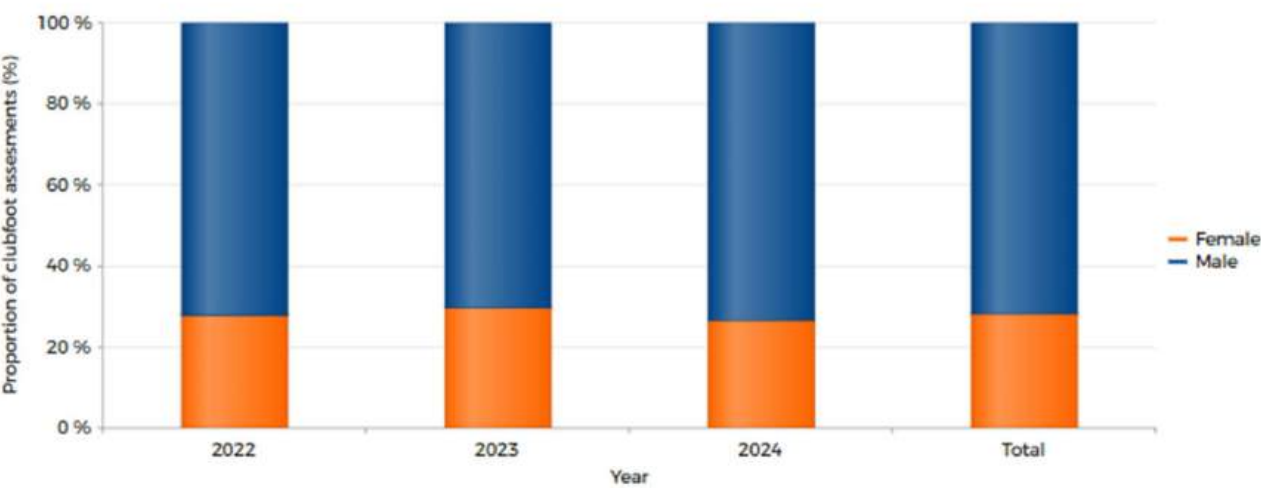
TABLE Patient and treatment characteristics of patients with a registered initial assessment clubfoot by treatment year in the Netherlands in 2022-2024

	2022	2023	2024	Total
n	144	152	131	427
Gender (%)				
Male	72	70	73	72
Female	28	30	27	28
Age (days)				
Mean (SD)	11 (14)	12 (13)	17 (24)	12 (13)
Median (IQR)	7 (5-11)	9 (6-13)	10 (6-17)	9 (5-13)
Treatment started within 1 week (%)	58	36	32	42
Treatment started within 2 weeks (%)	83	82	73	79
Bilateral (%)	48	43	45	45

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Gender

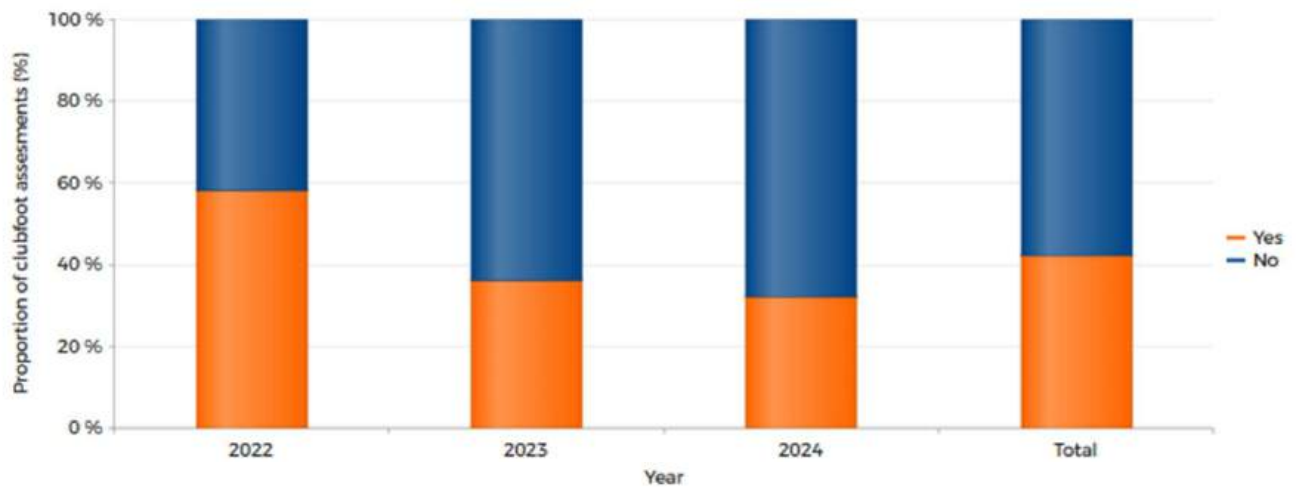
FIGURE Trend (proportion [%] per year) in gender of patients with a registered initial assesment clubfoot in the Netherlands in 2022-2024



	2022	2023	2024	Total
Female	27.78	29.61	26.72	28.10
Male	72.22	70.39	73.28	71.90
Total (n)	144	152	131	427

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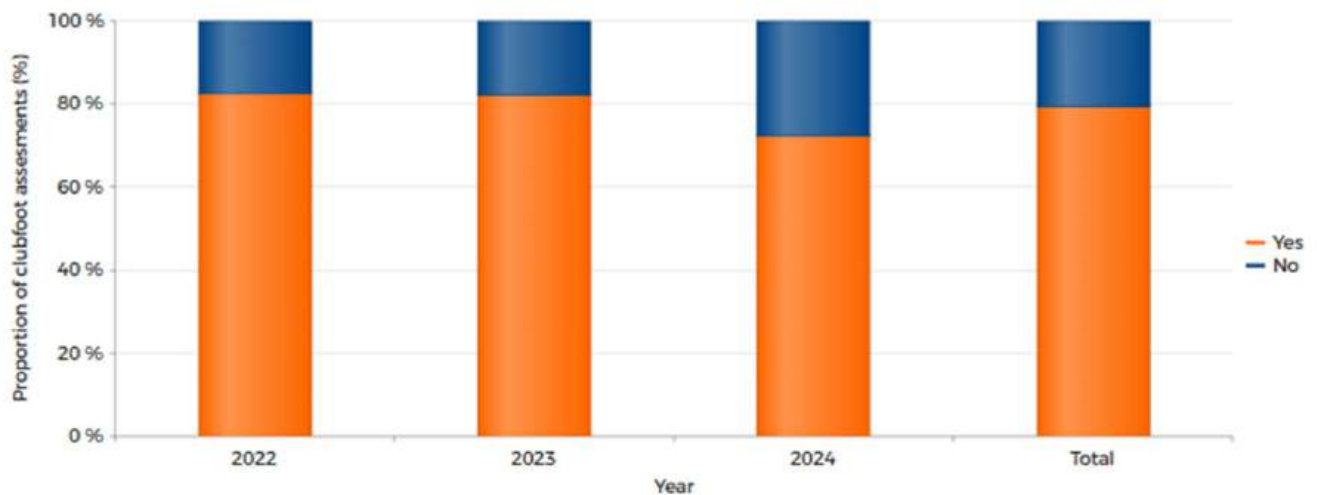
Treatment within 1 week

FIGURE Trend (proportion [%] per year) of patients with a registered initial assesment clubfoot who began treatment within one week in the Netherlands in 2022-2024

	2022	2023	2024	Total
Yes	58.33	36.18	32.06	42.39
No	41.67	63.82	67.94	57.61
Total (n)	144	152	131	427

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Treatment within 2 weeks

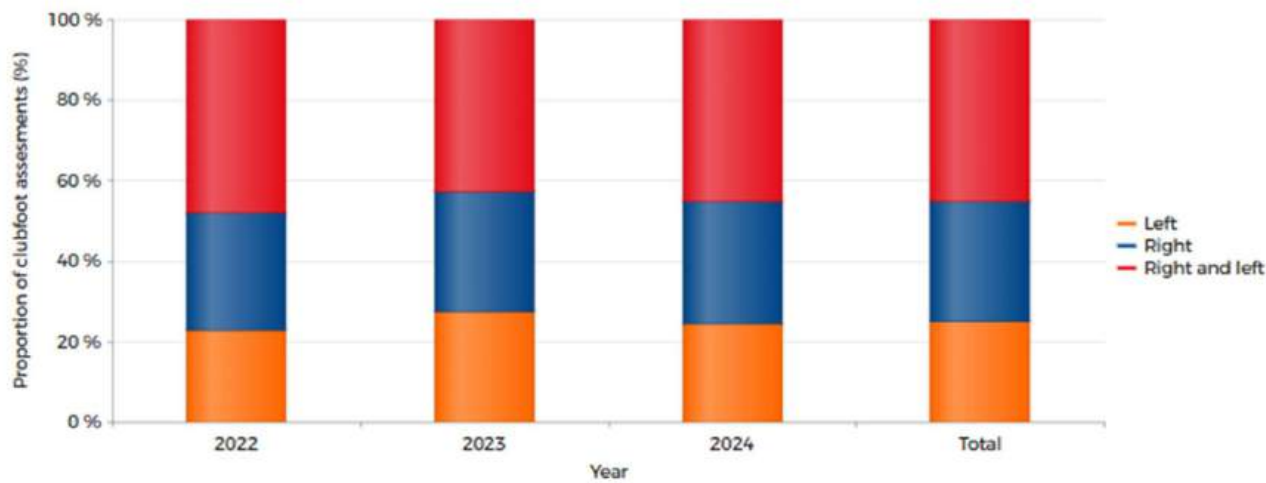
FIGURE Trend (proportion [%] per year) of patients with a registered initial assesment clubfoot who began treatment within two weeks in the Netherlands in 2022-2024

	2022	2023	2024	Total
Yes	82.64	82.24	72.52	79.39
No	17.36	17.76	27.48	20.61
Total (n)	144	152	131	427

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Affected side

FIGURE Trend (proportion [%] per year) in affected side of patients with a registered initial assesment clubfoot in the Netherlands in 2022-2024



	2022	2023	2024	Total
Left	22.92	27.63	24.43	25.06
Right	29.17	29.61	30.53	29.74
Right and left	47.92	42.76	45.04	45.20
Total (n)	144	152	131	427

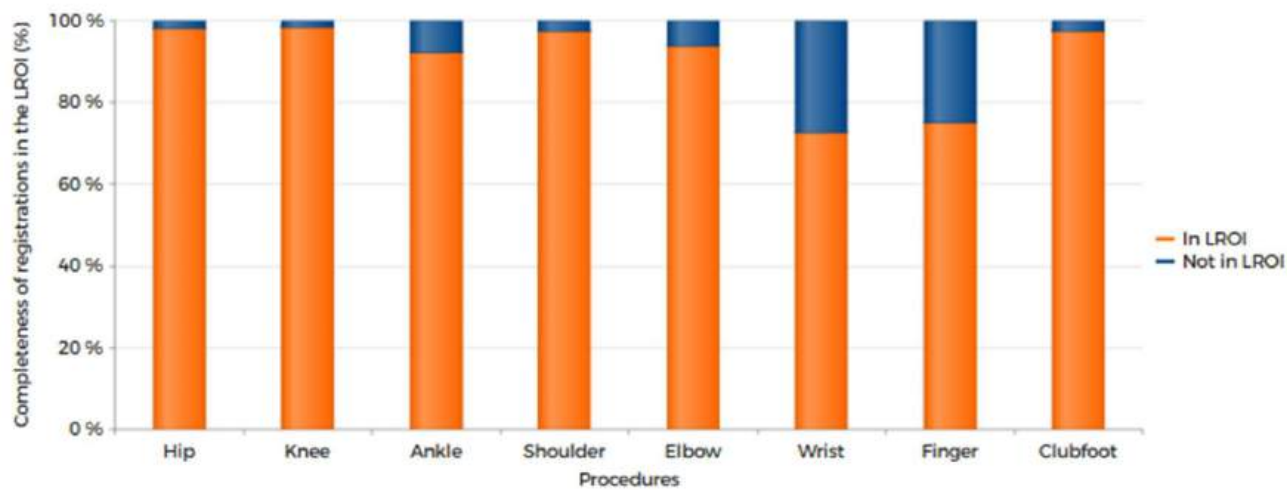
© LROI 2025 | C008

Data quality

Completeness

Overall completeness per procedure

FIGURE Completeness (proportion [%] per procedure) of the registration of procedures in the LROI in 2024



	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger	Clubfoot
In LROI	98.20	98.60	92.40	97.50	94	72.70	75.30	97.40
Not in LROI	1.80	1.40	7.60	2.50	6	27.30	24.70	2.60
Total (n)	40,008	36,237	224	4,102	232	110	219	154

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 July 2025, compared to the total number of arthroplasties performed in 2024 based on the hospital information system (HIS). This pertains only to hospitals that submitted data for comparison.

Please note: Fifteen orthopaedic departments (with 13,047 procedures in the LROI), seven trauma surgery departments (1,184 procedures in the LROI), and nine plastic surgery departments (63 procedures in the LROI) did not provide hospital information system (HIS) data for comparison. These procedures are therefore not included in determining the national completeness of the LROI.

Please note: Three clubfoot treatment departments (with 41 initial assessments in the LROI) did not provide HIS data for comparison. These clubfoot in

Completeness per year

TABLE Completeness (proportion [%] per procedure) of the registration of procedures in the LROI in 2013-2024

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Hip arthroplasties												
Primary total hip arthroplasties	97	96	98	99	99	99	99	99	99	99	98	98
Primary hip hemiarthroplasties	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	92	89	96
Primary hip hemiarthroplasties (orthopaedic surgeon)	71	84	88	95	96	96	94	97	96	n/a	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	n/a
Hip revision arthroplasties	88	93	97	97	98	97	97	98	98	97	99	100
Knee arthroplasties												
Primary knee arthroplasties	95	96	98	99	100	99	99	99	97	99	98	99
Knee revision arthroplasties	90	93	98	98	98	97	97	98	97	98	98	99
Ankle arthroplasties												
Primary ankle arthroplasties	n/a	80	91	92	100	98	98	95	95	96	95	95
Ankle revision arthroplasties	n/a	55	67	94	87	83	55	95	96	95	95	83
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	97
Primary shoulder arthroplasties (orthopaedic surgeon)	n/a	78	94	94	98	91	96	96	97	n/a	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	n/a
Shoulder revision arthroplasties	n/a	74	90	92	90	78	91	93	79	95	94	100
Elbow arthroplasties												
Primary elbow arthroplasties	n/a	70	85	88	91	89	85	92	89	85	88	97
Elbow revision arthroplasties	n/a	55	86	93	87	85	83	91	78	87	90	89
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	76
Primary wrist arthroplasties (orthopaedic surgeon)	n/a	n/a	n/a	n/a	71	29	55	70	73	n/a	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	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	60
Wrist revision arthroplasties (orthopaedic surgeon)	n/a	n/a	n/a	n/a	18	83	77	100	93	n/a	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	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	73
Primary finger arthroplasties (orthopaedic surgeon)	n/a	n/a	n/a	n/a	53	63	66	65	81	n/a	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	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	100
Finger revision arthroplasties (orthopaedic surgeon)	n/a	n/a	n/a	n/a	17	100	90	41	83	n/a	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	n/a
Clubfoot												
Initial assessment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	67	66	95

Please note: Completeness refers to the number of registered arthroplasties (orthopaedic, trauma and plastic surgery) in the LROI as of July 2025, compared to the total number of arthroplasties performed in 2024 based on the hospital information system (HIS). This pertains only to hospitals that submitted data for comparison.

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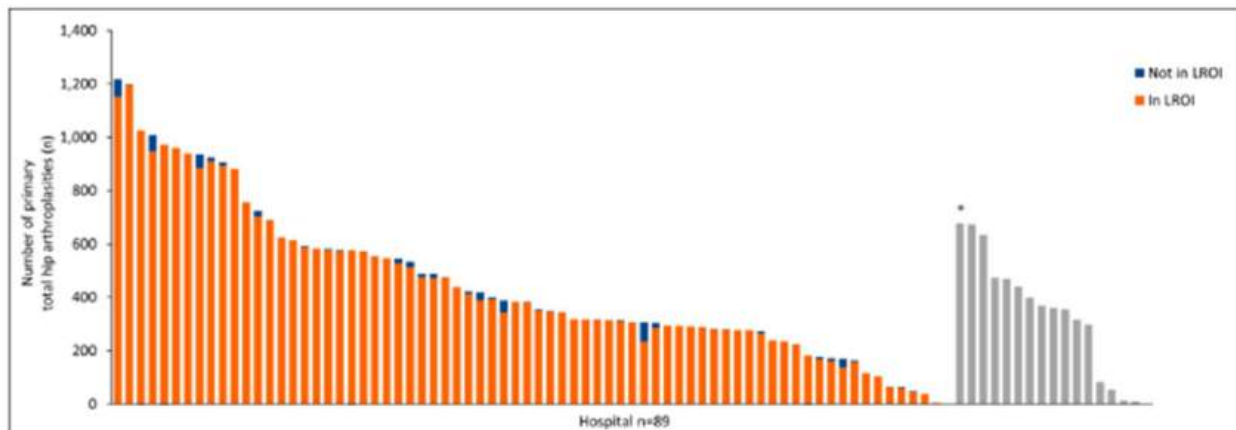
Please note: Three clubfoot treatment departments (with 41 initial assessments in the LROI) did not provide HIS data for comparison. These clubfoot initial assessments are therefore not included in determining the national completeness of the LROI.

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The completeness of number of registered procedures in the LROI is determined every year in July-August. Improving data completeness and data quality by registering missing data is an ongoing process.

Completeness primary THA per hospital account

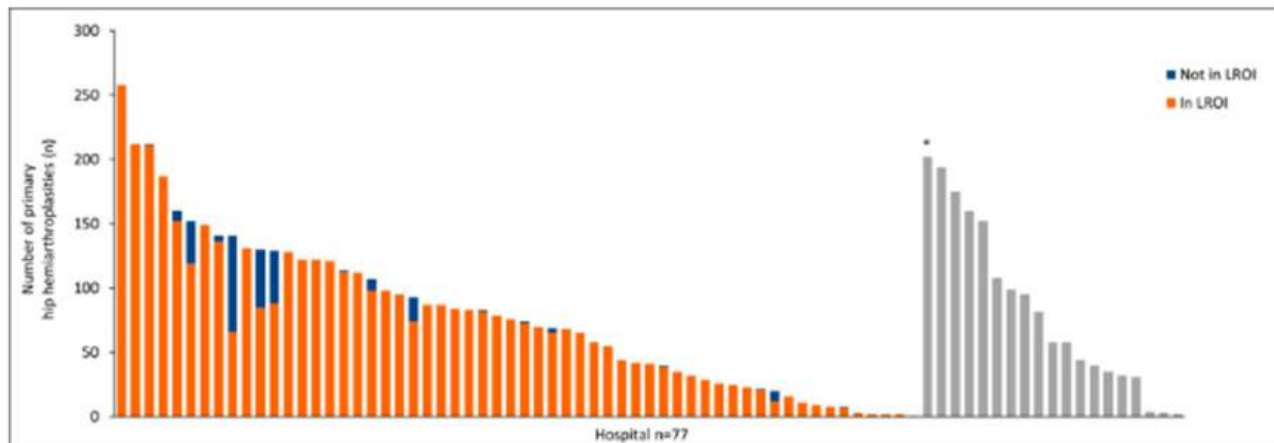
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary total hip arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness primary hip hemiarthroplasty per hospital account

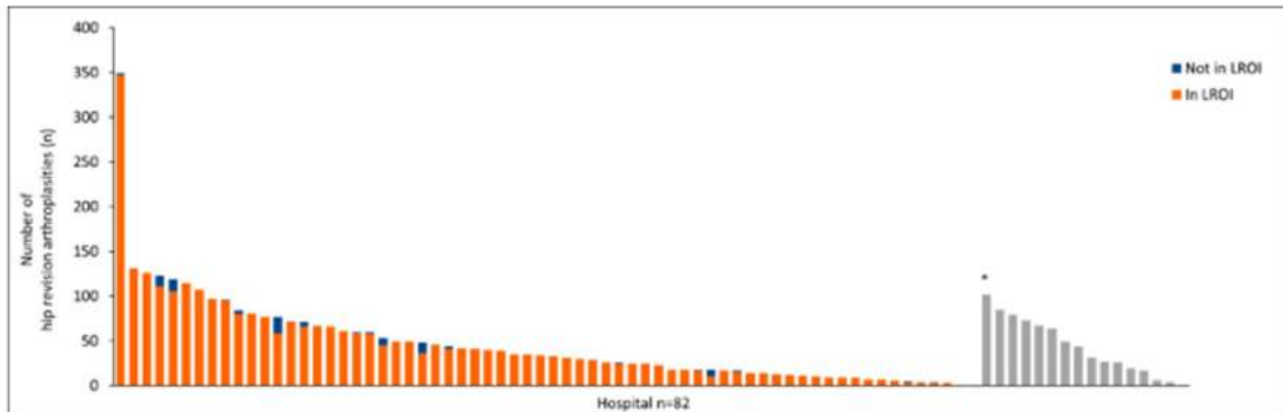
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary hip hemiarthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness hip revision per hospital account

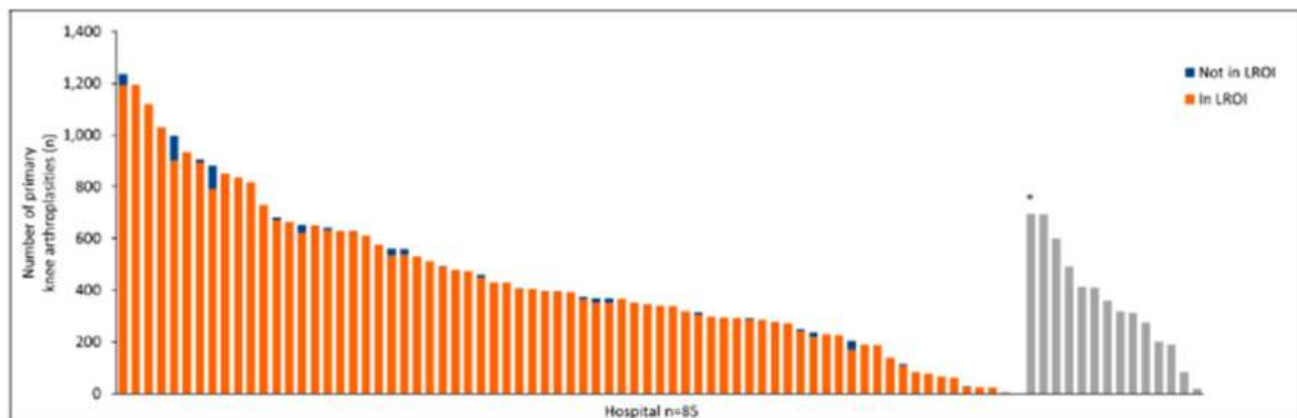
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for hip revision arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness primary knee per hospital account

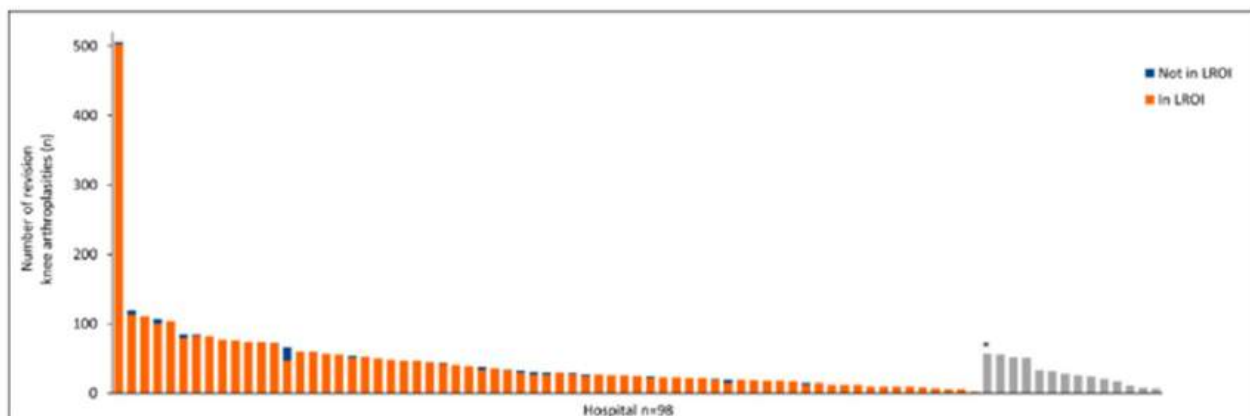
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary knee arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness knee revision per hospital account

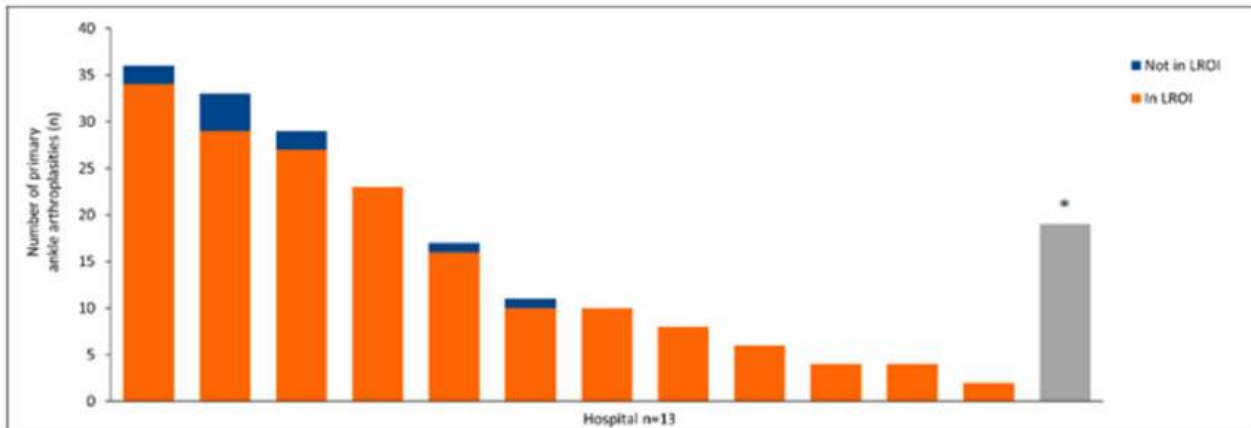
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for knee revision arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness primary ankle per hospital account

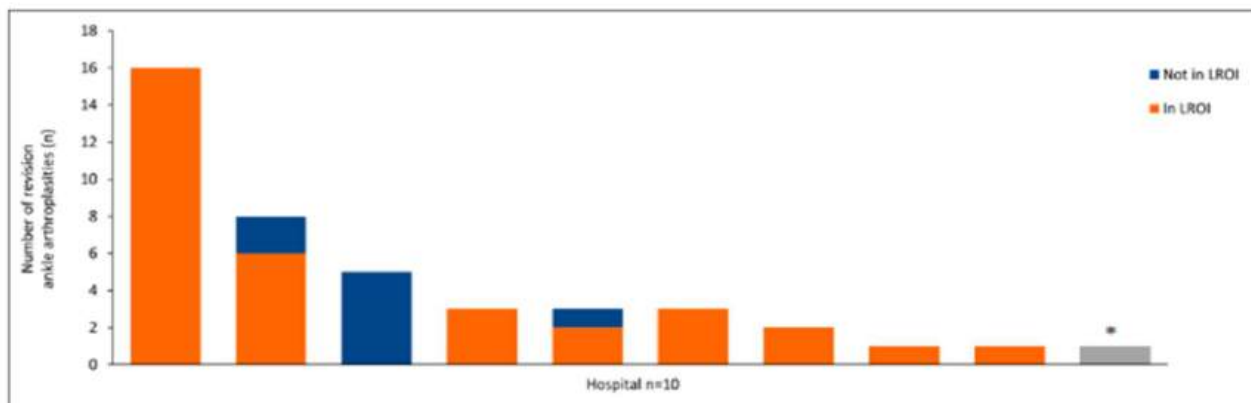
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary ankle arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness ankle revision per hospital account

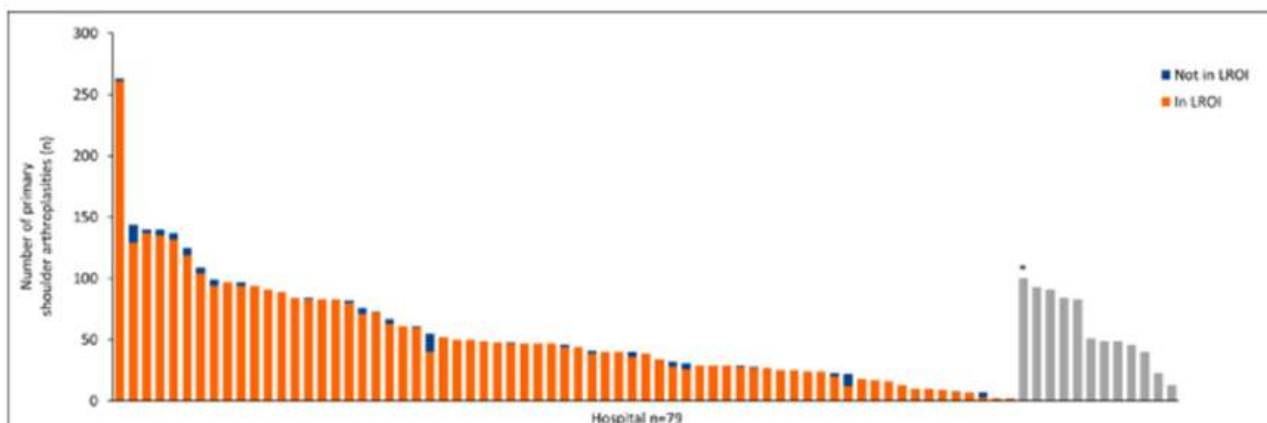
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for ankle revision arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness primary shoulder per hospital account

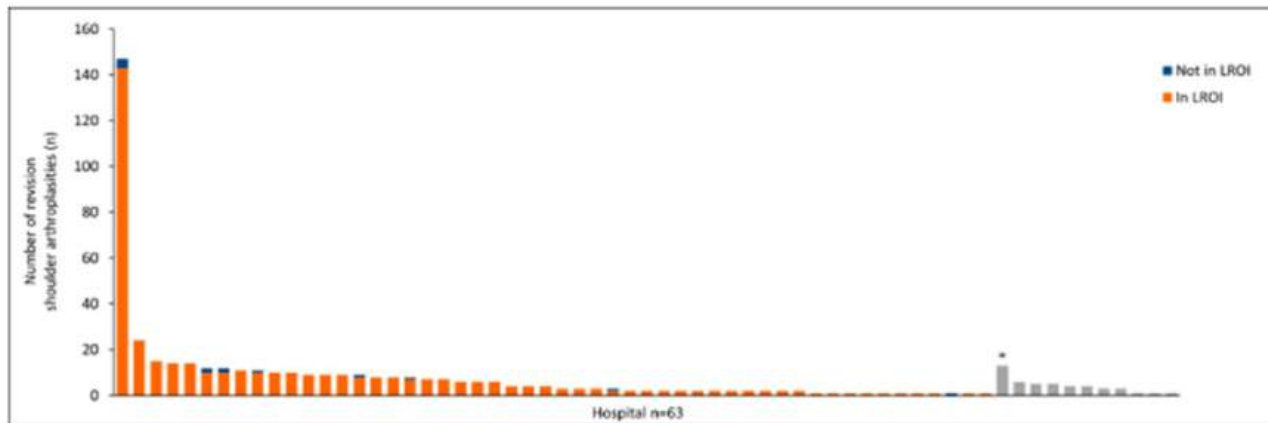
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary shoulder arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness shoulder revision per hospital account

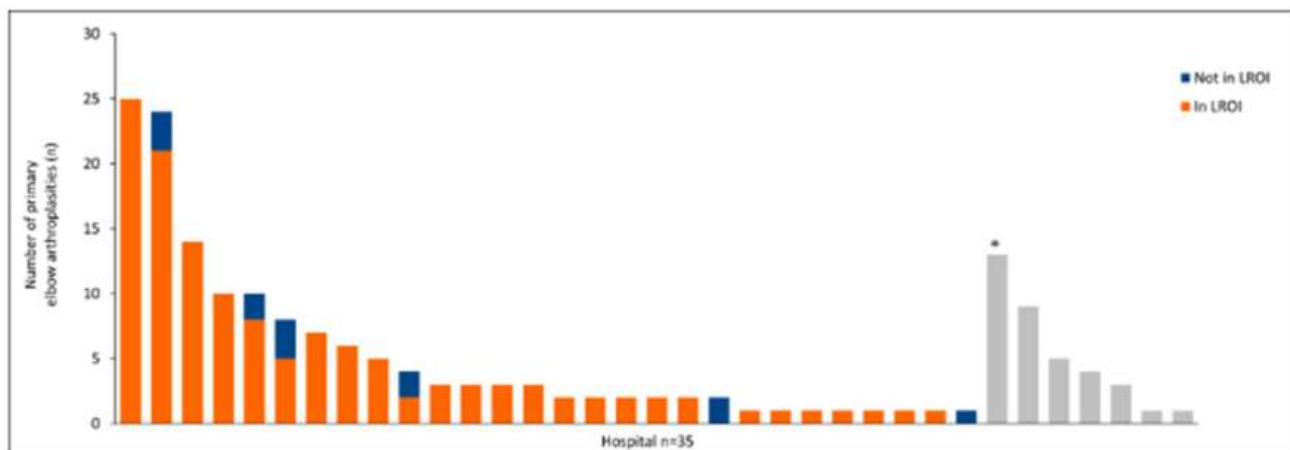
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for shoulder revision arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness primary elbow per hospital account

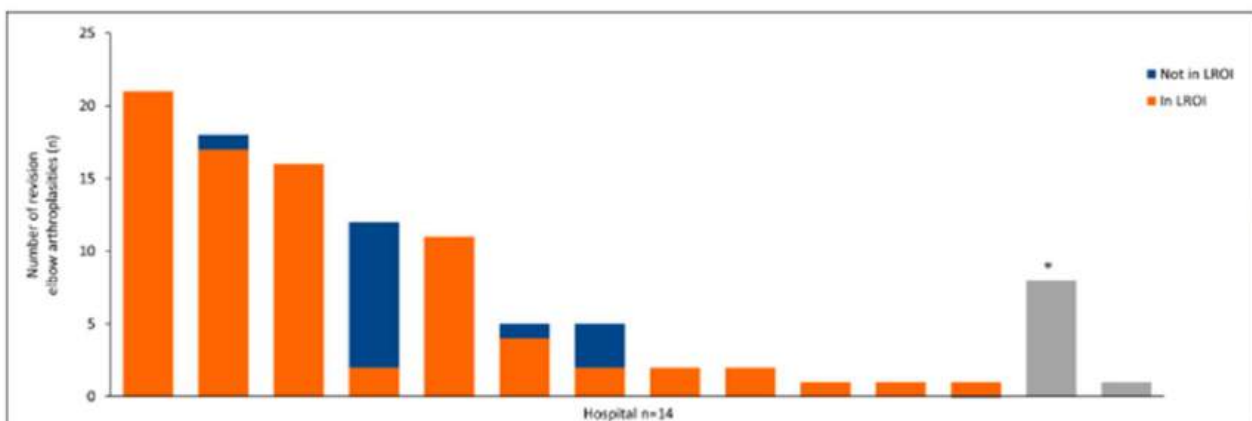
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary elbow arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness elbow revision per hospital account

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 2024

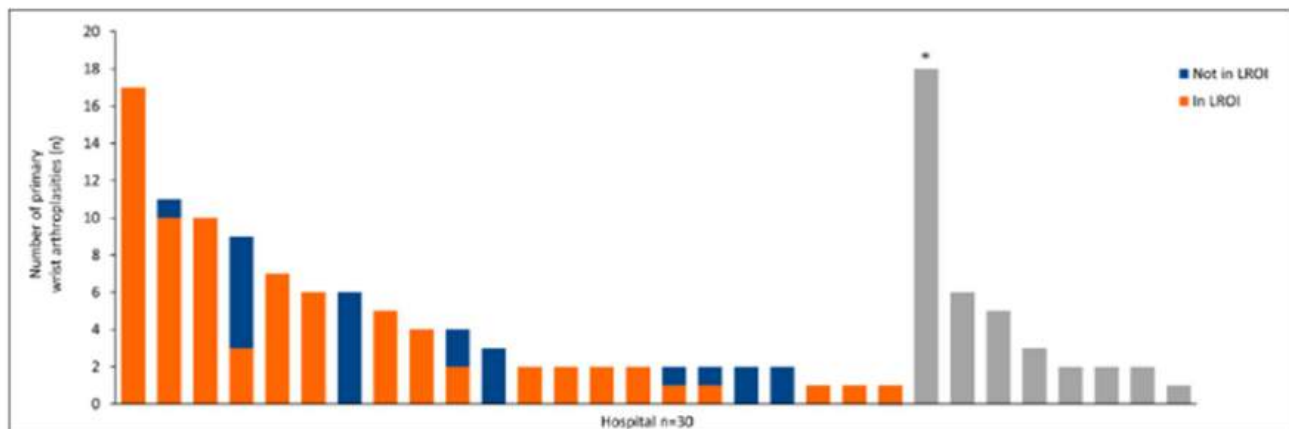


provided for comparison by the hospital account

*No data

Completeness primary wrist per hospital account

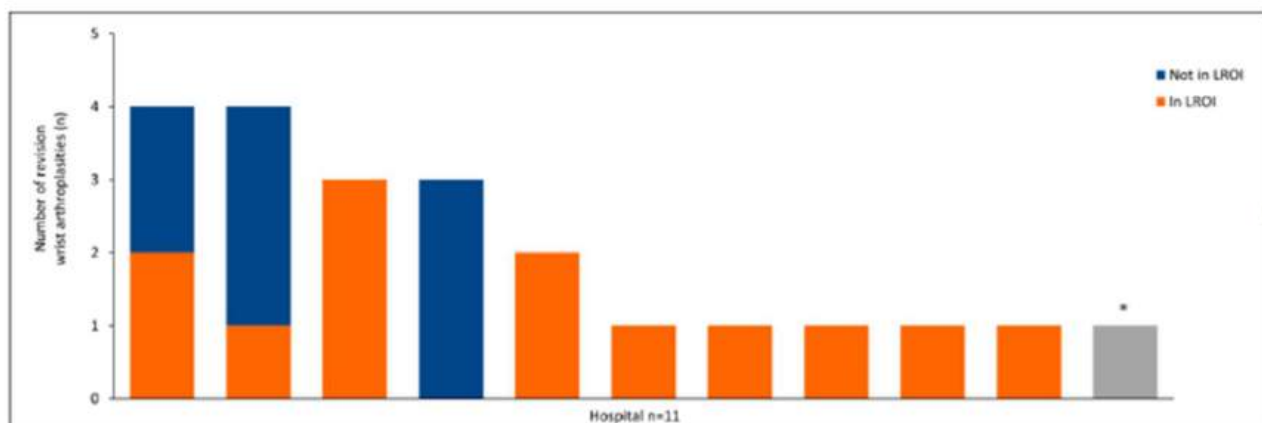
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary wrist arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness wrist revision per hospital account

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 2024

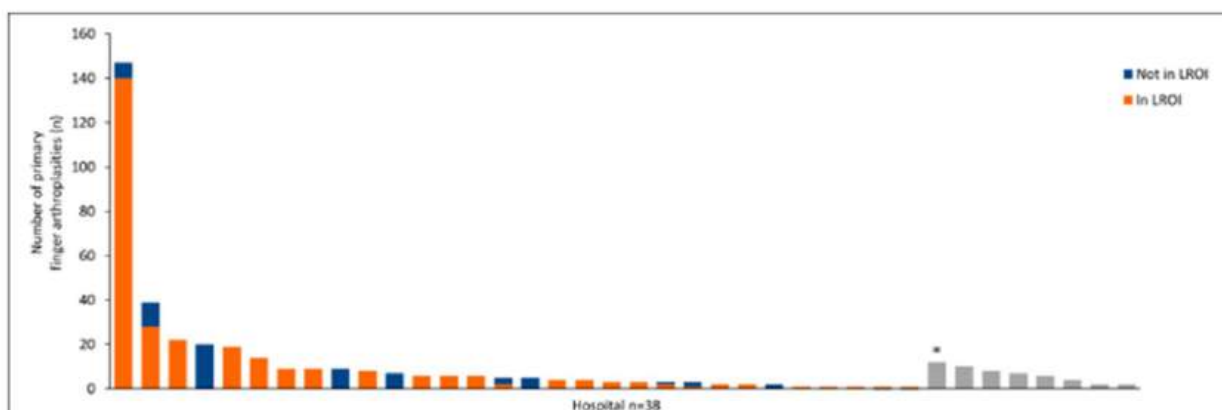


* No data

provided for comparison by the hospital account

Completeness primary finger per hospital account

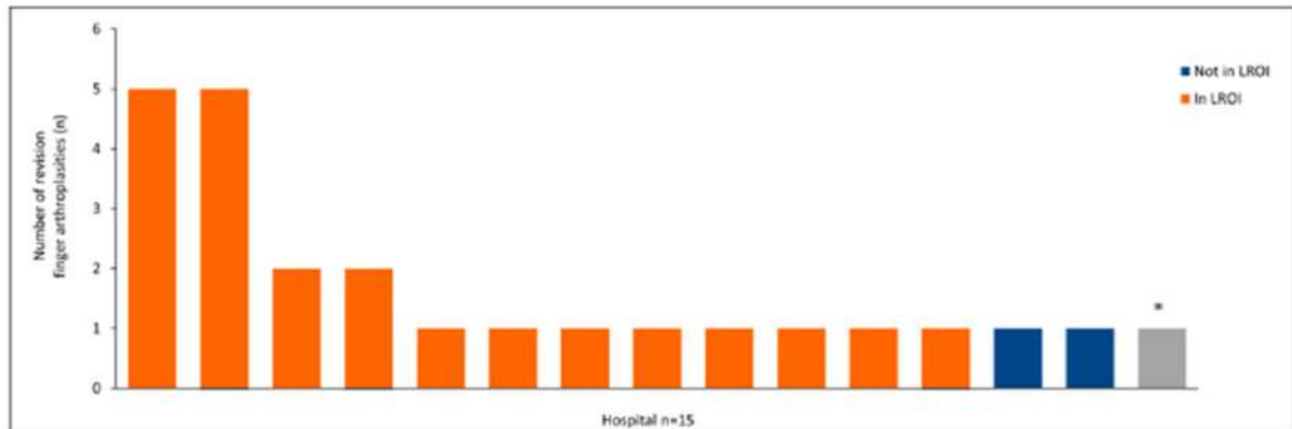
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for primary finger arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness finger revision per hospital account

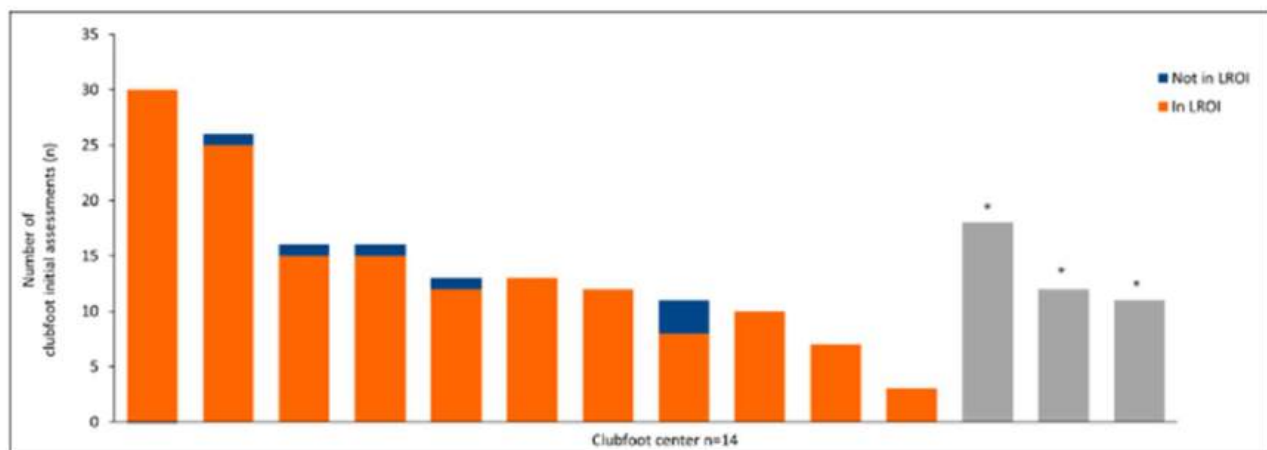
Number of procedures performed (based on the hospital information system) and the number of registered procedures in the LROI per hospital account for finger revision arthroplasties in 2024



* No data provided for comparison by the hospital account

Completeness clubfoot initial assessment per hospital account

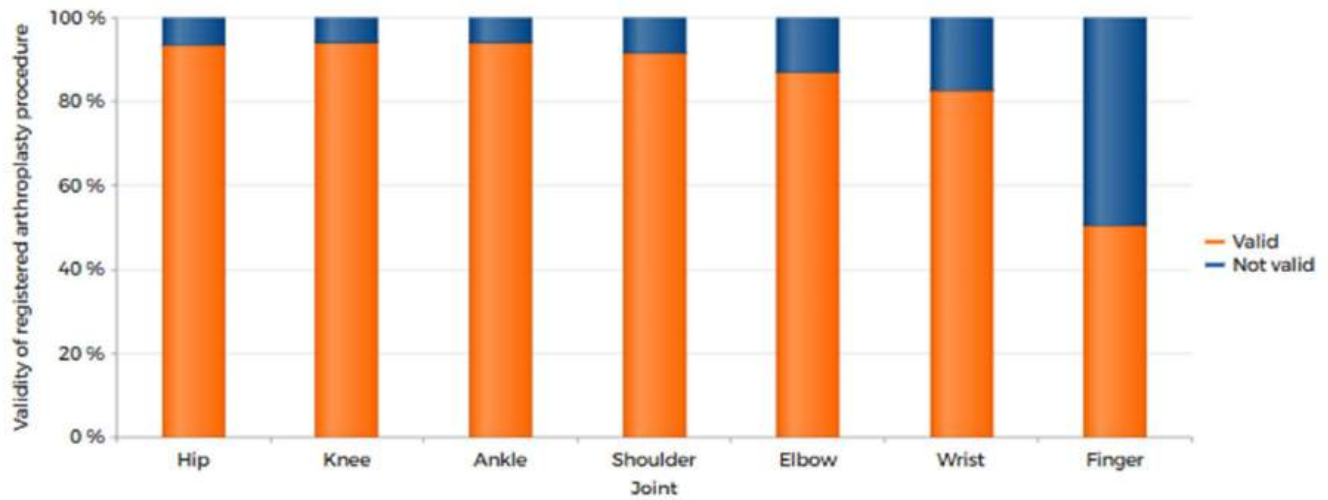
Number of treatments performed (based on the hospital information system) and the number of registered treatments in the LROI per hospital account for clubfoot initial assessments in 2024



* 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 2024

	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Valid	93.46	94.20	94.27	91.86	87.18	82.95	50.69
Not valid	6.54	5.80	5.73	8.14	12.82	17.05	49.31
Total (n)	46,949	41,165	227	4,793	234	129	363

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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 2024

	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Number of arthroplasties (n)	46,949	41,165	227	4,793	234	129	363
Number of primary arthroplasties (n)	43,167	37,687	192	4,301	152	116	339
Number of revision arthroplasties (n)	3,782	3,478	35	492	82	13	24
General characteristics	%	%	%	%	%	%	%
Gender	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Encrypted citizen service number	99.8	99.9	99.1	99.9	98.7	97.7	99.7
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	99.9	100.0	100.0	100.0	98.7	98.5	93.9
BMI	96.7	98.3	99.1	98.1	97.9	91.5	56.5
Smoking	98.1	98.7	97.4	99.2	97.0	97.7	93.1
ASA score	99.7	99.6	100.0	99.9	98.3	99.2	95.6
Fixation	99.8	99.9	99.1	99.8	97.9	97.7	95.0
Primary arthroplasty characteristics	%	%	%	%	%	%	%
Diagnosis	99.2	99.6	100.0	99.0	98.7	99.1	97.9
Charnley/Walch score	98.4	99.5	100.0	98.4	n.a.	n.a.	n.a.
Prosthesis	100.0	100.0	100.0	100.0	98.7	98.3	100.0
Surgical approach	99.5	97.5	99.5	95.7	96.7	97.4	98.5
Revision arthroplasty characteristics	%	%	%	%	%	%	%
Type of revision	99.4	99.6	100.0	99.2	97.7	100.0	91.7
Charnley score	100.0	100.0	n.a.	n.a.	n.a.	n.a.	n.a.
Reason for revision	98.7	98.8	97.1	98.6	92.7	100.0	91.7

Please note: Validity by variable as determined in April 2025.

HIS: hospital information system; BMI: body mass index

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Participating hospitals

General hospitals

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TABLE Overview of general hospitals registering joint arthroplasties and clubfoot treatments in the LROI 2007-2024

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	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 Jan van Goyen	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		x				
Reinier Haga Groep	x	x	x	x	x	x	x	
Reinier de Graaf Groep*	x	x	x	x	x		x	
Reinier de Graaf Gasthuis, 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				

TABLE Overview of general hospitals registering joint arthroplasties and clubfoot treatments in the LROI 2007-2024

Participating hospitals	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger	Clubfoot
Sint Antonius Ziekenhuis	x	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	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	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.

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University Medical Centers (UMC)

TABLE Overview of university medical centers registering joint arthroplasties and clubfoot treatments in the LROI 2007-2024

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.

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Private hospitals

TABLE Overview of private hospitals registering joint arthroplasties and clubfoot treatments in the LROI 2007-2024

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				
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, Laresse*	x	x		x				
De Schouderdokter				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						
Voor de hand							x	
Xpert Clinic, Loc. Amsterdam	x	x	x	x	x	x	x	
Xpert Clinic, Loc. Annatomie mc Amstelveen	x	x	x	x				
Xpert Clinic, Loc. Annatomie mc Utrecht	x	x	x	x			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. Rozendaal	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.

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Methodology

Definitions and abbreviations

An overview of definitions and abbreviations used in this LROI annual report

Definitions

An overview of definitions used in this LROI annual report

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

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 (inner 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

Revision of at least the acetabular or femoral component (hip) or femoral or tibial component (knee)

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.

Oxford Shoulder score

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 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 extent 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 (DBC's/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
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
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
Zo	Oxidized Zirconium