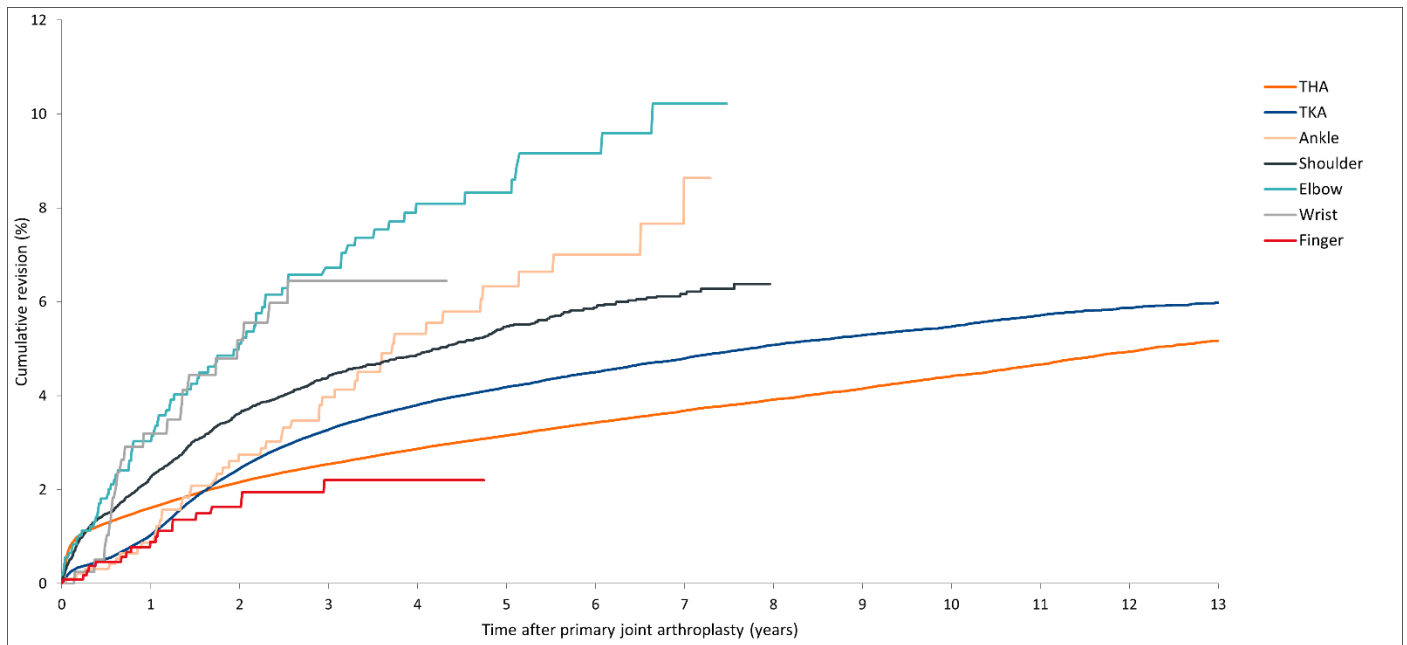


Introduction

This online annual report 2022 of the Dutch Arthroplasty Register (LROI) contains trends and outcome information on primary and revision hip, knee, ankle, shoulder, elbow, wrist and finger arthroplasties in the Netherlands between 2007 and 2021.

Survival outcomes are available for all joints



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

- survival by year of surgery of [THA](#) and [TKA](#);
- survival according to prosthesis- and surgery characteristics of [THA](#) and [TKA](#);
- survival according to patient characteristics of [reverse TSA](#) and [anatomical TSA](#);
- survival by ODEP classification of [THA](#) and [TKA](#);
- survival by PROMs response of [THA](#), [TKA](#) and [UKA](#);
- survival by pre-operative OHS/OKS score [THA](#) and [TKA](#).

This year PROMs results are shown:

- by age for [total hip prostheses](#);
- according to satisfaction score for [total knee prostheses](#);
- by recommendation score for total reverse and anatomical [shoulder arthroplasties](#).

You will find data on:

- Prosthesis characteristics
- Surgical techniques
- Patient characteristics of patients who underwent an arthroplasty procedure
- Patients' experiences in the form of PROMs (Patient Reported Outcome Measures)
- Survival of prostheses, like overall and major first revision and second revision rates
- Data quality, for example completeness and validity of the register

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Colophon

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Hip arthroplasty

Numbers

Registered procedures

TABLE Number of registered hip arthroplasties per year of surgery (2007-2021) in the LROI in May 2022

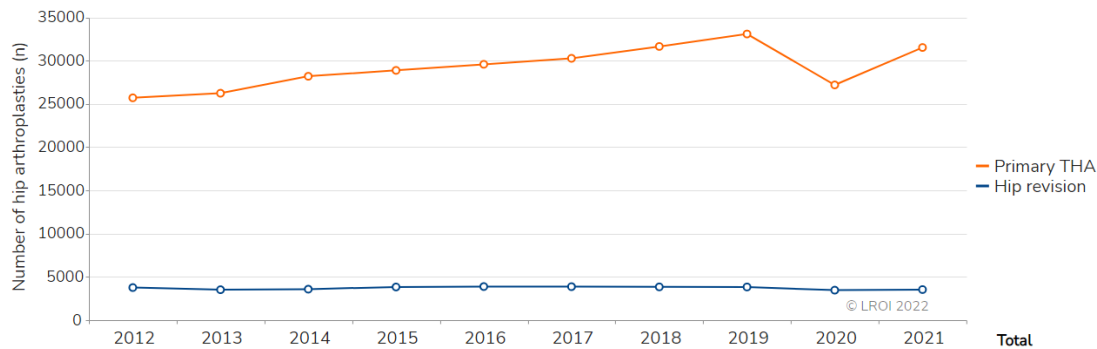
Year of surgery	Type of hip arthroplasty					Total (n)
	Total arthroplasty (n)	Hemi-arthroplasty (n)	Resurfacing arthroplasty (n)	Unknown/missing (n)	Revision arthroplasty (n)	
2007	8,903	1,056	452	933	1,268	12,612
2008	15,457	1,524	732	394	1,858	19,965
2009	22,106	2,145	864	299	2,680	28,094
2010	23,913	2,423	610	296	2,951	30,193
2011	24,333	2,519	229	372	3,197	30,650
2012	25,699	2,898	10	451	3,767	32,825
2013	26,231	3,070	2	291	3,517	33,111
2014	28,191	3,765	0	152	3,583	35,691
2015	28,871	4,966	15	69	3,834	37,755
2016	29,572	5,448	16	103	3,883	39,022
2017	30,264	5,947	5	52	3,871	40,139
2018	31,636	6,382	2	26	3,844	41,890
2019	33,076	6,313	1	37	3,835	43,262
2020	27,190	6,596	0	18	3,466	37,270
2021	31,514	6,006	0	29	3,535	41,084
Total	386,956	61,058	2,938	3,522	49,089	503,563

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

Type of procedures

FIGURE Number of primary total hip arthroplasties and hip revision arthroplasties registered in the LROI in the Netherlands in 2012-2021



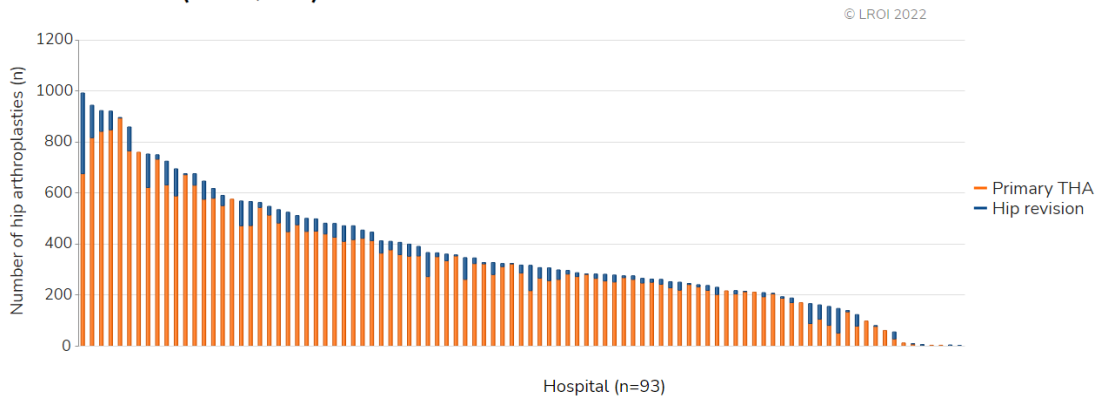
Type of procedure (n)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Primary THA	25,699	26,231	28,191	28,871	29,572	30,264	31,636	33,076	27,190	31,514	292,244
Hip revision	3,767	3,517	3,583	3,834	3,883	3,871	3,844	3,835	3,466	3,535	37,135
Total:	29,466	29,748	31,774	32,705	33,455	34,135	35,480	36,911	30,656	35,049	329,379

THA: total hip arthroplasty.

Out of 31,514 primary total hip arthroplasties that were performed in 2021, 2.5% (n=803) was performed bilaterally.

Type of procedure per hospital

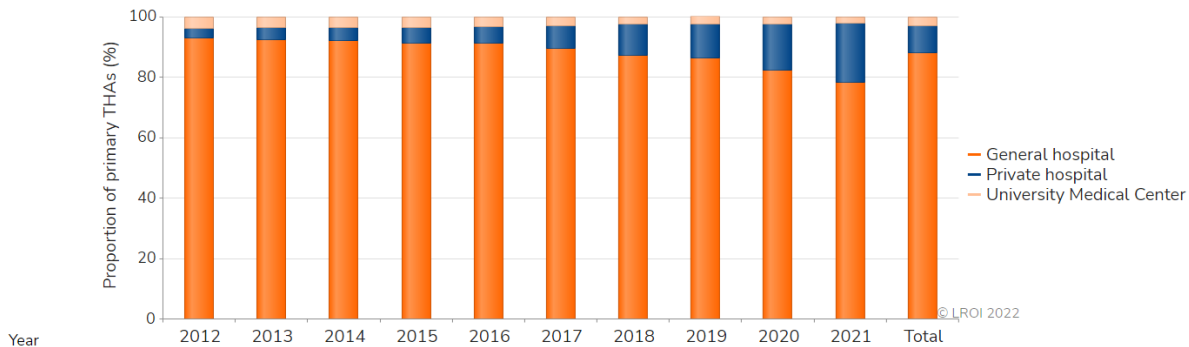
FIGURE Number of primary total hip arthroplasties and hip revision arthroplasties per hospital in the Netherlands in 2021 (n=35,049)



THA: total hip arthroplasty.

Type of hospital – primary

FIGURE Trend (proportion [%] per year) in type of hospital performing primary total hip arthroplasties in the Netherlands in 2012-2021



Type of hospital (%)

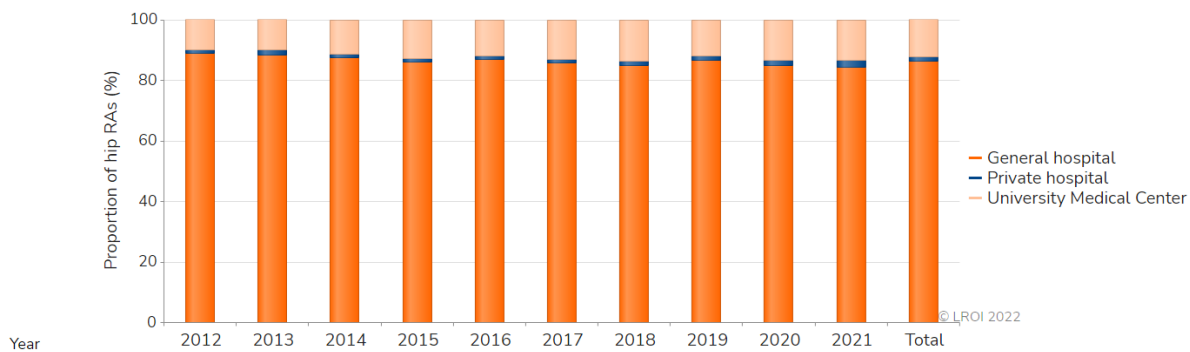
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
General hospital	92.98	92.42	92.07	91.32	91.21	89.58	87.26	86.38	82.39	78.17	88.20
Private hospital	3.21	3.87	4.26	4.96	5.48	7.52	10.17	11.08	15.22	19.80	8.77
University Medical Center	3.81	3.70	3.66	3.72	3.30	2.90	2.57	2.55	2.39	2.03	3.03
Total (n):	25,699	26,231	28,191	28,871	29,572	30,264	31,636	33,076	27,190	31,514	292,244

Please note: The number of general hospitals that performed primary total hip arthroplasties decreased from 72 to 68 between 2012-2021; the number of private hospitals increased from 6 to 18 and the number of University Medical Centers remained 7 between 2012-2021.

THA: total hip arthroplasty.

Type of hospital – revision

FIGURE Trend (proportion [%] per year) in type of hospital performing hip revision arthroplasties in the Netherlands in 2012-2021



Type of hospital (%)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
General hospital	88.93	88.48	87.50	86.05	86.97	85.71	84.99	86.62	84.91	84.30	86.45
Private hospital	1.17	1.54	1.20	1.17	1.11	1.11	1.48	1.49	1.59	2.26	1.40
University Medical Center	9.90	9.98	11.30	12.78	11.92	13.17	13.53	11.89	13.50	13.44	12.15
Total (n):	3,767	3,517	3,583	3,834	3,883	3,871	3,844	3,835	3,466	3,535	37,135

Please note: The number of general hospitals that performed hip revision arthroplasties decreased from 72 to 67 between 2012-2021; the number of private hospitals increased from 4 to 11 and the number of University Medical Centers remained 7 between 2012-2021.
RA: revision arthroplasty.

Total hip arthroplasty

Demographics

Patient characteristics by diagnosis

TABLE Patient characteristics of all patients with a registered primary total hip arthroplasty by diagnosis in the Netherlands in 2021

	Osteoarthritis	Fracture	Osteonecrosis	Late post-traumatic	Dysplasia	Rheumatoid arthritis	Post-Perthes disease	Tumour	Total
N	27,147 (86.1%)	1,823 (5.8%)	823 (2.6%)	696 (2.2%)	419 (1.3%)	128 (0.4%)	73 (0.2%)	117 (0.4%)	31,514
Mean age (years) (SD)	69.9 (9.8)	69.6 (8.3)	63.8 (1.9)	68.3 (12.3)	51.4 (14.2)	64.2 (13.9)	53.2 (15.0)	63.6 (12.8)	69.4 (10.4)
Age (years) (%)									
<50	3	1	18	7	41	12	33	14	4
50-59	12	9	18	14	32	19	30	21	13
60-69	29	35	24	28	17	30	19	28	29
70-79	40	46	23	33	9	32	16	31	39
≥80	16	9	17	18	1	8	1	6	15
Gender (%)									
Men	35	36	43	41	30	23	77	42	35
Women	65	64	57	59	70	77	23	58	65
ASA score (%)									
I	14	12	9	10	33	0	30	4	14
II	62	57	56	57	56	64	58	24	62
III-IV	23	31	36	34	11	36	12	72	24
Type of hospital (%)									
General	77	95	83	88	65	81	81	62	78
UMC	1	4	10	6	15	10	3	38	2
Private	22	0	7	6	20	9	16	0	20
Charnley-score (%)									
A One hip joint affected	41	57	55	79	51	34	65	58	43
B1 Both hip joints affected	31	13	20	9	29	22	17	12	30
B2 Contralateral hip joint with a total hip prosthesis	25	23	20	8	16	23	17	14	24
C Multiple joints affected or chronic disease that affects quality of life	3	7	5	4	4	21	2	16	3
Mean Body Mass Index (kg/m²) (SD)	27.3 (4.5)	25.0 (4.0)	26.8 (5.0)	25.4 (4.3)	26.4 (4.6)	27.5 (5.6)	27.4 (4.7)	25.7 (5.1)	27.1 (4.6)
Body Mass Index (kg/m²) (%)									
Underweight (≤18,5)	1	3	3	3	1	3	0	4	1
Normal weight (>18,5-25)	34	53	40	50	44	30	37	44	36
Overweight (>25-30)	42	34	33	33	36	36	34	38	41
Obesity (>30-40)	22	10	24	14	18	27	27	13	21
Morbid obesity (>40)	1	0	1	0	1	3	1	2	1
Smoking (%)									
No	92	90	83	83	87	91	79	89	91
Yes	8	10	17	17	13	9	21	11	9

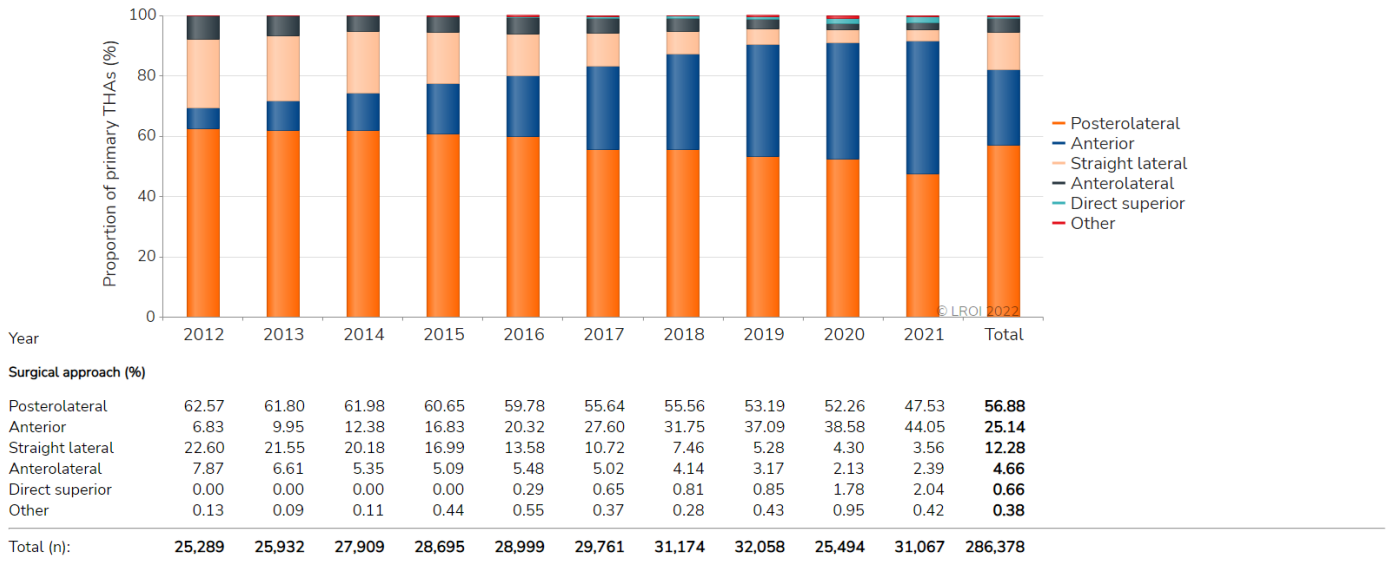
Please note: In 2021, 187 (0.6%) patients received a primary THA after a diagnosis that is not listed in the table. Of 101 (0.3%) primary THAs the diagnosis was not registered. General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation; THA: total hip arthroplasty.

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Surgical techniques

Surgical approach

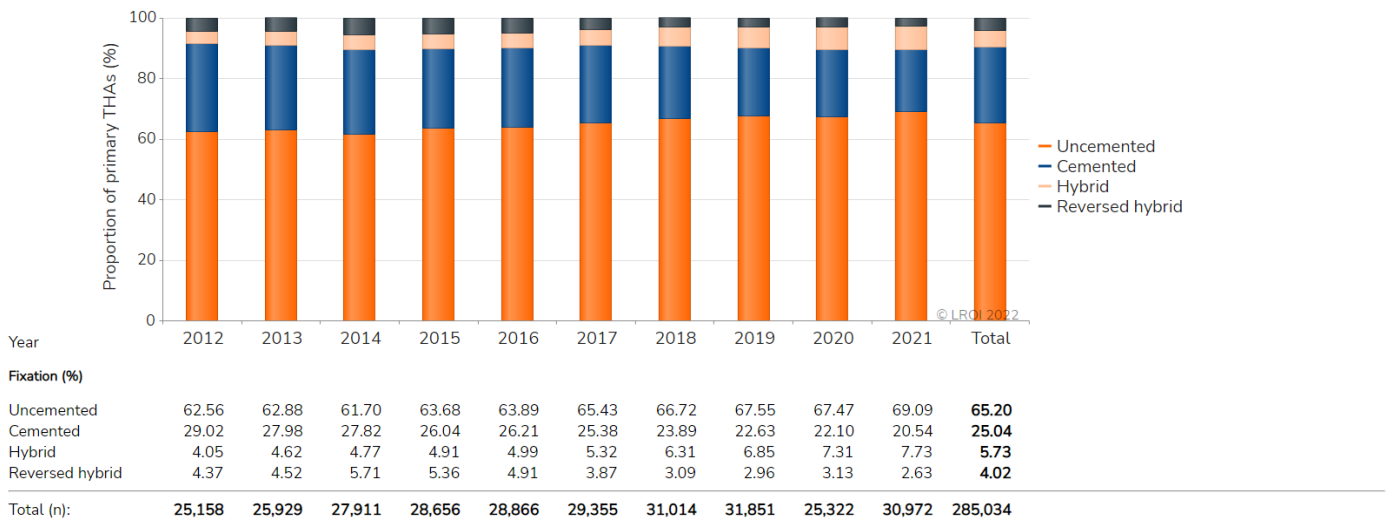
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary total hip arthroplasty in the Netherlands in 2012-2021



THA: total hip arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary total hip arthroplasties in the Netherlands in 2012-2021

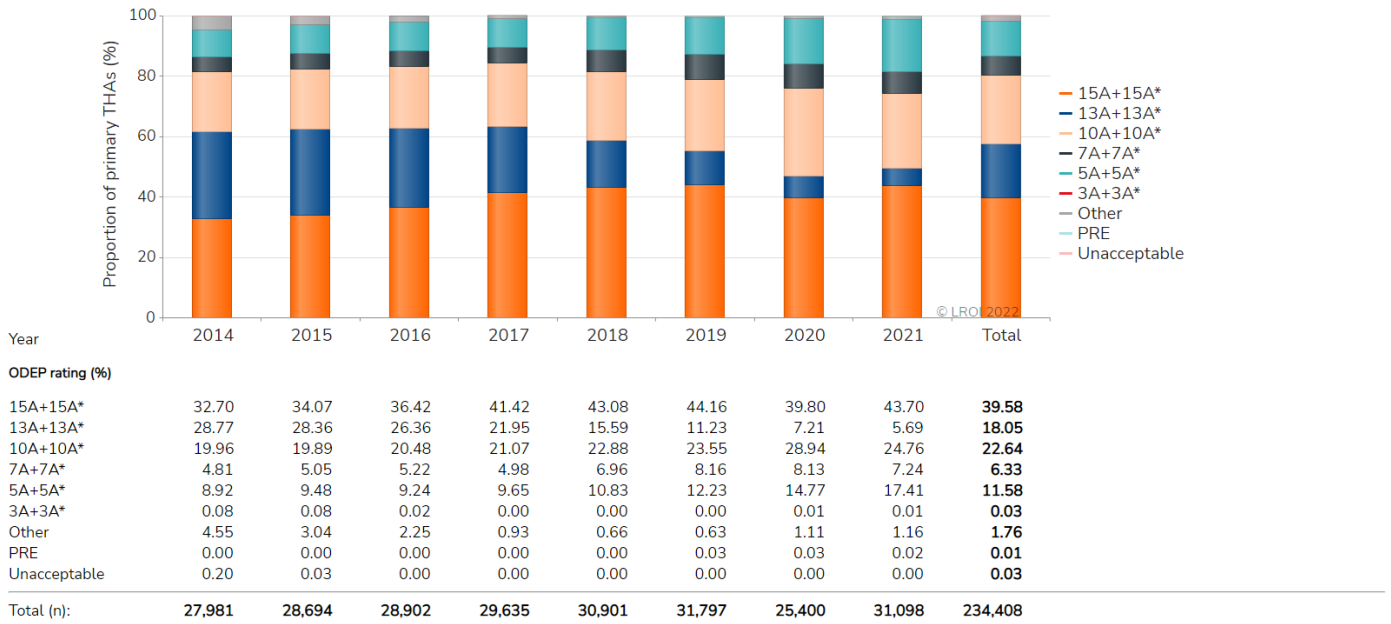


THA: total hip arthroplasty.

Prosthesis characteristics and materials

ODEP acetabular component

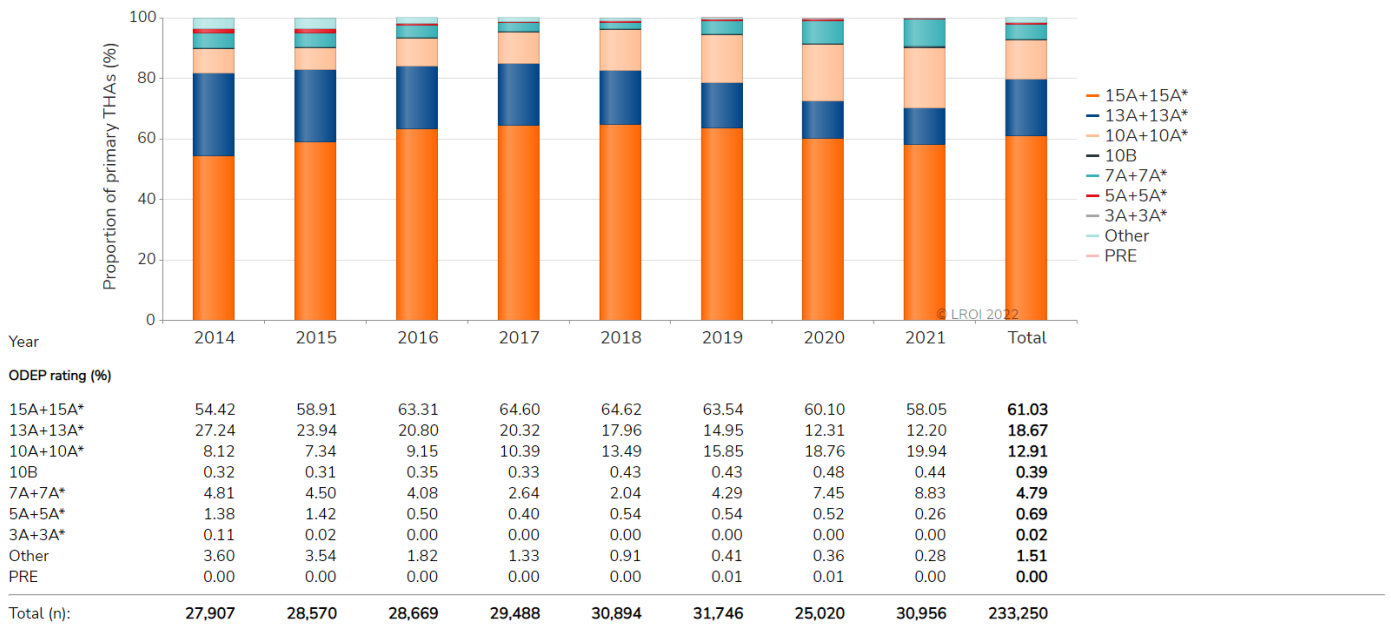
FIGURE Trend (proportion [%] per year) in ODEP rating acetabulum component in primary total hip arthroplasties in the Netherlands in 2014-2021



Please note: More information on ODEP rating can be found on www.odep.org.uk.
 Other: All total hip acetabular cups of which no ODEP rating is available.
 THA: total hip arthroplasty.

ODEP femoral component

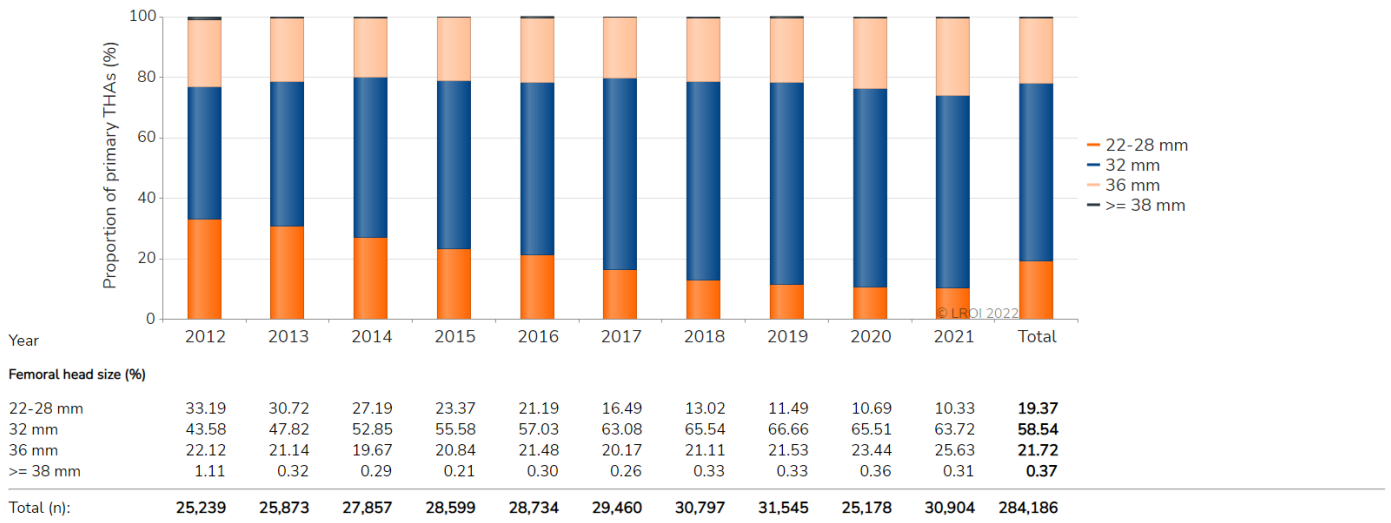
FIGURE Trend (proportion [%] per year) in ODEP rating femur component in primary total hip arthroplasties in the Netherlands in 2014-2021



Please note: More information on ODEP rating can be found on www.odep.org.uk.
 Other: All total hip femoral stems of which no ODEP rating is available.
 THA: total hip arthroplasty.

Femoral head diameter

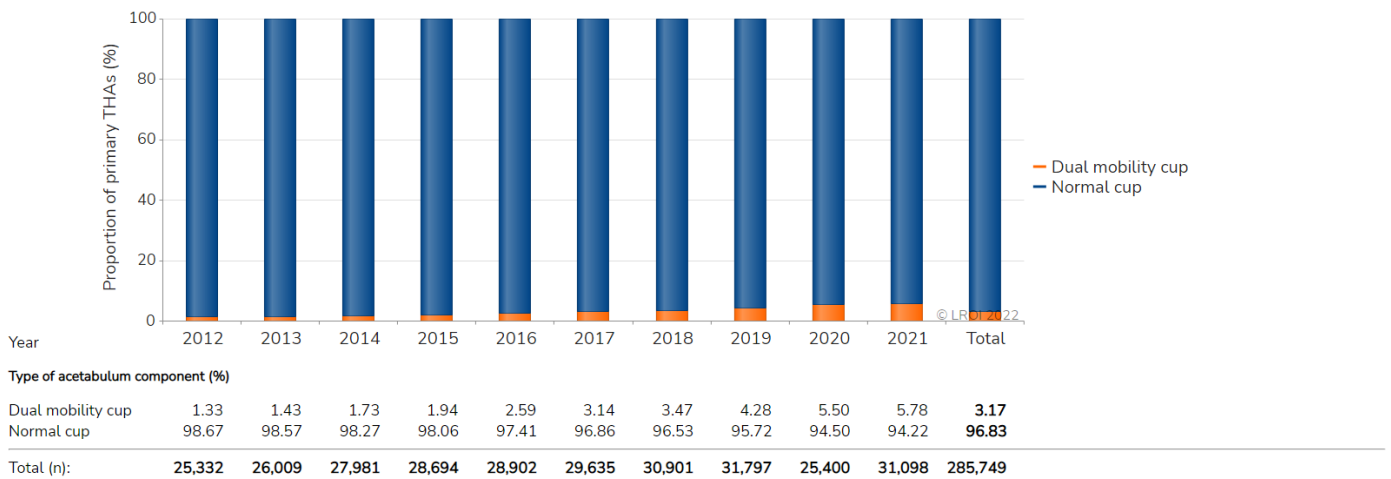
FIGURE Trend (proportion [%] per year) in femoral head component diameter in primary total hip arthroplasties in the Netherlands in 2012-2021



THA: total hip arthroplasty.

Dual mobility

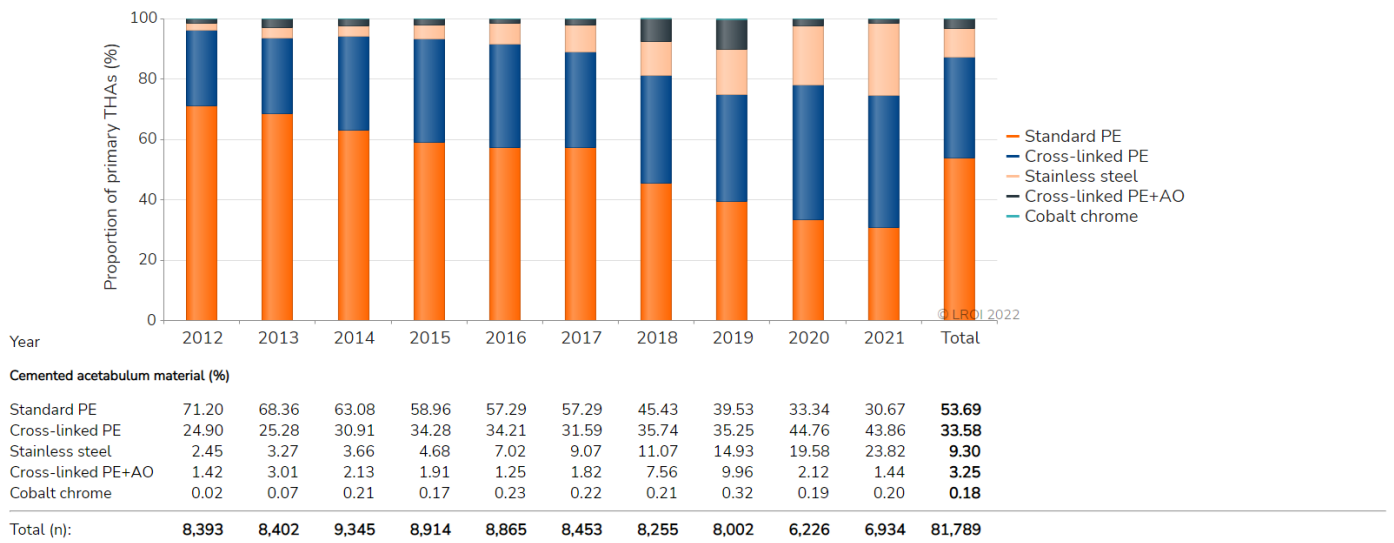
FIGURE Trend (proportion [%] per year) in type of acetabulum component in primary total hip arthroplasties in the Netherlands in 2012-2021



THA: total hip arthroplasty.

Cemented acetabular component

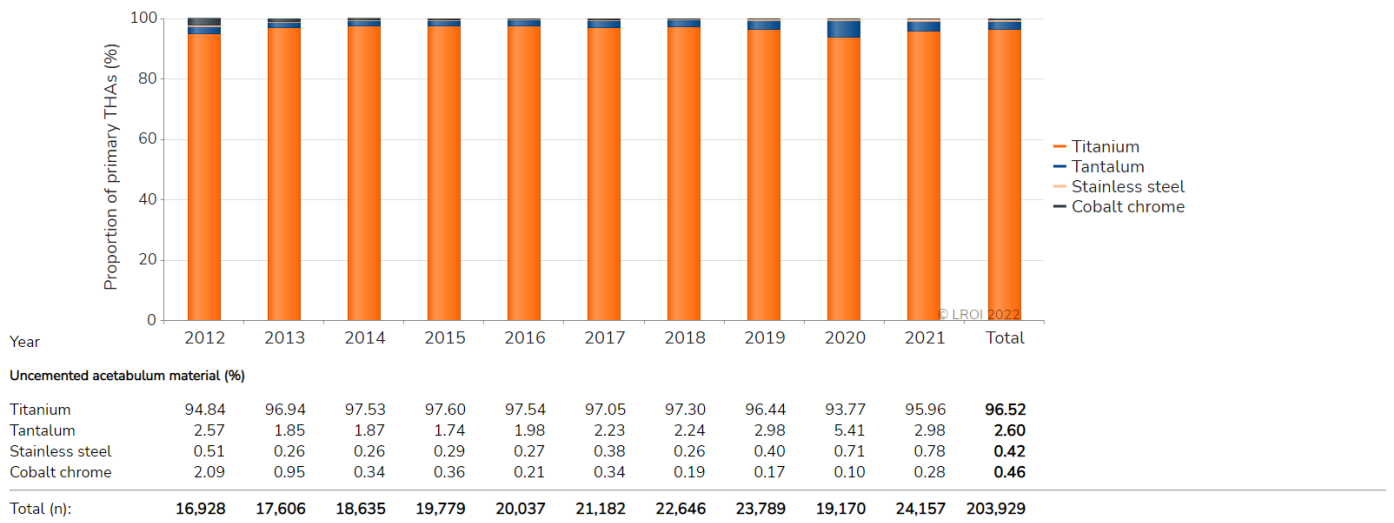
FIGURE Trend (proportion [%] per year) in cemented acetabulum material in primary total hip arthroplasties in the Netherlands in 2012-2021



Please note: Titanium was used in 7 (0.01%) primary THAs in 2012-2021.
 Please note: Stainless steel was used in cemented dual mobility cups.
 THA: total hip arthroplasty; PE: polyethylene; AO: antioxidant.

Uncemented acetabular component

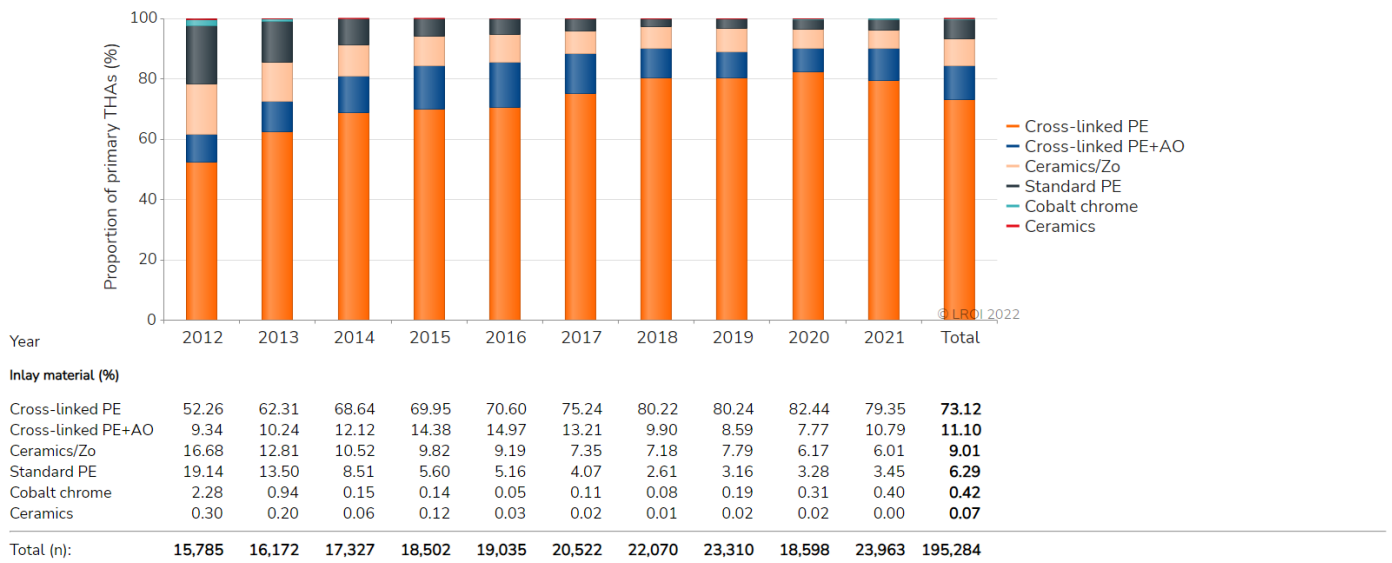
FIGURE Trend (proportion [%] per year) in uncemented acetabulum material in primary total hip arthroplasties in the Netherlands in 2012-2021



Please note: Cobalt Chrome/Titanium was used in 6 (<0.01%) primary THAs in 2012.
 THA: total hip arthroplasty.

Inlay

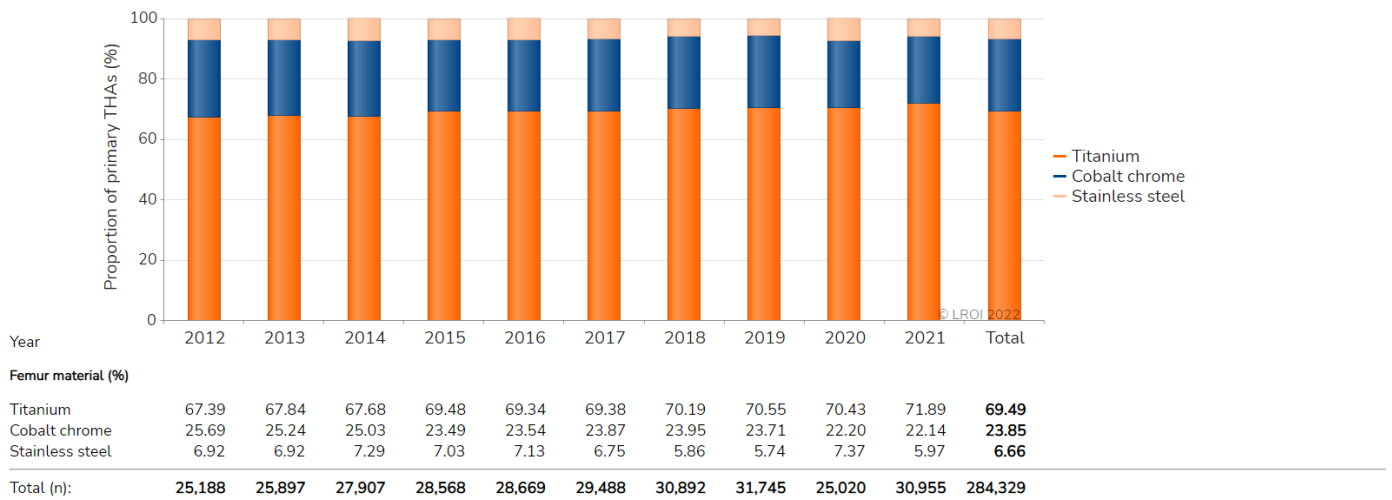
FIGURE Trend (proportion [%] per year) in inlay material in primary total hip arthroplasties in the Netherlands in 2012-2021



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

Femur component

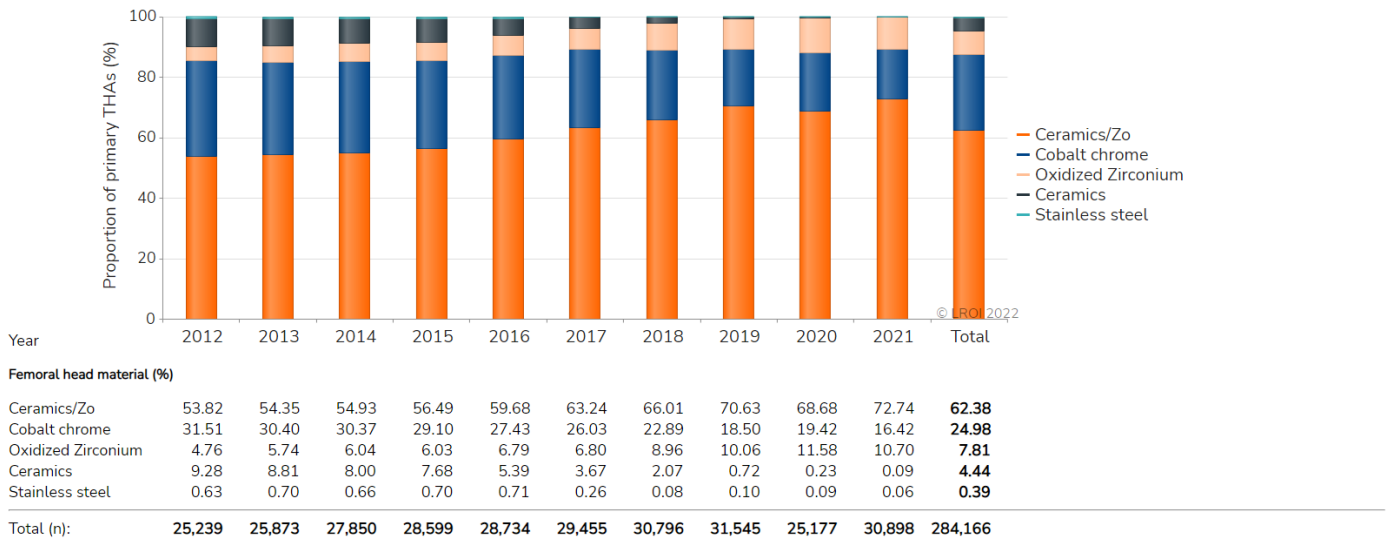
FIGURE Trend (proportion [%] per year) in femur component material in primary total hip arthroplasties in the Netherlands in 2012-2021



THA: total hip arthroplasty.

Femoral head component

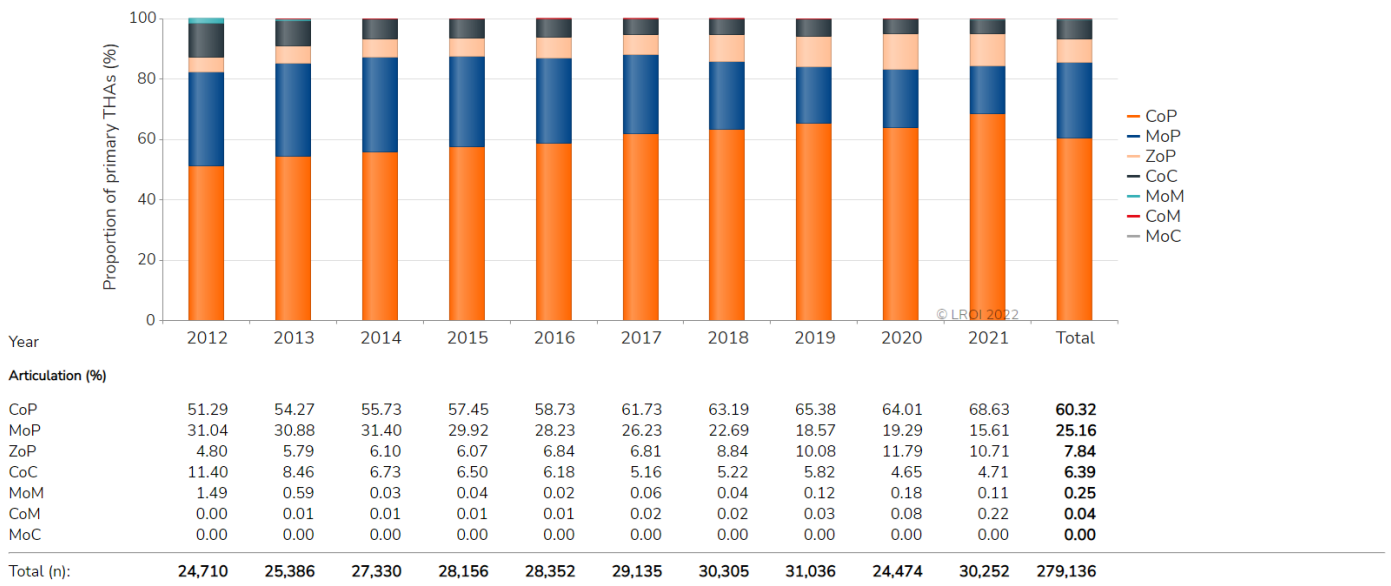
FIGURE Trend (proportion [%] per year) in femoral head material in primary total hip arthroplasties in the Netherlands in 2012-2021



Please note: A titanium femoral head was used in 13 (<0.01%) primary THAs in 2012-2021. A standard PE femoral head was used in 7 (<0.01%) primary THAs in 2012-2021.
THA: total hip arthroplasty; PE: polyethylene; Zo: Oxidized Zirconium.

Articulation

FIGURE Trend (proportion [%] per year) in articulation in primary total hip arthroplasties in the Netherlands in 2012-2021

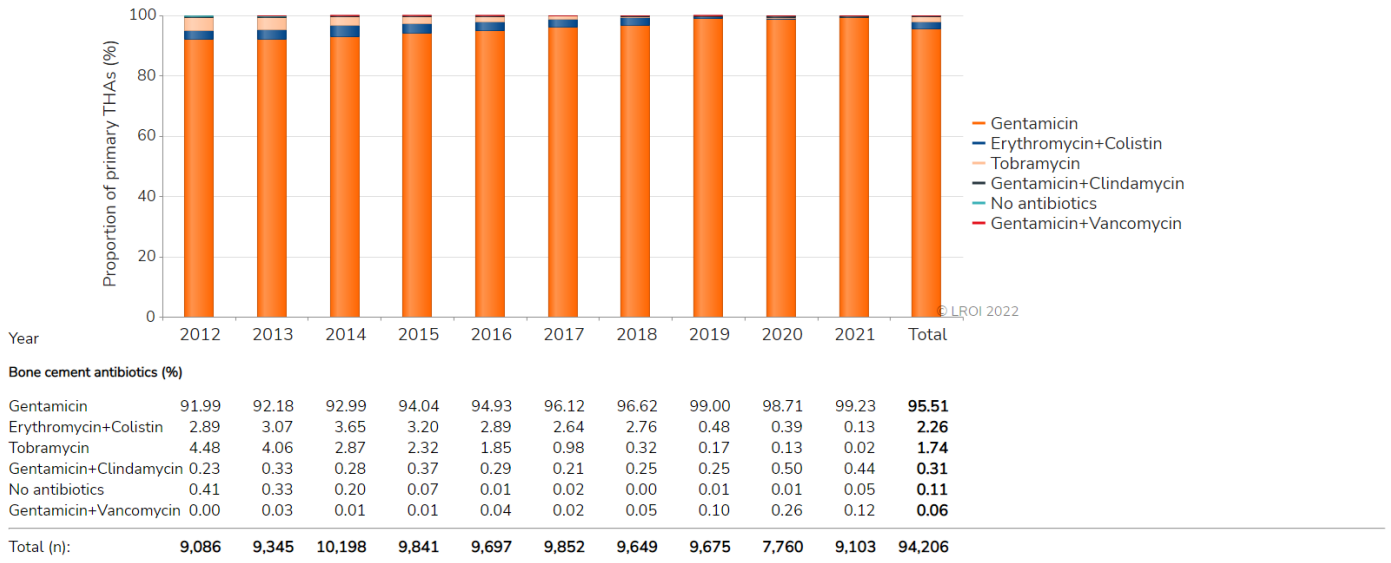


THA: total hip arthroplasty; CoP: Ceramics-on-polyethylene; MoP: Metal-on-polyethylene; CoC: Ceramics-on-ceramics; ZoP: Oxidized Zirconium-on-polyethylene; MoM: Metal-on-Metal; CoM: Ceramics-on-Metal; MoC: Metal-on-ceramics.

Bone cement

Antibiotics

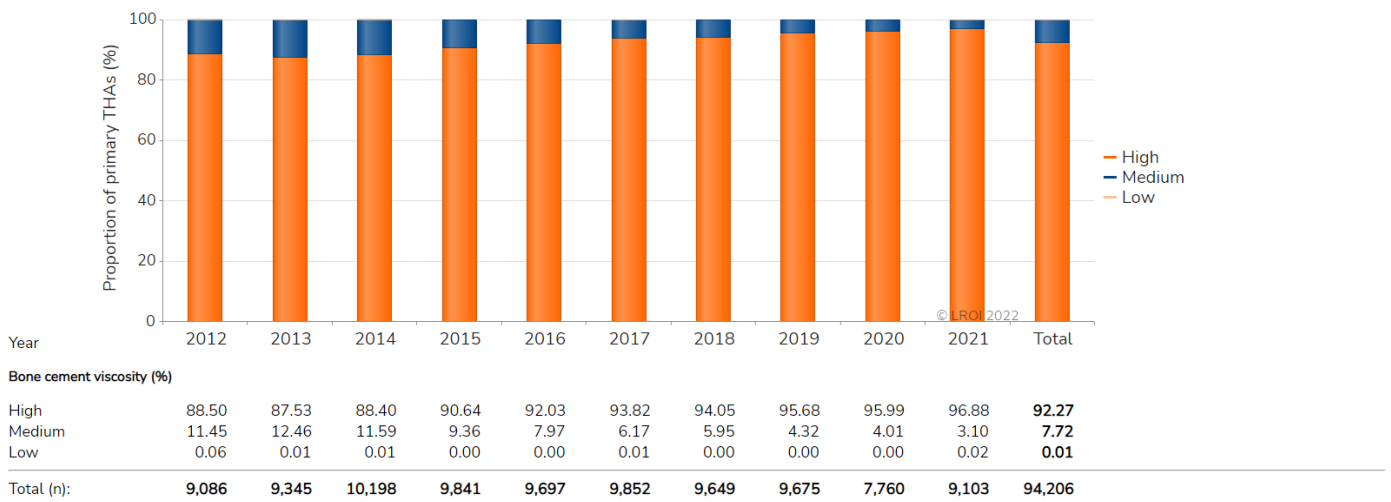
FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in primary total hip arthroplasties in the Netherlands in 2012-2021



THA: total hip arthroplasty.

Viscosity

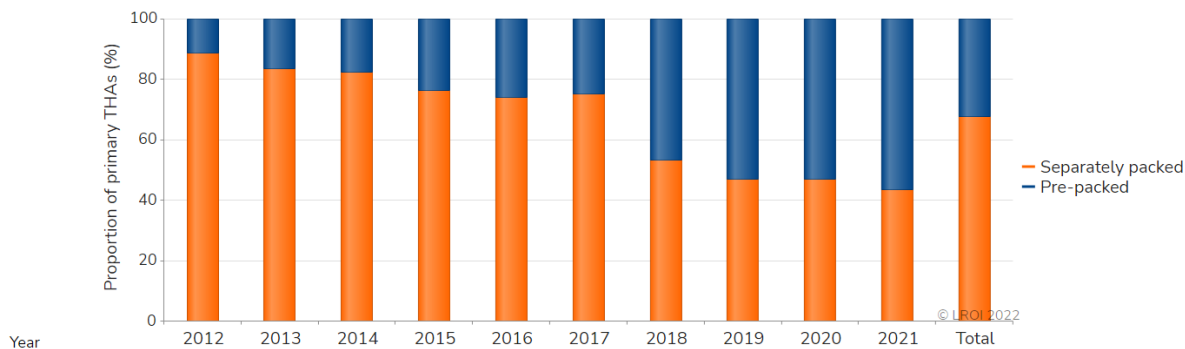
FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary total hip arthroplasties in the Netherlands in 2012-2021



THA: total hip arthroplasty.

Vacuum mixing system

FIGURE Trend (proportion [%] per year) in use of bone cement pre-packed in a vacuum mixing system in primary total hip arthroplasties in the Netherlands in 2012-2021



Vacuum mixing system (%)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Separately packed	88.73	83.32	82.26	76.22	74.02	75.23	53.23	46.82	46.98	43.47	67.51
Pre-packed	11.27	16.68	17.74	23.78	25.98	24.77	46.77	53.18	53.02	56.53	32.49
Total (n):	9,086	9,345	10,198	9,841	9,697	9,852	9,649	9,675	7,760	9,103	94,206

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

Most frequently registered

Components

TABLE The most frequently registered acetabulum (both cemented and uncemented) and femur (both cemented and uncemented) components in primary total hip arthroplasties in the Netherlands in 2021

Acetabulum		Uncemented (n=23,707)	
Cemented (n=7,093)		Name	Proportion (%)
Name	Proportion (%)	Name	Proportion (%)
Avantage Cemented	19.4	Allofit	34.8
Muller low profile Durasul	18.6	Pinnacle	20.5
IP Cup	12.8	R3	13.3
Marathon	8.7	Trident	8.9
FAL Cup	6.7	G7 PPS	5.8
Exeter Rimfit X3	6.6	RM Pressfit Vitamys cup	3.7
CCB cup Low Profile	4.7	Continuum	2.9
IP Cup X-Linked	3.3	Pinnacle Gription	2.2
Reflection All Poly XLPE	3.1	RM Pressfit cup	1.7
Muller low profile	3.1	Delta-TT	1.5

Femur		Uncemented (n=22,074)	
Cemented (n=8,583)		Name	Proportion (%)
Name	Proportion (%)	Name	Proportion (%)
Lubinus SPII	34.1	Taperloc Complete	30.6
Original ME Muller	28.2	Corail	20.1
Exeter	9.5	Polarstem	13.7
Taperloc Hip Cemented CoCr	6.5	Accolade II	9.9
C-Stem AMT	5.8	Fitmore	4.2
CPT	3.7	Twinsys stem Cementless	3.5
CCA stem	3.3	Corail AMT	3.3
Spectron EF	2.7	Alloclassic Zweymuller SL	2.3
CPCS	1.6	Avenir Muller	2.2
Twinsys stem Cemented	1.3	CLS Spotorno	2.2

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Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during primary total hip arthroplasties in the Netherlands in 2021

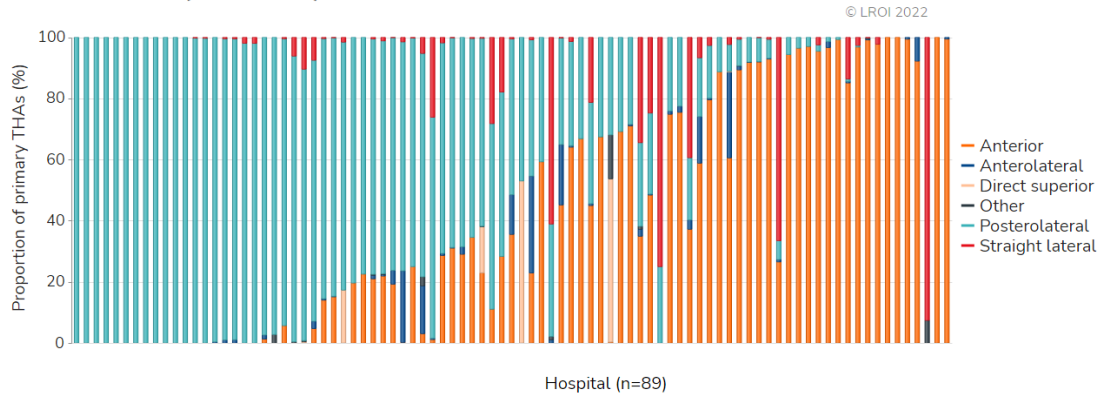
Separately packed bone cement components (n=3,930)		Bone cement pre-packed in a vacuum mixing system (n=5,098)	
Name	Proportion (%)	Name	Proportion (%)
Palacos R+G	87.6	Palacos R+G	50.5
Refobacin Bone Cement R	3.8	Refobacin Bone Cement R	43.8
Palacos MV+G	3.7	Refobacin Plus Bone Cement	5.7
Subiton G	2.5		
Copal G+C	0.8		

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Practice variation

Surgical approach

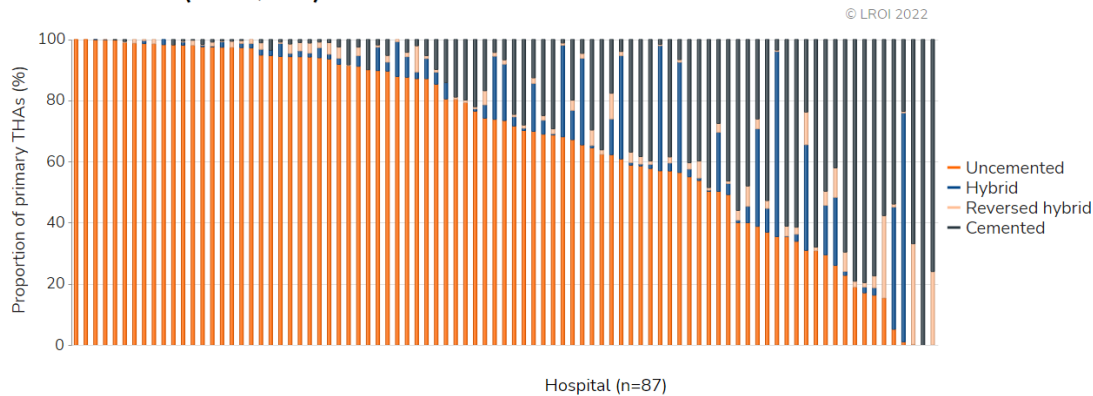
FIGURE Distribution of surgical approach used during primary total hip arthroplasties per hospital in the Netherlands in 2021 (n=31,056)



THA: total hip arthroplasty.

Fixation

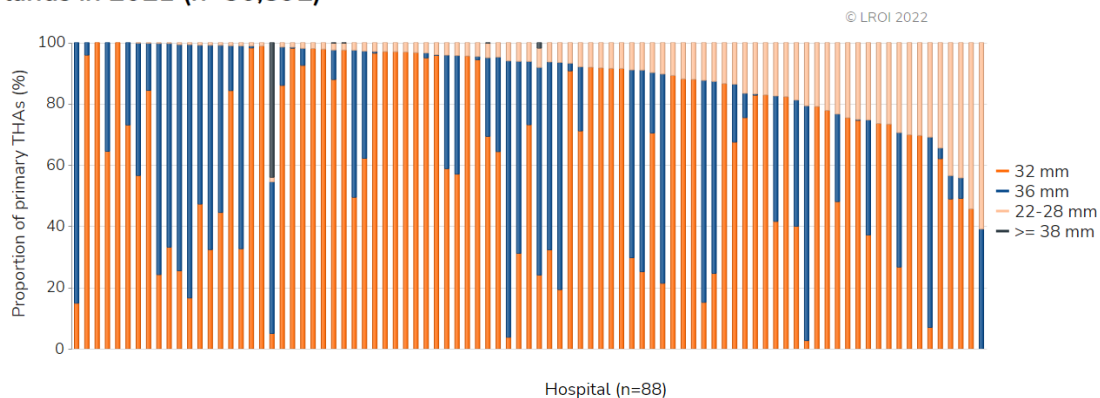
FIGURE Distribution of type of fixation used during primary total hip arthroplasties per hospital in the Netherlands in 2021 (n=30,960)



THA: total hip arthroplasty.

Femoral head diameter

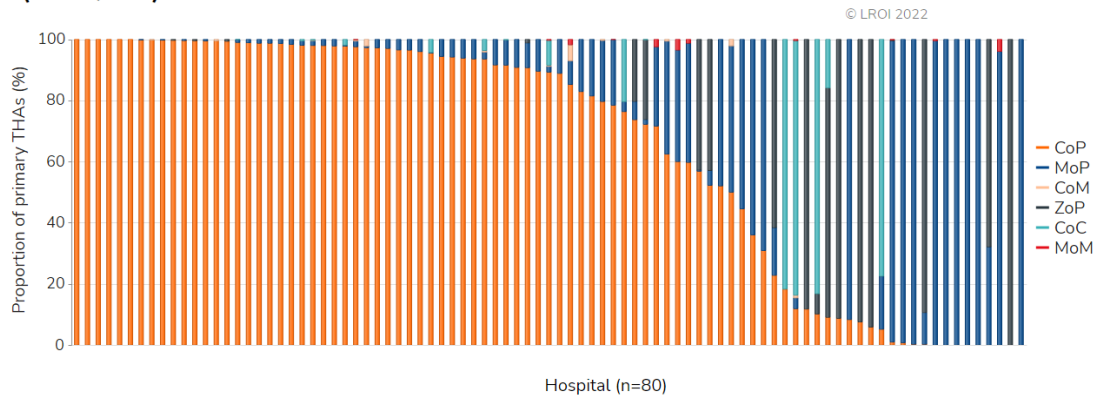
FIGURE Distribution of diameter femoral head used during primary total hip arthroplasties per hospital in the Netherlands in 2021 (n=30,892)



THA: total hip arthroplasty.

Articulation

FIGURE Distribution of articulation used during primary total hip arthroplasties per hospital in the Netherlands in 2021 (n=30,240)



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

Hip hemiarthroplasty

Demographics

TABLE Patient characteristics of all patients with a primary hip hemiarthroplasty by specialism in the Netherlands in 2021

N	Orthopaedic surgeon 4,096 (71.1%)	Trauma surgeon 1,668 (28.9%)	Total 5,764
Mean age (years) (SD)	82.7 (8.9)	81.6 (7.9)	81.6 (8.7)
Age (years) (%)			
<50	1	0	0
50-59	2	1	2
60-69	6	6	6
70-79	24	27	25
≥80	67	66	66
Gender (%)			
Men	36	35	36
Women	64	65	64
ASA score (%)			
I	2	2	2
II	26	27	27
III-IV	72	71	71
Type of hospital (%)			
General	97	95	96
Private	1	0	0
UMC	3	5	3
Diagnosis (%)			
Fracture (acute)	93	99	95
Osteoarthritis	4	0	3
Late post-traumatic	1	0	1
Tumour	1	0	0
Osteonecrosis	0	0	0
Dysplasia	0	0	0
Rheumatoid arthritis	0	0	0
Post-Perthes' disease	0	0	0
Inflammatory arthritis	0	0	0
Other	1	0	1
Charnley-score (%)			
A One hip joint affected	52	35	49
B1 Both hip joints affected	16	37	20
B2 Contralateral hip joint with a total hip prosthesis	24	15	22
C Multiple joints affected or chronic disease that affects quality of life	8	12	9
Mean Body Mass Index (kg/m²) (SD)	24.7 (4.3)	24.7 (4.0)	24.7 (4.2)
Body Mass Index (kg/m²) (%)			
Underweight (≤18,5)	5	5	5
Normal weight (>18,5-25)	55	57	56
Overweight (>25-30)	30	29	30
Obesity (>30-40)	9	10	9
Morbid obesity (>40)	1	0	0
Smoking (%)			
No	93	91	92
Yes	7	9	8

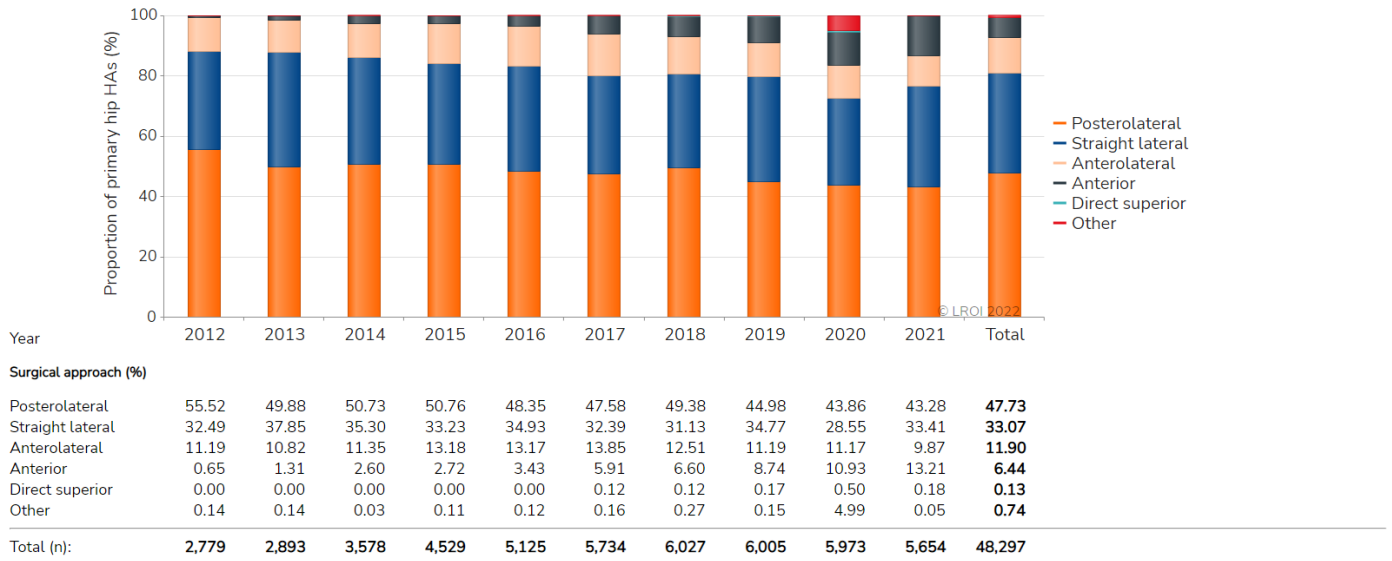
Please note: in 2021, 71 general hospitals, 7 UMCs and 6 private hospital performed primary hip hemiarthroplasties. General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Surgical techniques

Surgical approach

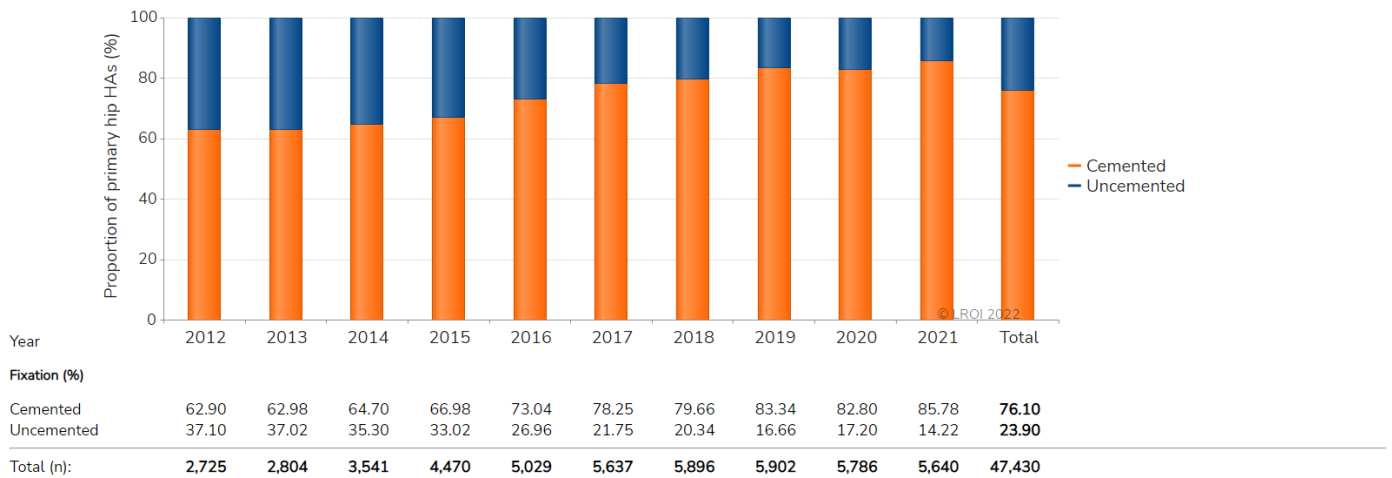
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary hip hemiarthroplasty in the Netherlands in 2012-2021



HA: hemiarthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary hip hemiarthroplasties in the Netherlands in 2012-2021



HA: hemiarthroplasty.

Most frequently registered

Components

TABLE The most frequently registered femur and femoral head components in primary hip hemiarthroplasties in the Netherlands in 2021

Femur component (n=5,690)		Femoral head component (n=5,641)	
Name	Proportion (%)	Name	Proportion (%)
Original ME Muller	24.7	Unipolar Head	27.6
Lubinus SPII	20.0	Link CoCr head	22.0
Spectron EF	9.8	Modular Cathcard Unipolar head	13.2
CCA stem	8.7	Stainless Steel head	9.5
C-Stem AMT	6.4	Smith & Nephew CoCr head	6.7
CPT	4.7	Versys Endo	5.8
Lubinus Classic Plus	3.2	Smith & Nephew Uni-polar	4.2
Alloclassic Zweymuller SL	3.1	UHR Unitrax	3.6
Corail Cemented	3.0	ZimmerBiomet Hemi Heads	1.4
Accolade II	2.8	ZimmerBiomet CoCr head	1.1

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Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during primary hip hemiarthroplasties in the Netherlands in 2021

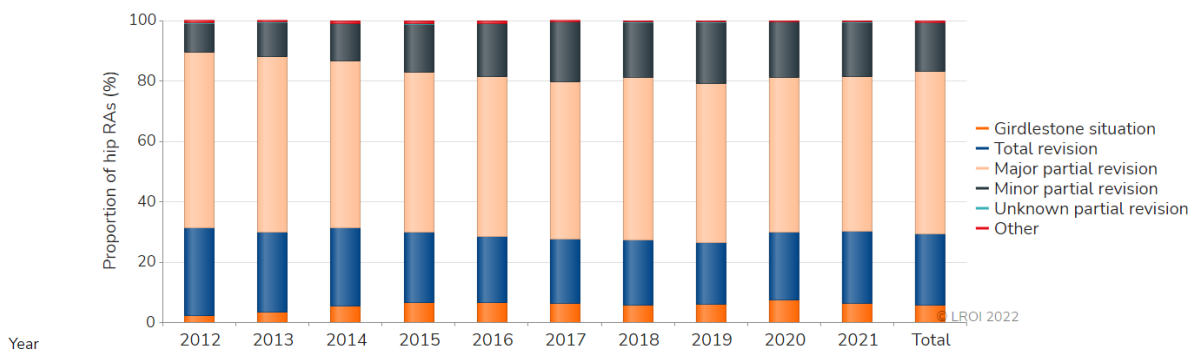
Separately packed bone cement components (n=1,483)		Bone cement pre-packed in a vacuum mixing system (n=2,820)	
Name	Proportion (%)	Name	Proportion (%)
Palacos R+G	74.5	Palacos R+G	49.5
Copal G+C	11.6	Refobacin Bone Cement R	44.3
Palacos MV+G	6.4	Refobacin Plus Bone Cement	6.2
Subiton G	4.9	Cemex Genta	0.1
Refobacin Bone Cement R	1.3		

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Hip revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in hip revision arthroplasties in the Netherlands in 2012-2021



Type of revision (%)

Girdlestone situation	2.30	3.46	5.47	6.74	6.53	6.32	5.86	5.92	7.51	6.23	5.65
Total revision	29.13	26.59	25.82	23.19	21.95	21.17	21.45	20.63	22.48	24.02	23.58
Major partial revision	58.12	58.04	55.30	53.07	52.85	52.18	53.97	52.55	51.04	51.26	53.82
Minor partial revision	9.43	11.33	12.34	15.77	17.55	19.87	18.06	20.16	18.45	17.84	16.15
Unknown partial revision	0.19	0.15	0.03	0.08	0.10	0.08	0.23	0.24	0.03	0.11	0.12
Other	0.84	0.44	1.04	1.15	1.01	0.39	0.42	0.50	0.49	0.54	0.68
Total (n):	3,701	3,441	3,548	3,812	3,858	3,860	3,837	3,819	3,448	3,531	36,855

RA: revision arthroplasty.

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

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

Unknown partial revision: partial revision of which the revised components were unknown.

In 1,141 (63%) major partial hip revision arthroplasties the acetabulum component was revised and in 669 (37%) major partial revision arthroplasties the femur component was revised in 2021.

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a hip revision arthroplasty in the Netherlands in 2014-2021

Year	2014	2015	2016	2017	2018	2019	2020	2021	Total
Hip revision arthroplasty (n)	3,583	3,834	3,883	3,871	3,844	3,835	3,466	3,535	29,851
Reasons for revision; Proportion¹ (%)									
Loosening of acetabulum component	26.4	24.8	22.3	21.8	21.1	20.6	18.5	16.9	21.6
Infection	12.3	17.9	19.4	21.2	20.7	22.7	25.0	25.2	20.5
Dislocation	19.1	19.9	19.4	17.8	18.9	18.5	17.6	18.9	18.8
Loosening of femur component	20.9	19.5	18.8	18.2	19.2	17.2	17.0	17.2	18.5
Inlay wear	20.1	19.6	18.3	18.2	16.0	15.8	13.4	13.2	16.9
Peri-prosthetic fracture	11.7	11.4	12.5	14.7	14.4	14.5	17.1	16.2	14.0
Girdlestone situation	6.4	5.7	6.1	5.2	4.8	4.5	4.3	4.9	5.3
Symptomatic MoM bearing	5.8	4.6	3.9	2.7	2.7	2.8	2.6	2.3	3.4
Peri-articular ossification	2.6	2.0	2.3	1.5	1.3	1.1	1.2	1.1	1.7
Other	11.6	11.3	10.6	10.1	11.3	12.8	10.8	11.8	11.3

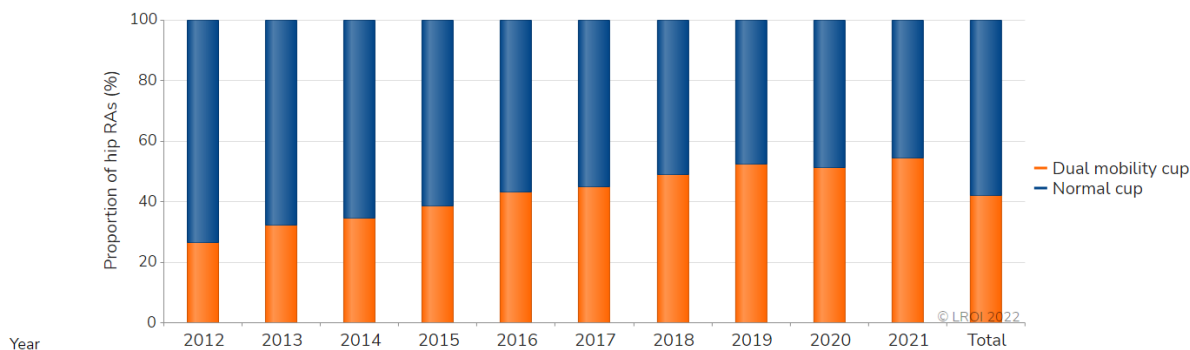
¹ One patient may have more than one reason for revision. As such, the total proportion is over 100%.

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Surgical techniques

Dual mobility

FIGURE Trend (proportion [%] per year) in type of acetabulum component in hip revision arthroplasties in the Netherlands in 2012-2021

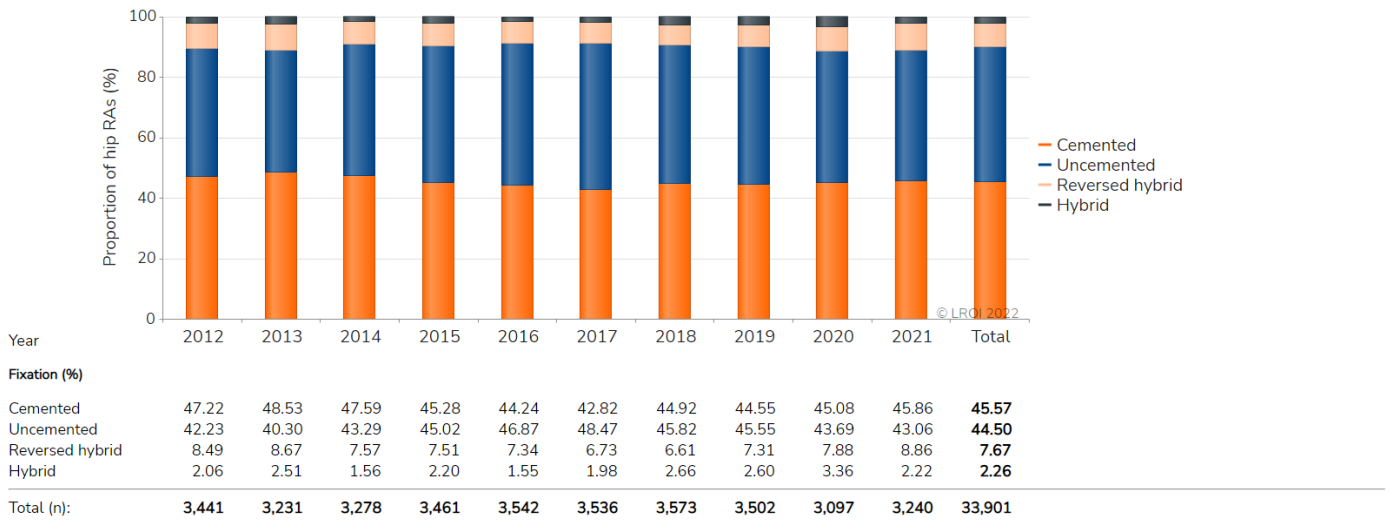


Type of acetabulum component (%)	
Dual mobility cup	26.43 32.18 34.53 38.54 43.29 44.91 48.83 52.38 51.24 54.27 42.12
Normal cup	73.57 67.82 65.47 61.46 56.71 55.09 51.17 47.62 48.76 45.73 57.88
Total (n):	2,539 2,287 2,346 2,418 2,347 2,182 2,222 2,161 1,930 2,095 22,527

RA: revision arthroplasty.

Fixation

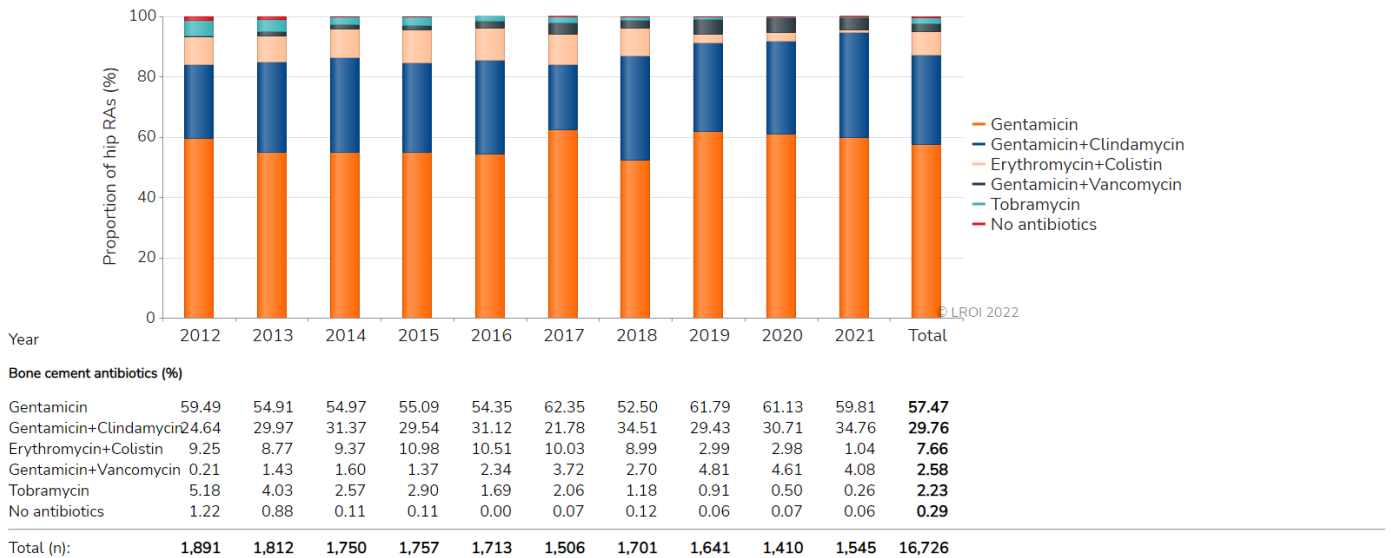
FIGURE Trend (proportion [%] per year) in type of fixation in hip revision arthroplasties in the Netherlands in 2012-2021



RA: revision arthroplasty.

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in hip revision arthroplasties in the Netherlands in 2012-2021



RA: revision arthroplasty.

Most frequently registered

Components

TABLE The most frequently registered acetabulum (both cemented and uncemented) and femur (both cemented and uncemented) components in hip revision arthroplasties in the Netherlands in 2021

Acetabulum		Acetabulum	
Cemented (n=1,405)		Uncemented (n=441)	
Name	Proportion (%)	Name	Proportion (%)
Avantage Cemented	60.3	Continuum	16.6
Polarcup	11.5	Allofit	10.9
Trabecular Metal	6.5	Delta-One TT	10.7
Bi-Mentum Cemented Cups	5.1	Avantage Reload	7.7
DS Evolution	2.9	Trident	7.0
Exeter Rimfit X3	2.6	Polarcup	5.9
BiMobile DM	1.6	R3	3.4
Marathon	1.3	Saturne Dual Mobility	3.4
Muller low profile Durasul	1.1	G7 OsseoTi	3.2
Redapt	1.1	Redapt	3.0

Femur		Femur	
Cemented (n=608)		Uncemented (n=778)	
Name	Proportion (%)	Name	Proportion (%)
Lubinus SPII	23.0	Arcos	22.6
Exeter	21.2	MP Reconstruction Prosthesis	18.6
CPT	11.2	Restoration Modular	10.3
Original ME Muller	6.9	Redapt	8.2
C-Stem AMT Long	6.3	Revitan	6.2
MP Reconstruction Prosthesis	4.8	Polarstem	4.0
Spectron EF	4.6	Wagner SL	3.9
C-Stem AMT	4.3	Alloclassic SLL	3.2
Taperloc Hip Cemented CoCr	2.6	Corail Revision	3.1
Twinsys stem Cemented	2.0	Taperloc Complete	2.8

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Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during hip revision arthroplasties in the Netherlands in 2021

Separately packed bone cement components (n=906)		Bone cement pre-packed in a vacuum mixing system (n=572)	
Name	Proportion (%)	Name	Proportion (%)
Copal G+C	35.5	Palacos R+G	57.0
Palacos R+G	32.0	Refobacin Bone Cement R	36.2
Refobacin Revision	15.3	Refobacin Revision	4.0
Copal G+V	6.5	Refobacin Plus Bone Cement	2.8
Palacos MV+G	3.1		

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Survival total hip arthroplasty

Revision within 1 and 3 years

By type of revision within 1 year

TABLE Cumulative 1-year revision percentage of primary total hip arthroplasties by type of revision in the Netherlands in 2016-2020 (n=147,099)

	Cumulative 1-year revision percentage	
	Competing Risk (95% CI)	Kaplan Meier (95% CI)
Any type of revision ¹	1.9 (1.8-1.9)	1.9 (1.8-2.0)
Major revision ²	1.0 (1.0-1.1)	1.1 (1.0-1.1)
Only acetabulum	0.3 (0.3-0.4)	0.3 (0.3-0.4)
Only femur	0.5 (0.5-0.5)	0.5 (0.5-0.5)
Acetabulum and femur	0.2 (0.2-0.2)	0.2 (0.2-0.2)
Minor revision ³	0.8 (0.8-0.9)	0.9 (0.8-0.9)
DAIR	0.6 (0.6-0.6)	0.6 (0.5-0.6)
No DAIR	0.2 (0.2-0.3)	0.2 (0.2-0.3)

¹ Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.

² Revision of at least the acetabulum or femur component.

³ Only inlay and/or femoral head exchange (including DAIR procedures).

THA: total hip arthroplasty; CI: confidence interval.

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In 2016-2020, 1,788 (1.2%) primary THAs were implanted in patients who died within one year after the primary procedure.

By type of revision within 3 year

TABLE Cumulative 3-year revision percentage of primary total hip arthroplasties by type of revision in the Netherlands in 2014-2018 (n=146,373)

	Cumulative 3-year revision percentage	
	Competing Risk (95% CI)	Kaplan Meier (95% CI)
Any type of revision ¹	2.7 (2.6-2.8)	2.7 (2.6-2.8)
Major revision ²	1.8 (1.7-1.9)	1.8 (1.8-1.9)
Only acetabulum	0.7 (0.6-0.7)	0.7 (0.6-0.7)
Only femur	0.7 (0.7-0.8)	0.8 (0.7-0.8)
Acetabulum and femur	0.4 (0.4-0.4)	0.4 (0.4-0.4)
Minor revision ³	0.8 (0.8-0.9)	0.8 (0.8-0.9)
DAIR	0.5 (0.5-0.5)	0.5 (0.5-0.5)
No DAIR	0.3 (0.3-0.4)	0.3 (0.3-0.4)

¹ Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.

² Revision of at least the acetabulum or femur component.

³ Only inlay and/or femoral head exchange (including DAIR procedures).

THA: total hip arthroplasty; CI: confidence interval.

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In 2014-2018, 6,427 (4.4%) primary THAs were implanted in patients who died within three years after the primary procedure.

First major or minor revision

TABLE Cumulative 1-year first revision percentage of primary total hip arthroplasties by type of first major or minor revision in the Netherlands in 2016-2020 (n=147,099)

	Cumulative 1-year first revision percentage	
	Competing Risk (95% CI)	Kaplan Meier (95% CI)
First major revision ¹	1.1 (1.1-1.2)	1.1 (1.1-1.2)
Acetabulum	0.6 (0.6-0.7)	0.6 (0.6-0.7)
Femur	0.8 (0.7-0.8)	0.8 (0.7-0.8)
First minor revision ²	0.8 (0.8-0.9)	0.9 (0.8-0.9)
Inlay	0.4 (0.3-0.4)	0.4 (0.3-0.4)
Femoral head	0.8 (0.7-0.8)	0.8 (0.7-0.8)

¹ First revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

² Only inlay and/or femoral head exchange (including DAIR procedures).

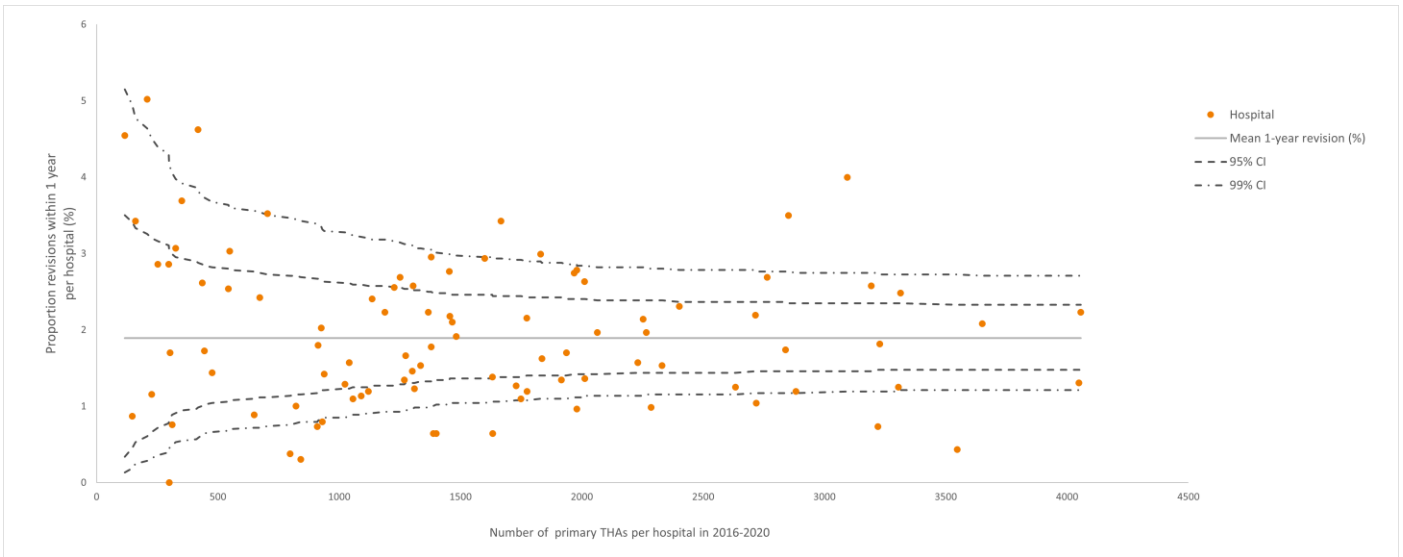
THA: total hip arthroplasty; CI: confidence interval.

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In 2016-2020, 1788 (1.2%) primary THAs were implanted in patients who died within one year after the primary procedure.

Overall revision per hospital

FIGURE Funnel plot of proportion of hip revision arthroplasties within one year after a total hip arthroplasty per hospital in the Netherlands in 2016-2020 (n=147,099)



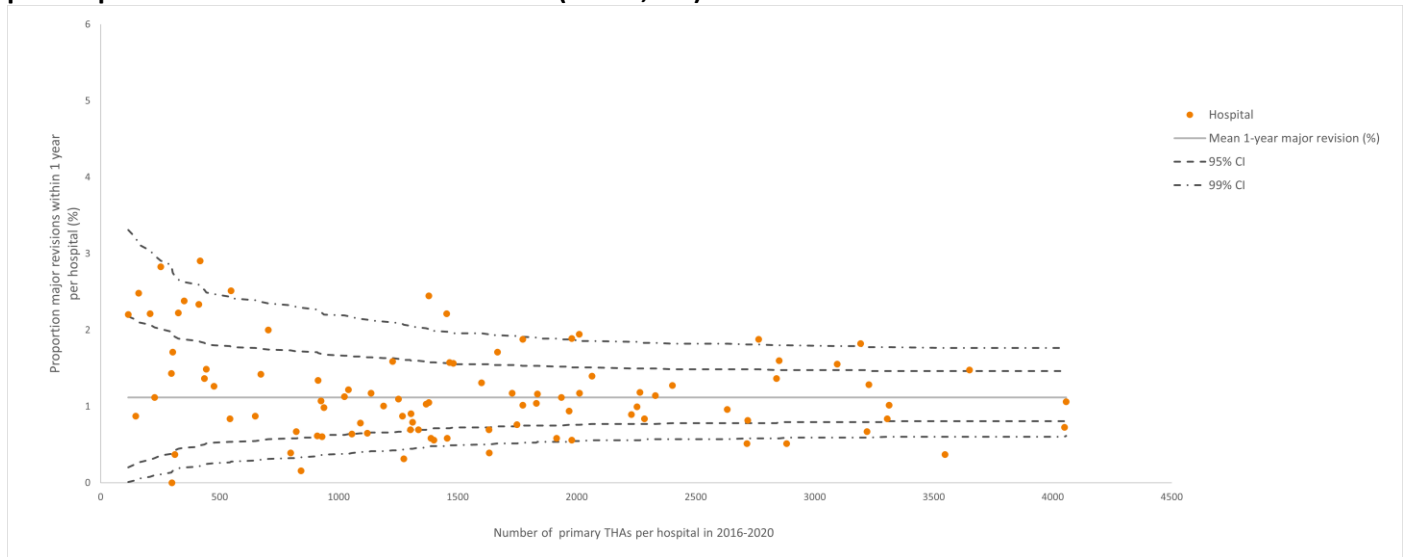
Please note: The proportions of revisions within 1 year per hospital were adjusted for casemix factors age, gender, ASA score, BMI, smoking, charnley score and diagnosis (osteoarthritis versus other).

THA: total hip arthroplasty; CL: control limits; CI: confidence interval.

The mean 1-year revision percentage is 1.9 (95% CI: 1.7-1.9) in the Netherlands in 2016-2020. Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Major revision per hospital

FIGURE Funnel plot of proportion of hip major revision arthroplasties within one year after a total hip arthroplasty per hospital in the Netherlands in 2016-2020 (n=147,099)



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; CI: confidence interval.

The mean 1-year major revision percentage is 1.2 (95% CI: 1.1-1.2) in the Netherlands in 2016-2020. Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Reasons for revision by type of revision

TABLE Reasons for revision within one year in patients that underwent a hip revision arthroplasty by type of revision in the Netherlands in 2016-2020

Reasons for revision	Major revision ¹ (n=1,644)	Minor revision ² (n=1,218)	Any type of revision ³ (n=2,786)
	Proportion ⁴ (%)	Proportion ⁴ (%)	Proportion ⁴ (%)
Infection	18.5	70.4	39.1
Dislocation	32.4	14.0	24.9
Peri-prosthetic fracture	30.6	2.1	19.0
Loosening of femur component	17.3	0.7	10.4
Loosening of acetabulum component	8.7	0.3	4.9
Girdlestone situation	3.3	0.1	1.4
Inlay wear	0.7	0.8	0.8
Peri-articular ossification	0.5	0.2	0.4
Symptomatic MoM bearing	0.1	0.0	0.1
Other	10.4	14.1	12.2

¹ 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.

² Only inlay and/or femoral head exchange (including DAIR procedures).

³ Any type of revision includes all first revisions, including revision procedures that could not be classified as minor or major revision.

⁴ One patient may have more than one reason for revision. As such, the total proportion is over 100%.

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Time after primary THA

TABLE Time after primary total hip arthroplasty until short-term revision in the Netherlands in 2014-2018 (n=146,373)

Time after primary THA	Percentage revisions (%)
Day 0-29	0.9
Day 30-182	0.6
Day 183-364	0.3
Day 365-730 (second year)	0.5
Day 731-1095 (third year)	0.3

THA: total hip arthroplasty.

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Mid- and long-term revision

THA by type of revision

FIGURE Cumulative revision percentage of total hip arthroplasties by type of revision in the Netherlands in 2007-2021 (n=379,261)

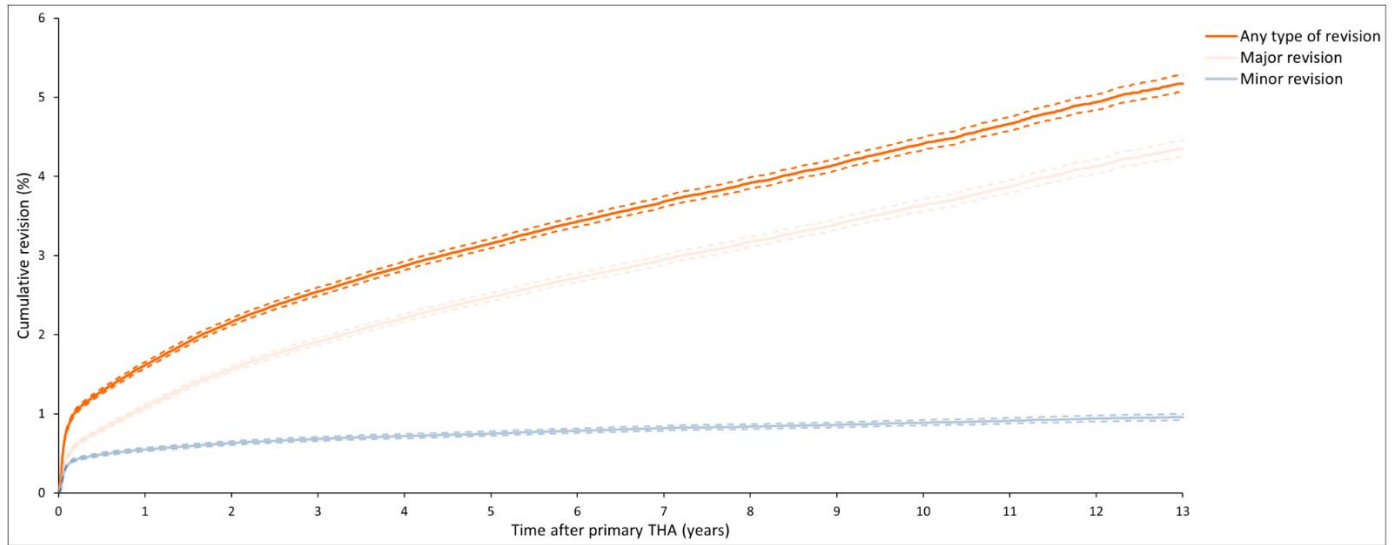


TABLE Cumulative revision percentages

	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Any type of revision			
1-year revision (%)	338,372	1.6 (1.6-1.7)	1.6 (1.6-1.6)
3-year revision (%)	271,414	2.5 (2.5-2.6)	2.6 (2.5-2.6)
5-year revision (%)	204,126	3.2 (3.1-3.2)	3.2 (3.2-3.3)
10-year revision (%)	69,902	4.4 (4.3-4.5)	4.7 (4.6-4.8)
13-year revision (%)	16,619	5.2 (5.1-5.3)	5.8 (5.6-5.9)
Major revision²			
1-year revision (%)	340,009	1.1 (1.1-1.1)	1.1 (1.0-1.1)
3-year revision (%)	272,984	1.9 (1.9-2.0)	1.9 (1.9-2.0)
5-year revision (%)	205,31	2.5 (2.4-2.5)	2.5 (2.5-2.6)
10-year revision (%)	70,401	3.6 (3.6-3.7)	3.9 (3.8-4.0)
13-year revision (%)	16,764	4.3 (4.2-4.5)	4.9 (4.8-5.0)
Minor revision³			
1-year revision (%)	342,039	0.5 (0.5-0.6)	0.6 (0.6-0.6)
3-year revision (%)	276,848	0.7 (0.7-0.7)	0.7 (0.7-0.8)
5-year revision (%)	209,737	0.7 (0.7-0.8)	0.8 (0.8-0.9)
10-year revision (%)	73,483	0.9 (0.9-0.9)	1.0 (1.0-1.0)
13-year revision (%)	17,796	1.0 (0.9-1.0)	1.1 (1.1-1.1)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.

² First revision of the acetabulum or femur component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

³ Only inlay and/or femoral head exchange (including DAIR procedures).

CI: confidence interval.

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In 2007-2021, 50,715 (13.4%) primary THAs were implanted in patients who died within thirteen years after the primary diagnosis

THA by procedure year

FIGURE Cumulative major revision percentage of total hip arthroplasties by procedure year of primary THA in the Netherlands in 2009-2021 (n=324,213)

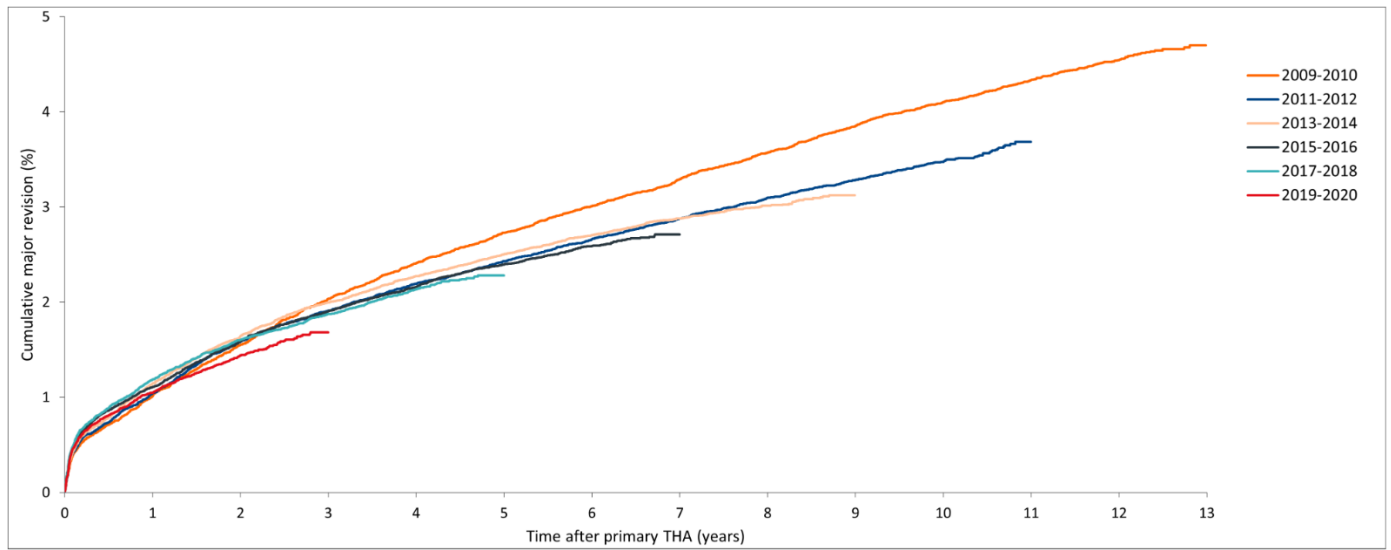


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Competing Risk (95% CI)

Procedure year primary THA	Number (n)	1yr	3yr	5yr	7yr	10yr
2009-2010	45,086	1.0 (0.9-1.1)	2.0 (1.9-2.2)	2.7 (2.6-2.9)	3.3 (3.1-3.5)	4.1 (3.9-4.3)
2011-2012	49,427	1.0 (1.0-1.1)	1.9 (1.8-2.0)	2.4 (2.3-2.6)	2.9 (2.7-3.0)	3.5 (3.3-3.6)
2013-2014	53,957	1.1 (1.1-1.2)	2.0 (1.9-2.1)	2.5 (2.4-2.6)	2.9 (2.7-3.0)	n.a.
2015-2016	57,611	1.1 (1.0-1.2)	1.9 (1.8-2.0)	2.4 (2.3-2.5)	n.a.	n.a.
2017-2018	60,739	1.2 (1.1-1.3)	1.9 (1.8-2.0)	n.a.	n.a.	n.a.
2019-2020	57,393	1.0 (1.0-1.1)	1.7 (1.6-1.8)	n.a.	n.a.	n.a.

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; n.a. if <50 cases were at risk.

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THA by procedure side

FIGURE Cumulative revision percentage of total hip arthroplasties by procedure side in the Netherlands in 2007-2021 (n=379,261)

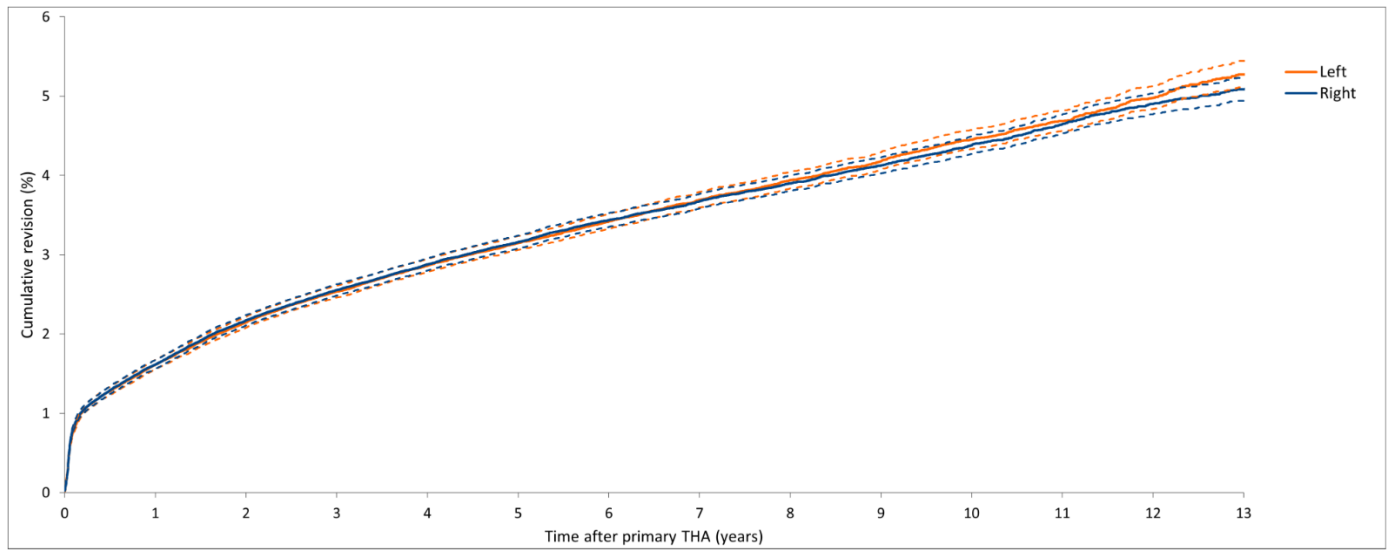


TABLE Cumulative 13-year revision percentage

Procedure side	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Left	175,633	5.3 (5.1-5.4)	5.9 (5.7-6.1)
Right	203,628	5.1 (4.9-5.2)	5.7 (5.5-5.8)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. THA: total hip arthroplasty, CI: confidence interval.

THA by approach

FIGURE Cumulative revision percentage of total hip arthroplasties by approach in the Netherlands in 2007-2021 (n=374,306)

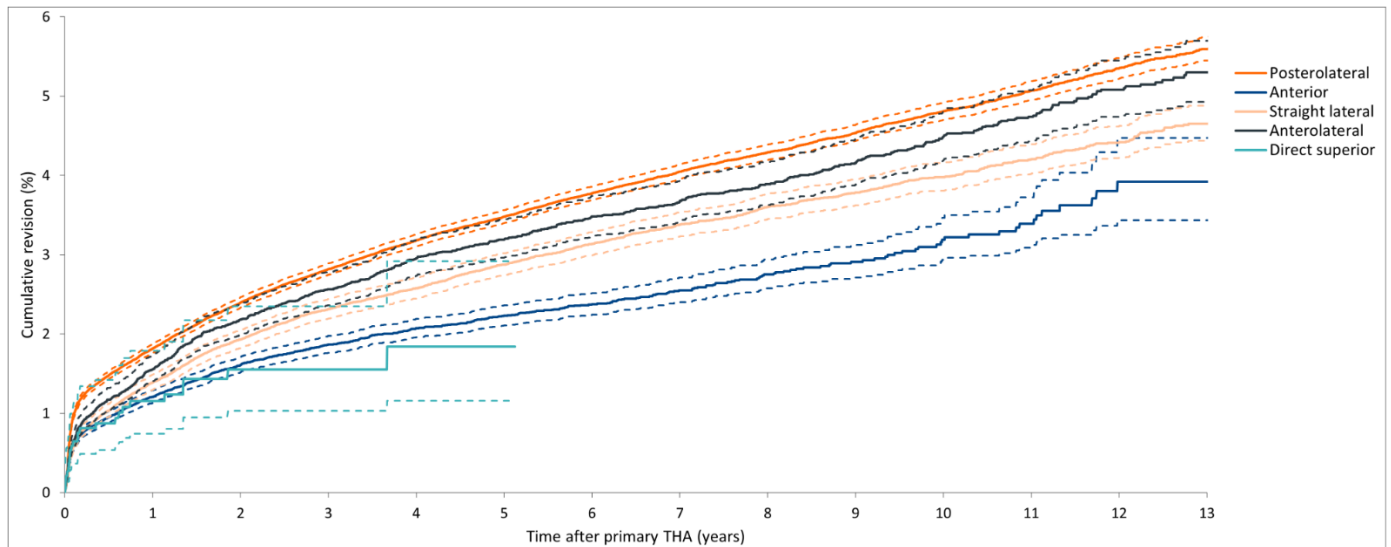


TABLE Cumulative 13-year revision percentage

Approach	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Posterolateral	217,124	5.6 (5.4-5.7)	6.2 (6.0-6.4)
Anterior	75,021	3.9 (3.4-4.5)	4.3 (3.7-5.0)
Straight lateral	58,033	4.7 (4.4-4.9)	5.2 (5.0-5.5)
Anterolateral	22,241	5.3 (4.9-5.7)	6.1 (5.6-6.5)
Direct superior	1,887	n.a.	n.a.

¹ The cumulative revision percentage using the competing risk method is shown in the figure. THA: total hip arthroplasty, CI: confidence interval; n.a. if <50 cases were at risk.

THA by femoral head size

FIGURE Cumulative revision percentage for dislocation of total hip arthroplasties by femoral head size in the Netherlands in 2007-2021 (n=370,093)

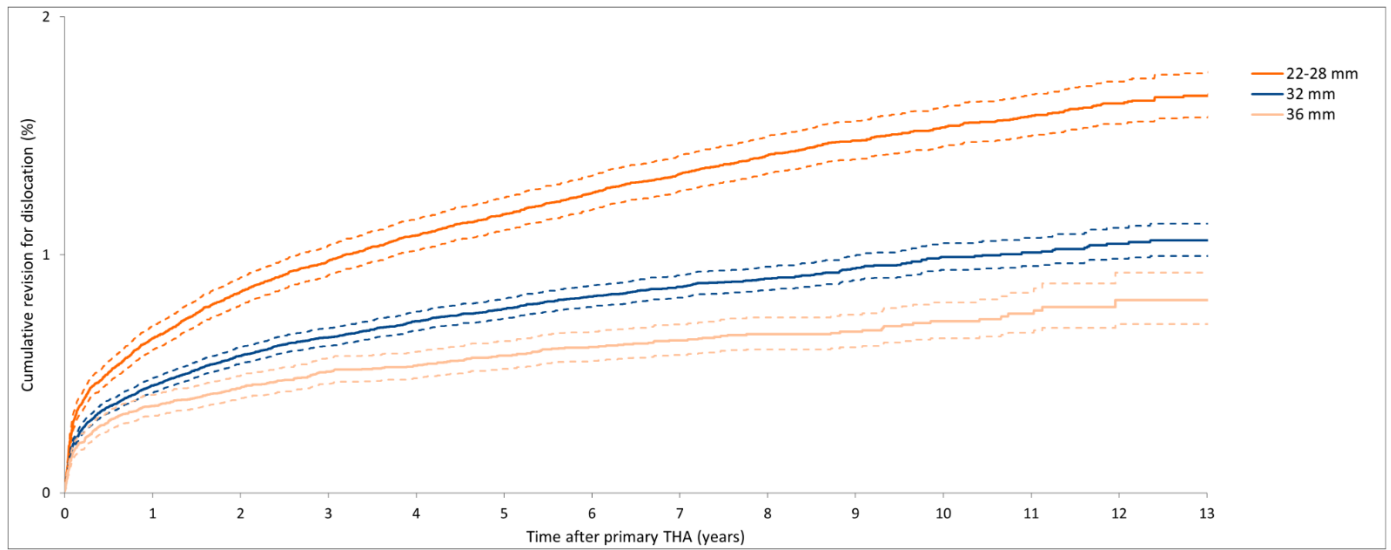


TABLE Cumulative 13-year revision percentage for dislocation

Femoral head size	Number (n)	Cumulative 13-year revision percentage for dislocation	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
22-28 mm	98,320	1.7 (1.6-1.8)	1.8 (1.7-1.9)
32 mm	197,493	1.1 (1.0-1.1)	1.2 (1.1-1.2)
36 mm	74,280	0.8 (0.7-0.9)	0.9 (0.7-1.0)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. THA: total hip arthroplasty; CI: confidence interval.

THA by pre-PROM

FIGURE Cumulative revision percentage of total hip arthroplasties by valid pre-operative PROM of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2021 (n=202,932)

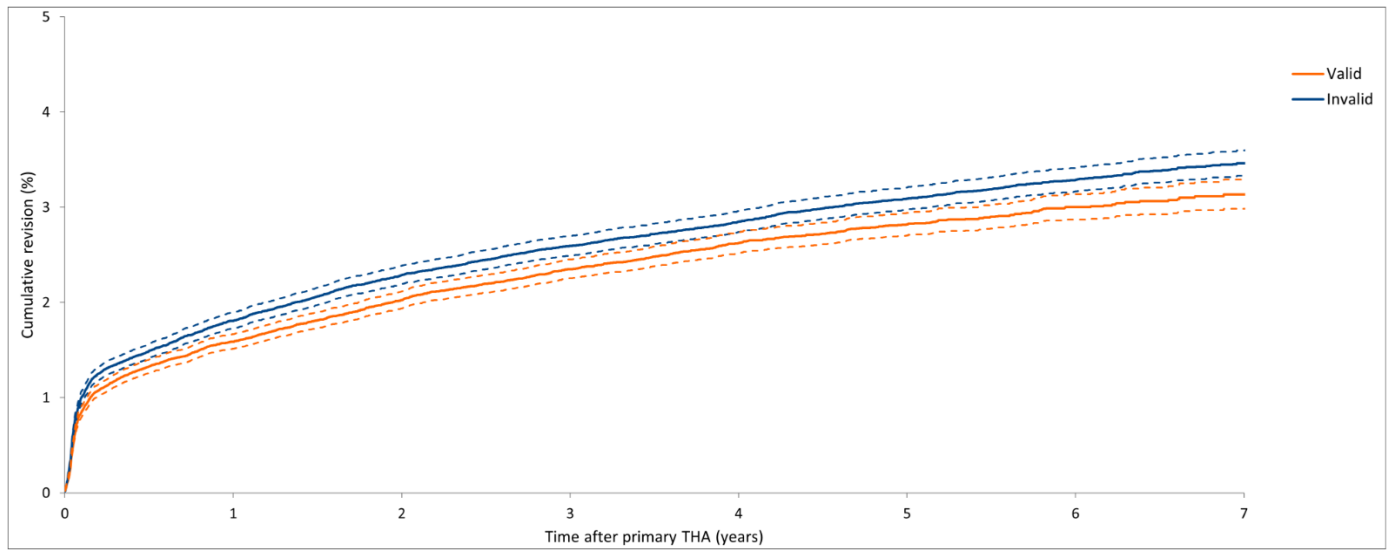


TABLE Cumulative 7-year revision percentage

Pre-PROM	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Valid	104,533	3.1 (3.0-3.3)	3.2 (3.1-3.4)
Invalid	98,399	3.5 (3.3-3.6)	3.6 (3.4-3.7)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 Valid: pre-operative PROM reported, Invalid: non-responders to pre-operative PROM, PROM: patient reported outcome measure.
 THA: total hip arthroplasty, CI: confidence interval.

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

FIGURE Cumulative revision percentage of total hip arthroplasties by completeness PROM trajectory of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2021 (n=202,932)

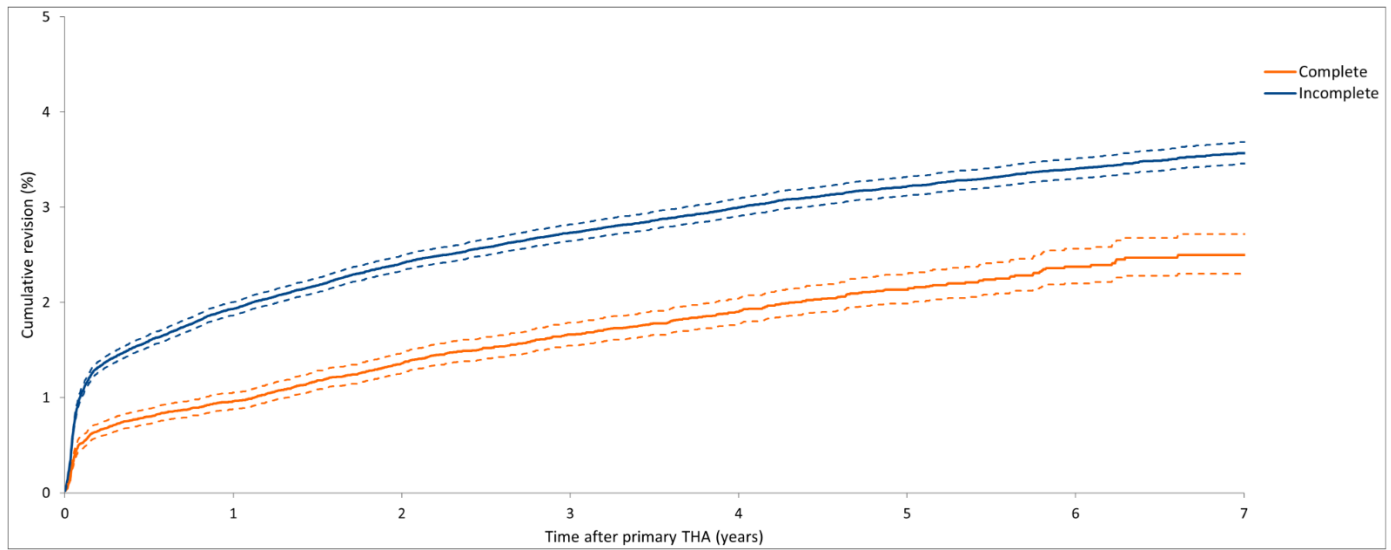


TABLE Cumulative 7-year revision percentage

Reported pre-, 3mnd and 12mnd PROM	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Complete	48,003	2.5 (2.3-2.7)	2.6 (2.4-2.8)
Incomplete	154,929	3.6 (3.5-3.7)	3.7 (3.6-3.8)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: A PROM trajectory is considered complete when preoperative, 3-months postoperative and 12-months postoperative PROMs are reported. THA: total hip arthroplasty, CI: confidence interval, PROM: patient reported outcome measure.

THA by pre-OHS

FIGURE Cumulative revision percentage of total hip arthroplasties by pre-operative Oxford Hip score of patients who underwent a THA for osteoarthritis in the Netherlands in 2014-2021 (n=93,271)

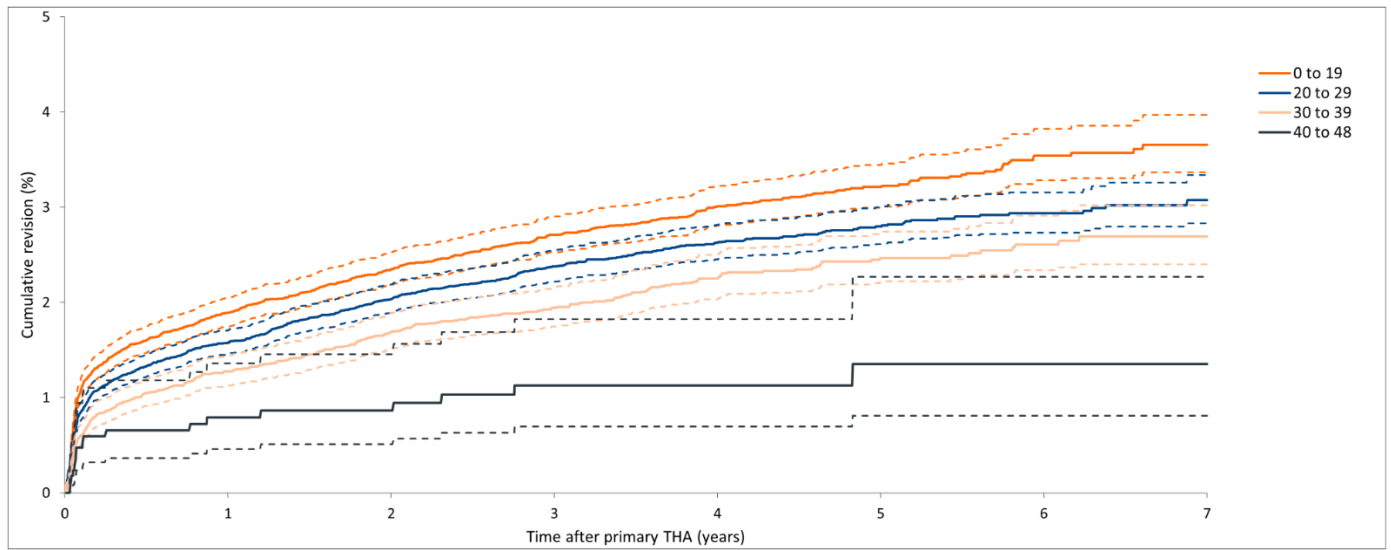


TABLE Cumulative 7-year revision percentage

Pre-operative Oxford Hip score	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
0 to 19	33,064	3.7 (3.4-4.0)	3.8 (3.5-4.1)
20 to 29	38,331	3.1 (2.8-3.3)	3.2 (2.9-3.4)
30 to 39	20,182	2.7 (2.4-3.0)	2.8 (2.4-3.1)
40 to 48	1,694	1.4 (0.8-2.3)	1.4 (2.4-3.1)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. PROM: patient reported outcome measure; THA: total hip arthroplasty; CI: confidence interval.

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

THA by gender

FIGURE Cumulative revision percentage of total hip arthroplasties by gender in the Netherlands in 2007-2021 (n=378,594)

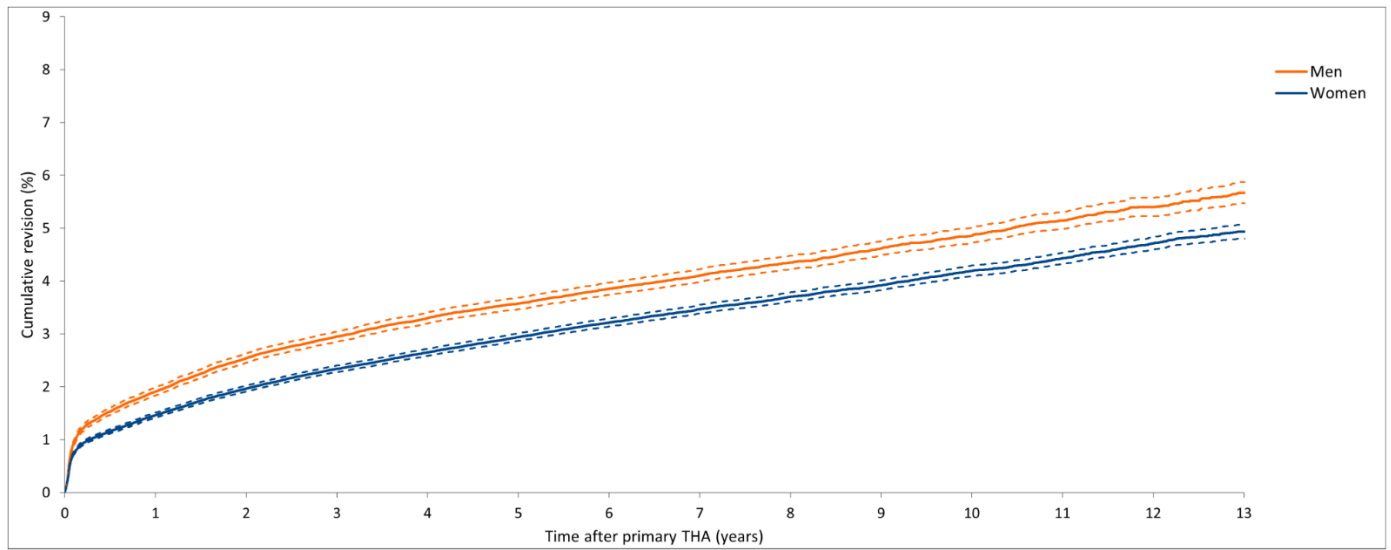


TABLE Cumulative 13-year revision percentage

Gender	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Men	128,642	5.7 (5.5-5.9)	6.4 (6.1-6.6)
Women	249,952	4.9 (4.8-5.1)	5.5 (5.3-5.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

THA by age category

FIGURE Cumulative revision percentage of total hip arthroplasties by age category in the Netherlands in 2007-2021 (n=378,910)

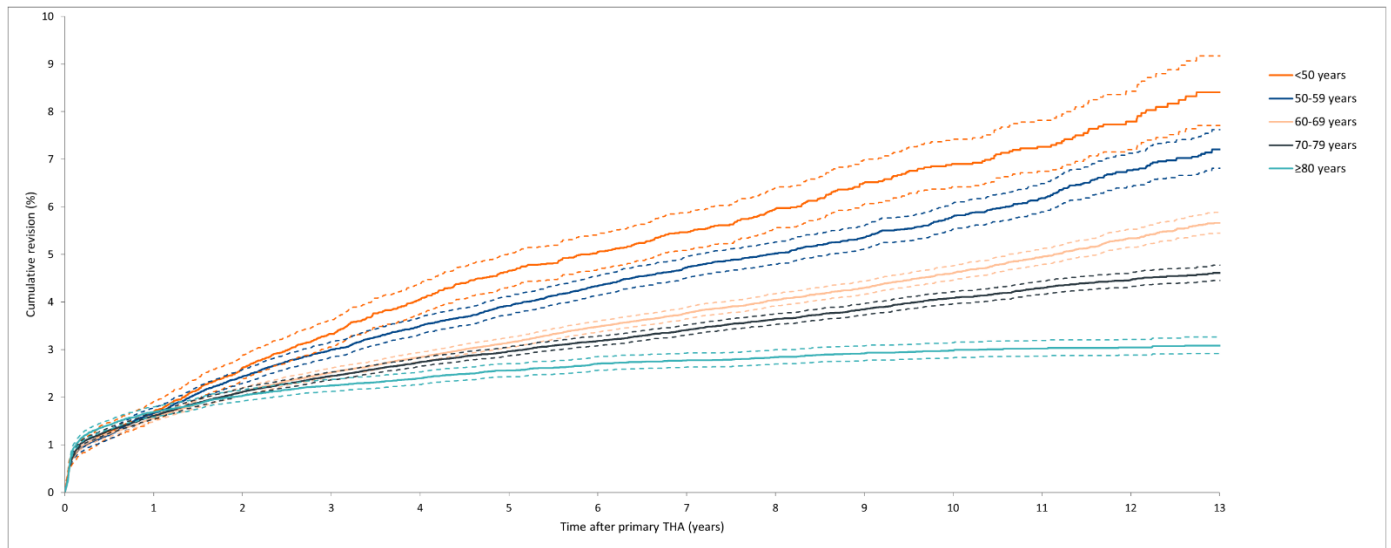


TABLE Cumulative 13-year revision percentage

Age (years)	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
<50	16,500	8.4 (7.7-9.2)	8.7 (7.9-9.4)
50-59	46,696	7.2 (6.8-7.6)	7.4 (7.0-7.8)
60-69	118,806	5.7 (5.5-5.9)	6.1 (5.8-6.3)
70-79	140,536	4.6 (4.5-4.8)	5.2 (5.0-5.4)
≥80	56,372	3.1 (2.9-3.3)	3.6 (3.4-3.9)

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THA by diagnosis

FIGURE Cumulative revision percentage of total hip arthroplasties by diagnosis in the Netherlands in 2007-2021 (n=374,880)

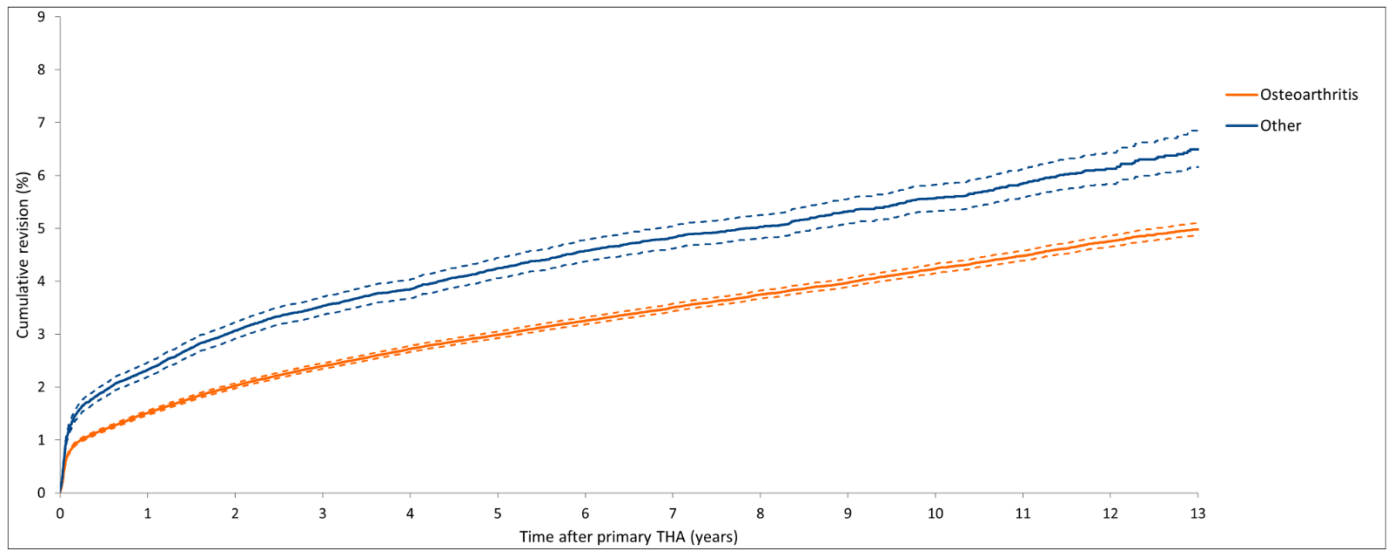


TABLE Cumulative 13-year revision percentage

Diagnosis	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Osteoarthritis	325,834	5.0 (4.9-5.1)	5.5 (5.4-5.7)
Other	49,046	6.5 (6.2-6.8)	7.4 (7.0-7.9)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

THA by ASA score

FIGURE Cumulative revision percentage of total hip arthroplasties by ASA score in the Netherlands in 2007-2021 (n=367,485)

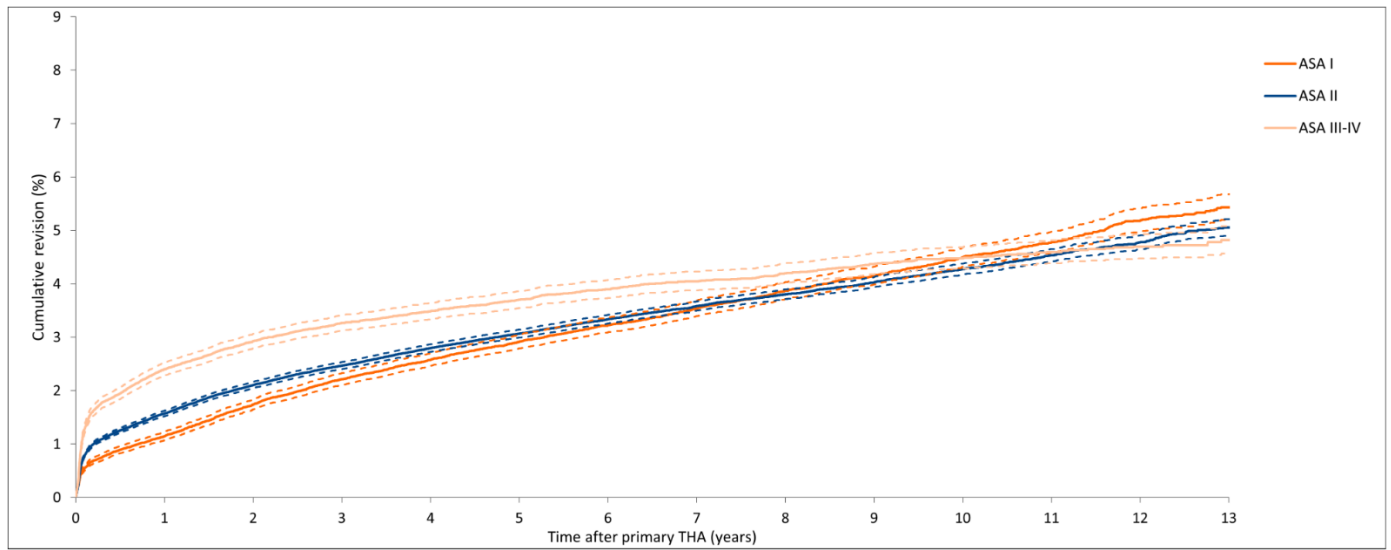


TABLE Cumulative 13-year revision percentage

ASA score	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
I	73,907	5.4 (5.2-5.7)	5.7 (5.5-6.0)
II	230,458	5.1 (4.9-5.2)	5.6 (5.4-5.8)
III-IV	63,120	4.8 (4.6-5.1)	5.7 (5.3-6.1)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

THA by BMI category

FIGURE Cumulative revision percentage of total hip arthroplasties by BMI category in the Netherlands in 2014-2021 (n=230,943)

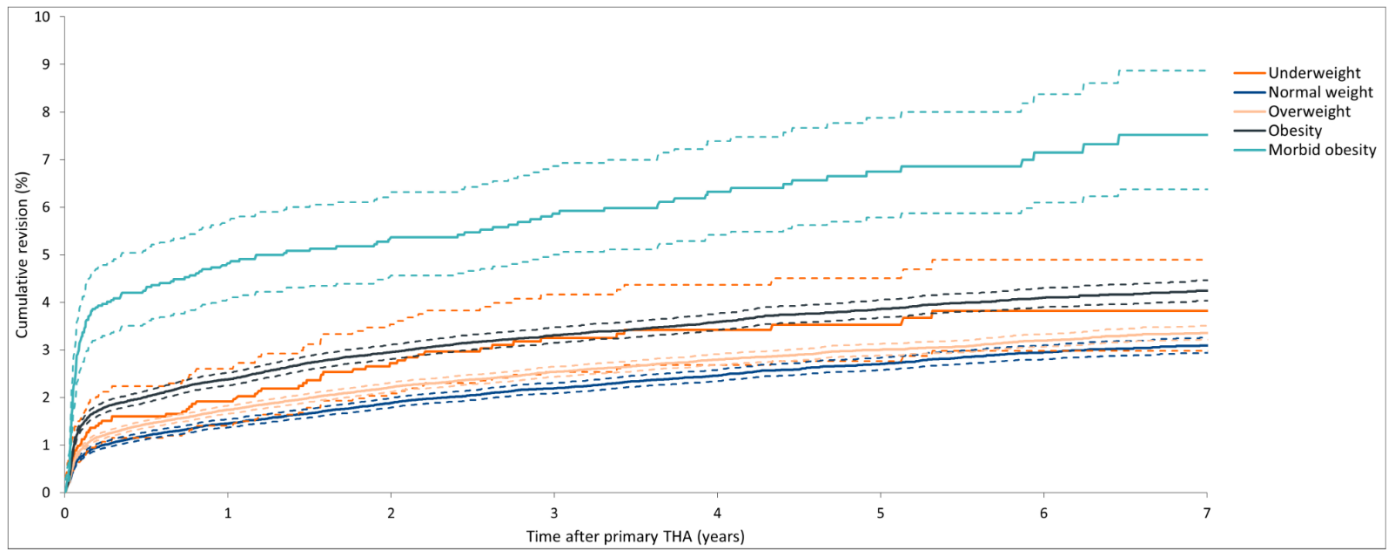


TABLE Cumulative 7-year revision percentage

Body Mass Index (kg/m ²)	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Underweight (≤18,5)	2,146	3.8 (3.0-4.9)	4.1 (3.0-5.1)
Normal weight (>18,5-25)	78,529	3.1 (2.9-3.3)	3.2 (3.1-3.4)
Overweight (>25-30)	96,111	3.4 (3.2-3.5)	3.5 (3.3-3.6)
Obesity (>30-40)	51,474	4.2 (4.0-4.5)	4.4 (4.1-4.6)
Morbid obesity (>40)	2,683	7.5 (6.4-8.9)	7.8 (6.5-9.1)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty, CI: confidence interval.

THA by Charnley score

FIGURE Cumulative revision percentage of total hip arthroplasties by charnley score in the Netherlands in 2014-2021 (n=221,260)

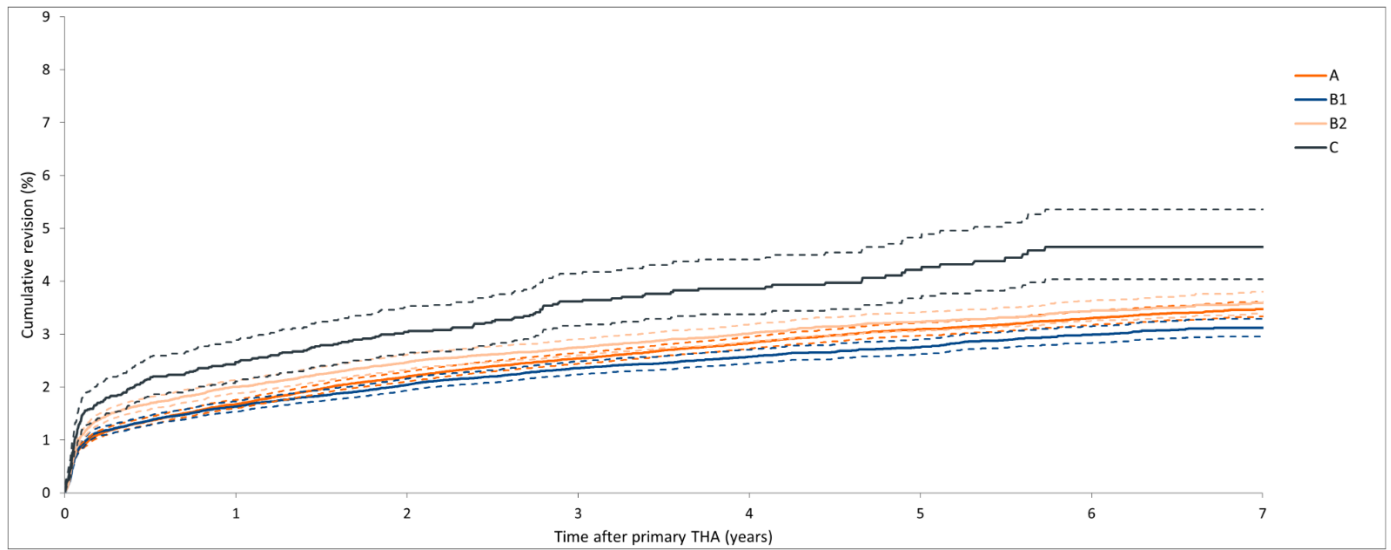


TABLE Cumulative 7-year revision percentage

Charnley-score	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
A One hip joint affected	99,495	3.5 (3.3-3.6)	3.6 (3.4-3.7)
B1 Both hip joints affected	65,722	3.1 (3.0-3.3)	3.2 (3.1-3.4)
B2 Contralateral hip joint with a total hip prosthesis	49,659	3.6 (3.4-3.8)	3.7 (3.5-3.9)
C Multiple joints affected or chronic disease that affects quality of life	6,384	4.7 (4.0-5.4)	4.9 (4.2-5.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty, CI: confidence interval.

THA by Smoking

FIGURE Cumulative revision percentage of total hip arthroplasties by smoking in the Netherlands in 2014-2021 (n=226,307)

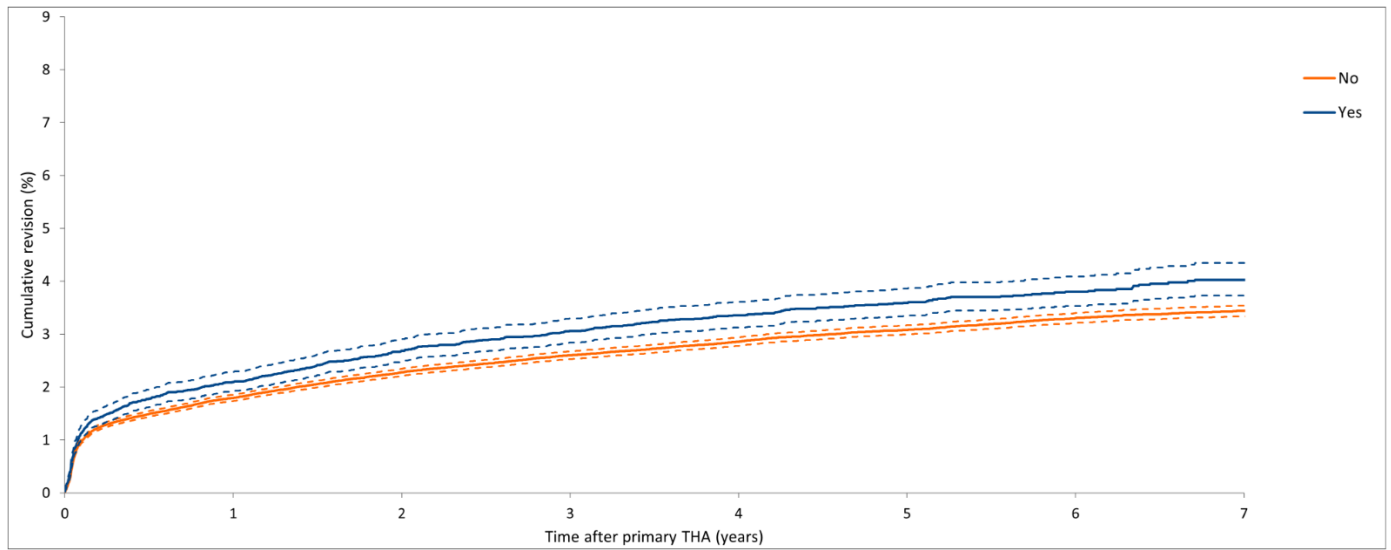


TABLE Cumulative 7-year revision percentage

Smoking	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
No	201,902	3.4 (3.3-3.5)	3.6 (3.4-3.7)
Yes	24,405	4.0 (3.7-4.3)	4.2 (3.9-4.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty; CI: confidence interval.

Revision per component

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 2007-2021 (n=82,092)

Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Total revision arthroplasties (n)	Type of revision (n)					Cumulative revision percentage (95% CI)					
					Total hip (complete revision)	Only femur component	Only acetabulum component	Only femoral head/inlay	Missing/unknown	1yr	3yr	5yr	7yr	10yr	13yr
All cemented THAs for osteoarthritis		82,092	76 (71-81)	2,345	461	241	958	645	40	1.3 (1.2-1.4)	2.0 (1.9-2.1)	2.6 (2.4-2.7)	3.0 (2.9-3.1)	3.7 (3.6-3.9)	4.6 (4.3-4.9)
Lubinus SPII	IP Cup	14,118	76 (72-81)	362	54	46	161	96	5	1.1 (0.9-1.3)	2.0 (1.7-2.2)	2.5 (2.2-2.8)	2.8 (2.5-3.1)	3.2 (2.8-3.5)	4.0 (3.4-4.7)
Original ME Muller	Muller low profile Durasul	8,498	75 (70-80)	225	28	5	49	140	3	1.8 (1.5-2.1)	2.3 (1.9-2.6)	2.7 (2.4-3.1)	3.0 (2.6-3.5)	3.7 (3.1-4.3)	3.9 (3.2-4.7)
Original ME Muller	Muller low profile	6,324	77 (73-81)	176	24	2	103	41	6	1.4 (1.1-1.7)	2.4 (2.0-2.8)	2.7 (2.3-3.1)	3.1 (2.6-3.5)	3.1 (2.6-3.5)	3.3 (2.8-3.9)
Lubinus SPII	FAL Cup	5,760	75 (70-80)	186	42	11	70	58	5	1.9 (1.5-2.2)	2.5 (2.1-2.9)	3.1 (2.7-3.6)	3.8 (3.2-4.4)	4.5 (3.7-5.2)	5.1 (4.0-6.2)
Spectron EF	Reflection All Poly XLPE	4,878	77 (73-81)	112	37	13	40	22	0	0.6 (0.4-0.9)	1.4 (1.1-1.8)	1.8 (1.4-2.2)	2.6 (2.1-3.0)	2.8 (2.3-3.4)	3.0 (2.4-3.6)
Exeter	Exeter Rimfit X3	4,664	75 (69-80)	99	24	20	22	33	0	1.4 (1.0-1.7)	1.9 (1.5-2.3)	2.4 (1.9-2.9)	2.4 (1.9-2.9)	2.6 (2.0-3.1)	n.a.
Stanmore	Stanmore	3,374	75 (70-80)	73	25	2	39	5	2	0.7 (0.4-1.0)	1.4 (1.0-1.8)	1.9 (1.4-2.3)	2.0 (1.5-2.5)	2.5 (1.9-3.1)	2.7 (2.0-3.4)
Exeter	Exeter Contemporary Hooded	2,827*	77 (72-81)	95	22	20	36	14	3	1.2 (0.8-1.6)	1.7 (1.2-2.2)	2.3 (1.7-2.9)	2.9 (2.3-3.6)	4.2 (3.3-5.1)	4.7 (3.6-5.8)
Lubinus SPII	SHP	2,506*	75 (71-80)	45	9	3	32	1	0	0.2 (0.0-0.4)	0.7 (0.3-1.0)	1.0 (0.6-1.3)	1.7 (1.2-2.2)	2.0 (1.4-2.6)	2.1 (1.5-2.7)
Exeter	Exeter	2,447*	73 (68-79)	142	23	14	70	31	4	2.8 (2.1-3.4)	3.6 (2.8-4.3)	4.1 (3.3-4.9)	4.9 (4.0-5.7)	6.2 (5.2-7.3)	7.0 (5.8-8.2)
Exeter	Exeter Contemporary Flanged	2,436	75 (67-80)	77	17	9	40	9	2	0.8 (0.4-1.1)	1.4 (0.9-1.9)	2.0 (1.4-2.6)	2.3 (1.7-3.0)	3.3 (2.5-4.2)	5.0 (3.6-6.3)
Stanmore	SHP	2,097*	75 (71-79)	115	39	5	60	10	1	1.6 (1.0-2.1)	3.1 (2.3-3.8)	4.0 (3.2-4.9)	4.8 (3.8-5.7)	5.8 (4.7-6.9)	8.1 (6.4-9.9)
CCA stem	CCB cup Low Profile	1,768	77 (73-80)	55	8	4	13	29	1	2.1 (1.4-2.7)	2.6 (1.8-3.3)	2.9 (2.1-3.7)	3.2 (2.3-4.1)	4.2 (2.9-5.5)	4.7 (3.1-6.4)
Stanmore	Exceed ABT Cemented	1,273	76 (71-81)	22	4	1	8	9	0	1.0 (0.5-1.6)	1.5 (0.8-2.2)	1.8 (0.9-2.6)	3.0 (1.3-4.6)	n.a.	n.a.
C-Stem AMT	Marathon	1,133	80 (74-83)	16	0	2	0	14	0	1.2 (0.5-1.8)	1.7 (0.8-2.5)	n.a.	n.a.	n.a.	n.a.
Original ME Muller	Avantage Cemented	1,105	77 (71-82)	41	2	1	3	35	0	3.3 (2.2-4.4)	3.9 (2.6-5.1)	4.8 (3.0-6.5)	5.6 (3.2-8.0)	n.a.	n.a.
Lubinus SPII	IP Cup X-Linked	1,083	77 (72-82)	28	7	3	6	12	0	1.6 (0.9-2.4)	2.5 (1.5-3.5)	3.4 (2.1-4.7)	3.4 (2.1-4.7)	n.a.	n.a.
Stanmore	All Poly Arcom Cup	1,056*	74 (69-79)	21	3	4	13	0	1	0.3 (0.0-0.6)	1.3 (0.6-2.0)	1.7 (0.9-2.5)	1.8 (1.0-2.7)	2.7 (1.4-4.0)	n.a.
Twinsys stem Cemented	CCB cup Low Profile	884	80 (77-83)	11	1	3	6	0	1	0.5 (0.0-1.0)	1.1 (0.3-1.8)	1.5 (0.5-2.5)	1.8 (0.7-3.0)	1.8 (0.7-3.0)	n.a.
Stanmore	Muller	877*	76 (71-81)	12	3	2	6	1	0	0.7 (0.1-1.2)	1.3 (0.5-2.0)	1.3 (0.5-2.0)	1.3 (0.5-2.0)	1.7 (0.6-2.8)	n.a.
Spectron EF	Mueller cup	831*	77 (72-81)	12	3	2	4	3	0	0.4 (0.0-0.8)	0.7 (0.1-1.3)	1.0 (0.3-1.6)	1.1 (0.4-1.8)	1.4 (0.6-2.2)	1.6 (0.7-2.5)
Lubinus SPII	AVANTAGE Cemented	731	78 (72-83)	24	5	0	2	17	0	2.7 (1.5-3.9)	2.9 (1.6-4.1)	4.1 (2.2-6.0)	5.0 (2.5-7.6)	n.a.	n.a.
Spectron EF	Reflection All Poly	617*	77 (74-82)	47	11	0	32	4	0	0.8 (0.1-1.5)	1.8 (0.7-2.9)	2.7 (1.4-4.0)	3.3 (1.8-4.7)	6.6 (4.5-8.8)	10.2 (7.2-13.2)
Spectron EF	Muller low profile Durasul	503*	78 (74-83)	12	4	0	2	6	0	0.8 (0.0-1.6)	1.7 (0.5-2.8)	2.3 (0.8-3.7)	n.a.	n.a.	n.a.
MS30	Muller low profile	497*	78 (74-82)	16	0	8	8	0	0	0.8 (0.0-1.6)	1.7 (0.5-2.8)	2.4 (1.0-3.7)	3.0 (1.4-4.6)	4.5 (2.1-6.9)	n.a.
Stanmore	Apollo	381*	75 (70-79)	6	3	1	1	0	1	0.3 (0.0-0.8)	0.8 (0.0-1.7)	1.4 (0.2-2.6)	1.4 (0.2-2.6)	1.8 (0.4-3.2)	n.a.
Stanmore	Avantage Cemented	368	79 (74-84)	10	0	1	0	9	0	2.2 (0.7-3.7)	2.7 (1.1-4.4)	2.7 (1.1-4.4)	n.a.	n.a.	n.a.
Exeter	Avantage Cemented	353	74 (65-82)	8	3	2	0	3	0	1.5 (0.2-2.9)	2.5 (0.6-4.4)	3.1 (0.9-5.4)	3.1 (0.9-5.4)	n.a.	n.a.
Lubinus SPII	FAL Cup X-Linked	304	78 (74-81)	3	0	0	2	1	0	0.7 (0.0-1.8)	0.7 (0.0-1.8)	n.a.	n.a.	n.a.	n.a.
GHE-huftstiel	Huftpfanne	273*	75 (71-80)	23	5	3	15	0	0	0.4 (0.0-1.1)	1.5 (0.0-3.0)	2.7 (0.7-4.7)	4.4 (1.8-6.9)	7.2 (3.9-10.6)	n.a.
Charnley Modular	Marathon	255*	71 (65-79)	10	3	5	2	0	0	0.4 (0.0-1.2)	1.2 (0.0-2.6)	1.6 (0.0-3.2)	4.0 (1.4-6.5)	4.5 (1.8-7.3)	n.a.

* Denotes prosthesis combinations with no reported use in primary THAs in 2021.

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.

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 2007-2021 (n=212,796)

Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Total RAs (n)	Type of revision (n)					Cumulative revision percentage (95% CI)					
					Total hip (complete revision)	Only femur component	Only acetabulum component	Only femoral head/inlay	Missing/unknown	1yr	3yr	5yr	7yr	10yr	13yr
All uncemented THAs for osteoarthritis		212,796	68 (62-74)	7,307	1,198	2,568	1,909	1,511	121	1.5 (1.5-1.6)	2.5 (2.4-2.6)	3.2 (3.1-3.3)	3.8 (3.7-3.9)	4.7 (4.6-4.8)	5.7 (5.5-5.9)
Corail	Pinnacle	37,203	69 (63-75)	842	154	256	178	244	10	1.2 (1.0-1.3)	1.8 (1.7-2.0)	2.3 (2.1-2.5)	2.6 (2.4-2.8)	3.4 (3.1-3.7)	3.9 (3.4-4.4)
Taperloc Complete	Allofit	19,329	67 (61-73)	349	62	125	66	93	3	1.4 (1.2-1.6)	2.0 (1.8-2.2)	2.3 (2.0-2.6)	2.5 (2.0-2.9)	n.a.	n.a.
Alloclassic Zweymuller SL	Allofit	14,468	70 (64-76)	498	76	193	121	102	6	1.2 (1.0-1.3)	2.0 (1.8-2.2)	2.6 (2.4-2.9)	3.2 (2.8-3.5)	4.3 (3.9-4.7)	4.9 (4.4-5.4)
CLS Spotorno	Allofit	11,068	64 (58-69)	486	52	190	130	96	18	2.6 (2.3-2.9)	3.6 (3.2-3.9)	4.1 (3.7-4.4)	4.6 (4.2-5.0)	5.2 (4.7-5.7)	5.7 (5.0-6.3)
Polarstem	R3	10,103	69 (63-75)	211	20	72	24	94	1	1.8 (1.6-2.1)	2.4 (2.0-2.7)	2.7 (2.2-3.2)	n.a.	n.a.	n.a.
Taperloc Complete	Exceed ABT	8,663	69 (63-75)	192	34	70	35	49	4	1.4 (1.2-1.7)	1.9 (1.6-2.2)	2.3 (1.9-2.6)	2.6 (2.2-3.0)	2.8 (2.3-3.2)	n.a.
Accolade	Trident	7,605	69 (62-76)	311	44	161	44	60	2	1.4 (1.1-1.7)	2.8 (2.4-3.2)	3.7 (3.3-4.2)	4.4 (3.9-4.9)	5.3 (4.6-6.0)	7.6 (6.0-9.1)
Mallory Head Stems	Mallory Head	6,018	65 (60-69)	214	27	23	91	67	6	1.4 (1.1-1.7)	2.3 (1.9-2.6)	2.7 (2.3-3.1)	3.2 (2.7-3.7)	3.7 (3.2-4.2)	4.6 (3.9-5.4)
Accolade	Trident Tritanium	4,539*	68 (62-74)	120	11	44	22	42	1	1.1 (0.8-1.4)	2.2 (1.7-2.6)	2.7 (2.2-3.2)	3.1 (2.5-3.6)	n.a.	n.a.
Twinsys stem Cementless	RM Pressfit Vitamys cup	4,299	66 (60-71)	118	15	55	28	18	2	1.7 (1.3-2.1)	2.3 (1.8-2.7)	2.7 (2.2-3.2)	3.0 (2.4-3.7)	4.9 (3.7-6.2)	n.a.
Taperloc HIP system	Exceed ABT	3,892*	68 (62-75)	121	20	32	36	25	8	1.2 (0.8-1.5)	2.3 (1.8-2.8)	2.7 (2.2-3.2)	2.9 (2.4-3.5)	3.3 (2.7-3.9)	n.a.
SL Plus	Bicon Plus	3,777	70 (64-76)	260	38	131	72	16	3	1.7 (1.3-2.1)	3.9 (3.3-4.6)	5.4 (4.6-6.1)	6.3 (5.5-7.1)	7.7 (6.7-8.6)	8.7 (7.5-9.9)
Taperloc HIP system	Mallory Head	3,670*	67 (61-71)	135	26	38	48	22	1	1.5 (1.1-1.8)	2.6 (2.1-3.1)	2.9 (2.4-3.5)	3.5 (2.8-4.1)	3.8 (3.1-4.4)	4.9 (3.9-6.0)
Accolade II	Trident	3,503	70 (63-75)	60	10	21	9	19	1	1.8 (1.3-2.2)	2.4 (1.5-3.4)	2.4 (1.5-3.4)	n.a.	n.a.	n.a.
Twinsys stem Cementless	RM Pressfit cup	3,285	73 (68-78)	121	16	55	23	26	1	2.5 (2.0-3.1)	3.2 (2.5-3.8)	3.5 (2.8-4.1)	4.0 (3.2-4.7)	4.6 (3.6-5.5)	n.a.
Taperloc Complete	Mallory Head	3,105	67 (61-72)	114	20	25	30	38	1	2.1 (1.6-2.6)	3.1 (2.5-3.7)	3.4 (2.7-4.0)	3.8 (3.1-4.5)	5.0 (3.5-6.5)	n.a.
Synergy	Reflection	2,930*	66 (60-72)	139	11	67	29	31	1	2.1 (1.6-2.6)	2.7 (2.1-3.3)	3.1 (2.5-3.7)	3.6 (2.9-4.3)	4.5 (3.7-5.3)	6.2 (5.1-7.3)
Alloclassic Zweymuller SL	Alloclassic Zweymuller CSF	2,903*	69 (63-75)	127	16	50	24	35	2	1.1 (0.7-1.5)	2.7 (2.1-3.2)	3.3 (2.6-3.9)	3.5 (2.9-4.2)	4.4 (3.6-5.2)	4.9 (4.0-5.8)
Alloclassic offset	Allofit	2,770	71 (65-77)	80	16	32	15	14	3	1.3 (0.9-1.7)	2.0 (1.4-2.5)	2.6 (1.9-3.2)	2.9 (2.2-3.6)	3.6 (2.8-4.5)	4.1 (3.1-5.2)
M/L Taper	Allofit IT	2,144	71 (65-76)	74	10	29	24	10	1	2.3 (1.6-2.9)	3.2 (2.4-4.0)	3.7 (2.8-4.5)	4.0 (3.1-5.0)	4.3 (3.2-5.3)	n.a.
Synergy	R3	2,096	66 (60-72)	62	10	34	8	8	2	1.8 (1.2-2.4)	2.3 (1.7-3.0)	2.8 (2.1-3.5)	3.1 (2.3-3.9)	3.2 (2.4-4.0)	n.a.
SYMAX	Trident	2,073*	69 (63-75)	71	6	18	20	27	0	0.6 (0.3-0.9)	1.7 (1.1-2.2)	2.2 (1.5-2.8)	2.8 (2.0-3.5)	3.2 (2.5-4.0)	4.0 (3.1-5.0)
Anthology	R3	1,841	65 (59-69)	59	8	20	16	15	0	2.1 (1.4-2.7)	2.6 (1.9-3.3)	3.4 (2.5-4.2)	3.6 (2.7-4.5)	3.6 (2.7-4.5)	n.a.
SYMAX	Trident Tritanium	1,743*	67 (61-73)	85	10	37	24	13	1	2.3 (1.6-3.0)	3.6 (2.7-4.5)	4.0 (3.0-4.9)	4.6 (3.6-5.6)	5.4 (4.2-6.6)	n.a.
Corail AMT	Pinnacle	1,683	69 (62-74)	16	2	5	4	5	0	0.7 (0.3-1.1)	1.2 (0.5-1.8)	n.a.	n.a.	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary THAs in 2021.
Please note: n.a. if <50 cases were at risk; THA: total hip arthroplasty; CI: confidence interval; IQR: interquartile range.

TABLE Continued - Cumulative revision percentages of uncemented primary total hip arthroplasties by prosthesis component combination of patients who underwent a THA for osteoarthritis in the Netherlands in 2007-2021 (n=212,796)

Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Total RAs (n)	Type of revision (n)					Cumulative revision percentage (95% CI)					
					Total hip (complete revision)	Only femur component	Only acetabulum component	Only femoral head/inlay	Missing/unknown	1yr	3yr	5yr	7yr	10yr	13yr
Mallory Head Stems	Exceed ABT	1,637*	65 (59-71)	36	3	15	16	2	0	0.7 (0.3-1.1)	1.6 (1.0-2.2)	1.7 (1.0-2.3)	2.0 (1.3-2.7)	2.4 (1.6-3.2)	n.a.
OMNIFIT HA	Trident	1,501*	63 (57-67)	145	18	70	24	29	4	3.1 (2.2-3.9)	4.5 (3.4-5.5)	6.3 (5.0-7.5)	7.8 (6.4-9.1)	9.5 (8.0-11.0)	10.5 (8.8-12.2)
M/L Taper	Continuum	1,265	68 (63-73)	22	2	17	2	1	0	1.5 (0.8-2.2)	1.9 (1.1-2.7)	1.9 (1.1-2.7)	n.a.	n.a.	n.a.
Alloclassic Zweymuller SL	Continuum	1,207	71 (64-77)	31	7	12	4	7	1	1.3 (0.7-2.0)	2.0 (1.2-2.8)	2.4 (1.5-3.3)	2.6 (1.7-3.6)	n.a.	n.a.
Taperloc Complete	G7 PPS	1,199	69 (63-75)	22	6	9	4	3	0	2.3 (1.3-3.3)	n.a.	n.a.	n.a.	n.a.	n.a.
Fitmore	Allofit	1,187	67 (62-72)	13	3	3	1	6	0	1.0 (0.4-1.6)	n.a.	n.a.	n.a.	n.a.	n.a.
CLS Spotorno	RM Classic cup	1,178*	63 (58-68)	75	14	21	32	7	1	1.9 (1.1-2.6)	2.6 (1.7-3.6)	3.3 (2.3-4.4)	3.9 (2.8-5.0)	5.1 (3.8-6.4)	6.6 (5.1-8.1)
CLS Spotorno	Pinnacle	1,166*	67 (62-72)	50	7	17	10	16	0	1.3 (0.6-1.9)	2.3 (1.4-3.1)	2.8 (1.9-3.8)	3.6 (2.5-4.8)	5.2 (3.7-6.7)	n.a.
SL Plus Mia	R3	1,109*	71 (65-77)	33	3	16	6	8	0	1.9 (1.1-2.7)	2.7 (1.8-3.7)	3.1 (2.0-4.1)	3.1 (2.0-4.1)	3.1 (2.0-4.1)	n.a.
SL Plus	Reflection	1,020*	67 (61-73)	42	5	14	14	9	0	1.8 (1.0-2.6)	3.3 (2.2-4.4)	3.8 (2.6-5.0)	4.4 (3.1-5.7)	4.4 (3.1-5.7)	n.a.
Avenir Muller	Allofit	1,006	69 (62-73)	16	2	7	2	5	0	1.3 (0.6-2.0)	1.4 (0.6-2.2)	1.7 (0.8-2.6)	2.2 (1.0-3.4)	2.2 (1.0-3.4)	n.a.
SL Plus	Hofer-Imhoff Lubriment	977*	70 (64-76)	57	13	27	9	6	2	1.1 (0.5-1.8)	2.3 (1.3-3.2)	3.6 (2.4-4.7)	4.5 (3.1-5.8)	5.6 (4.1-7.1)	6.7 (4.8-8.5)
Alloclassic Zweymuller SL	Trilogy	968*	68 (63-75)	35	10	10	7	8	0	1.3 (0.6-2.1)	2.2 (1.3-3.1)	2.6 (1.6-3.6)	2.9 (1.9-4.0)	3.6 (2.4-4.8)	3.7 (2.5-5.0)
Polarstem	Reflection	927*	70 (64-76)	18	5	4	2	7	0	1.1 (0.4-1.7)	1.6 (0.8-2.4)	2.2 (1.2-3.3)	2.2 (1.2-3.3)	n.a.	n.a.
Summit Tapered	Pinnacle Gription	880	68 (62-73)	19	2	5	2	9	1	1.9 (1.0-2.8)	2.2 (1.2-3.2)	2.6 (1.3-3.8)	n.a.	n.a.	n.a.
SL Plus	EP-Fit Plus	790*	68 (63-75)	45	10	24	10	1	0	1.3 (0.5-2.1)	3.1 (1.9-4.3)	3.8 (2.4-5.1)	4.9 (3.3-6.4)	5.7 (4.0-7.4)	6.5 (4.6-8.3)
Alloclassic Zweymuller SL	Alloclassic Variall	778*	71 (64-77)	23	4	10	3	5	1	1.0 (0.3-1.7)	1.9 (1.0-2.9)	2.4 (1.3-3.4)	2.6 (1.5-3.8)	3.0 (1.7-4.2)	3.5 (1.9-5.1)
CLS Spotorno	Fitmore	758*	66 (61-71)	36	3	16	6	10	1	1.9 (0.9-2.8)	2.4 (1.3-3.5)	2.6 (1.5-3.8)	3.3 (2.0-4.6)	4.4 (2.9-5.9)	5.2 (3.5-6.9)
DB10	Spidercup	755*	71 (64-77)	39	2	19	10	7	1	1.5 (0.6-2.3)	2.3 (1.2-3.3)	2.9 (1.6-4.1)	3.7 (2.4-5.1)	5.0 (3.3-6.7)	7.2 (4.6-9.7)
Taperloc Complete	Continuum	751	68 (59-74)	15	4	5	1	5	0	1.9 (0.9-2.9)	2.7 (0.9-4.4)	n.a.	n.a.	n.a.	n.a.
CLS Spotorno	Morscher	712*	73 (68-78)	37	6	19	12	0	0	1.3 (0.4-2.1)	2.6 (1.4-3.7)	3.2 (1.9-4.5)	4.2 (2.7-5.7)	5.9 (3.9-7.8)	7.8 (4.5-11.1)
Optimys stem	RM Pressfit Vitamys cup	677	62 (55-68)	14	2	9	2	1	0	2.0 (0.9-3.1)	2.4 (1.1-3.7)	2.4 (1.1-3.7)	n.a.	n.a.	n.a.
CLS Spotorno	RM Pressfit cup	625*	66 (60-71)	52	5	21	18	5	3	3.1 (1.7-4.4)	4.4 (2.8-6.0)	5.7 (3.9-7.6)	6.5 (4.5-8.5)	7.8 (5.6-10.0)	9.8 (7.2-12.4)
CBH stem	RM Pressfit Vitamys cup	593*	65 (60-70)	24	8	7	7	2	0	1.0 (0.2-1.8)	2.4 (1.1-3.6)	3.3 (1.8-4.7)	4.0 (2.4-5.6)	n.a.	n.a.
CBH stem	RM Pressfit cup	551*	75 (69-79)	23	4	6	11	2	0	2.2 (1.0-3.4)	3.7 (2.1-5.3)	3.9 (2.3-5.5)	4.3 (2.6-6.1)	n.a.	n.a.
Alloclassic Zweymuller SL	Trabecular Metal	547*	68 (62-75)	25	2	7	9	6	1	0.6 (0.0-1.2)	1.9 (0.7-3.0)	2.6 (1.3-4.0)	3.2 (1.7-4.7)	3.4 (1.8-4.9)	4.8 (2.8-6.8)

* Denotes prosthesis combinations with no reported use in primary THAs in 2021.

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 2007-2021 (n=82,092)

Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Major revision ¹ arthroplasties (n)	Cumulative revision percentage Kaplan Meier (95% CI)					
					1yr	3yr	5yr	7yr	10yr	13yr
All cemented THAs for osteoarthritis		82,092	76 (71-81)	1,755	0.7 (0.6-0.7)	1.4 (1.3-1.4)	1.8 (1.7-1.9)	2.3 (2.2-2.4)	3.0 (2.8-3.1)	3.8 (3.6-4.1)
Lubinus SPII	IP Cup	14,118	76 (72-81)	287	0.6 (0.4-0.7)	1.4 (1.2-1.6)	1.9 (1.7-2.2)	2.2 (1.9-2.5)	2.7 (2.3-3.0)	3.7 (3.0-4.3)
Original ME Muller	Muller low profile Durasul	8,498	75 (70-80)	94	0.5 (0.4-0.7)	0.9 (0.6-1.1)	1.2 (0.9-1.5)	1.4 (1.1-1.7)	1.8 (1.4-2.2)	1.8 (1.4-2.2)
Original ME Muller	Muller low profile	6,324	77 (73-81)	136	0.9 (0.7-1.1)	1.8 (1.4-2.1)	2.1 (1.7-2.4)	2.4 (2.0-2.8)	2.4 (2.0-2.8)	2.7 (2.1-3.2)
Lubinus SPII	FAL Cup	5,760	75 (70-80)	133	1.0 (0.7-1.2)	1.6 (1.3-2.0)	2.3 (1.8-2.7)	2.9 (2.4-3.5)	3.6 (2.9-4.3)	4.0 (3.1-5.0)
Spectron EF	Reflection All Poly XLPE	4,878	77 (73-81)	92	0.4 (0.2-0.5)	1.1 (0.8-1.3)	1.5 (1.1-1.8)	2.1 (1.7-2.6)	2.4 (1.9-2.9)	2.6 (2.0-3.1)
Exeter	Exeter Rimfit X3	4,664	75 (69-80)	66	0.7 (0.5-0.9)	1.2 (0.9-1.6)	1.7 (1.3-2.1)	1.7 (1.3-2.1)	1.8 (1.3-2.3)	n.a.
Stanmore	Stanmore	3,374	75 (70-80)	67	0.5 (0.3-0.8)	1.3 (0.9-1.7)	1.7 (1.2-2.1)	1.9 (1.4-2.3)	2.3 (1.7-2.9)	2.5 (1.8-3.2)
Exeter	Exeter Contemporary Hooded	2,827*	77 (72-81)	81	0.7 (0.4-1.0)	1.2 (0.8-1.6)	1.8 (1.3-2.3)	2.3 (1.7-2.9)	3.8 (2.9-4.7)	4.3 (3.2-5.3)
Lubinus SPII	SHP	2,506*	75 (71-80)	44	0.2 (0.0-0.4)	0.6 (0.3-0.9)	0.9 (0.5-1.3)	1.7 (1.1-2.2)	1.9 (1.4-2.5)	2.0 (1.4-2.6)
Exeter	Exeter	2,447*	73 (68-79)	115	1.8 (1.2-2.3)	2.5 (1.9-3.1)	3.1 (2.4-3.8)	3.8 (3.0-4.6)	5.1 (4.1-6.1)	5.8 (4.7-6.9)

¹ Revision of at least the acetabulum or femur component.

* Denotes prosthesis combinations with no reported use in primary THAs in 2021.

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 2007-2021 (n=212,796)

Femur component	Acetabulum component	Total primary THAs (n)	Median (IQR) age (yr)	Major revision ¹ arthroplasties (n)	Cumulative revision percentage (95% CI)					
					1yr	3yr	5yr	7yr	10yr	13 yr
All uncemented THAs for osteoarthritis		212,796	68 (62-74)	5,936	1.1 (1.1-1.1)	2.0 (1.9-2.0)	2.6 (2.5-2.6)	3.1 (3.0-3.2)	3.9 (3.8-4.0)	4.9 (4.7-5.0)
Corail	Pinnacle	37,202	69 (63-75)	632	0.7 (0.7-0.8)	1.3 (1.3-1.4)	1.8 (1.8-1.9)	2.0 (2.0-2.2)	2.7 (2.7-2.9)	3.1 (3.1-3.6)
Taperloc Complete	Allofit	19,329	67 (61-73)	267	1.0 (1.0-1.2)	1.6 (1.6-1.8)	1.9 (1.9-2.1)	2.0 (2.0-2.4)	2.0 (2.0-2.4)	2.0 (2.0-2.4)
Alloclassic Zweymuller SL	Allofit	14,468	70 (64-76)	405	0.9 (0.9-1.0)	1.6 (1.6-1.8)	2.1 (2.1-2.4)	2.5 (2.5-2.8)	3.5 (3.5-3.8)	4.1 (4.1-4.6)
CLS Spotorno	Allofit	11,068	64 (58-69)	395	1.9 (1.9-2.1)	2.8 (2.8-3.1)	3.2 (3.2-3.6)	3.8 (3.8-4.1)	4.4 (4.4-4.9)	4.8 (4.8-5.5)
Polarstem	R3	10,103	69 (63-75)	125	1.0 (1.0-1.2)	1.5 (1.5-1.7)	1.8 (1.8-2.3)	n.a.	n.a.	n.a.
Taperloc Complete	Exceed ABT	8,663	69 (63-75)	147	1.1 (1.1-1.3)	1.5 (1.5-1.7)	1.7 (1.7-2.0)	2.0 (2.0-2.4)	2.2 (2.2-2.6)	n.a.
Accolade	Trident	7,605	69 (62-76)	260	1.0 (1.0-1.3)	2.2 (2.2-2.6)	3.1 (3.1-3.5)	3.6 (3.6-4.1)	4.6 (4.6-5.2)	7.0 (7.0-8.6)
Mallory Head Stems	Mallory Head	6,018	65 (60-69)	156	0.9 (0.9-1.2)	1.6 (1.6-1.9)	2.0 (2.0-2.4)	2.4 (2.4-2.8)	2.8 (2.8-3.2)	3.3 (3.3-4.0)
Accolade	Trident Tritanium	4,539*	68 (62-74)	78	0.6 (0.6-0.8)	1.4 (1.4-1.8)	1.8 (1.8-2.2)	2.0 (2.0-2.5)	n.a.	n.a.
Twinsys stem Cementless	RM Pressfit Vitamys cup	4,299	66 (60-71)	102	1.4 (1.4-1.7)	1.9 (1.9-2.3)	2.3 (2.3-2.8)	2.7 (2.7-3.3)	4.4 (4.4-5.6)	n.a.

¹ Revision of at least the acetabulum or femur component.

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

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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 in the Netherlands in 2007-2021

Bone cement	Total primary THAs (n)	Total RAs (n)	Cumulative revision percentage Kaplan Meier (95% CI)					
			1yr	3yr	5yr	7yr	10yr	13yr
Separately packed bone cement components	90,412	3,081	1.4 (1.4-1.5)	2.4 (2.3-2.5)	3.0 (2.9-3.1)	3.5 (3.4-3.6)	4.3 (4.2-4.5)	5.3 (5.0-5.6)
Palacos R+G	69,263	2,283	1.5 (1.4-1.6)	2.5 (2.3-2.6)	3.0 (2.9-3.2)	3.5 (3.3-3.6)	4.2 (4.0-4.4)	5.2 (4.8-5.5)
Refobacin Bone Cement R	6,178	182	1.0 (0.8-1.3)	1.9 (1.6-2.3)	2.3 (1.9-2.7)	2.8 (2.4-3.3)	3.7 (3.1-4.2)	3.8 (3.2-4.4)
Palacos MV+G	3,720	93	0.9 (0.6-1.2)	1.4 (1.0-1.8)	2.1 (1.6-2.6)	3.1 (2.5-3.8)	3.5 (2.8-4.3)	n.a.
Simplex ABC EC	2,670	146	2.2 (1.6-2.7)	3.5 (2.8-4.2)	4.4 (3.6-5.2)	5.1 (4.2-6.0)	6.7 (5.5-7.9)	9.0 (6.8-11.3)
Simplex ABC Tobra	2,304	143	2.0 (1.4-2.6)	3.3 (2.5-4.0)	4.0 (3.2-4.8)	4.7 (3.8-5.6)	6.5 (5.4-7.6)	7.6 (6.3-8.9)
Simplex P	1,321*	29	0.8 (0.3-1.2)	1.8 (1.1-2.5)	1.9 (1.1-2.6)	2.1 (1.3-2.9)	2.7 (1.7-3.8)	2.7 (1.7-3.8)
Simplex HV	572*	12	0.7 (0.0-1.4)	0.9 (0.1-1.7)	2.1 (0.9-3.3)	2.6 (1.0-4.2)	n.a.	n.a.
Refobacin Plus Bone Cement	557*	22	1.6 (0.6-2.7)	2.6 (1.2-3.9)	3.4 (1.8-4.9)	3.7 (2.0-5.3)	4.3 (2.5-6.2)	4.8 (2.7-6.9)
Palamed G	493*	14	0.4 (0.0-1.0)	0.8 (0.0-1.6)	1.3 (0.3-2.3)	2.0 (0.7-3.2)	3.0 (1.4-4.6)	3.3 (1.6-4.9)
Biomet Plus Bone Cement	453*	26	0.4 (0.0-1.1)	1.4 (0.3-2.4)	2.5 (1.1-4.0)	3.3 (1.6-5.0)	4.4 (2.4-6.3)	7.4 (4.5-10.3)
Subiton G	381	6	0.9 (0.0-2.0)	2.5 (0.4-4.5)	n.a.	n.a.	n.a.	n.a.
CMW 1 Gentamicin Bone Cement	326*	13	1.9 (0.4-3.3)	2.8 (1.0-4.6)	3.1 (1.2-5.0)	3.1 (1.2-5.0)	4.0 (1.7-6.2)	4.5 (2.1-6.8)
Palacos R	312	16	1.6 (0.2-3.0)	2.7 (0.8-4.5)	4.2 (1.9-6.5)	5.0 (2.4-7.6)	6.2 (3.2-9.3)	n.a.
Palamed	277*	22	1.1 (0.0-2.3)	2.5 (0.7-4.4)	3.7 (1.4-5.9)	3.7 (1.4-5.9)	6.1 (3.2-9.0)	8.9 (5.3-12.4)
Bone cement pre-packed in a vacuum mixing system	31,948	902	1.9 (1.8-2.1)	2.7 (2.5-2.9)	3.3 (3.0-3.5)	3.8 (3.5-4.1)	4.6 (4.1-5.2)	5.1 (4.3-5.8)
Refobacin Bone Cement R	15,726	469	2.0 (1.8-2.2)	2.8 (2.5-3.0)	3.3 (3.0-3.7)	3.9 (3.5-4.3)	5.2 (4.2-6.1)	n.a.
Palacos R+G	11,237	297	2.1 (1.8-2.3)	2.9 (2.5-3.2)	3.6 (3.1-4.0)	n.a.	n.a.	n.a.
Refobacin Plus Bone Cement	4,296	114	1.3 (0.9-1.6)	2.1 (1.7-2.6)	2.6 (2.1-3.1)	3.1 (2.5-3.7)	3.4 (2.7-4.1)	n.a.
Cemex Genta	429	10	1.2 (0.2-2.2)	1.9 (0.6-3.2)	2.2 (0.8-3.6)	2.2 (0.8-3.6)	3.8 (0.4-7.2)	n.a.

* Denotes types of bone cement with no reported use in primary THAs in 2021.

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.

THA by ODEP 5A or higher acetabulum

FIGURE Cumulative acetabulum revision percentage of total hip arthroplasties by ODEP rating acetabulum in the Netherlands in 2007-2021 (n=376,606)

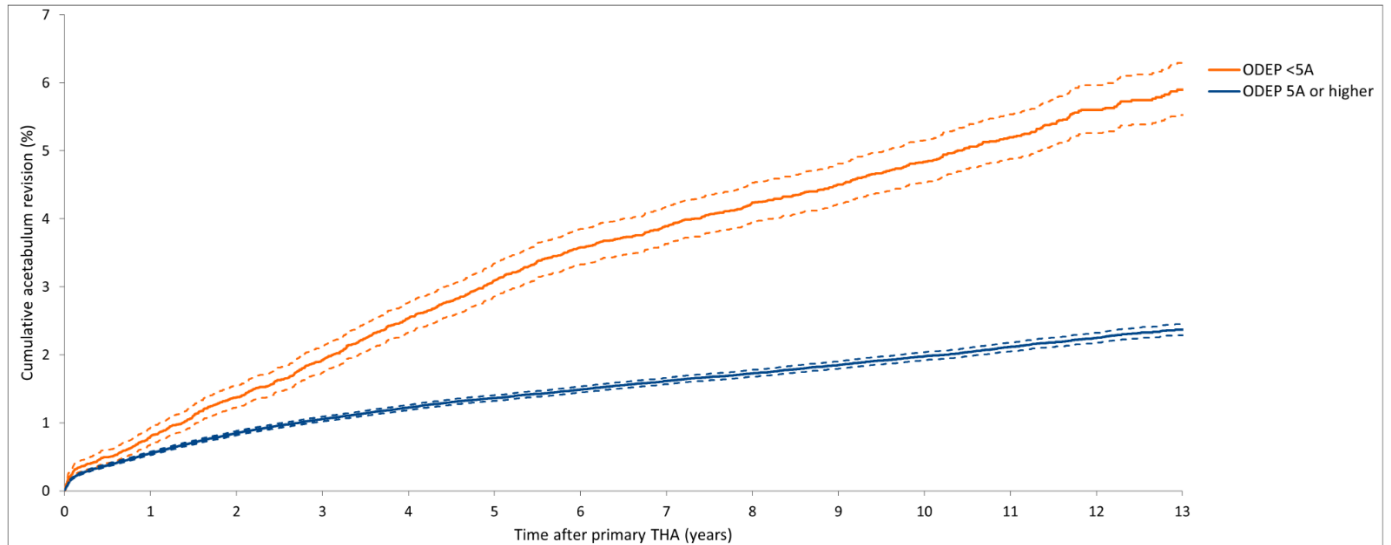


TABLE Cumulative 13-year acetabulum revision percentage

ODEP acetabulum	Number (n)	Cumulative 13-year acetabulum revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
<5A	20,452	5.9 (5.5-6.3)	7.0 (6.5-7.4)
5A or higher	356,154	2.4 (2.3-2.5)	3.0 (2.9-3.1)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. 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. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty; CI: confidence interval.

THA by ODEP 5A or higher femur

FIGURE Cumulative femur revision percentage of total hip arthroplasties by ODEP rating femur in the Netherlands in 2007-2021 (n=374,822)

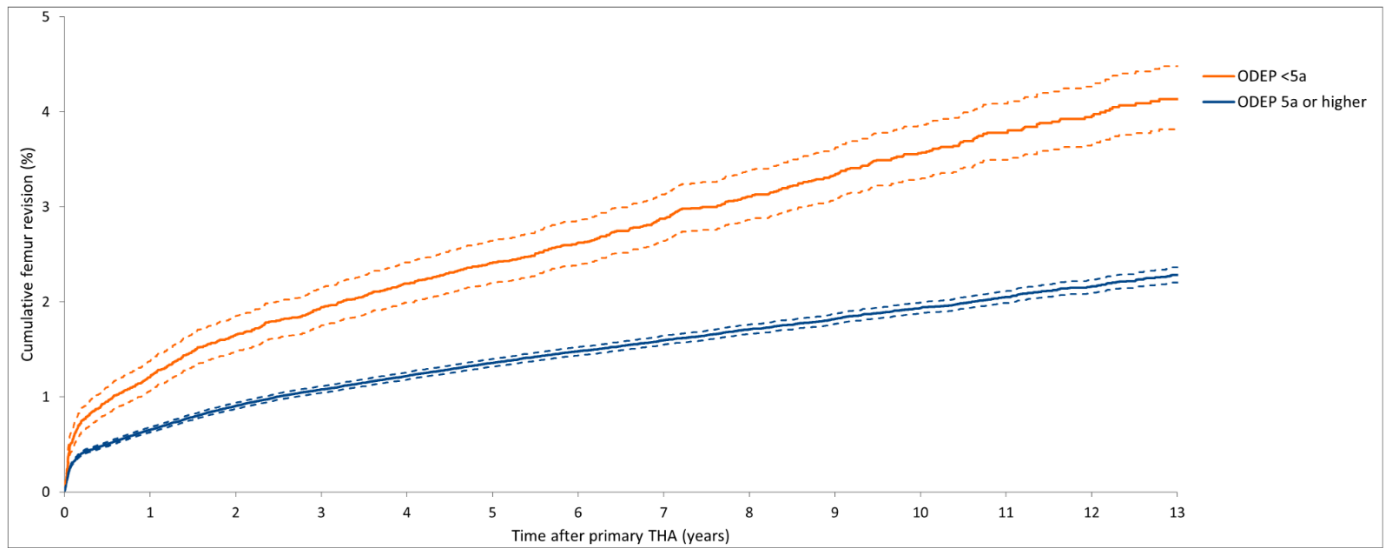


TABLE Cumulative 13-year femur revision percentage

	Number (n)	Cumulative 13-year femur revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
ODEP femur			
<5A	18,603	4.1 (3.8-4.5)	4.9 (4.5-5.3)
5A or higher	356,219	2.3 (2.2-2.4)	2.7 (2.6-2.8)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 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.
 Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
 THA: total hip arthroplasty; CI: confidence interval.

THA by cemented material acetabulum

FIGURE Cumulative acetabulum revision percentage of total hip arthroplasties by cemented acetabulum material in the Netherlands in 2007-2021 (n=104,593)

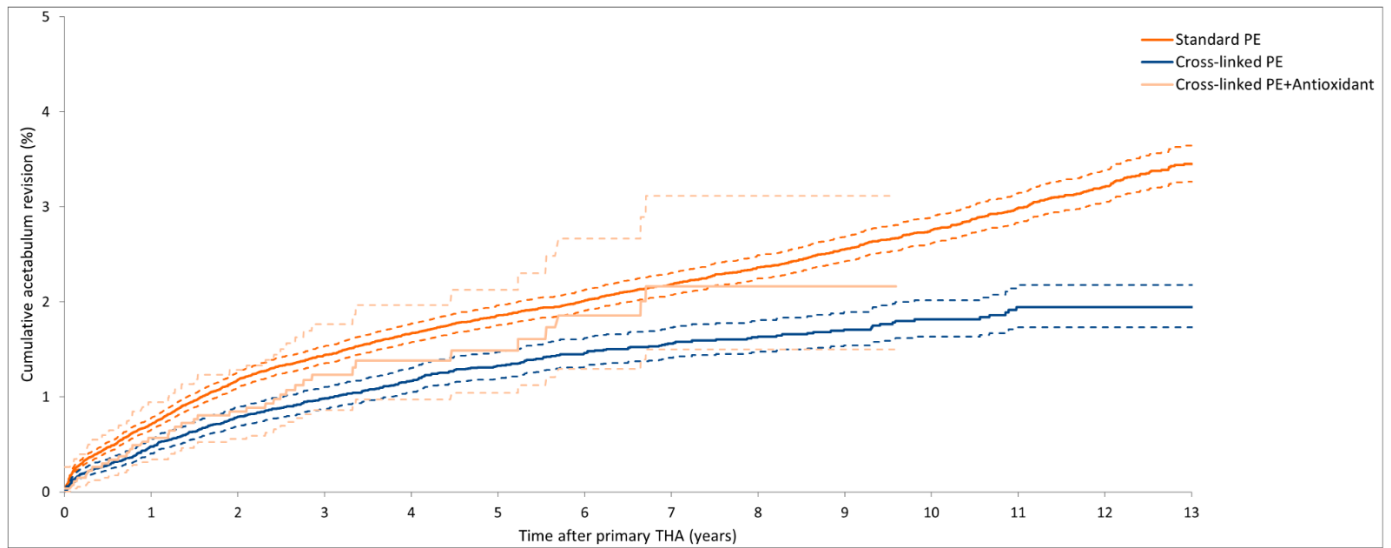


TABLE Cumulative 7- and 13-year acetabulum revision percentage

Cemented acetabulum material	Number (n)	Cumulative 7-year acetabulum revision percentage		Cumulative 13-year acetabulum revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Standard PE	69,396	2.2 (2.1-2.3)	2.5 (2.4-2.6)	3.5 (2.3-3.6)	4.4 (4.2-4.7)
Cross-linked PE	32,513	1.3 (1.2-1.5)	1.8 (1.6-2.0)	1.9 (1.7-2.2)	2.4 (2.1-2.7)
Cross-linked PE + Antioxidant	2,684	2.2 (1.5-3.1)	2.5 (1.6-3.4)	n.a.	n.a.

¹ The cumulative revision percentage using the competing risk method is shown in the figure. 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. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA by uncemented material inlay

FIGURE Cumulative acetabulum revision percentage of total hip arthroplasties by uncemented inlay material in the Netherlands in 2007-2021 (n=234,959)

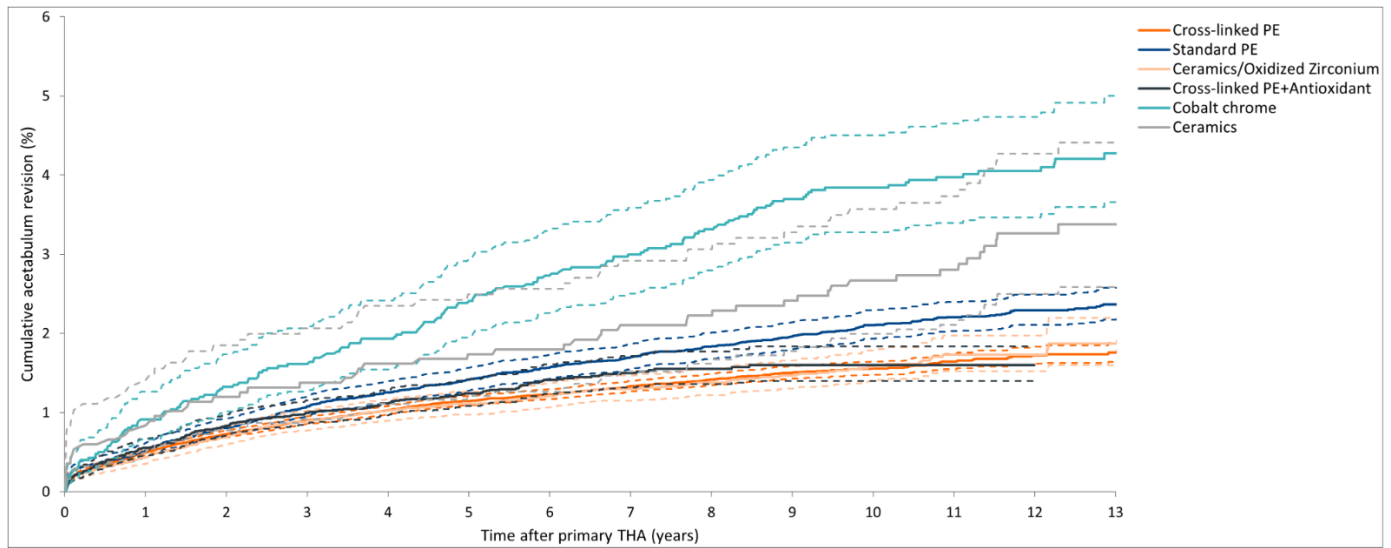


TABLE Cumulative 10- and 13-year acetabulum revision percentage

Uncemented inlay material	Number (n)	Cumulative 10-year acetabulum revision percentage		Cumulative 13-year acetabulum revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Cross-linked PE	160,639	1.6 (1.5-1.6)	1.9 (1.8-2.0)	1.8 (1.6-1.9)	2.1 (2.0-2.3)
Standard PE	26,015	2.1 (1.9-2.3)	2.6 (2.3-2.8)	2.4 (2.2-2.6)	2.9 (2.7-3.2)
Ceramics/Oxidized Zirconium	23,401	1.6 (1.4-1.8)	1.8 (1.6-2.0)	1.9 (1.6-2.2)	2.2 (1.9-2.6)
Cross-linked PE + Antioxidant	19,247	1.6 (1.4-1.8)	1.9 (1.6-2.2)	n.a.	n.a.
Cobalt chrome	3,983	3.8 (3.3-4.5)	4.5 (3.8-5.2)	4.3 (3.7-5.0)	5.2 (4.4-6.0)
Ceramics	1,674	2.7 (2.0-3.6)	3.0 (2.2-3.9)	3.4 (2.6-4.4)	3.8 (2.8-4.8)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. 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. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA by cemented material femur

FIGURE Cumulative femur revision percentage of total hip arthroplasties by cemented femur material in the Netherlands in 2007-2021 (n=22,058)

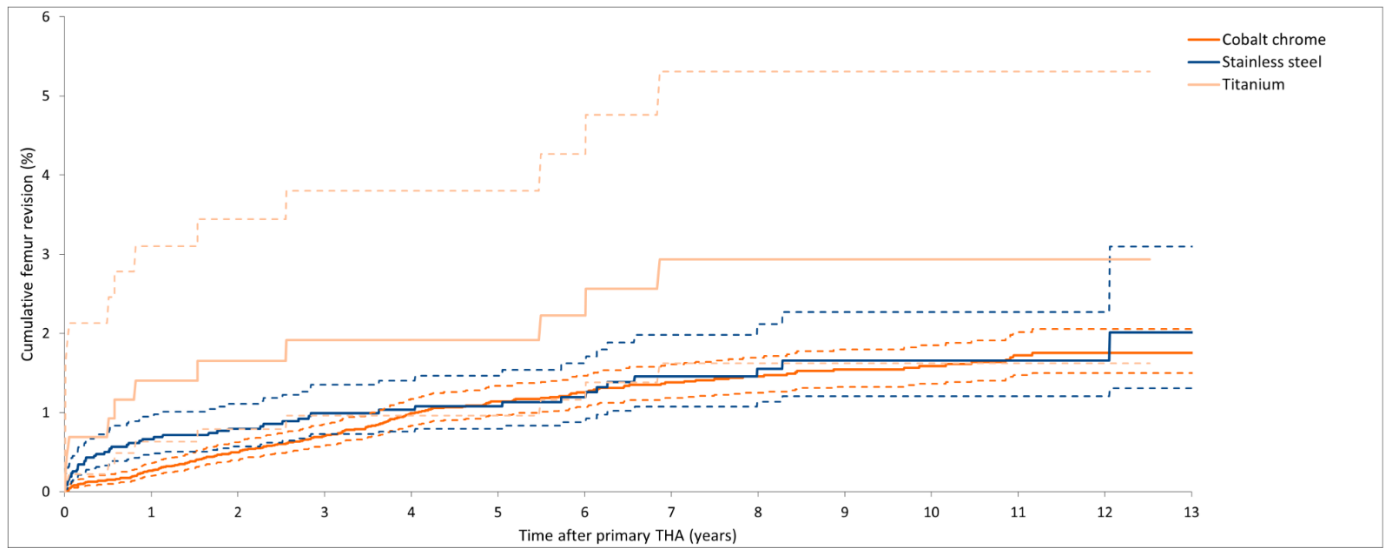


TABLE Cumulative 13-year femur revision percentage

Cemented femur material	Number (n)	Cumulative 13-year femur revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Cobalt chrome	16,954	1.8 (1.5-2.1)	2.2 (1.8-2.5)
Stainless steel	4,668	2.0 (1.3-3.1)	2.7 (1.4-4.0)
Titanium	436	2.9 (1.6-5.3)	3.4 (1.4-5.3)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. 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. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty, CI: confidence interval.

THA by uncemented material femur

FIGURE Cumulative femur revision percentage of total hip arthroplasties by uncemented femur material in the Netherlands in 2007-2021 (n=19,387)

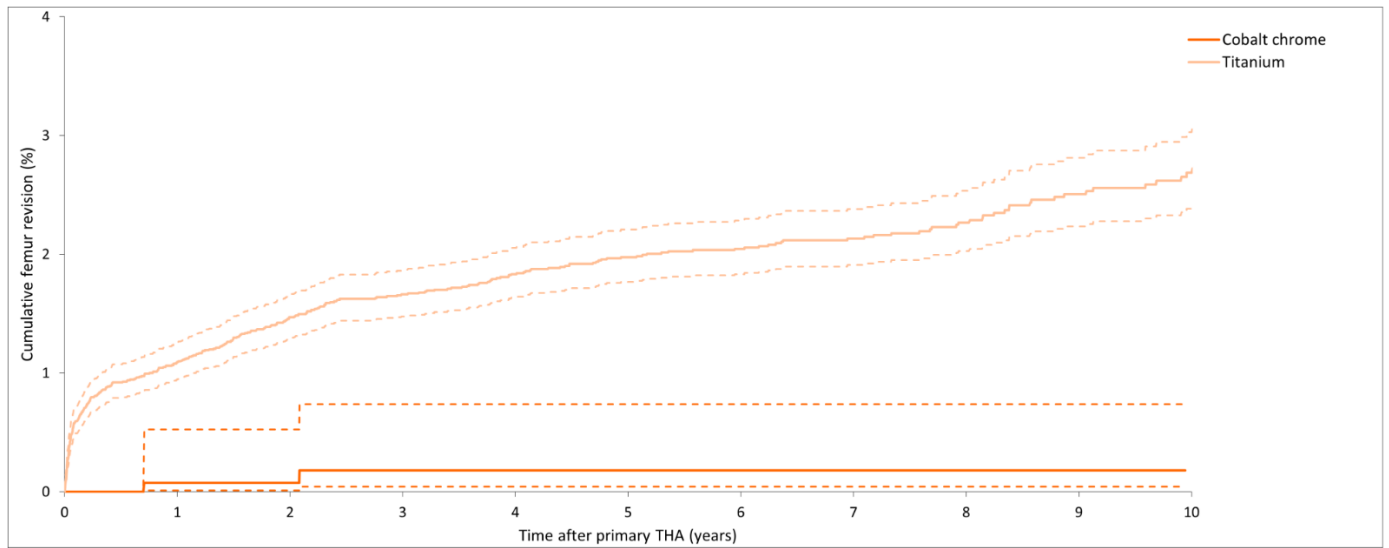


TABLE Cumulative 10-year femur revision percentage

Uncemented femur material	Number (n)	Cumulative 10-year femur revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Titanium	17,538	2.3 (2.7-2.4)	3.0 (2.7-3.4)
Cobalt chrome	1,849	0.2 (0.0-0.7)	0.7 (0.2-1.2)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. 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. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

THA by modularity

FIGURE Cumulative femur revision percentage of total hip arthroplasties by femur modularity in the Netherlands in 2007-2021 (n=373,058)

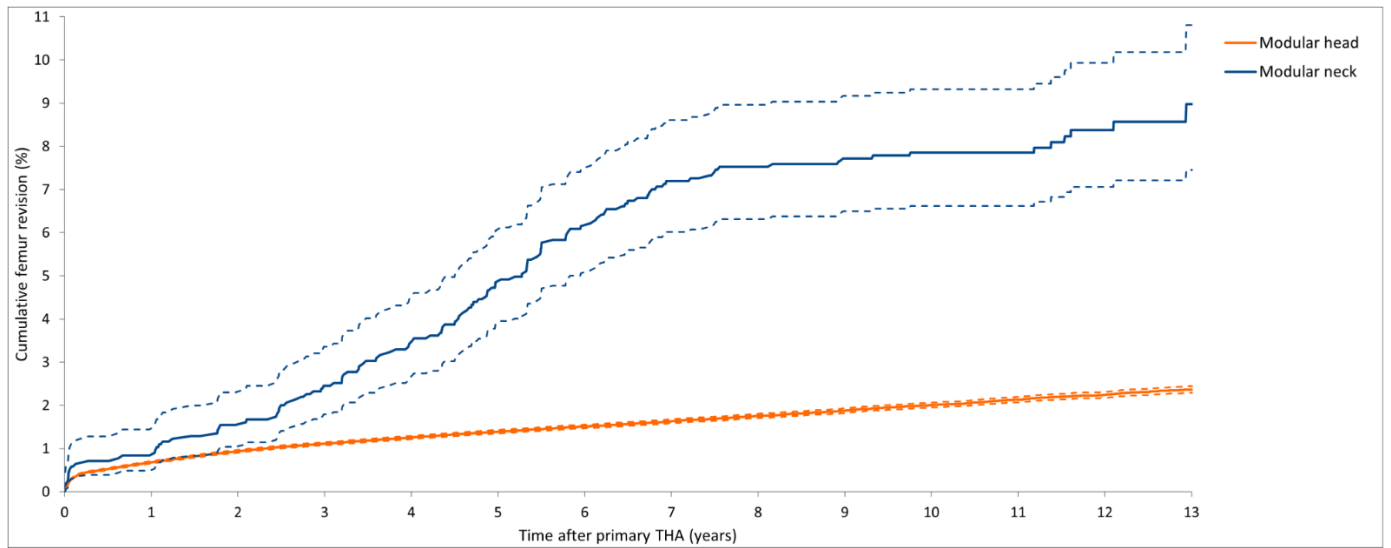


TABLE Cumulative 13-year femur revision percentage

Modularity	Number (n)	Cumulative 13-year femur revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Modular head	371,505	2.4 (2.3-2.4)	2.8 (2.7-2.9)
Modular neck	1,553	9.0 (7.5-10.8)	9.8 (8.1-11.5)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. 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. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. THA: total hip arthroplasty; CI: confidence interval.

Rerevision

Overall second revision

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision in the Netherlands in 2007-2021 (n=12,308)

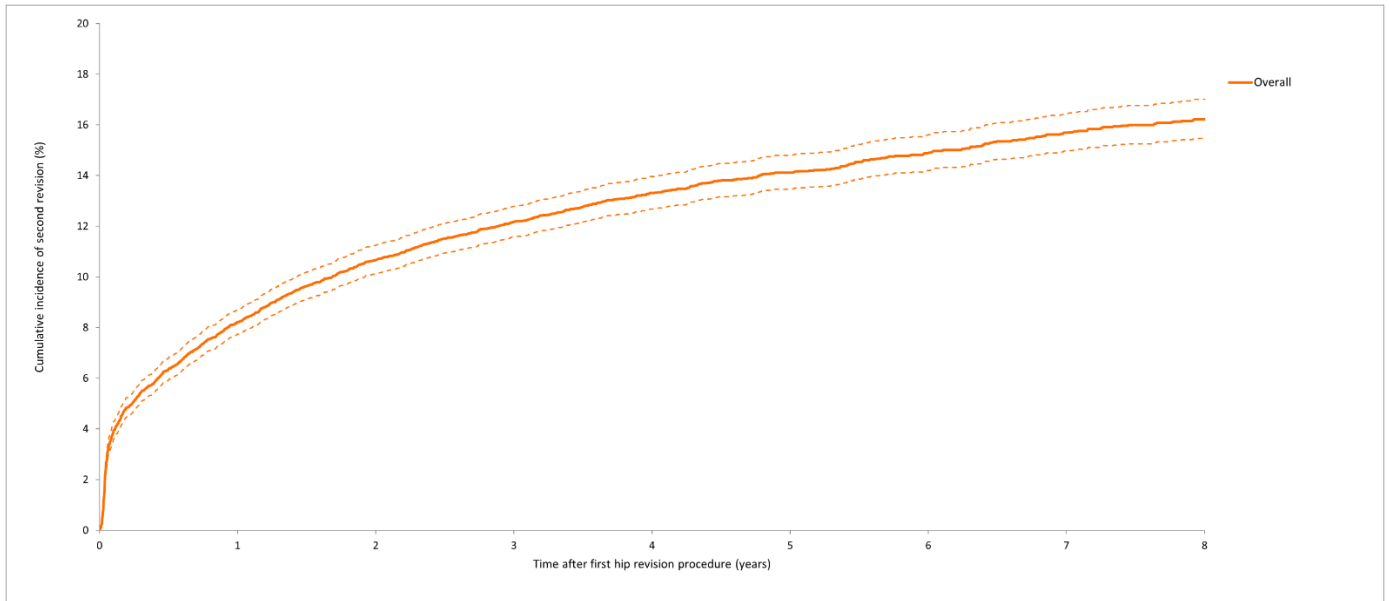


TABLE Cumulative second revision percentages

	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
1-year second revision (%)	9,939	8.2 (7.7-8.7)	8.3 (7.8-8.7)
3-year second revision (%)	7,097	12.2 (11.6-12.8)	12.4 (11.8-13.1)
5-year second revision (%)	4,679	14.1 (13.5-14.8)	14.6 (13.9-15.3)
8-year second revision (%)	2,141	16.2 (15.5-17.0)	17.2 (16.3-18.0)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.
 CI: confidence interval.

By type of first revision

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision by type of first revision in the Netherlands in 2007-2021 (n=12,308)

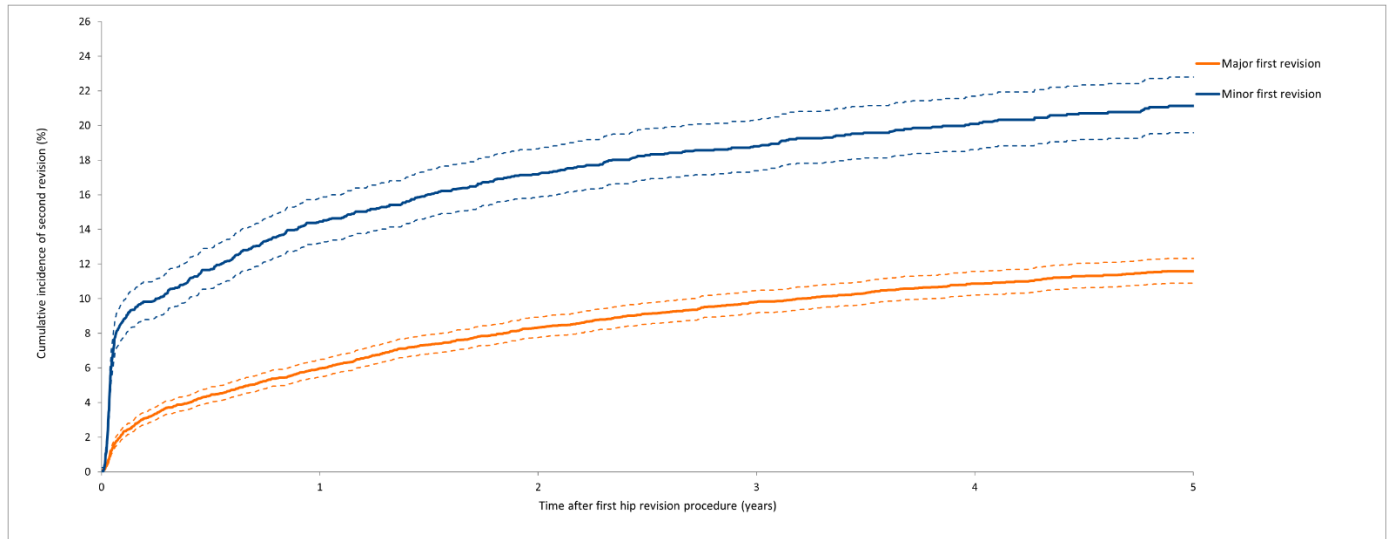


TABLE Cumulative second revision percentages

	Number of first revisions (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Major first revision	9,163			
1-year second revision (%)		7,576	5.9 (5.5-6.5)	6.0 (5.5-6.5)
3-year second revision (%)		5,440	9.8 (9.2-10.5)	10.1 (9.4-10.7)
5-year second revision (%)		3,653	11.6 (10.9-12.3)	12.0 (11.3-12.8)
Minor first revision	2,912			
1-year second revision (%)		2,184	14.4 (13.2-15.8)	14.6 (13.3-15.9)
3-year second revision (%)		1,508	18.8 (17.4-20.3)	19.2 (17.7-20.7)
5-year second revision (%)		899	21.1 (19.6-22.8)	21.8 (20.1-23.4)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.
 Major revision: revision of at least the acetabulum or femur component.
 Minor revision: only inlay and/or femoral head exchange (including DAIR procedures).
 CI: confidence interval.

By time to first revision

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision by time to first revision in the Netherlands in 2007-2021 (n=12,308)

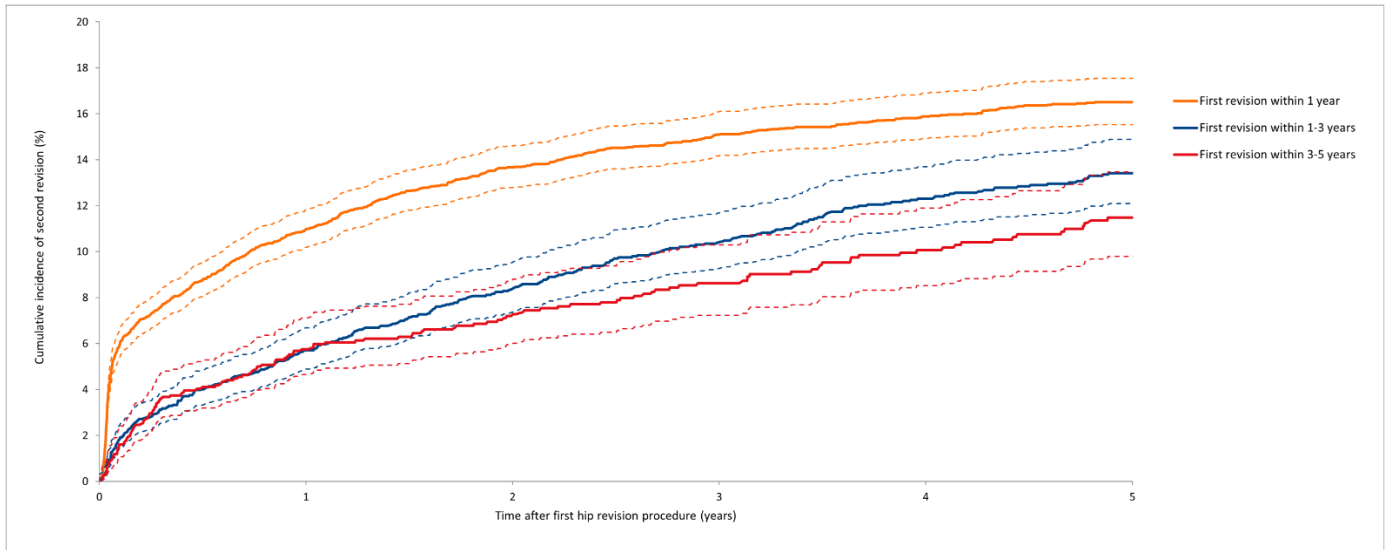
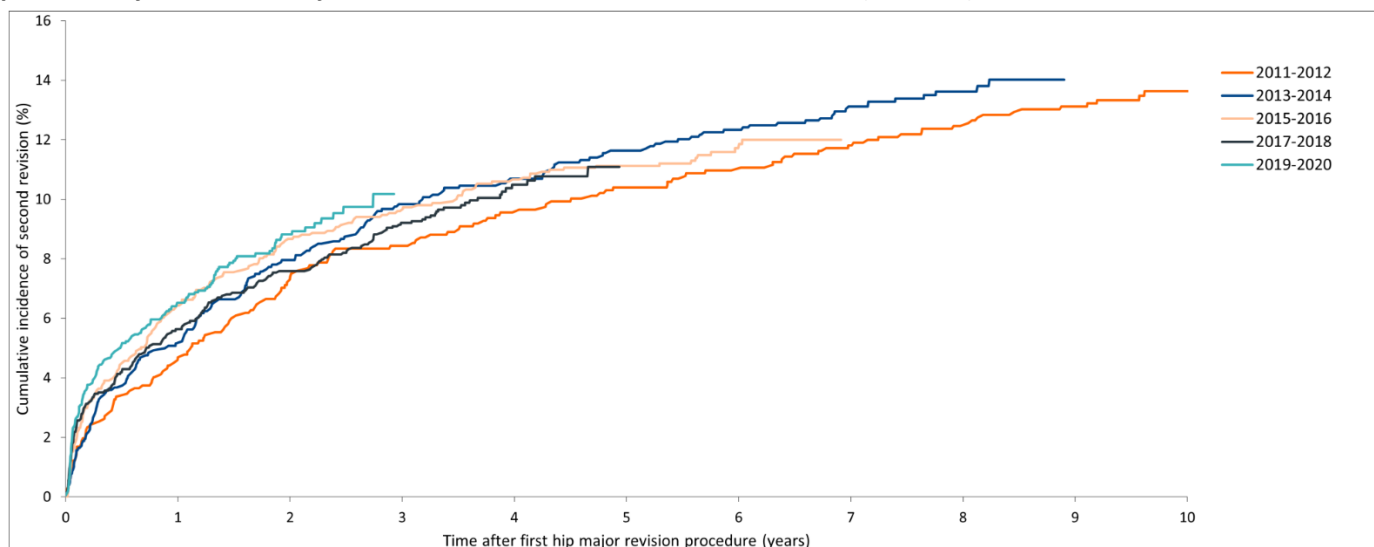


TABLE Cumulative second revision percentages

	Number of first revisions (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
First revision within 1 year	5,779			
1-year second revision (%)		4,580	10.9 (10.1-11.8)	11.0 (10.2-11.8)
3-year second revision (%)		3,398	15.1 (14.2-16.1)	15.4 (14.4-16.4)
5-year second revision (%)		2,315	16.5 (15.5-17.6)	17.0 (15.9-18.0)
First revision within 1-3 years	2,664			
1-year second revision (%)		2,320	5.7 (4.9-6.6)	5.7 (4.8-6.6)
3-year second revision (%)		1,810	10.4 (9.3-11.7)	10.6 (9.3-11.8)
5-year second revision (%)		1,302	13.4 (12.1-14.9)	13.8 (12.4-15.3)
First revision within 3-5 years	1,435			
1-year second revision (%)		1,215	5.8 (4.7-7.1)	5.8 (4.6-7.0)
3-year second revision (%)		887	8.6 (7.2-10.3)	8.8 (7.2-10.3)
5-year second revision (%)		615	11.5 (9.8-13.5)	11.9 (10.0-13.8)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis.
 CI: confidence interval.

By procedure year of first major revision

FIGURE Cumulative second revision percentage of total hip arthroplasty after a one-stage first revision by procedure year of first major revision in the Netherlands in 2012-2021 (n=9,159)**TABLE** Cumulative second revision percentages

Procedure year major revision	Number (n)	Cumulative revision percentages - Competing Risk (95% CI)				
		1yr	3yr	5yr	7yr	10yr
2011-2012	1,607	4.7 (3.6-6.1)	8.4 (6.9-10.3)	10.4 (8.7-12.4)	11.8 (10.0-13.9)	13.6 (11.7-15.9)
2013-2014	1,281	5.2 (4.1-6.5)	9.8 (8.3-11.6)	11.6 (10.0-13.5)	13.1 (22.4-15.1)	n.a.
2015-2016	1,510	6.4 (5.3-7.8)	9.6 (8.2-11.2)	11.1 (9.6-12.8)	n.a.	n.a.
2017-2018	1,792	5.6 (4.7-6.8)	9.2 (8.0-10.6)	n.a.	n.a.	n.a.
2019-2020	1,778	6.5 (5.5-7.8)	n.a.	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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Reasons for seconds revision by type of first revision

TABLE Reasons for second revision within five 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 2007-2021

Reasons for second revision	Major first revision ¹ (n=921)	Minor first revision ² (n=556)	Any type of first revision ³ (n=1,534)
	Proportion ⁴ (%)	Proportion ⁴ (%)	Proportion ⁴ (%)
Infection	30.5	59.5	41.5
Dislocation	27.8	26.6	26.7
Loosening of acetabulum component	19.7	5.2	14.0
Loosening of femur component	17.7	4.7	12.6
Peri-prosthetic fracture	9.6	1.8	6.6
Inlay wear	2.9	2.7	2.7
Symptomatic MoM bearing	1.1	0.5	0.9
Peri-articular ossification	1.1	0.2	0.7
Malalignment	0.1	0.0	0.1
Other	13.8	7.6	11.7

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

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

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Survival resurfacing hip arthroplasty

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

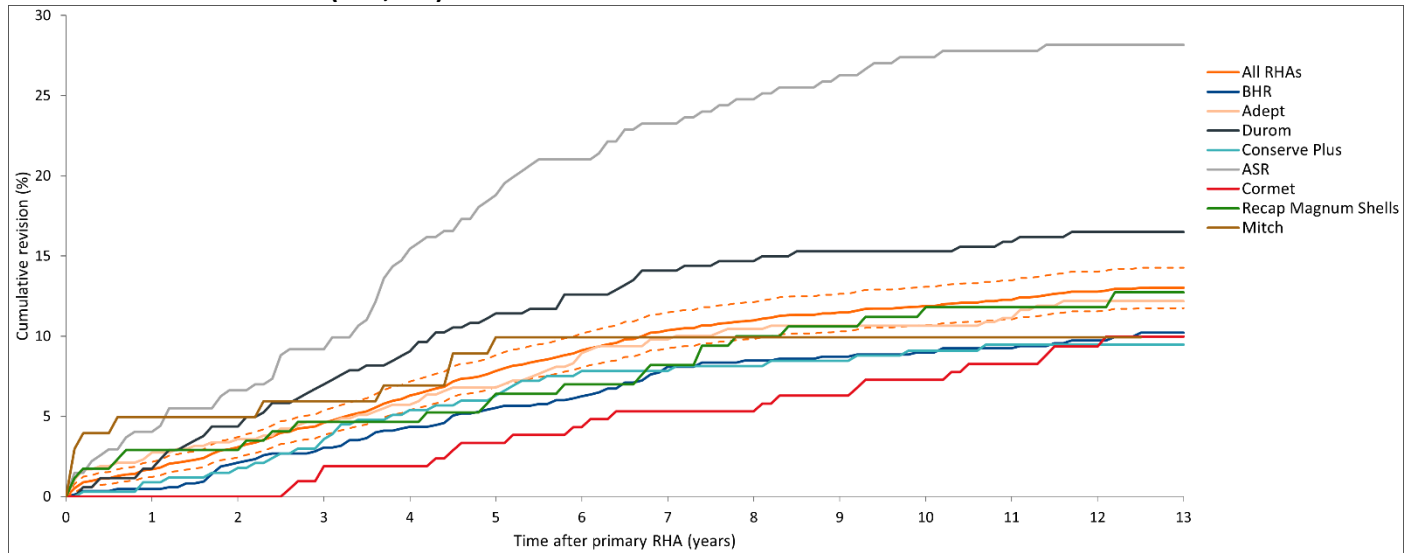


TABLE Cumulative revision percentages of resurfacing hip arthroplasties by prosthesis component in the Netherlands in 2007-2021 (n=2,893)

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

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

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PROMs

Response

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

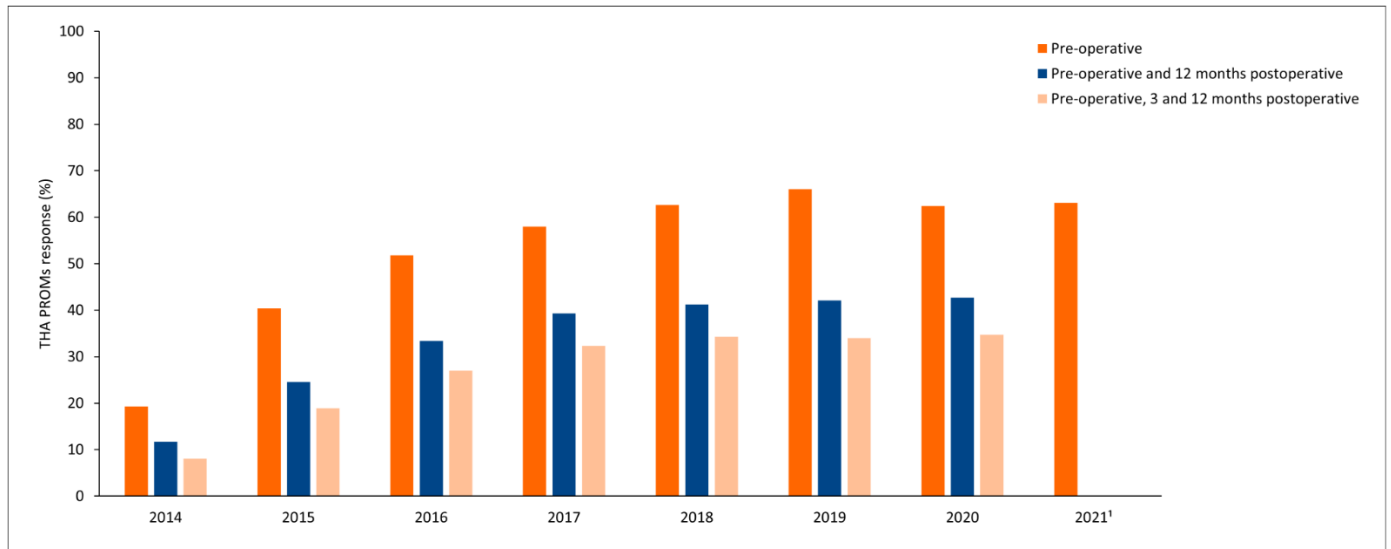


TABLE PROMs response percentages

Year	2014	2015	2016	2017	2018	2019	2020	2021 ¹
THA for osteoarthritis (n)	23,372	24,013	24,148	25,025	26,323	26,776	20,789	25,726
THA PROMs response (%)								
Pre-operative	19.3	40.4	51.8	58.0	62.6	66.0	62.4	63.1
Pre-operative and 12 months postoperative	11.7	24.6	33.4	39.3	41.2	42.1	42.7	n.a.
Pre-operative, 3 and 12 months postoperative	8.1	18.9	27.0	32.3	34.3	34.0	34.7	n.a.

¹ The 12 months postoperative PROMs response percentage is not (yet) available for 2021.
THA: total hip arthroplasty, PROM: patient reported outcome measure.

Mean scores

NRS (rest)

FIGURE Mean pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2020

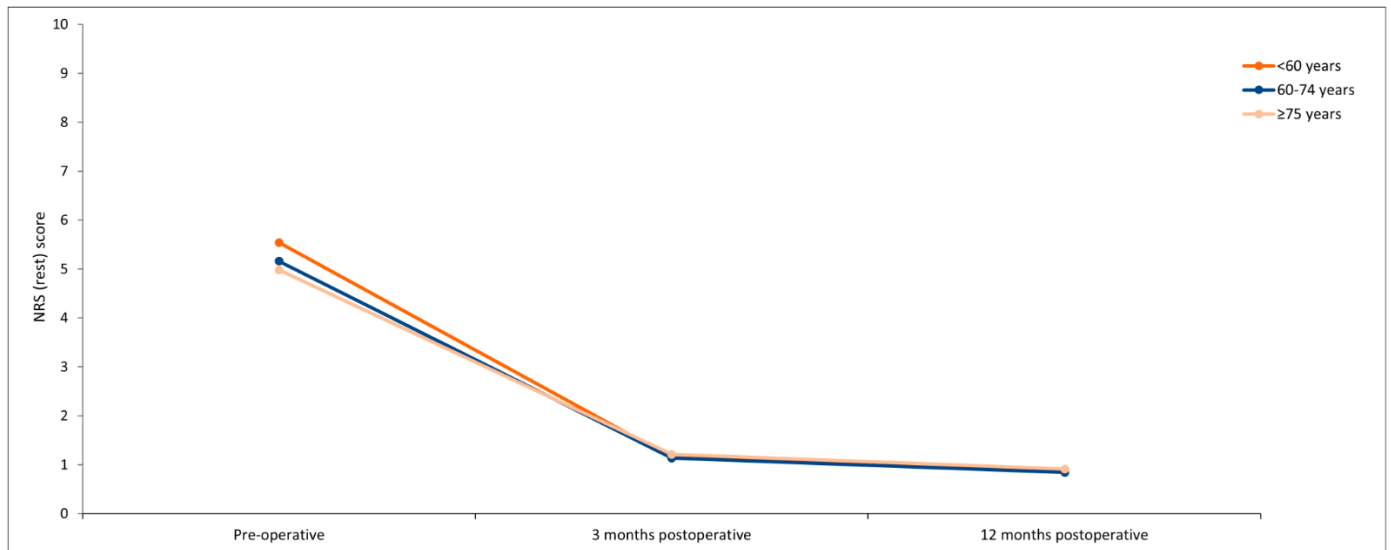


TABLE Mean NRS (rest) scores

NRS (rest) score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	6,845	5.5 (5.5-5.6)	6,868	1.1 (1.1-1.2)	6,829	0.9 (0.8-0.9)
60-74 years	26,263	5.2 (5.1-5.2)	26,349	1.1 (1.1-1.2)	26,189	0.8 (0.8-0.9)
≥75 years	12,679	5.0 (4.9-5.0)	12,671	1.2 (1.2-1.2)	12,561	0.9 (0.9-0.9)
Total	45,793	5.2 (5.1-5.2)	45,894	1.2 (1.1-1.2)	45,585	0.9 (0.9-0.9)

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 pre-operative, 3 months and 12 months postoperative NRS (activity) scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2020

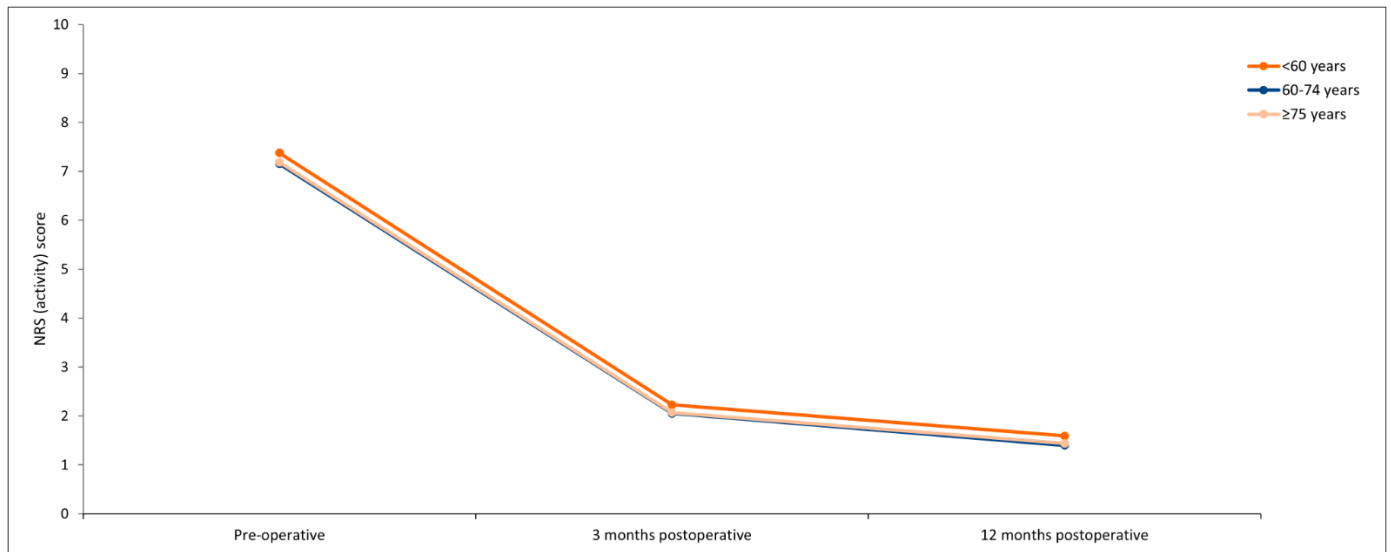


TABLE Mean NRS (activity) scores

NRS (activity) score Age category	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	6,846	7.4 (7.3-7.4)	6,872	2.2 (2.2-2.3)	6,836	1.6 (1.5-1.6)
60-74 years	26,283	7.2 (7.1-7.2)	26,389	2.1 (2.0-2.1)	26,212	1.4 (1.4-1.4)
≥75 years	12,678	7.2 (7.1-7.2)	12,670	2.1 (2.0-2.1)	12,568	1.4 (1.4-1.5)
Total	45,813	7.2 (7.2-7.2)	45,937	2.1 (2.1-2.1)	45,622	1.4 (1.4-1.5)

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.

EQ5D index score

FIGURE Mean pre-operative, 3 months and 12 months postoperative EQ-5D index scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2020

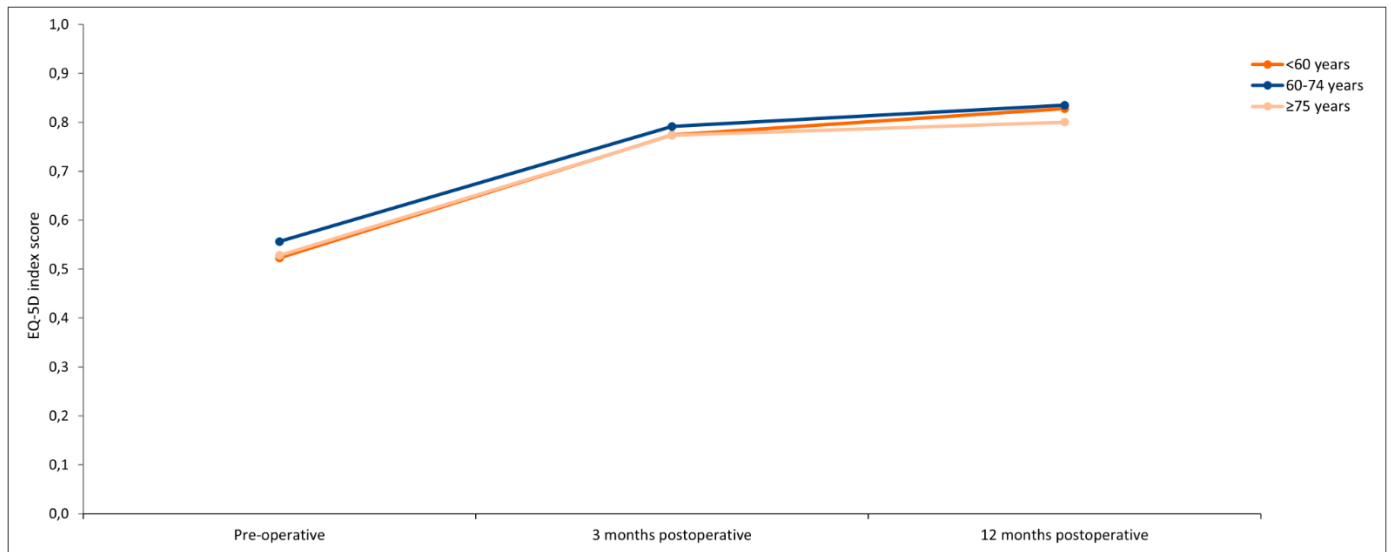


TABLE Mean EQ-5D index scores

EQ-5D Index score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	6,834	0.52 (0.52-0.53)	6,786	0.77 (0.77-0.78)	6,737	0.83 (0.82-0.83)
60-74 years	26,228	0.56 (0.55-0.56)	25,994	0.79 (0.79-0.79)	25,821	0.83 (0.83-0.84)
≥75 years	12,586	0.53 (0.52-0.53)	12,395	0.77 (0.77-0.78)	12,292	0.80 (0.80-0.80)
Total	45,654	0.54 (0.54-0.55)	45,181	0.78 (0.78-0.79)	44,856	0.82 (0.82-0.83)

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.

EQ5D thermometer

FIGURE Mean pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2020

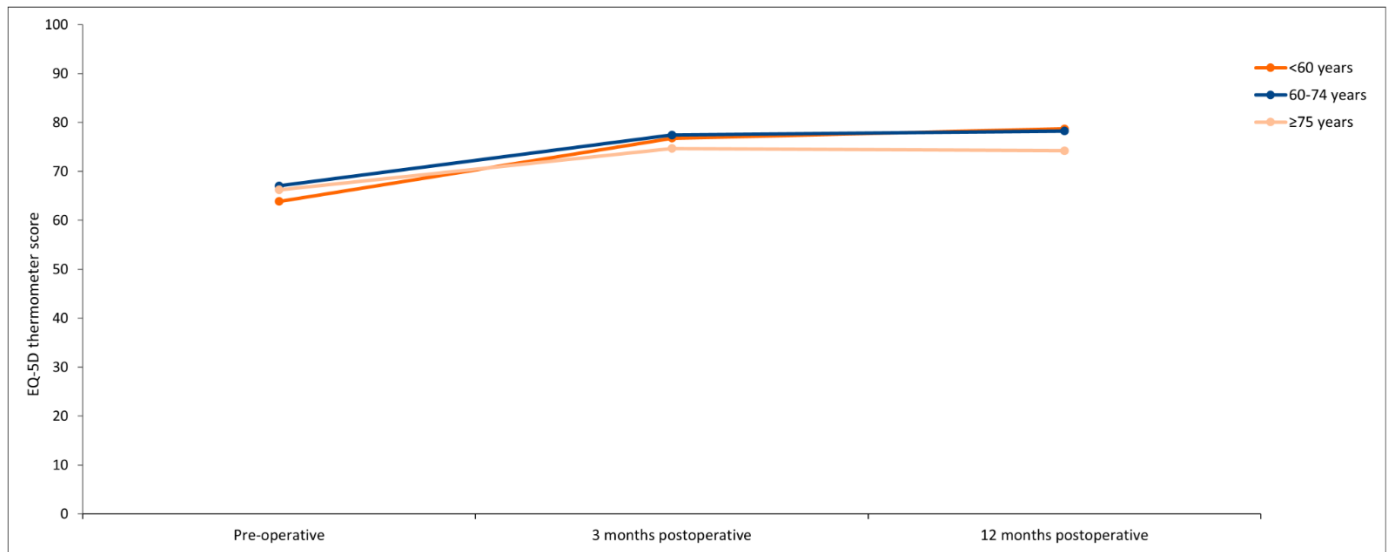


TABLE Mean EQ-5D thermometer scores

EQ-5D thermometer score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	6,854	63.9 (63.4-64.3)	6,838	76.8 (76.3-77.2)	6,814	78.7 (78.3-79.2)
60-74 years	26,301	67.1 (66.8-67.3)	26,275	77.5 (77.2-77.7)	26,126	78.2 (78.0-78.5)
≥75 years	12,608	66.3 (65.9-66.6)	12,537	74.7 (74.3-75.0)	12,465	74.3 (73.9-74.6)
Total	45,769	66.4 (66.2-66.5)	45,656	76.6 (76.4-76.8)	45,411	77.2 (77.0-77.4)

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 pre-operative, 3 months and 12 months postoperative HOOS-PS scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2020

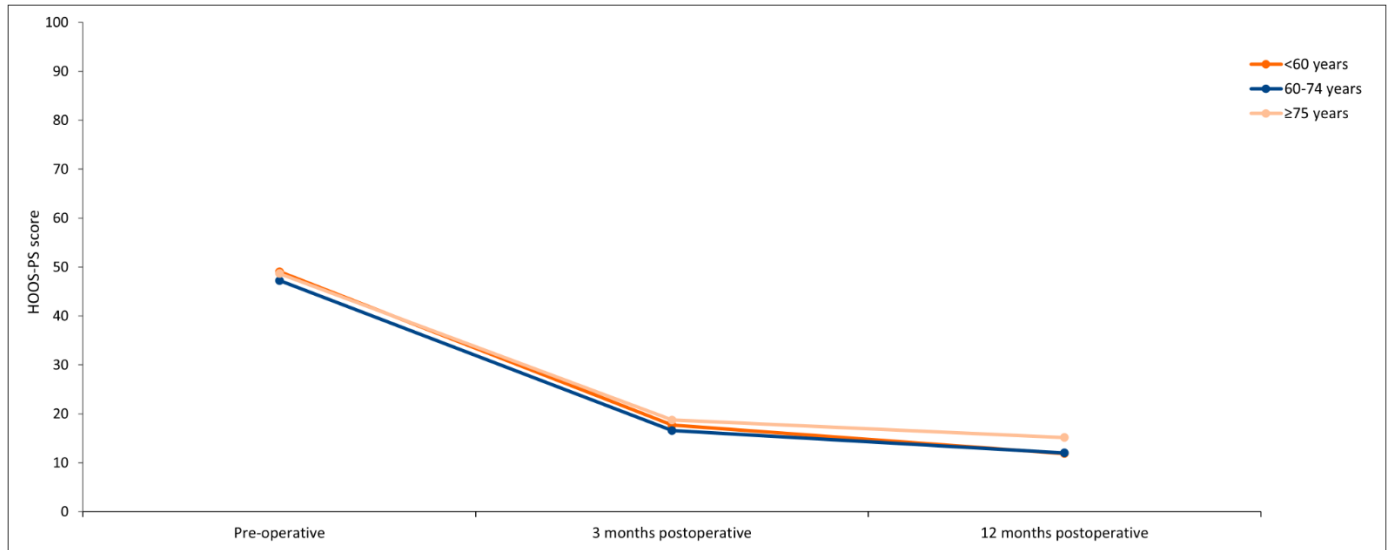


TABLE Mean HOOS-PS scores

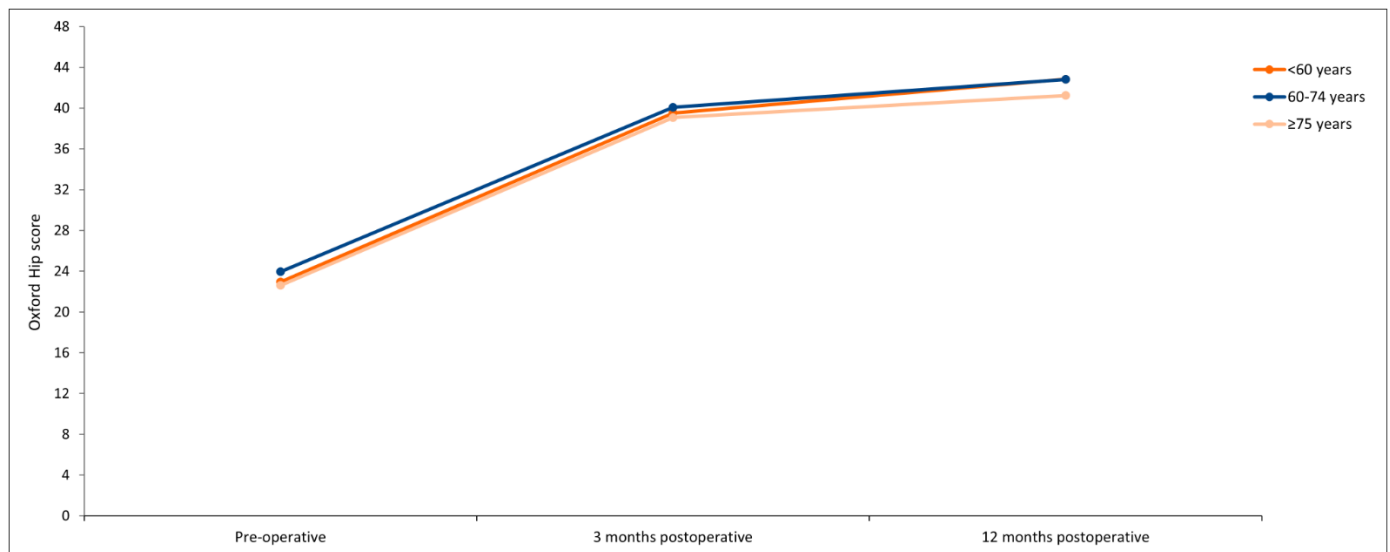
HOOS-PS score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	6,721	49.0 (48.6-49.4)	6,548	17.7 (17.3-18.0)	6,635	11.9 (11.5-12.2)
60-74 years	25,423	47.2 (47.0-47.5)	24,741	16.6 (16.4-16.8)	24,892	12.0 (11.8-12.2)
≥75 years	11,698	48.7 (48.3-49.0)	10,981	18.7 (18.4-19.0)	11,032	15.2 (14.9-15.4)
Total	43,848	47.9 (47.7-48.1)	42,276	17.3 (17.2-17.4)	42,565	12.8 (12.7-12.9)

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 pre-operative, 3 months and 12 months postoperative Oxford Hip scores of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2020**TABLE** Mean Oxford Hip scores

Oxford Hip score Age category	Pre-operative		3 months postoperative		12 months postoperative ¹	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	6,388	22.9 (22.7-23.1)	6,341	39.5 (39.3-39.7)	6,283	42.8 (42.7-43.0)
60-74 years	24,661	23.9 (23.8-24.0)	24,475	40.1 (40.0-40.2)	24,225	42.8 (42.7-42.9)
≥75 years	11,769	22.6 (22.4-22.8)	11,474	39.1 (38.9-39.2)	11,389	41.2 (41.1-41.4)
Total	42,824	23.4 (23.3-23.5)	42,296	39.7 (39.6-39.8)	41,903	42.4 (42.3-42.5)

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.

Anchor question: Daily functioning

FIGURE Mean 3 months and 12 months postoperative Anchor scores: change in daily functioning of patients who underwent a THA for osteoarthritis by age category in the Netherlands in 2014-2020

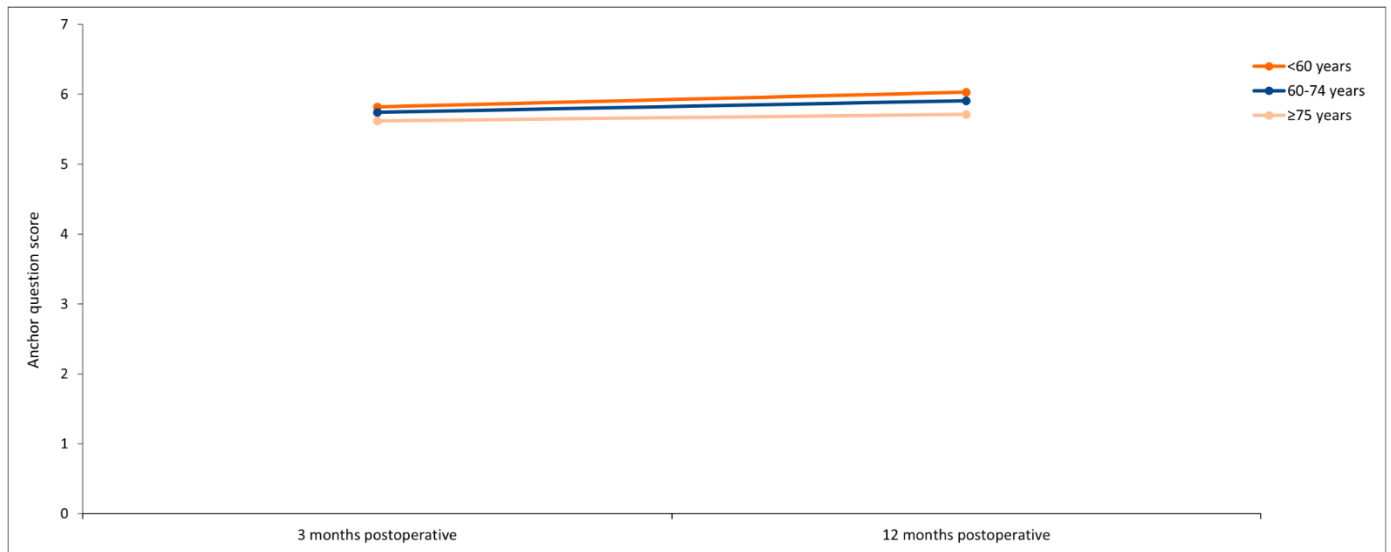


TABLE Mean anchor question: Daily functioning

Anchor question score	3 months postoperative		12 months postoperative ¹	
	n	Mean (95% CI)	n	Mean (95% CI)
<60 years	6,634	5.9 (5.9-5.9)	6,697	6.2 (6.1-6.2)
60-74 years	25,577	5.8 (5.8-5.8)	25,632	6.0 (6.0-6.0)
≥75 years	12,293	5.6 (5.6-5.6)	12,219	5.7 (5.7-5.7)
Total	44,510	5.8 (5.8-5.8)	44,554	6.0 (5.9-6.0)

THA: total hip arthroplasty, CI: confidence interval.

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

Knee arthroplasty

Numbers

Registered procedures

TABLE Number of registered knee arthroplasties per year of surgery (2007-2021) in the LROI in May 2022

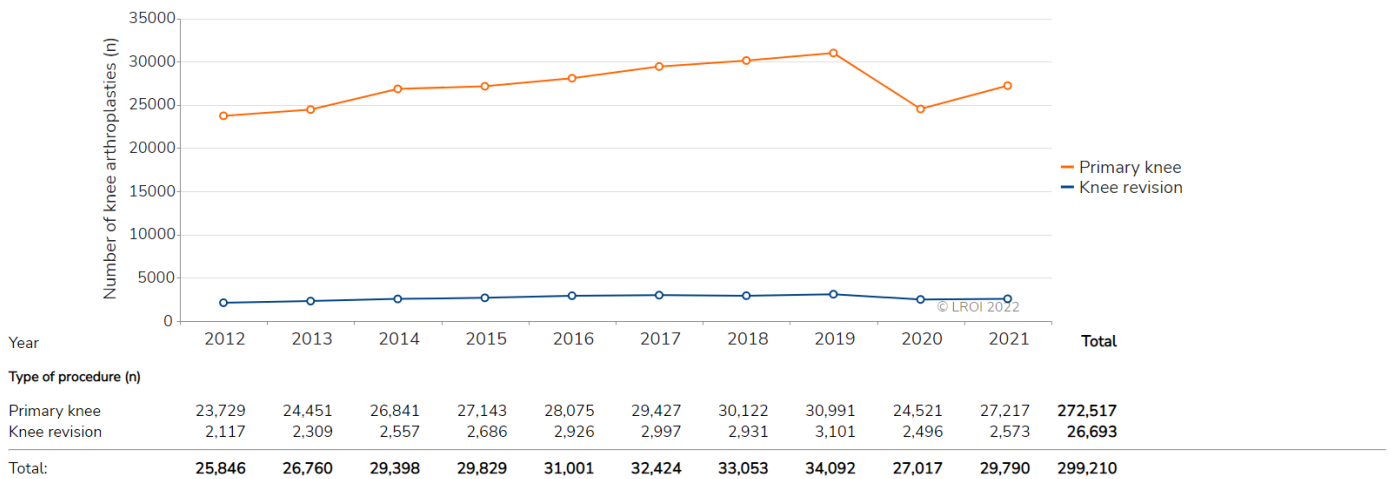
Year of surgery	Type of knee arthroplasty					Total (n)
	Total arthroplasty (n)	Unicondylar arthroplasty (n)	Patellofemoral arthroplasty (n)	Unknown/missing (n)	Revision arthroplasty (n)	
2007	7,035	780	47	877	595	9,334
2008	11,749	1,221	92	405	908	14,375
2009	16,790	1,547	139	176	1,300	19,952
2010	18,507	1,716	143	241	1,624	22,231
2011	19,521	1,586	116	207	1,794	23,224
2012	21,726	1,577	171	255	2,117	25,846
2013	22,304	1,805	135	207	2,309	26,760
2014	24,243	2,364	116	118	2,557	29,398
2015	24,246	2,693	156	48	2,686	29,829
2016	24,884	2,947	144	101	2,925	31,001
2017	25,554	3,662	168	43	2,997	32,424
2018	25,837	4,073	183	29	2,931	33,053
2019	25,885	4,888	175	43	3,101	34,092
2020	19,615	4,725	158	23	2,496	27,017
2021	21,444	5,648	107	19	2,572	29,790
Total	309,340	41,232	2,050	2,792	32,912	388,326

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

Type of procedures

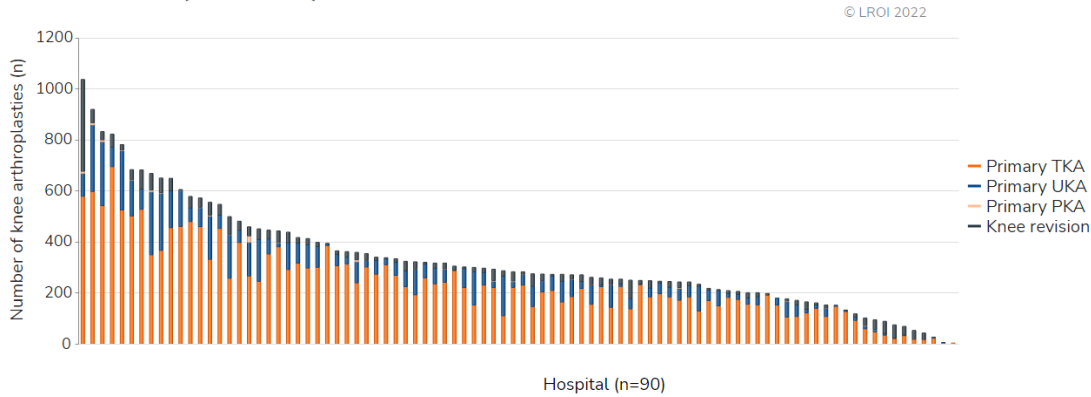
FIGURE Number of primary knee arthroplasties and knee revision arthroplasties registered in the LROI in the Netherlands in 2012-2021



Out of 27,217 primary knee arthroplasties that were performed in 2021, 3% (n=702) was performed bilaterally.

Type of procedure per hospital

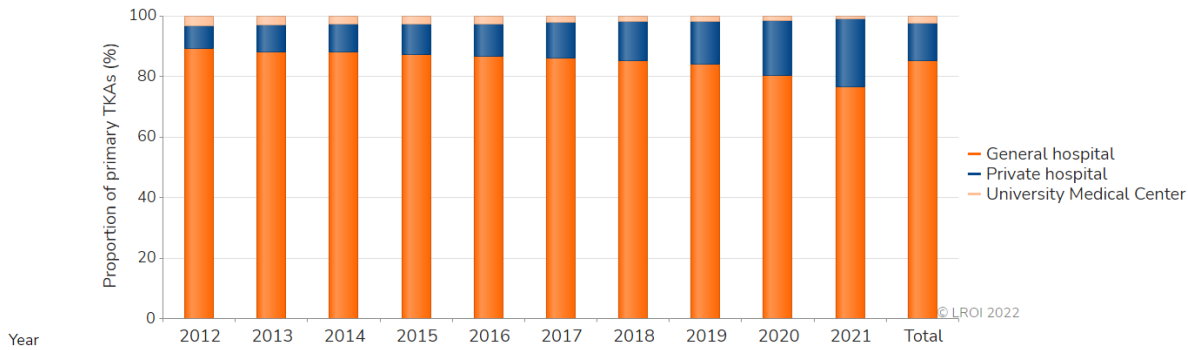
FIGURE Number of primary knee arthroplasties and knee revision arthroplasties per hospital in the Netherlands in 2021 (n=29,437)



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

Type of hospital - primary

FIGURE Trend (proportion [%] per year) in type of hospital performing primary total knee arthroplasties in the Netherlands in 2012-2021



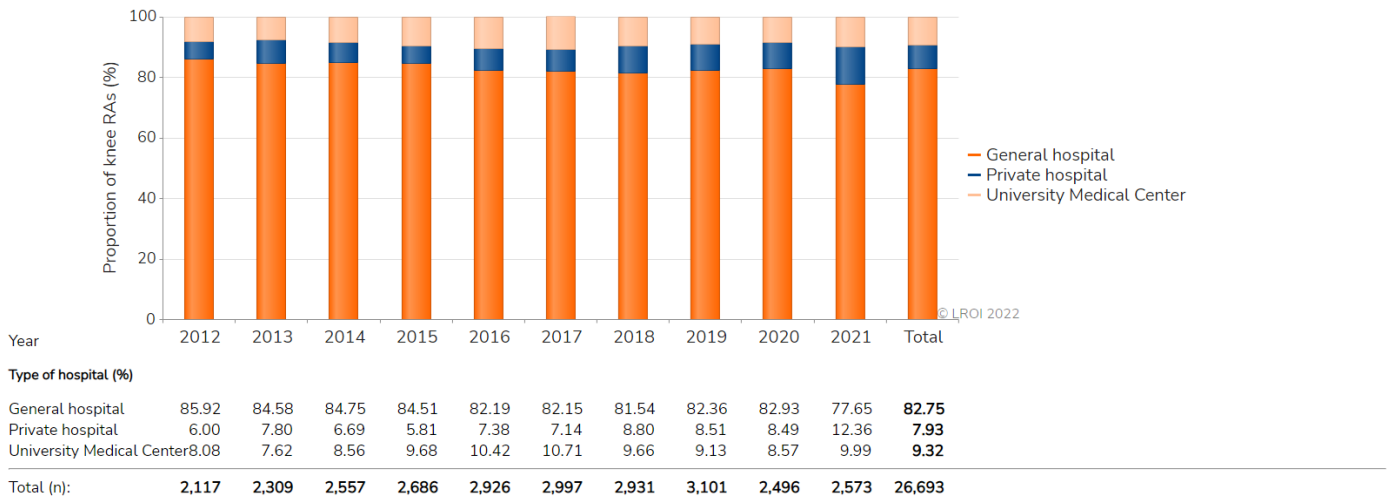
Type of hospital (%)	
General hospital	89.30 88.00 88.03 87.08 86.67 86.05 85.07 84.08 80.15 76.44 85.22
Private hospital	7.48 8.90 9.19 10.24 10.71 11.67 13.05 13.96 18.41 22.50 12.47
University Medical Center	3.22 3.09 2.78 2.68 2.62 2.28 1.88 1.96 1.44 1.06 2.31
Total (n):	21,726 22,304 24,243 24,246 24,884 25,554 25,837 25,885 19,615 21,444 235,738

Please note: The number of general hospitals that performed primary total knee arthroplasties decreased from 72 to 64 between 2012-2021; the number of private hospitals increased from 11 to 19 and the number of University Medical Centers remained 7 between 2012-2021.

TKA: total knee arthroplasty.

Type of hospital - revision

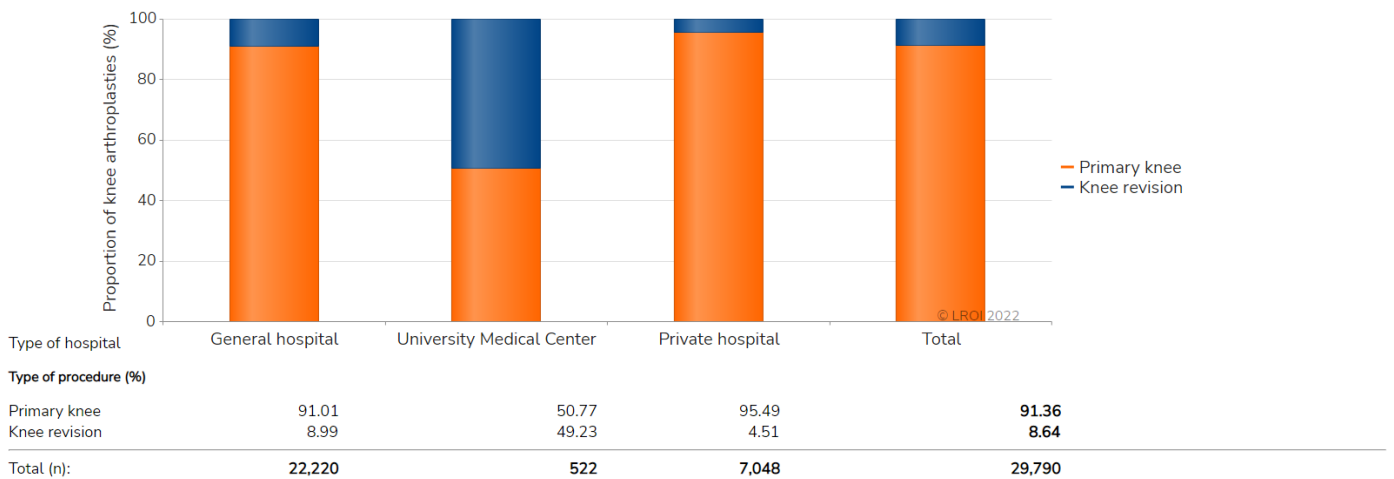
FIGURE Trend (proportion [%] per year) in type of hospital performing knee revision arthroplasties in the Netherlands in 2012-2021



Please note: The number of general hospitals that performed knee revision arthroplasties decreased from 72 to 63 between 2012-2021; the number of private hospitals increased from 7 to 15 and the number of University Medical Centers remained 7 between 2012-2021.
RA: revision arthroplasty.

Type of procedure by type of hospital

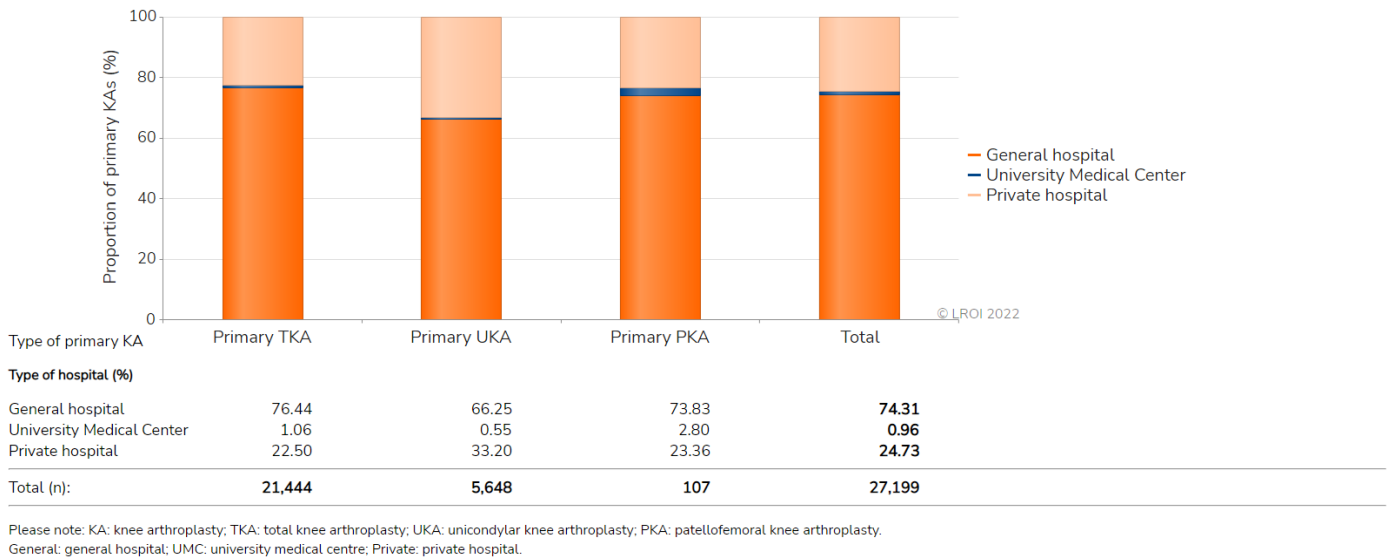
FIGURE Primary knee arthroplasties and knee revision arthroplasties (proportion [%] per category) by type of hospital in the Netherlands in 2021



Please note: In 2021, 64 general hospitals, 7 UMCs and 19 private hospitals performed knee arthroplasties.
General: general hospital; UMC: university medical centre; Private: private hospital.

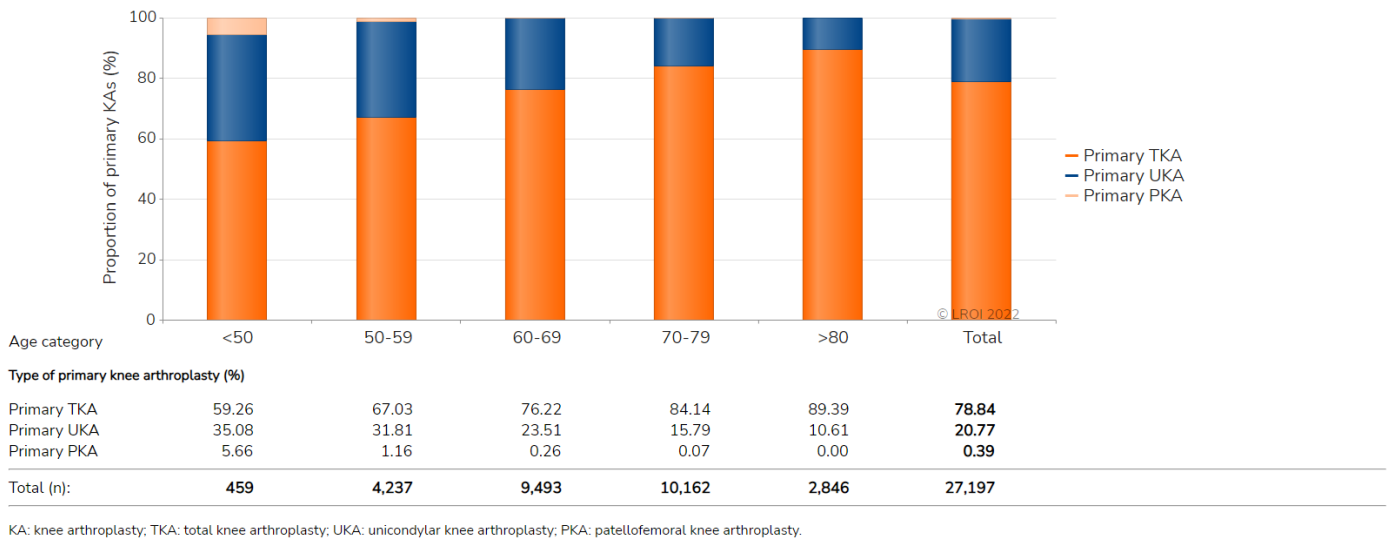
Type of primary knee prosthesis by type of hospital

FIGURE Type of hospital (proportion [%] per category) by type of primary knee arthroplasty in the Netherlands in 2021



Type of primary knee prosthesis by age category

FIGURE Type of primary knee arthroplasty (proportion [%] per category) of patients who underwent a primary knee arthroplasty by age category in the Netherlands in 2021



Patient characteristics

By type of knee prosthesis

TABLE Patient characteristics of all patients with a registered primary knee arthroplasty by type of knee arthroplasty in the Netherlands in 2021

	TKA	UKA	PFA	Total ¹
N (%)	21,444 (78)	5,648 (20)	107 (0)	27,217
Mean age (years) (SD)	69.3 (8.9)	65.4 (8.8)	54.6 (9.0)	68.4 (9.0)
Age (years) (%)				
<50	1	3	24	2
50-59	13	24	46	16
60-69	34	40	23	35
70-79	40	28	7	37
≥80	12	5	0	10
Gender (%)				
Men	38	46	29	39
Women	62	54	71	61
ASA score (%)				
I	10	16	30	12
II	65	69	58	64
III-IV	25	15	12	23
Type of hospital (%)				
General	76	66	74	74
UMC	1	1	3	1
Private	23	33	23	25
Diagnosis (%)				
Osteoarthritis	96	99	94	97
Post-traumatic	2	0	5	1
Rheumatoid arthritis	1	0	1	1
Osteonecrosis	1	1	0	1
Other	0	0	0	0
Charnley-score (%)				
A One knee joint affected	38	47	47	40
B1 Both knee joints affected	34	33	29	34
B2 Contralateral knee joint with a total knee prosthesis	24	18	19	23
C Multiple joints affected or chronic disease that affects quality of life	4	2	5	3
Mean Body Mass Index (kg/m²) (SD)	29.4 (4.9)	28.9 (4.4)	28.3 (4.7)	29.3 (4.8)
Body Mass Index (kg/m²) (%)				
Underweight (≤18,5)	0	0	2	0
Normal weight (>18,5-25)	19	20	26	19
Overweight (>25-30)	42	44	37	42
Obesity (>30-40)	36	34	34	36
Morbid obesity (>40)	3	1	1	3
Smoking (%)				
No	93	93	90	93
Yes	7	7	10	7

¹ Also contains 18 (0.1%) primary knee arthroplasties of which the type of prosthesis was not registered.

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

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By diagnosis

TABLE Patient characteristics of all patients with a registered primary knee arthroplasty by type of diagnosis in the Netherlands in 2021

	Osteoarthritis 26,187 (96)	Post-traumatic 359 (1)	Rheumatoid arthritis 258 (1)	Osteonecrosis 141 (1)	Total ¹ 27,217
N (%)					
Mean age (years) (SD)	68.5 (8.9)	62.8 (10.8)	65.3 (11.2)	69.0 (11.7)	68.4 (9.0)
Age (years) (%)					
<50	1	9	6	4	2
50-59	15	31	21	11	16
60-69	35	31	33	29	35
70-79	38	22	31	38	37
≥80	11	7	8	18	10
Gender (%)					
Men	39	46	25	35	39
Women	61	54	75	65	61
ASA score (%)					
I	12	17	3	7	12
II	65	65	67	58	64
III-IV	23	18	30	35	23
Type of hospital (%)					
General	74	69	74	74	74
UMC	1	8	5	5	1
Private	25	23	21	21	25
Charnley-score (%)					
A One knee joint affected	39	69	19	74	40
B1 Both knee joints affected	34	20	41	18	34
B2 Contralateral knee joint with a total knee prosthesis	23	7	14	7	23
C Multiple joints affected or chronic disease that affects quality of life	3	4	26	2	3
Mean Body Mass Index (kg/m²) (SD)	29.3 (4.8)	28.5 (4.6)	28.1 (4.8)	28.7 (4.6)	29.3 (4.8)
Body Mass Index (kg/m²) (%)					
Underweight (≤18,5)	0	0	1	1	0
Normal weight (>18,5-25)	19	25	28	23	19
Overweight (>25-30)	42	45	40	42	42
Obesity (>30-40)	36	28	29	33	36
Morbid obesity (>40)	3	3	2	1	3
Smoking (%)					
No	93	89	92	94	93
Yes	7	11	8	6	7

Please note: In 2021, 121 (0.4%) patients had a primary knee arthroplasty after a diagnosis that is not listed in the table. Of 151 (0.6%) primary knee arthroplasties the diagnosis was not registered. General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

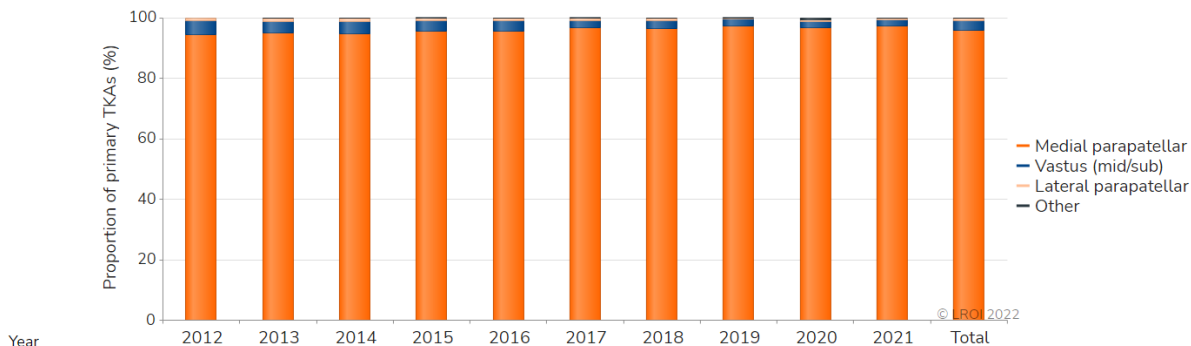
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Total knee arthroplasty

Surgical techniques

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary total knee arthroplasty in the Netherlands in 2012-2021

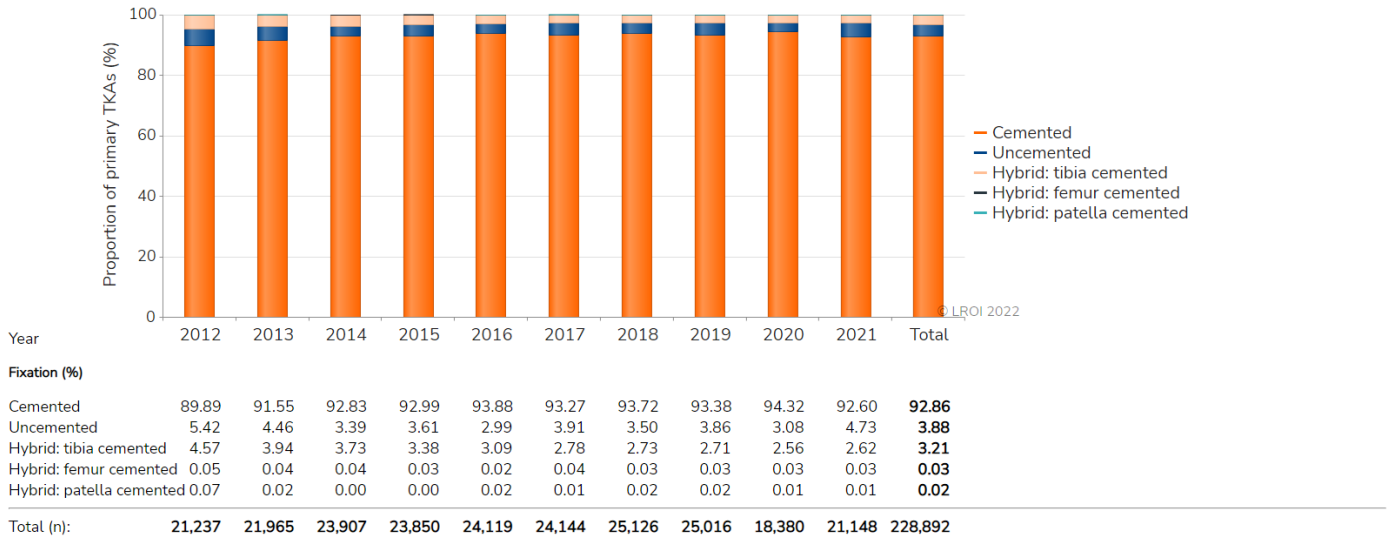


Surgical approach (%)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Medial parapatellar	94.28	95.08	94.67	95.60	95.45	96.79	96.49	97.31	96.67	97.14	95.95
Vastus (mid/sub)	4.65	3.71	4.17	3.40	3.59	2.18	2.57	2.15	2.06	2.11	3.06
Lateral parapatellar	1.07	1.05	0.96	0.96	0.88	0.91	0.84	0.48	0.52	0.59	0.83
Other	0.00	0.16	0.20	0.05	0.08	0.12	0.10	0.06	0.75	0.16	0.15
Total (n):	21,216	21,927	23,993	23,931	24,211	24,247	25,245	25,148	18,399	21,182	229,499

TKA: total knee arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary total knee arthroplasties in the Netherlands in 2012-2021

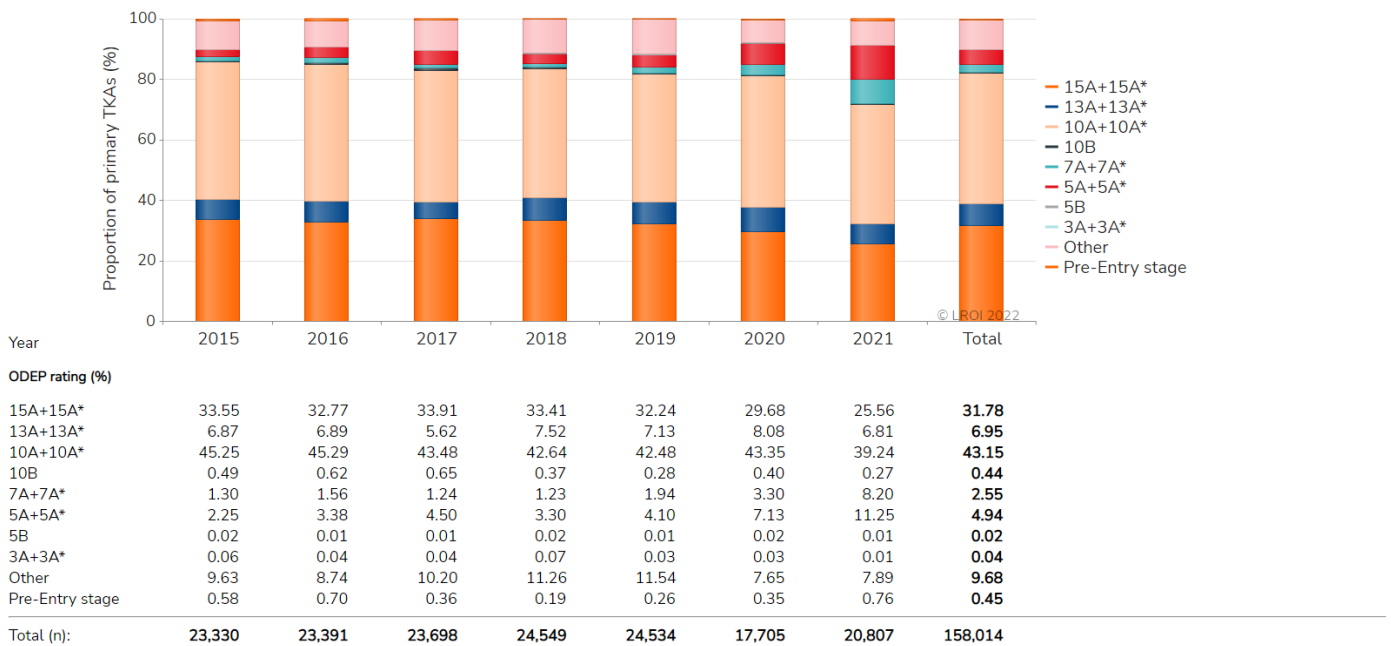


TKA: total knee arthroplasty.

Prosthesis characteristics

ODEP rating

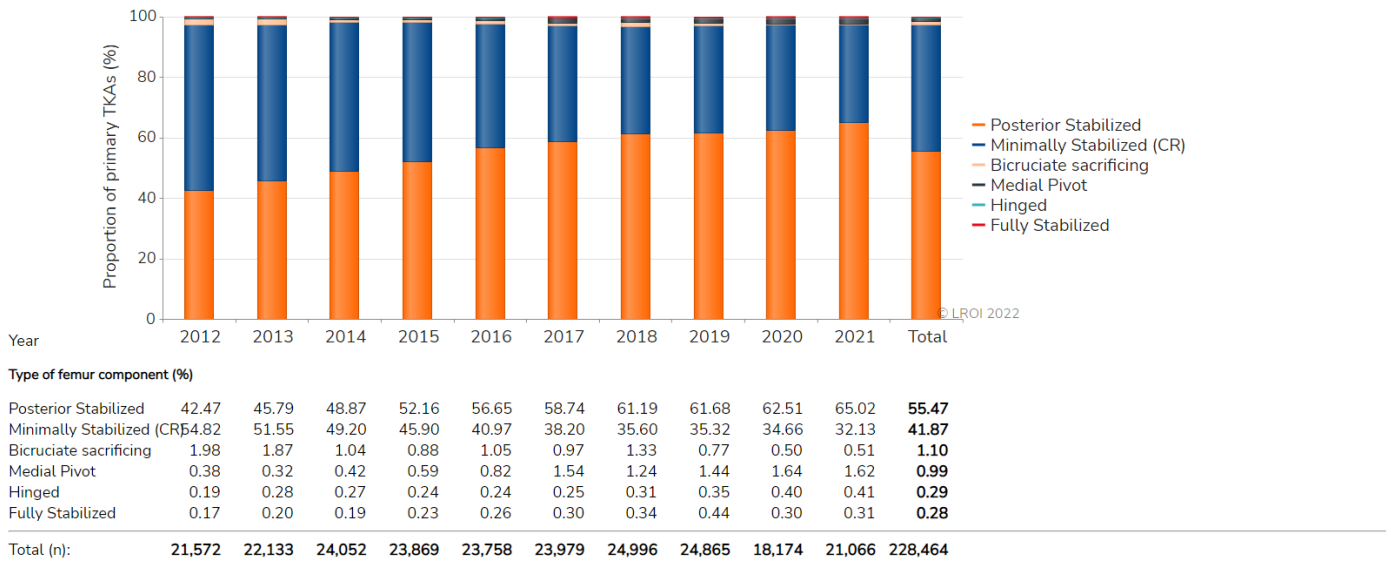
FIGURE Trend (proportion [%] per year) in ODEP rating in primary total knee arthroplasties in the Netherlands in 2015-2021



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

Type of femur component

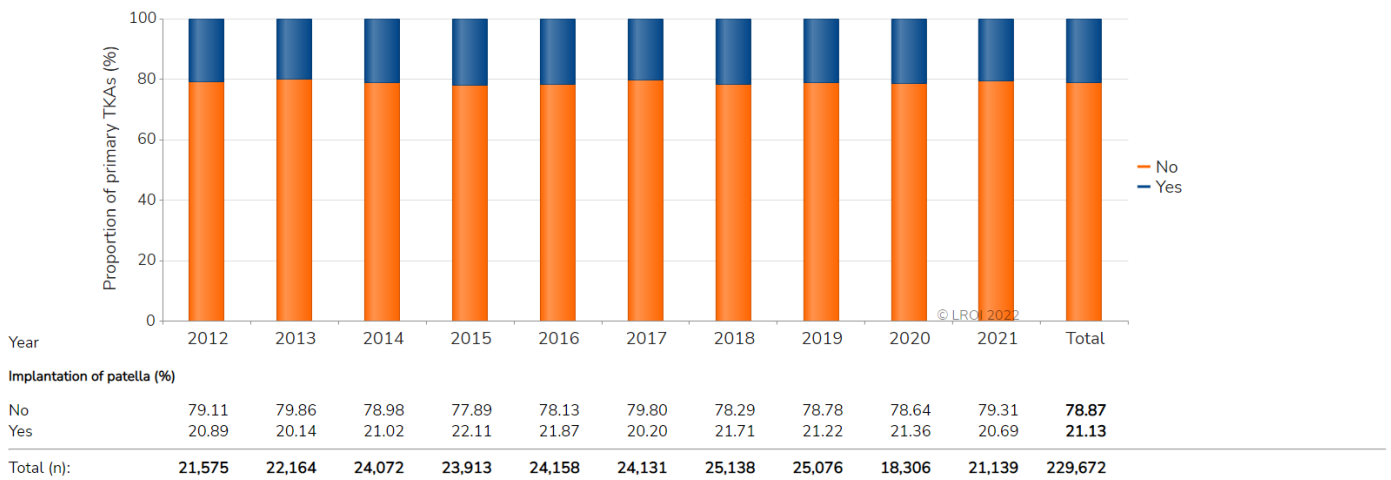
FIGURE Trend (proportion [%] per year) in type of femur component in primary total knee arthroplasties in the Netherlands in 2012-2021



TKA: total knee arthroplasty.

Implantation of patella

FIGURE Trend (proportion [%] per year) in implantation of patella in primary total knee arthroplasties in the Netherlands in 2012-2021

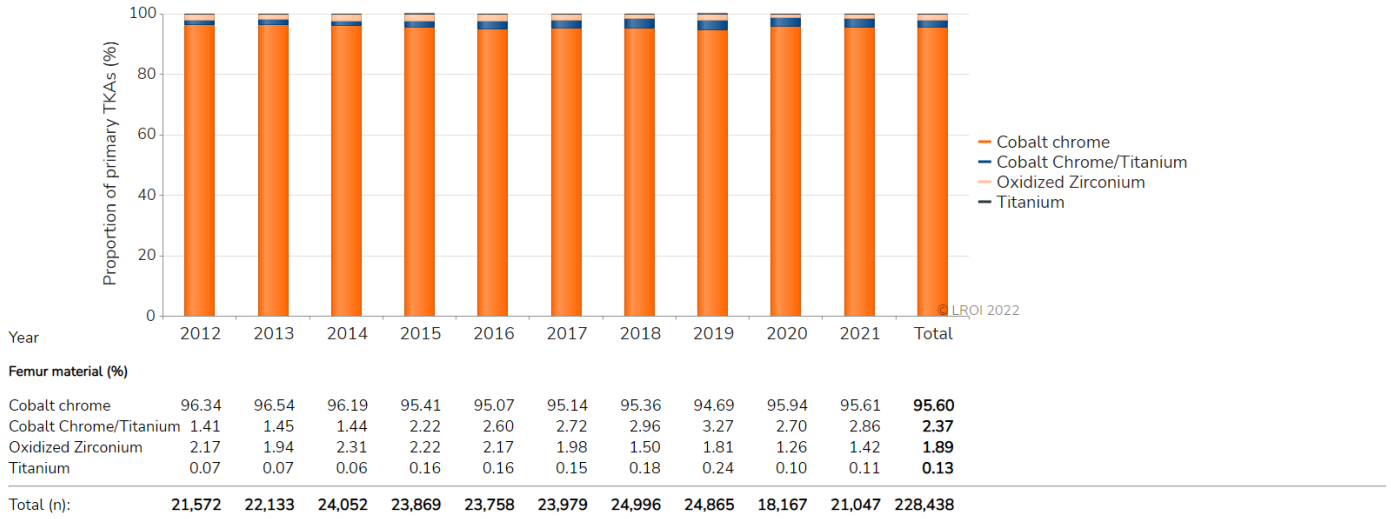


TKA: total knee arthroplasty.

Materials

Femur component

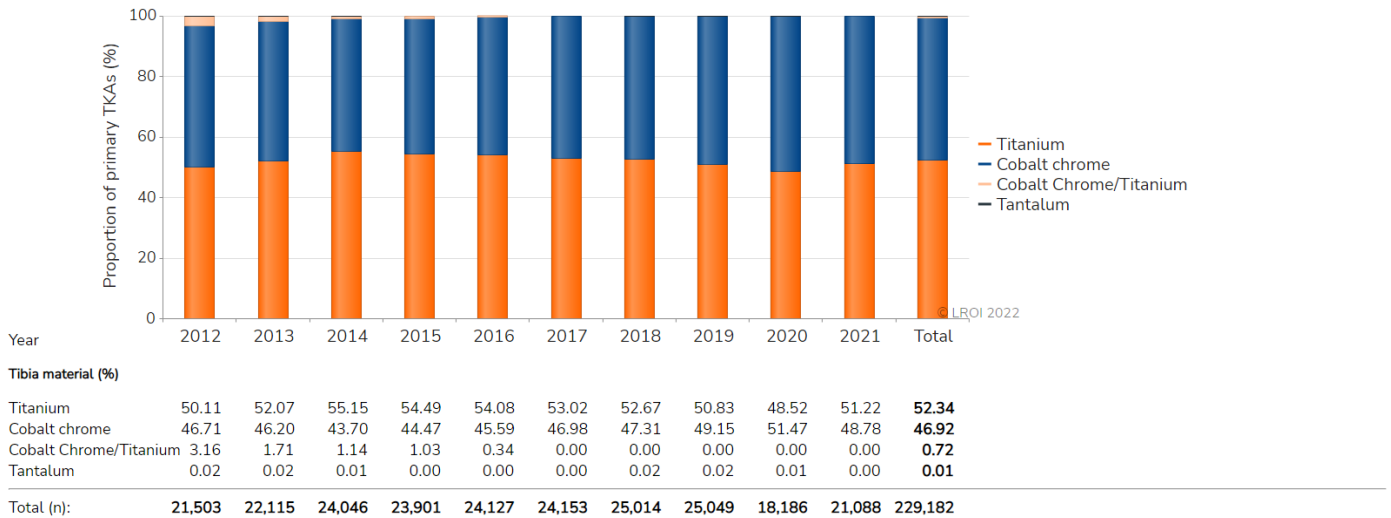
FIGURE Trend (proportion [%] per year) in femur material in primary total knee arthroplasties in the Netherlands in 2012-2021



TKA: total knee arthroplasty.

Tibia component

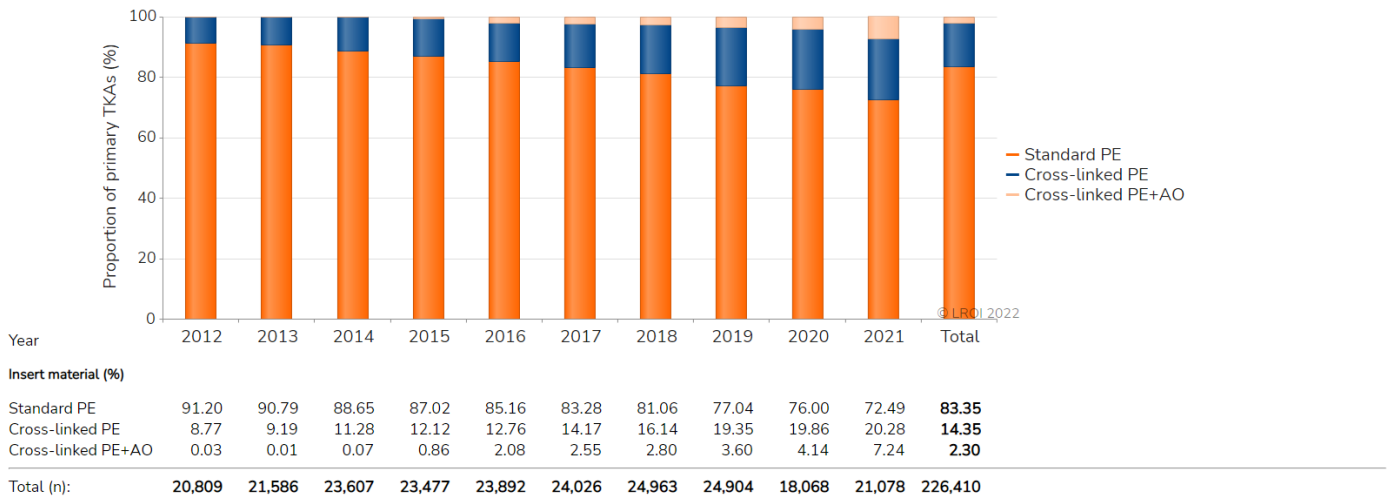
FIGURE Trend (proportion [%] per year) in tibia material in primary total knee arthroplasties in the Netherlands in 2012-2021



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

Insert

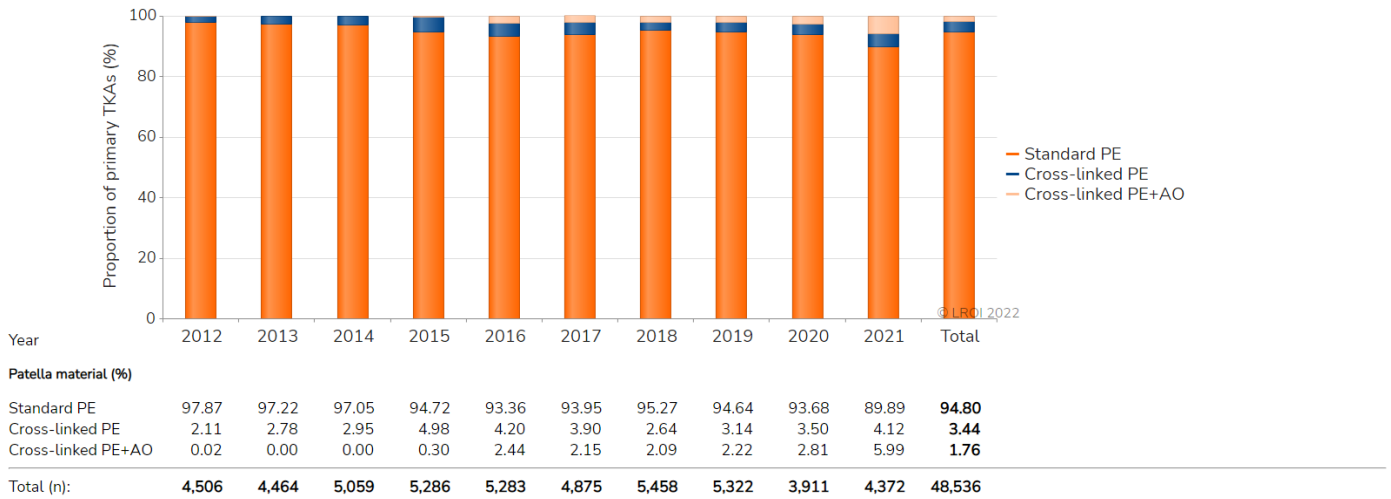
FIGURE Trend (proportion [%] per year) in insert material in primary total knee arthroplasties in the Netherlands in 2012-2021



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

Patella component

FIGURE Trend (proportion [%] per year) in patella material in primary total knee arthroplasties in the Netherlands in 2012-2021

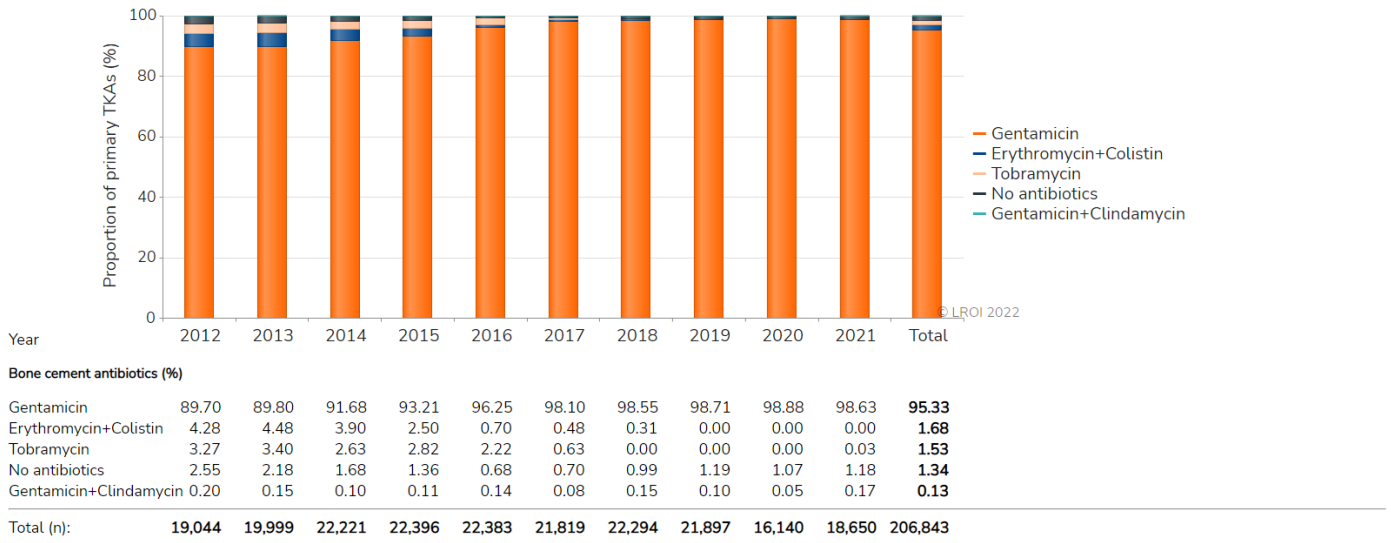


TKA: total knee arthroplasty; PE: polyethylene; AO: antioxidant.

Bone cement

Antibiotics

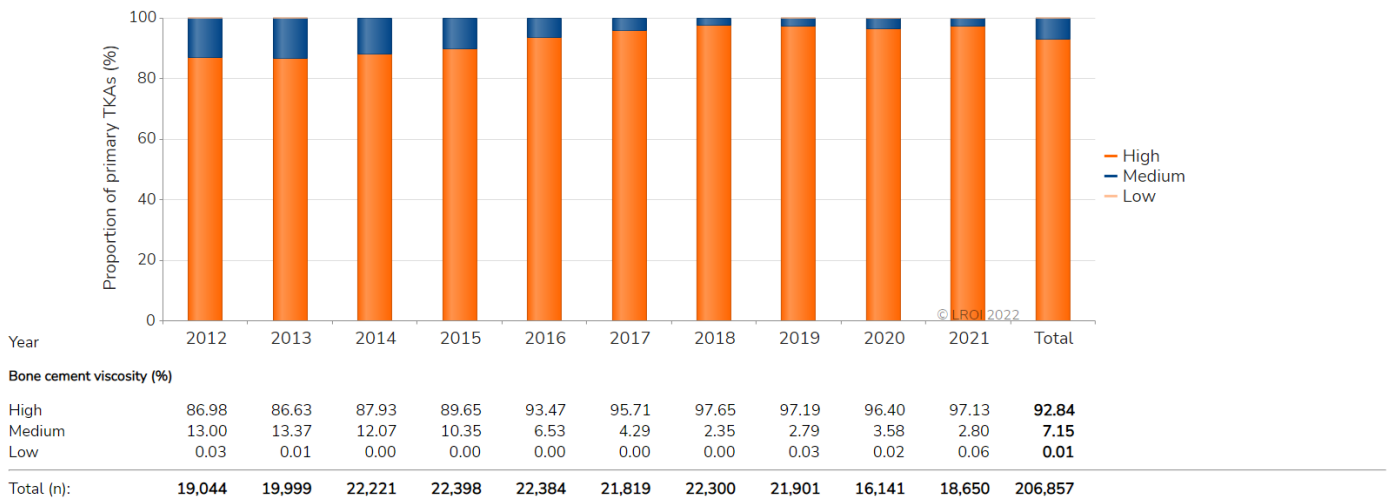
FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in primary total knee arthroplasties in the Netherlands in 2012-2021



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

Viscosity

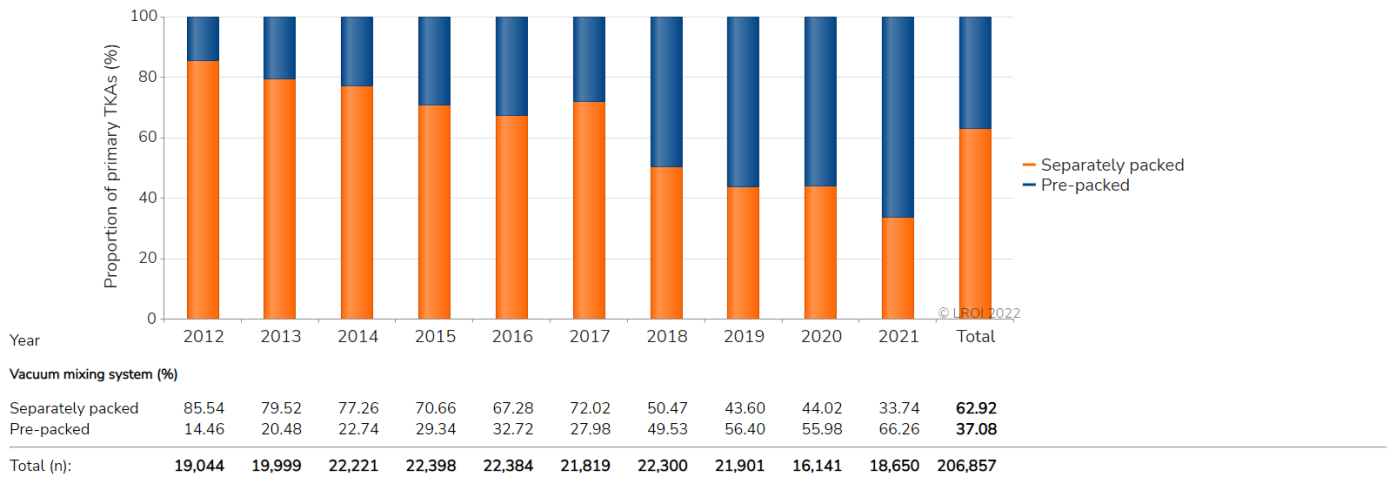
FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary total knee arthroplasties in the Netherlands in 2012-2021



TKA: total knee arthroplasty.

Vacuum mixing system

FIGURE Trend (proportion [%] per year) in use of bone cement pre-packed in a vacuum mixing system in primary total knee arthroplasties in the Netherlands in 2012-2021



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

Most frequently registered

Total knee prostheses

TABLE The most frequently registered primary total knee arthroplasties in the Netherlands in 2021 (n=21,066)

Name	Proportion (%)
Genesis II	21.3
Vanguard Complete Knee	19.0
NexGen	17.4
Triathlon	9.6
Persona	9.5

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Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during primary total knee arthroplasties in the Netherlands in 2021

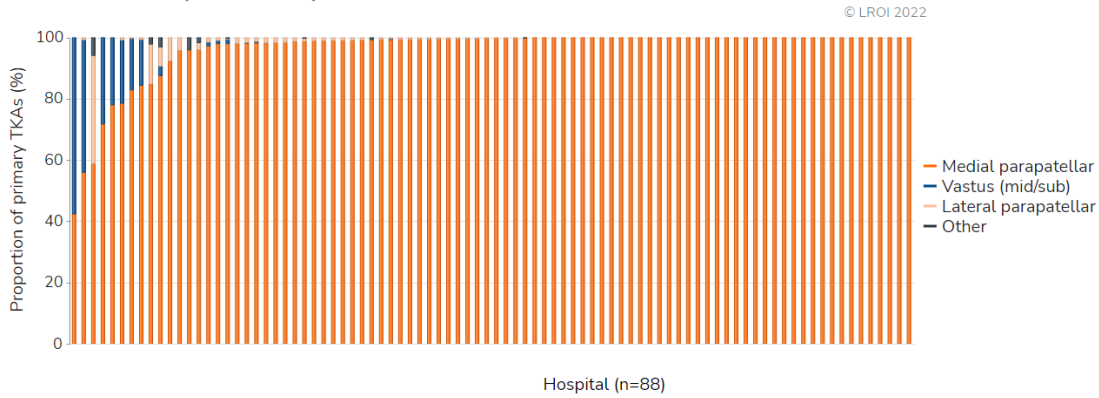
Separately packed bone cement components (n=6,274)		Bone cement pre-packed in a vacuum mixing system (n=12,304)	
Name	Proportion (%)	Name	Proportion (%)
Palacos R+G	81.7	Palacos R+G	49.1
Refobacin Bone Cement R	5.8	Refobacin Bone Cement R	45.3
Subiton G	5.8	Refobacin Plus Bone Cement	5.6
Biomet Bone Cement R	3.5	Cemex Genta	0.1
Palacos MV+G	2.4		

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Practice variation

Surgical approach

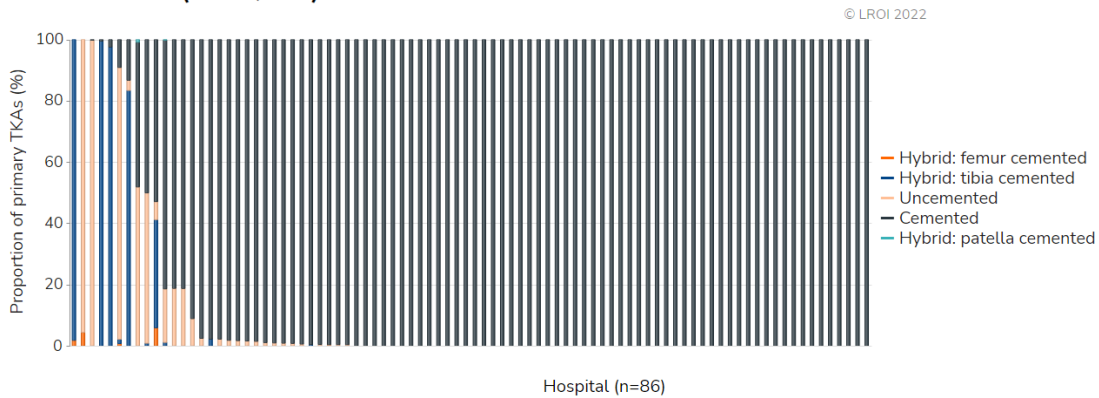
FIGURE Distribution of surgical approach used during primary total knee arthroplasties per hospital in the Netherlands in 2021 (n=21,175)



TKA: total knee arthroplasty.

Fixation

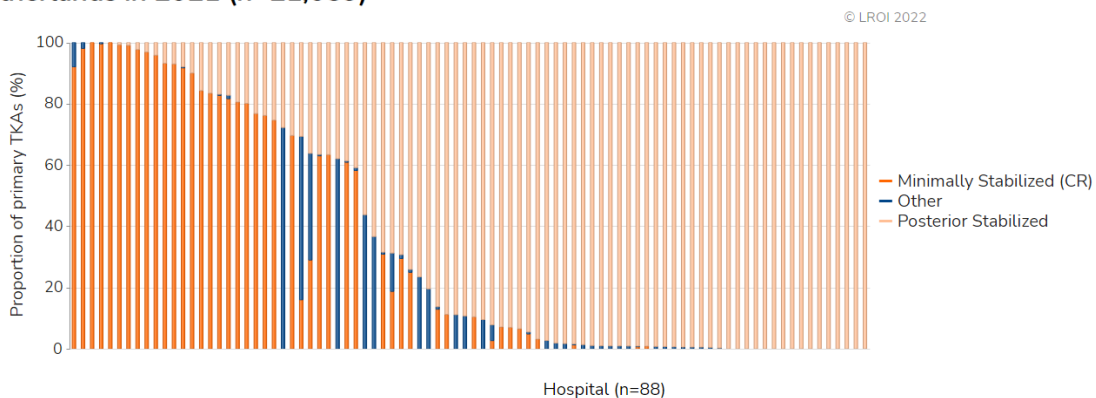
FIGURE Distribution of type of fixation used during primary total knee arthroplasties per hospital in the Netherlands in 2021 (n=21,141)



TKA: total knee arthroplasty.

Type of femur component

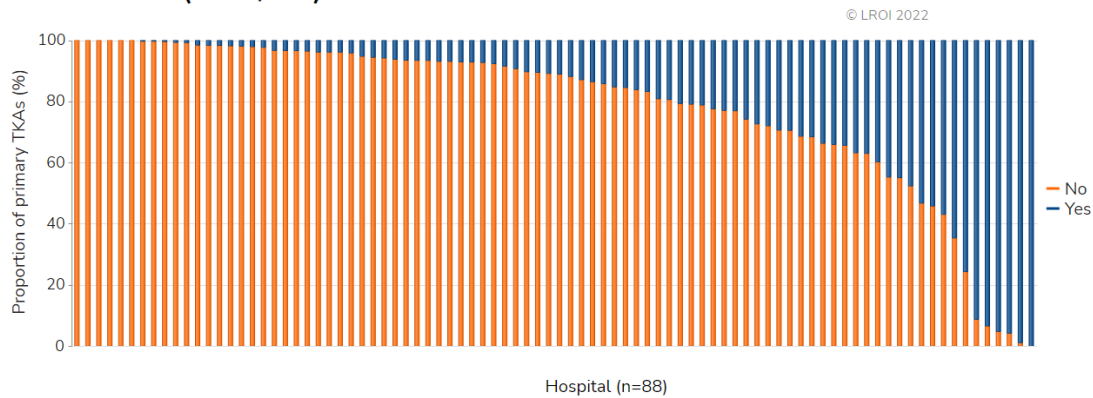
FIGURE Distribution of type of femur component used during primary total knee arthroplasties per hospital in the Netherlands in 2021 (n=21,059)



TKA: total knee arthroplasty.

Implantation of patella

FIGURE Distribution of implantation of patella during primary total knee arthroplasties per hospital in the Netherlands in 2021 (n=21,132)



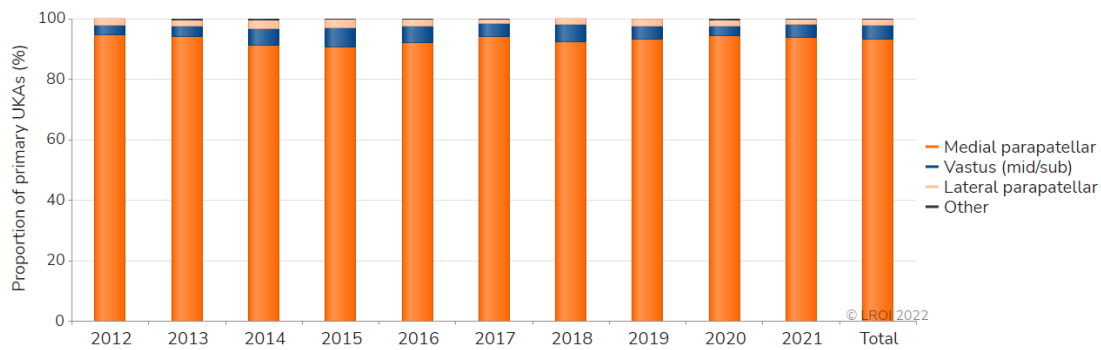
TKA: total knee arthroplasty.

Unicondylar knee arthroplasty

Surgical techniques

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary unicondylar knee arthroplasty in the Netherlands in 2012-2021



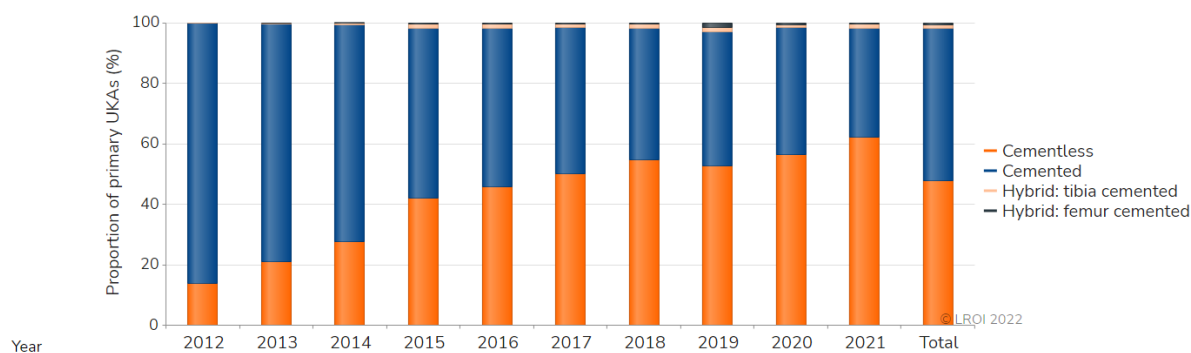
Surgical approach (%)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Medial parapatellar	94.63	94.12	91.10	90.60	92.03	94.05	92.50	93.20	94.31	93.77	93.10
Vastus (mid/sub)	3.15	3.51	5.53	6.33	5.56	4.48	5.71	4.38	3.26	4.31	4.63
Lateral parapatellar	2.23	1.96	3.07	2.95	2.16	1.25	1.80	2.42	2.02	1.86	2.11
Other	0.00	0.40	0.30	0.12	0.25	0.21	0.00	0.00	0.41	0.05	0.16
Total (n):	1,526	1,736	2,314	2,607	2,822	3,278	3,785	4,500	4,168	5,472	32,208

UKA: unicondylar knee arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary unicondylar knee arthroplasties in the Netherlands in 2012-2021



Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Fixation (%)											
Cementless	13.81	21.08	27.76	42.03	45.89	49.95	54.57	52.79	56.29	62.08	47.87
Cemented	85.93	78.35	71.38	55.98	52.12	48.37	43.55	44.27	42.03	35.93	50.33
Hybrid: tibia cemented	0.26	0.39	0.65	1.68	1.56	1.31	1.37	1.36	1.06	1.42	1.21
Hybrid: femur cemented	0.00	0.17	0.22	0.31	0.42	0.37	0.50	1.58	0.62	0.56	0.58
Total (n):	1,535	1,774	2,320	2,617	2,824	3,273	3,782	4,484	4,168	5,499	32,276

UKA: unicondylar knee arthroplasty.

Most frequently registered

Unicondylar knee prostheses

TABLE The most frequently registered primary unicondylar knee arthroplasties in the Netherlands in 2021 (n=5,456)

Name	Proportion (%)
Oxford PKR cementless	65.7
Physica Zimmer Unicompartmental High Flex Knee	16.6
Oxford PKR cemented	14.0
Restoris MCK	1.5
BalanSys Uni	1.4

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Types of bone cement

TABLE The most frequently registered types of bone cement by type of mixing system used during primary unicondylar knee arthroplasties in the Netherlands in 2021

Separately packed bone cement components (n=949)		Bone cement pre-packed in a vacuum mixing system (n=923)	
Name	Proportion (%)	Name	Proportion (%)
Palacos R+G	78.5	Palacos R+G	63.9
Palacos MV+G	7.9	Refobacin Bone Cement R	34.6
Biomet Bone Cement R	7.5	Refobacin Plus Bone Cement	1.5
Refobacin Bone Cement R	2.7		
Subiton G	2.5		

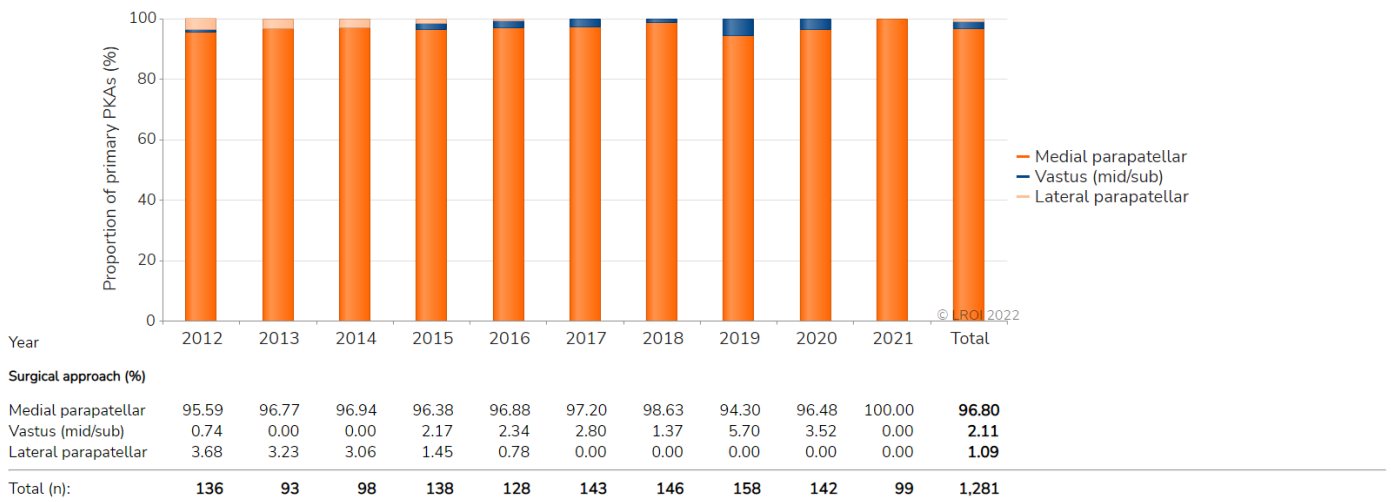
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Patellofemoral knee arthroplasty

Surgical techniques

Surgical approach

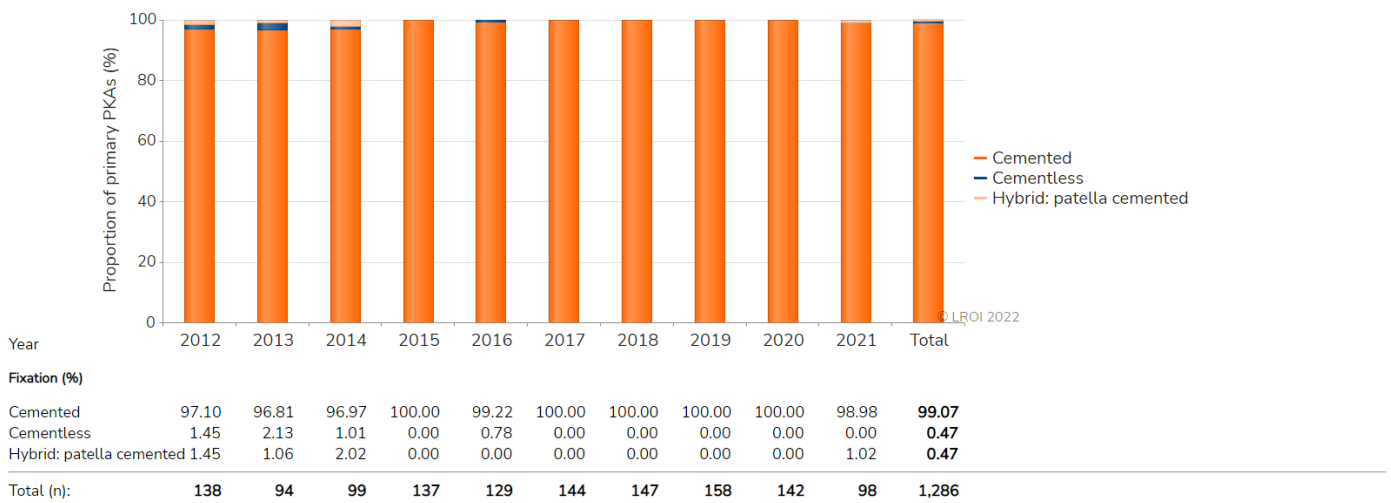
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary patellofemoral knee arthroplasty in the Netherlands in 2012-2021



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

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary patellofemoral knee arthroplasties in the Netherlands in 2012-2021



PKA: patellofemoral knee arthroplasty.

Most frequently registered

Patellofemoral knee prostheses

TABLE The most frequently registered primary patellofemoral knee arthroplasties in the Netherlands in 2021 (n=99)

Name	Proportion (%)
Gender Solutions® Patello-Femoral Joint	50.5
Journey PFJ	25.3
Avon	20.2
PFR implant	2.0
Restoris MCK	2.0

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Types of bone cement

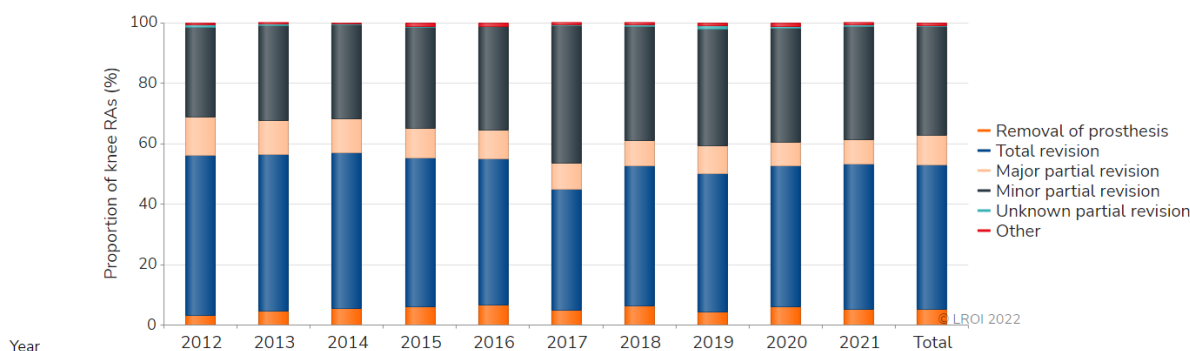
TABLE The most frequently registered types of bone cement used during primary patellofemoral knee arthroplasties in the Netherlands in 2021 (n=89)

Name	Proportion (%)
Palacos R+G	83.2
Refobacin Bone Cement R	11.2
Refobacin Plus Bone Cement	4.4
Subiton G	1.1

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Knee revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in knee revision arthroplasties in the Netherlands in 2012-2021

Type of revision (%)

Removal of prosthesis	3.23	4.52	5.37	6.16	6.67	4.80	6.20	4.40	5.98	5.26	5.31
Total revision	52.82	51.95	51.64	49.03	48.43	39.95	46.46	45.55	46.55	48.07	47.73
Major partial revision	12.78	11.16	11.09	9.93	9.46	8.81	8.46	9.29	8.03	7.95	9.58
Minor partial revision	29.57	31.49	31.19	33.23	34.02	45.39	37.52	38.63	37.56	37.44	35.96
Unknown partial revision	1.01	0.31	0.20	0.26	0.21	0.24	0.65	1.13	0.64	0.43	0.51
Other	0.58	0.58	0.51	1.38	1.20	0.82	0.72	1.00	1.24	0.86	0.90
Total (n):	2,073	2,258	2,533	2,678	2,907	2,939	2,921	3,091	2,492	2,567	26,459

RA: revision arthroplasty.

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

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

Unknown partial revision: partial revision of which the revised components were unknown.

in 2021, the femur component was revised in 83 (40.7%) major partial knee revision arthroplasties and the tibia component was revised in 112 (54.9%) major partial knee revision arthroplasties.

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a knee revision arthroplasty in the Netherlands in 2014-2021

Year	2014	2015	2016	2017	2018	2019	2020	2021	Total
Knee revision arthroplasty (n)	2,557	2,686	2,926	2,997	2,931	3,101	2,496	2,573	22,267
Reasons for revision; Proportion¹ (%)									
Instability	25.3	26.4	25.1	27.7	25.8	27.4	26.2	26.4	26.3
Loosening of tibia component	22.3	20.6	21.9	20.9	19.5	20.7	19.5	19.2	20.6
Patellar pain	22.9	23.1	21.5	19.7	18.9	20.2	18.7	17.8	20.3
Infection	14.7	16.5	19.6	20.3	20.8	20.2	23.7	21.9	19.7
Malalignment	15.7	14.7	13.9	11.3	10.7	10.2	10.6	11.1	12.2
Loosening of femur component	10.0	9.5	9.0	8.9	8.4	8.6	8.0	8.9	8.9
Progression of osteoarthritis	9.1	8.3	9.3	8.2	8.7	8.0	7.6	8.8	8.5
Insert wear	8.4	7.8	7.6	6.8	6.6	7.1	7.0	7.8	7.4
Revision after knee removal	6.9	5.7	6.3	5.6	4.9	4.2	5.1	4.3	5.3
Arthrofibrosis	4.7	5.1	4.3	4.9	4.6	5.3	3.9	4.4	4.7
Patellar dislocation	2.5	2.8	2.1	2.4	2.2	2.5	2.8	2.2	2.4
Periprosthetic fracture	2.2	2.3	1.7	1.8	1.5	1.9	2.6	2.6	2.1
Loosening of patella component	2.0	1.5	1.9	1.8	1.4	1.7	1.8	1.8	1.7
Other	8.1	8.6	8.3	7.4	7.8	7.8	7.5	8.7	8.0

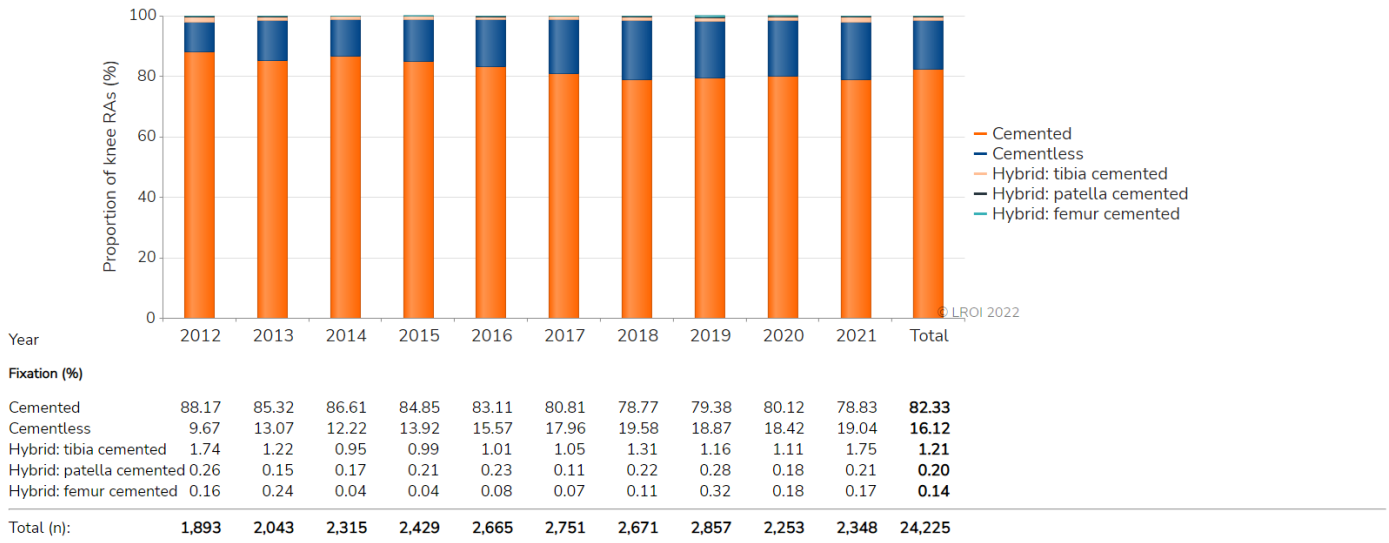
¹ One patient may have more than one reason for revision. As such, the total proportion is over 100%.

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Surgical techniques

Fixation

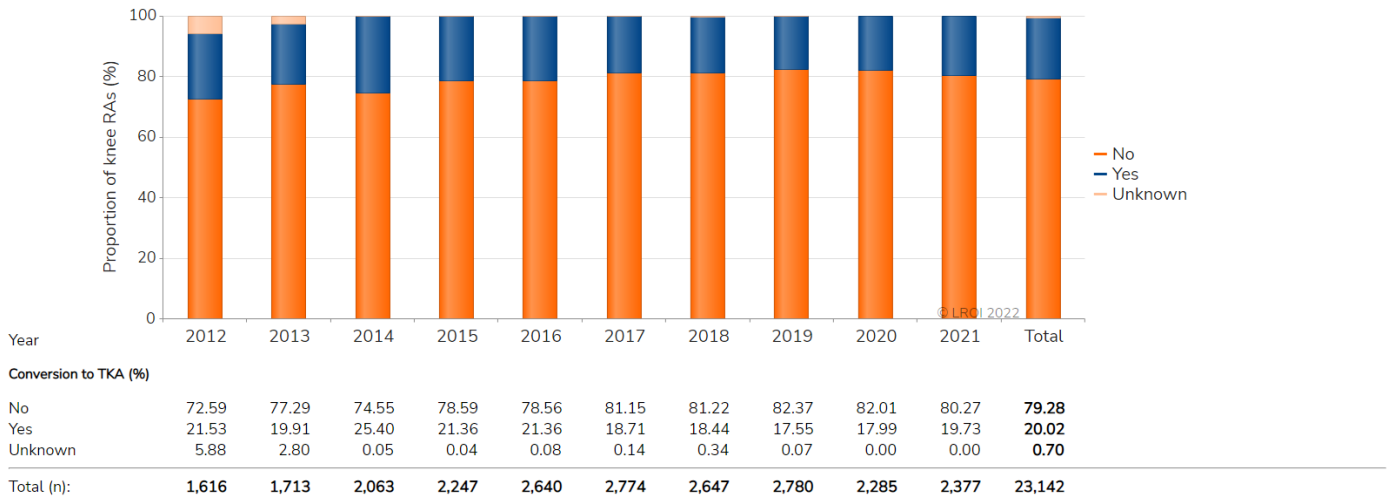
FIGURE Trend (proportion [%] per year) in type of fixation in knee revision arthroplasties in the Netherlands in 2012-2021



RA: revision arthroplasty.

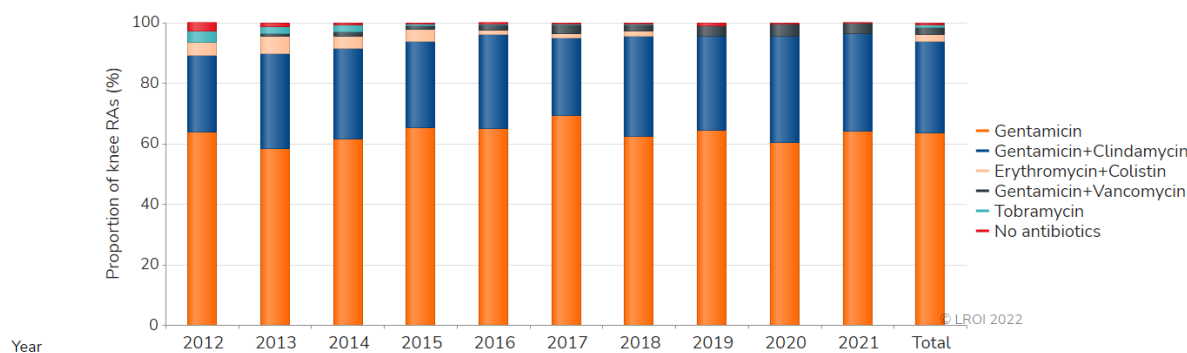
Conversion to TKA

FIGURE Trend (proportion [%] per year) in conversion of a unicondylar or patellofemoral knee arthroplasty to a total knee arthroplasty in the Netherlands in 2012-2021



RA: revision arthroplasty; TKA: total knee arthroplasty.

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in knee revision arthroplasties in the Netherlands in 2012-2021

Bone cement antibiotics (%)

Gentamicin	63.90	58.51	61.63	65.24	65.04	69.28	62.39	64.53	60.51	64.27	63.66
Gentamicin+Clindamycin	25.38	31.25	29.78	28.56	31.11	25.57	33.05	31.00	35.10	32.08	30.25
Erythromycin+Colistin	4.25	5.65	4.06	4.18	1.32	1.54	1.77	0.00	0.00	0.00	2.26
Gentamicin+Vancomycin	0.13	1.01	1.60	1.03	1.71	3.02	2.20	3.56	3.93	3.42	2.16
Tobramycin	3.49	2.32	2.08	0.67	0.34	0.05	0.05	0.00	0.00	0.00	0.86
No antibiotics	2.86	1.25	0.85	0.31	0.49	0.53	0.54	0.91	0.46	0.24	0.81

Total (n):	1,576	1,680	1,874	1,936	2,051	1,885	1,861	1,968	1,527	1,696	18,054
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RA: revision arthroplasty.

Most frequently registered

Components

TABLE The most frequently registered femur, tibia, insert and patella components in knee revision arthroplasties in the Netherlands in 2021

Femur (n=1,147)		Tibia (n=1,234)	
Name	Proportion (%)	Name	Proportion (%)
Legion	20.1	Legion	20.4
NexGen	18.6	NexGen	15.6
Triathlon	8.4	Triathlon	9.0
Vanguard Complete Knee	7.9	S-ROM	7.6
Genesis II	7.6	Vanguard 360	7.4
Vanguard 360	6.0	RT Plus	5.8
PFC / SIGMA	5.6	Vanguard Complete Knee	5.4
Attune	4.2	Genesis II	4.9
RT Plus	4.0	Attune	4.9
Legion Hinged	3.5	Legion Hinged	3.3

Insert (n=1,947)		Patella (n=936)	
Name	Proportion (%)	Name	Proportion (%)
Genesis II	24.7	Genesis II	45.2
NexGen	14.2	Vanguard	15.1
Vanguard Complete Knee	8.5	NexGen	12.0
Triathlon	7.9	Triathlon	7.6
Oxford PKR	5.9	PFC / SIGMA	6.1
PFC / SIGMA	5.6	Attune	3.9
Legion	4.6	balanSys	2.8
Vanguard SSK	4.0	LCS	2.1
RT Plus	3.5	Persona	2.1
Attune	3.0	ACS	0.8

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*Types of bone cement***TABLE** The most frequently registered types of bone cement by type of mixing system used during knee revision arthroplasties in the Netherlands in 2021

Separately packed bone cement components (n=1,000)		Bone cement pre-packed in a vacuum mixing system (n=667)	
Name	Proportion (%)	Name	Proportion (%)
Copal G+C	39.2	Palacos R+G	48.7
Palacos R+G	34.0	Refobacin Bone Cement R	40.9
Refobacin Revision	12.4	Refobacin Plus Bone Cement	8.1
Copal G+V	5.2	Refobacin Revision	2.1
Subiton G	4.7		

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Survival total knee arthroplasty**Revision within 1 and 3 years***By type of revision within 1 year***TABLE** Cumulative 1-year revision percentage of primary total knee arthroplasties by type of revision in the Netherlands in 2016-2020 (n=116,961)

	Cumulative 1-year revision percentage	
	Competing Risk (95% CI)	Kaplan Meier (95% CI)
Any type of revision ¹	1.2 (1.1-1.2)	1.2 (1.1-1.2)
Major revision ²	0.3 (0.3-0.4)	0.3 (0.3-0.4)
Only femur	0.0 (0.0-0.1)	0.0 (0.0-0.1)
Only tibia	0.1 (0.1-0.1)	0.1 (0.1-0.1)
Femur and tibia	0.2 (0.2-0.2)	0.2 (0.2-0.2)
Minor revision ³	0.8 (0.8-0.9)	0.8 (0.8-0.9)
DAIR	0.5 (0.4-0.5)	0.5 (0.4-0.5)
No DAIR	0.3 (0.2-0.3)	0.3 (0.2-0.3)
Patella addition	0.1 (0.1-0.1)	0.1 (0.1-0.1)

¹ Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.² Revision of at least the femur or tibia component.³ Only insert and/or patella exchange (including DAIR procedures).

TKA: total knee arthroplasty; CI: confidence interval.

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In 2016-2020, 846 (0.7%) primary TKAs were implanted in patients who died within one year after the primary procedure.*By type of revision within 3 year***TABLE** Cumulative 3-year revision percentage of primary total knee arthroplasties by type of revision in the Netherlands in 2014-2018 (n=121,487)

	Cumulative 3-year revision percentage	
	Competing Risk (95% CI)	Kaplan Meier (95% CI)
Any type of revision ¹	3.4 (3.3-3.5)	3.5 (3.4-3.6)
Major revision ²	1.5 (1.4-1.5)	1.5 (1.4-1.5)
Only femur	0.2 (0.1-0.2)	0.2 (0.1-0.2)
Only tibia	0.3 (0.3-0.3)	0.3 (0.3-0.3)
Femur and tibia	1.0 (0.9-1.1)	1.0 (1.0-1.1)
Minor revision ³	1.9 (1.8-2.0)	1.9 (1.9-2.0)
DAIR	0.5 (0.4-0.5)	0.5 (0.4-0.5)
No DAIR	0.8 (0.8-0.9)	0.8 (0.8-0.9)
Patella addition	0.6 (0.6-0.7)	0.6 (0.6-0.7)

¹ Any type of revision includes minor and major revisions as well as revision procedures that could not be classified as minor or major revision.² Revision of at least the acetabulum or femur component.³ Only insert and/or patella exchange (including DAIR procedures).

TKA: total knee arthroplasty; CI: confidence interval.

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In 2014-2018, 3,781 (3.1%) primary TKAs were implanted in patients who died within three years after the primary procedure.

First major or minor revision

TABLE Cumulative 3-year first revision percentage of primary total knee arthroplasties by type of first major or first minor revision in the Netherlands in 2014-2018 (n=121,487)

	Cumulative 3-year first revision percentage	
	Competing Risk (95% CI)	Kaplan Meier (95% CI)
First major revision ¹	1.6 (1.5-1.7)	1.6 (1.5-1.7)
Femur	1.3 (1.2-1.4)	1.3 (1.3-1.4)
Tibia	1.4 (1.4-1.5)	1.5 (1.4-1.5)
First minor revision ²	1.9 (1.8-2.0)	1.9 (1.9-2.0)
Insert	1.2 (1.2-1.3)	1.3 (1.2-1.3)
Patella	1.0 (0.9-1.0)	1.0 (0.9-1.0)

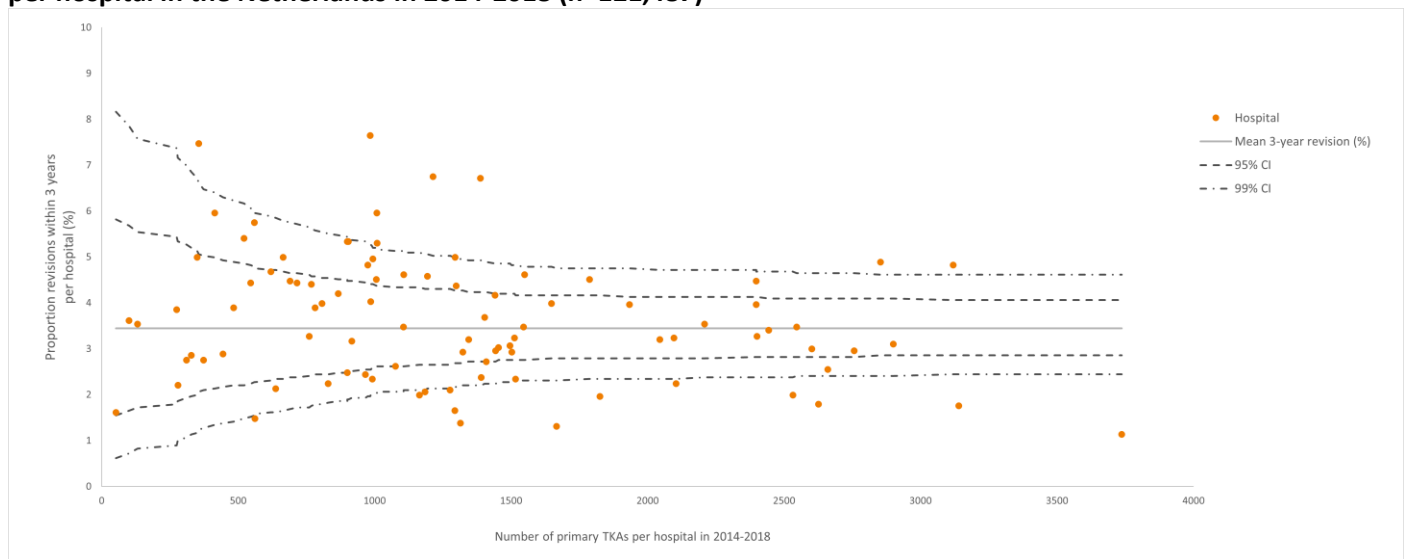
¹ First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefor, the first three revision procedures were reviewed.
² Only insert and/or patella exchange (including DAIR procedures).
 TKA: total knee arthroplasty; CI: confidence interval.

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In 2014-2018, 3,781 (3.1%) primary TKAs were implanted in patients who died within three years after the primary procedure.

Overall revision per hospital

FIGURE Funnel plot of proportion of knee revision arthroplasties within three years after a total knee arthroplasty per hospital in the Netherlands in 2014-2018 (n=121,487)



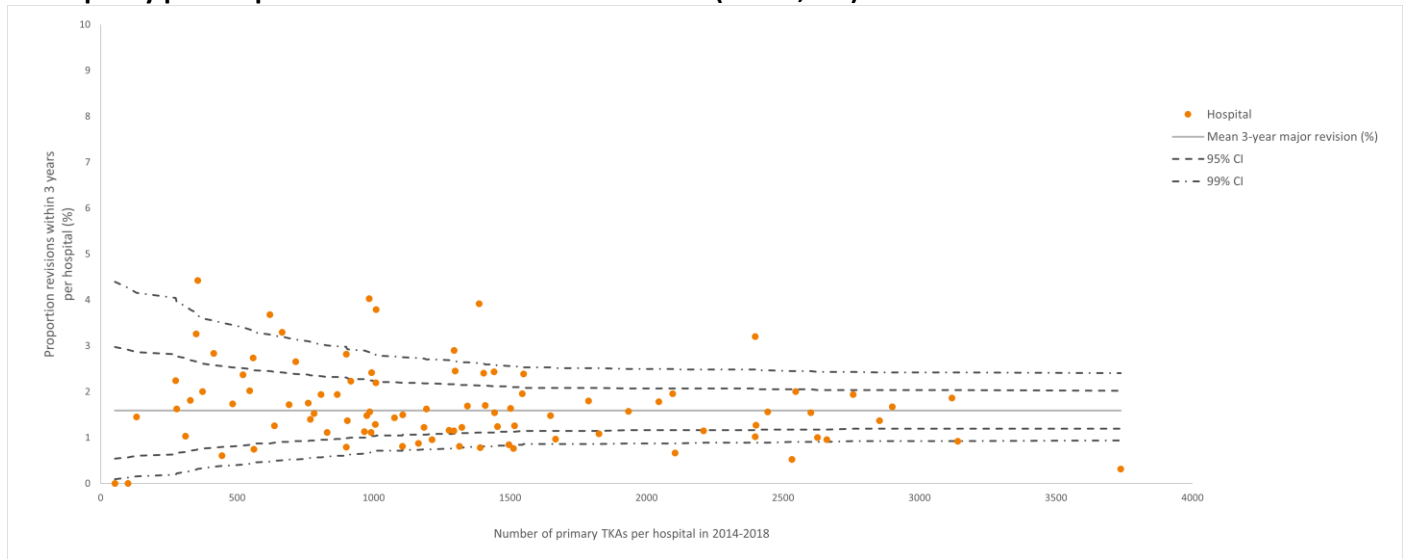
Please note: The proportion of revisions within 3 years per hospital were adjusted for casemix factors age, gender, ASA score and diagnosis (osteoarthritis versus other).

TKA: total knee arthroplasty; CI: confidence interval.

The mean 3-year revision percentage is 3.4 (95% CI: 3.3-3.5) in the Netherlands in 2014-2018. Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Major revision per hospital

FIGURE Funnel plot of proportion of knee major revision arthroplasties within three years after a total knee arthroplasty per hospital in the Netherlands in 2014-2018 (n=121,487)



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; CI: confidence interval.

The mean 3-year major revision percentage is 1.6 (95% CI: 1.6-1.7) in the Netherlands in 2014-2018. Control limits indicate the plausible range of outcome if all hospitals perform equally well.

Reasons for revision by type of revision

TABLE Reasons for revision within three years in patients that underwent a knee revision arthroplasty by type of revision in the Netherlands in 2014-2018

Reasons for revision	Major revision ¹ (n=1,934)	Minor revision ² (n=2,331)	Any type of revision ³ (n=4,184)
	Proportion ⁴ (%)	Proportion ⁴ (%)	Proportion ⁴ (%)
Patellar pain	8.6	44.2	29.1
Instability	32.2	26.7	27.1
Infection	20.9	24.5	21.5
Loosening of tibia component	33.8	0.6	15.4
Malalignment	26.7	1.6	12.6
Arthrofibrosis	8.8	6.8	7.8
Loosening of femur component	8.5	0.2	3.9
Patellar dislocation	3.2	4.1	3.5
Periprosthetic fracture	4.1	0.3	2.1
Revision after knee removal	4.0	0.3	1.6
Insert wear	0.7	1.9	1.4
Loosening of patella component	0.4	0.9	0.7
Progression of osteoarthritis	0.3	0.5	0.5
Other	6.8	8.8	8.2

¹ 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.

² Only insert and/or patella exchange (including DAIR procedures).

³ Any type of revision includes all first revisions, including revision procedures that could not be classified as minor or major revision.

⁴ ? One patient may have more than one reason for revision. As such, the total proportion is over 100%.

Time after primary TKA

TABLE Time after primary total knee arthroplasty until short-term revision in the Netherlands in 2014-2018 (n=121,487)

Time after primary TKA	Percentage revisions (%)
Day 0-29	0.3
Day 30-182	0.4
Day 183-364	0.5
Day 365-730 (second year)	1.5
Day 731-1095 (third year)	0.8

TKA: total knee arthroplasty.
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Mid- and long-term revision

TKA by type of revision

FIGURE Cumulative revision percentage of total knee arthroplasties by type of revision in the Netherlands in 2007-2021 (n=302,749)

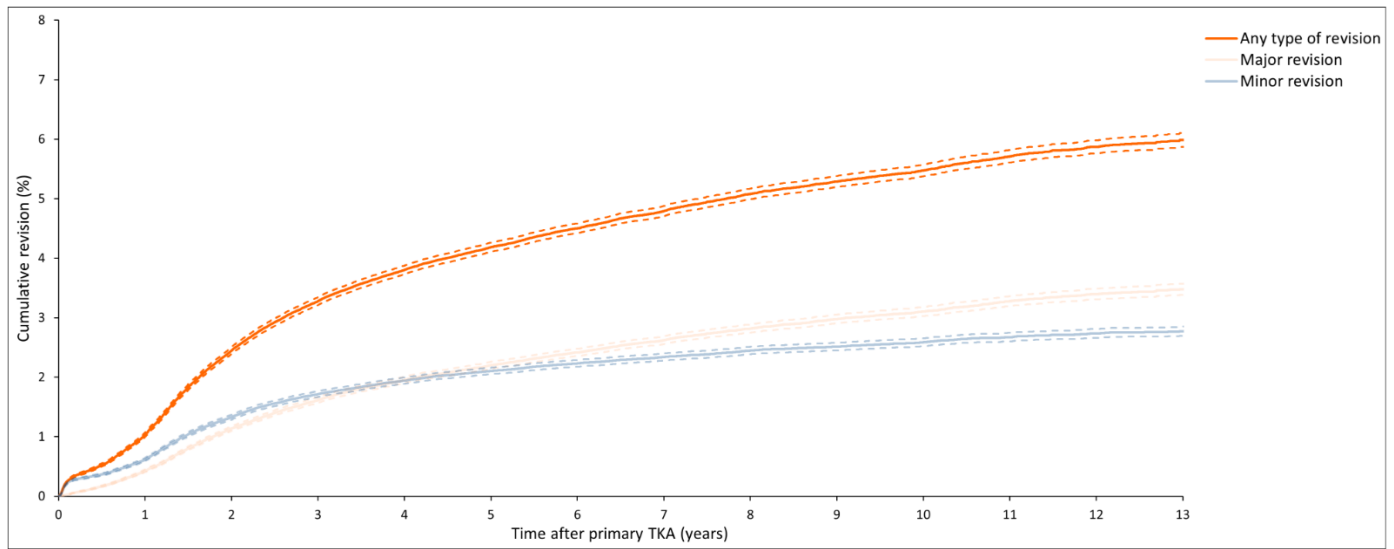


TABLE Cumulative revision percentages

	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Any type of revision			
1-year revision (%)	276,639	1.0 (1.0-1.1)	0.9 (0.9-1.0)
3-year revision (%)	223,100	3.3 (3.2-3.3)	3.3 (3.2-3.3)
5-year revision (%)	168,674	4.2 (4.1-4.3)	4.2 (4.2-4.3)
10-year revision (%)	55,403	5.5 (5.4-5.6)	5.7 (5.6-5.8)
13-year revision (%)	12,831	6.0 (5.9-6.1)	6.4 (6.3-6.6)
Major revision²			
1-year revision (%)	278,036	0.4 (0.4-0.5)	0.4 (0.3-0.4)
3-year revision (%)	226,805	1.6 (1.6-1.7)	1.6 (1.6-1.6)
5-year revision (%)	172,113	2.2 (2.1-2.3)	2.2 (2.2-2.3)
10-year revision (%)	56,845	3.1 (3.0-3.2)	3.3 (3.2-3.3)
13-year revision (%)	13,196	3.5 (3.4-3.6)	3.8 (3.7-3.9)
Minor revision³			
1-year revision (%)	277,759	0.6 (0.6-0.6)	0.6 (0.6-0.6)
3-year revision (%)	226,771	1.7 (1.7-1.8)	1.8 (1.7-1.8)
5-year revision (%)	172,691	2.1 (2.1-2.2)	2.2 (2.2-2.3)
10-year revision (%)	57,577	2.6 (2.5-2.7)	2.8 (2.7-2.9)
13-year revision (%)	13,384	2.8 (2.7-2.9)	3.1 (3.0-3.2)

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

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In 2007-2021, 35,810 (11.8%) primary TKAs were implanted in patients who died within thirteen years after the primary diagnosis

TKA by procedure year

FIGURE Cumulative major revision percentage of total knee arthroplasties by procedure year of primary TKA in the Netherlands in 2009-2021 (n=262,833)

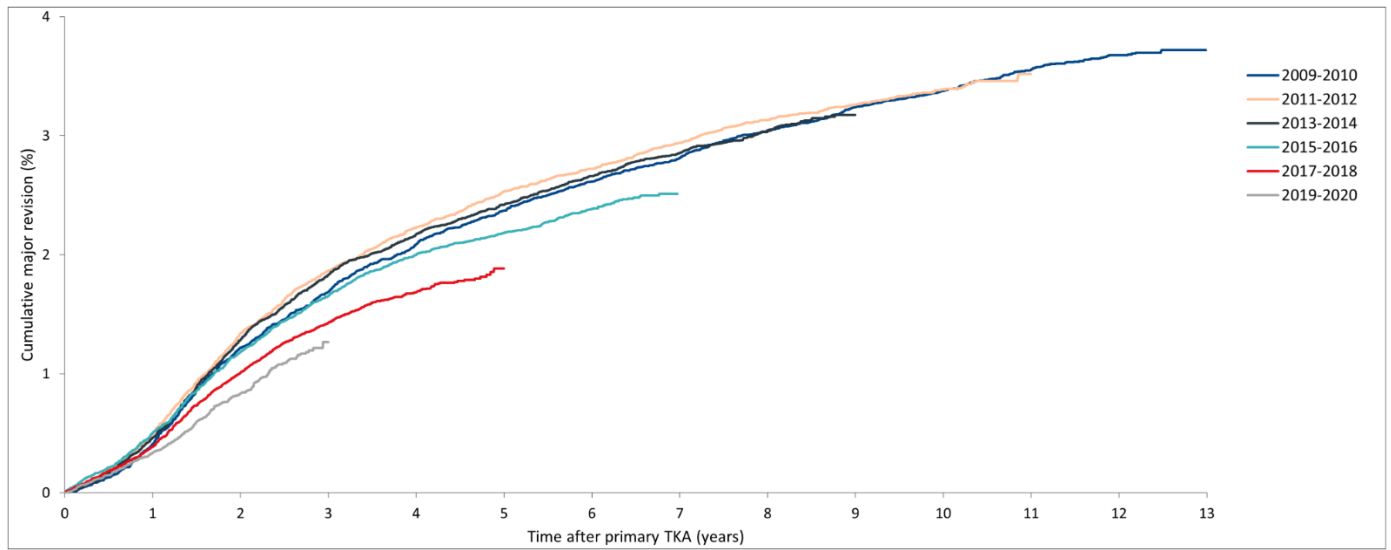


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Competing Risk (95% CI)

Procedure year primary TKA	Number (n)	1yr	3yr	5yr	7yr	10yr
2009-2010	34,974	0.4 (0.3-0.5)	1.7 (1.6-1.8)	2.4 (2.2-2.5)	2.8 (2.6-3.0)	3.4 (3.2-3.6)
2011-2012	40,904	0.5 (0.4-0.6)	1.9 (1.7-2.0)	2.5 (2.4-2.7)	2.9 (2.8-3.1)	3.4 (3.2-3.6)
2013-2014	46,140	0.5 (0.4-0.5)	1.8 (1.7-2.0)	2.4 (2.3-2.6)	2.9 (2.7-3.0)	n.a.
2015-2016	48,067	0.5 (0.4-0.6)	1.7 (1.5-1.8)	2.2 (2.1-2.3)	n.a.	n.a.
2017-2018	49,282	0.4 (0.3-0.4)	1.4 (1.3-1.5)	1.9 (1.7-2.0)	n.a.	n.a.
2019-2020	43,466	0.3 (0.3-0.4)	1.3 (1.1-1.5)	n.a.	n.a.	n.a.

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

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TKA by procedure side

FIGURE Cumulative revision percentage of total knee arthroplasties by procedure side in the Netherlands in 2007-2021 (n=379,261)

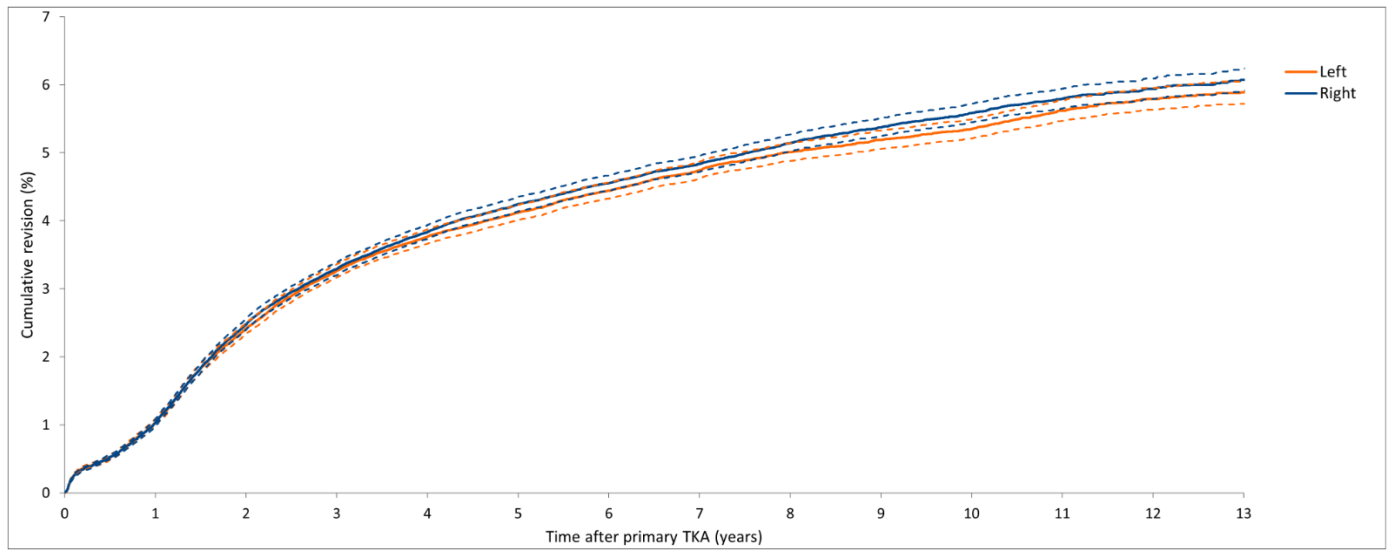


TABLE Cumulative 13-year revision percentage

Procedure side	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Left	143,246	5.9 (5.7-6.1)	6.3 (6.1-6.5)
Right	159,503	6.1 (5.9-6.2)	6.5 (6.3-6.7)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. TKA: total knee arthroplasty; CI: confidence interval.

TKA by pre-PROM

FIGURE Cumulative revision percentage of total knee arthroplasties by valid pre-operative PROM of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2021 (n=178,837)

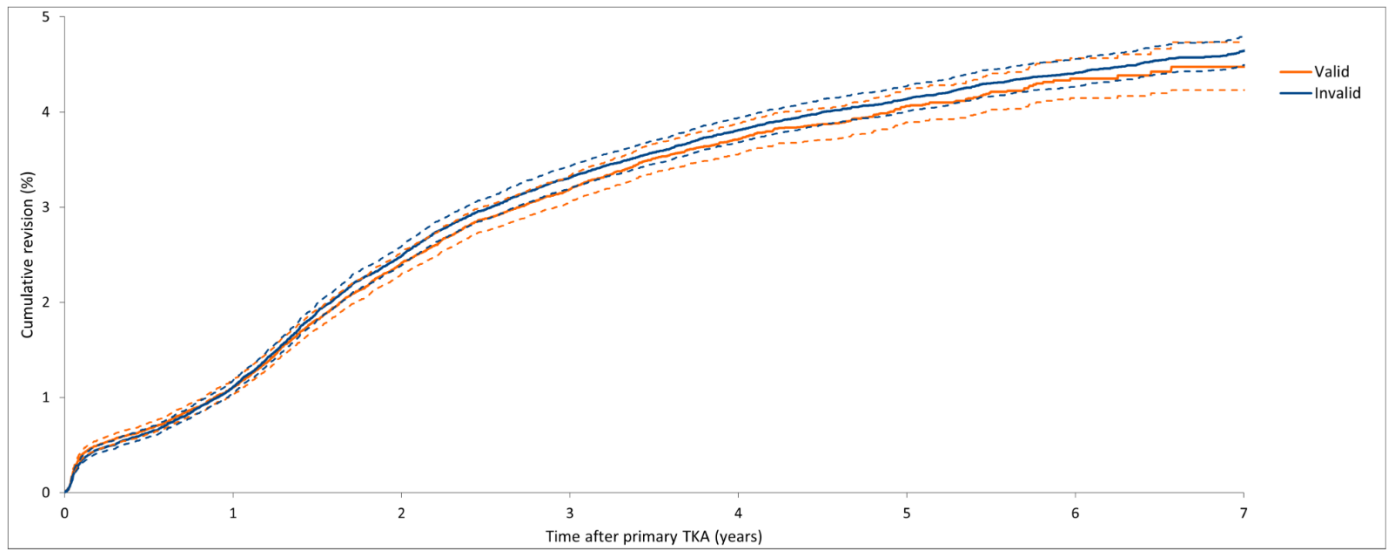


TABLE Cumulative 7-year revision percentage

Pre-PROM	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Valid	77,136	4.5 (4.2-4.7)	4.6 (4.3-4.9)
Invalid	101,701	4.6 (4.5-4.8)	4.7 (4.6-4.9)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
Valid: pre-operative PROM reported, Invalid: non-responders to pre-operative PROM, PROM: patient reported outcome measure.
TKA: total knee arthroplasty, CI: confidence interval.

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

FIGURE Cumulative revision percentage of total knee arthroplasties by completeness PROM trajectory of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2021 (n=178,837)

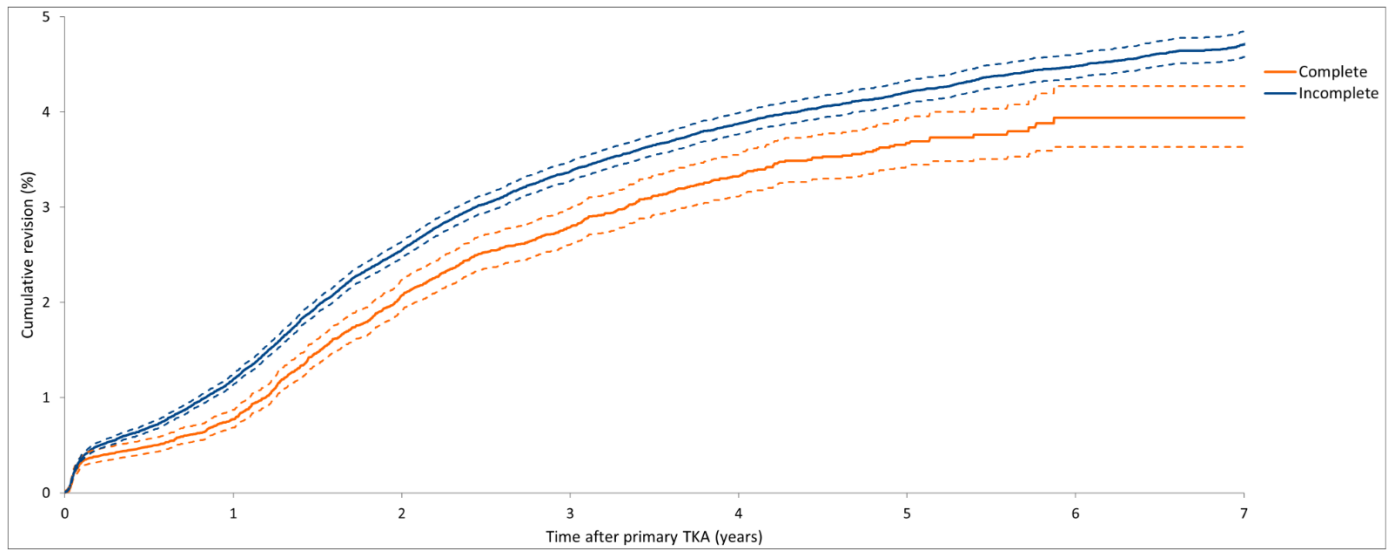


TABLE Cumulative 7-year revision percentage

PROM (pre-, 6mnd, 12mnd)	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Complete	33,519	3.9 (3.6-4.3)	4.0 (3.7-4.3)
Incomplete	145,318	4.7 (4.6-4.8)	4.8 (4.7-5.0)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 Complete: pre-operative, 6 and 12 months postoperative PROM reported; Incomplete: one or more PROMs missing; PROM: patient reported outcome measure.
 TKA: total knee arthroplasty; CI: confidence interval.

TKA by pre-OKS

FIGURE Cumulative revision percentage of total knee arthroplasties by pre-operative Oxford Knee score of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2021 (n=66,952)

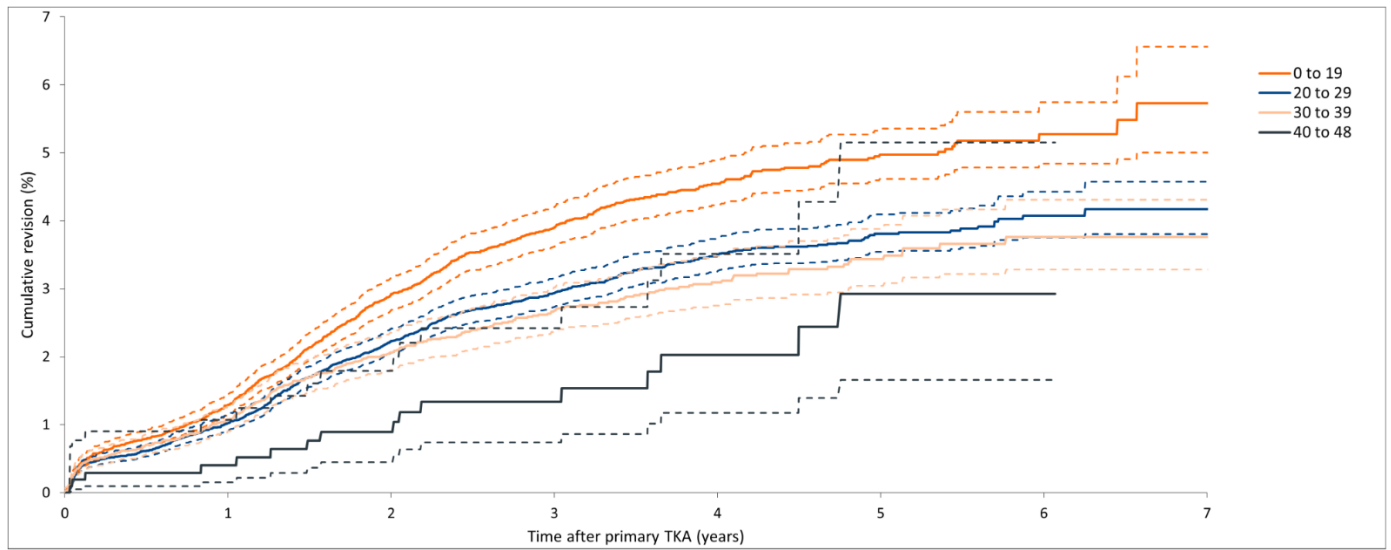


TABLE Cumulative 5- and 7-year revision percentage

Pre-operative Oxford Knee score	Number (n)	Cumulative 5-year revision percentage		Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
0 to 19	22,142	5.0 (4.6-5.4)	5.0 (4.6-5.4)	5.7 (5.0-6.6)	5.9 (5.1-6.8)
20 to 29	31,400	3.8 (3.5-4.1)	3.8 (3.5-4.1)	4.2 (3.8-4.6)	4.3 (3.9-4.7)
30 to 39	12,371	3.4 (3.0-3.9)	3.5 (3.1-3.9)	3.8 (3.3-4.3)	3.9 (3.3-4.4)
40 to 48	1,039	2.9 (1.7-5.2)	3.0 (1.3-4.7)	n.a.	n.a.

¹ The cumulative revision percentage using the competing risk method is shown in the figure. TKA: total knee arthroplasty; CI: confidence interval; n.a. if <50 cases were at risk.

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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.

TKA by gender

FIGURE Cumulative revision percentage of total knee arthroplasties by gender in the Netherlands in 2007-2021 (n=302,269)

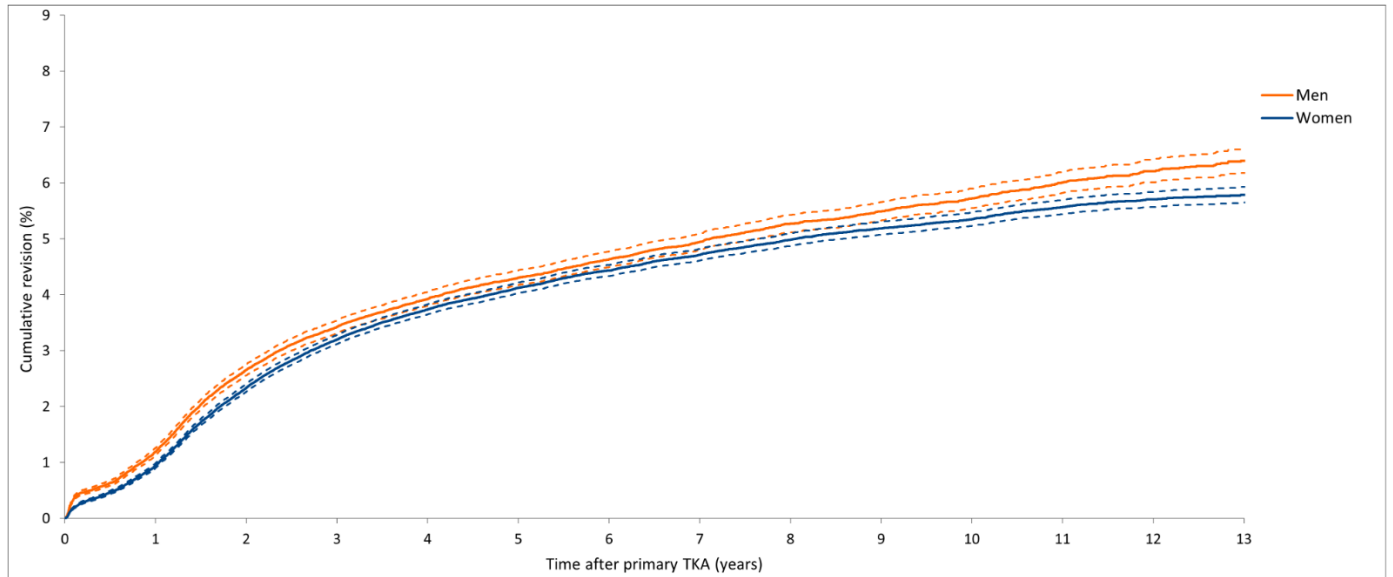


TABLE Cumulative 13-year revision percentage

Gender	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Men	196,149	6.4 (6.2-6.6)	7.0 (6.7-7.2)
Women	106,120	5.8 (5.7-5.9)	6.2 (6.0-6.3)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

TKA by age category

FIGURE Cumulative revision percentage of total knee arthroplasties by age category in the Netherlands in 2007-2021 (n=302,480)

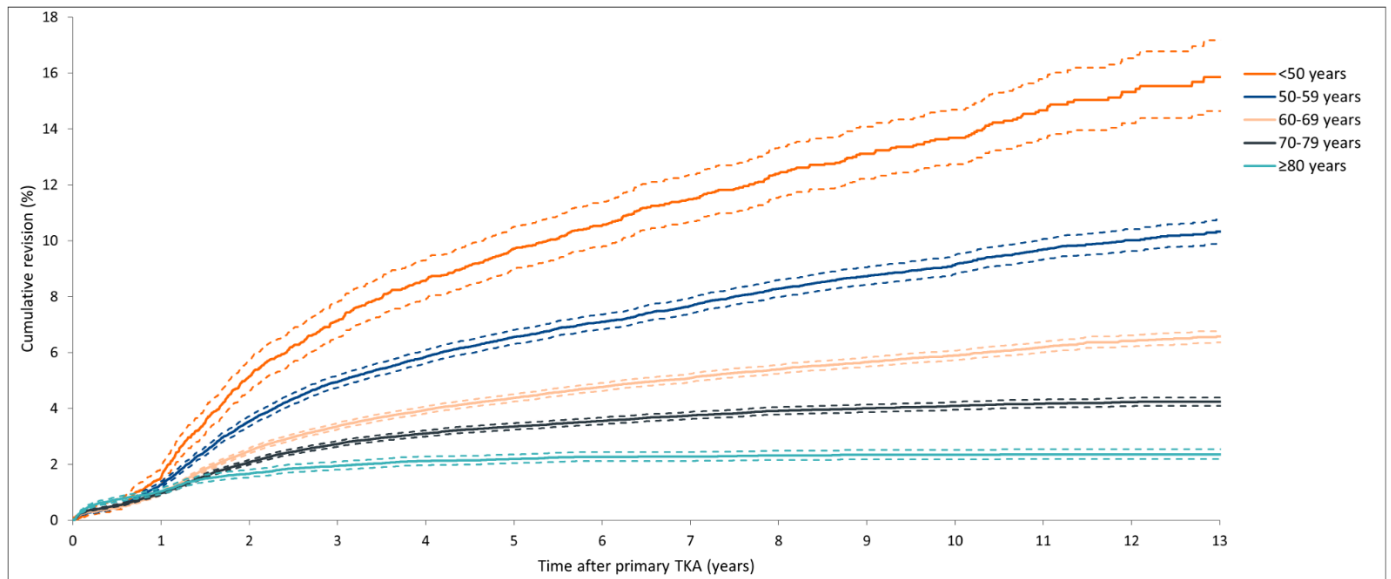


TABLE Cumulative 13-year revision percentage

Age (years)	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
<50	6,637	15.8 (14.6-17.2)	16.2 (14.9-17.5)
50-59	43,461	10.3 (9.9-10.8)	10.5 (10.1-11)
60-69	105,622	6.6 (6.4-6.8)	6.8 (6.6-7.0)
70-79	109,825	4.2 (4.1-4.4)	4.5 (4.4-4.7)
≥80	36,935	2.4 (2.2-2.5)	2.6 (2.4-2.7)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

TKA by diagnosis

FIGURE Cumulative revision percentage of total knee arthroplasties by diagnosis in the Netherlands in 2007-2021 (n=300,152)

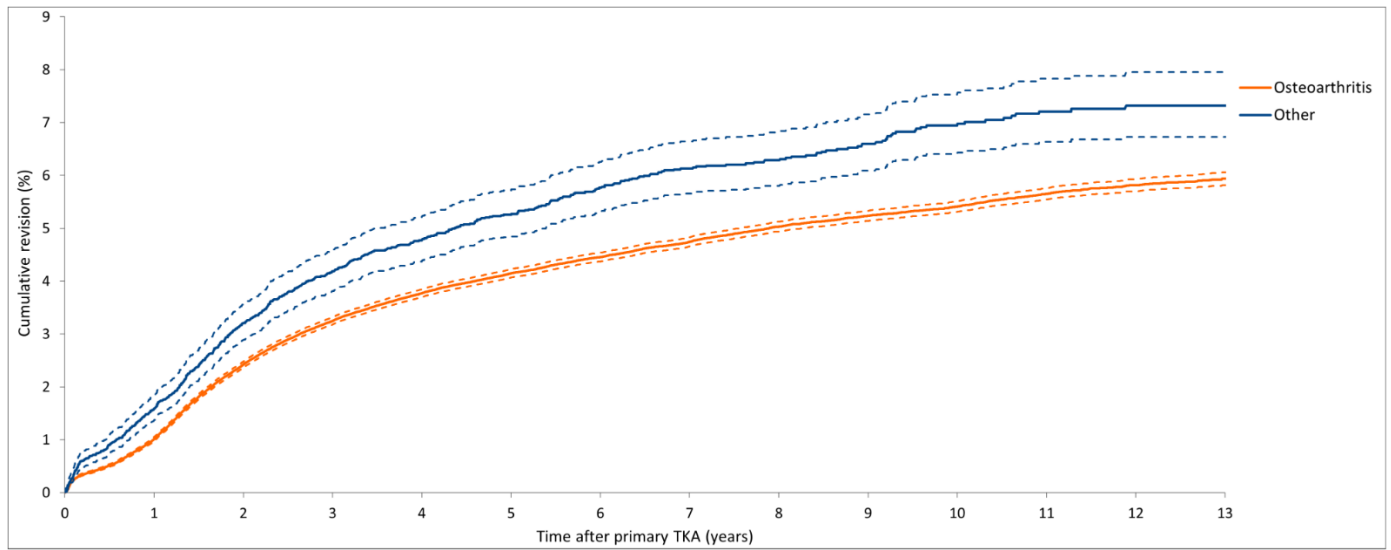


TABLE Cumulative 13-year revision percentage

Diagnosis	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Osteoarthritis	288,838	5.9 (5.8-6.1)	6.4 (6.2-6.5)
Other	11,314	7.3 (6.7-8.0)	7.9 (7.2-8.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
CI: confidence interval.

TKA by ASA score

FIGURE Cumulative revision percentage of total knee arthroplasties by ASA score in the Netherlands in 2007-2021 (n=293,619)

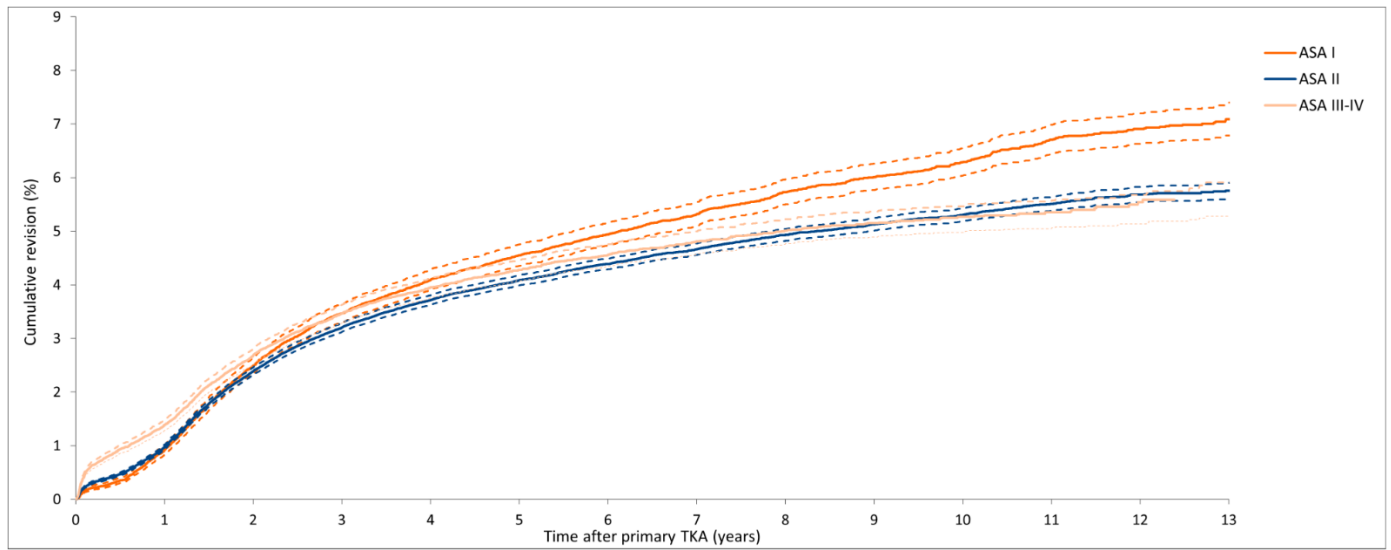


TABLE Cumulative 13-year revision percentage

ASA score	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
I	46,863	7.1 (6.8-7.4)	7.4 (7.0-7.7)
II	194,910	5.8 (5.6-5.9)	6.1 (5.9-6.3)
III-IV	51,846	5.6 (5.3-5.9)	6.4 (5.9-6.8)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

TKA by BMI category

FIGURE Cumulative revision percentage of total knee arthroplasties by BMI category in the Netherlands in 2014-2021 (n=183,197)

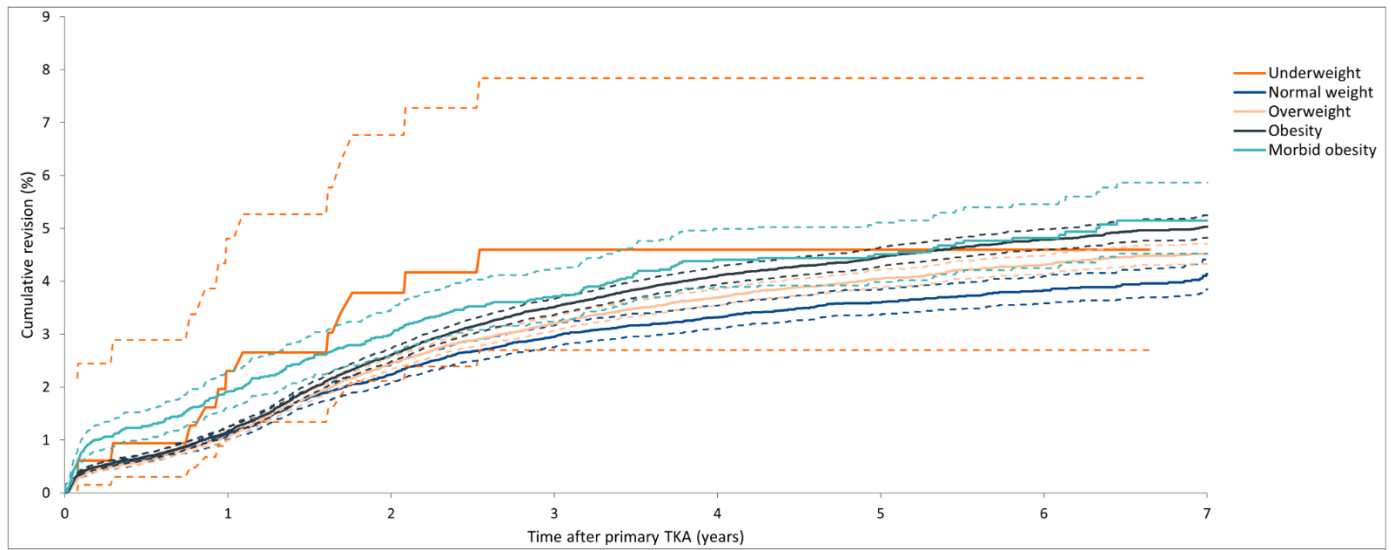


TABLE Cumulative 7-year revision percentage

Body Mass Index (kg/m ²)	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Underweight (≤18,5)	326	n.a.	n.a.
Normal weight (>18,5-25)	31,782	4.1 (3.8-4.4)	4.2 (3.9-4.4)
Overweight (>25-30)	75,263	4.5 (4.3-4.7)	4.7 (4.5-4.8)
Obesity (>30-40)	69,332	5.0 (4.8-5.2)	5.1 (4.9-5.3)
Morbid obesity (>40)	6,494	5.1 (4.5-5.9)	5.3 (4.6-6.0)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

TKA by Charnley score

FIGURE Cumulative revision percentage of total knee arthroplasties by charnley score in the Netherlands in 2014-2021 (n=182,586)

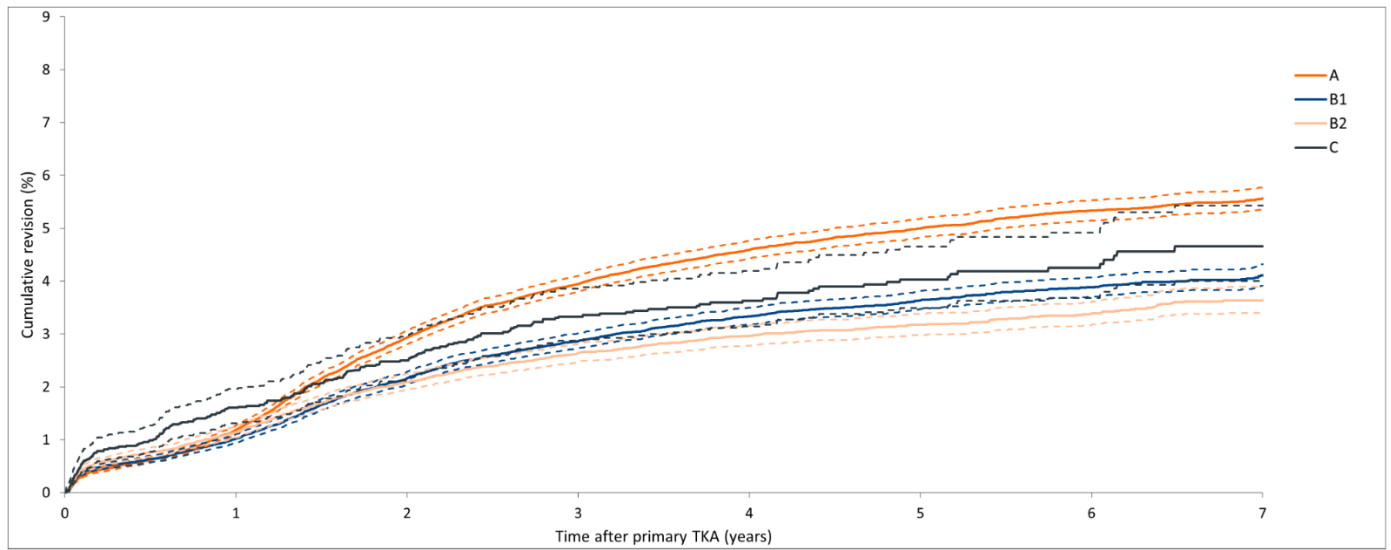


TABLE Cumulative 7-year revision percentage

Charnley-score	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
A One hip joint affected	74,264	5.6 (5.4-5.8)	5.7 (5.5-5.9)
B1 Both hip joints affected	62,760	4.1 (3.9-4.3)	4.2 (4.0-4.4)
B2 Contralateral hip joint with a total hip prosthesis	39,401	3.6 (3.4-3.9)	3.8 (3.5-4.0)
C Multiple joints affected or chronic disease that affects quality of life	6,161	4.7 (4.0-5.4)	4.9 (4.1-5.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

TKA by smoking

FIGURE Cumulative revision percentage of total knee arthroplasties by smoking in the Netherlands in 2014-2021 (n=178,836)

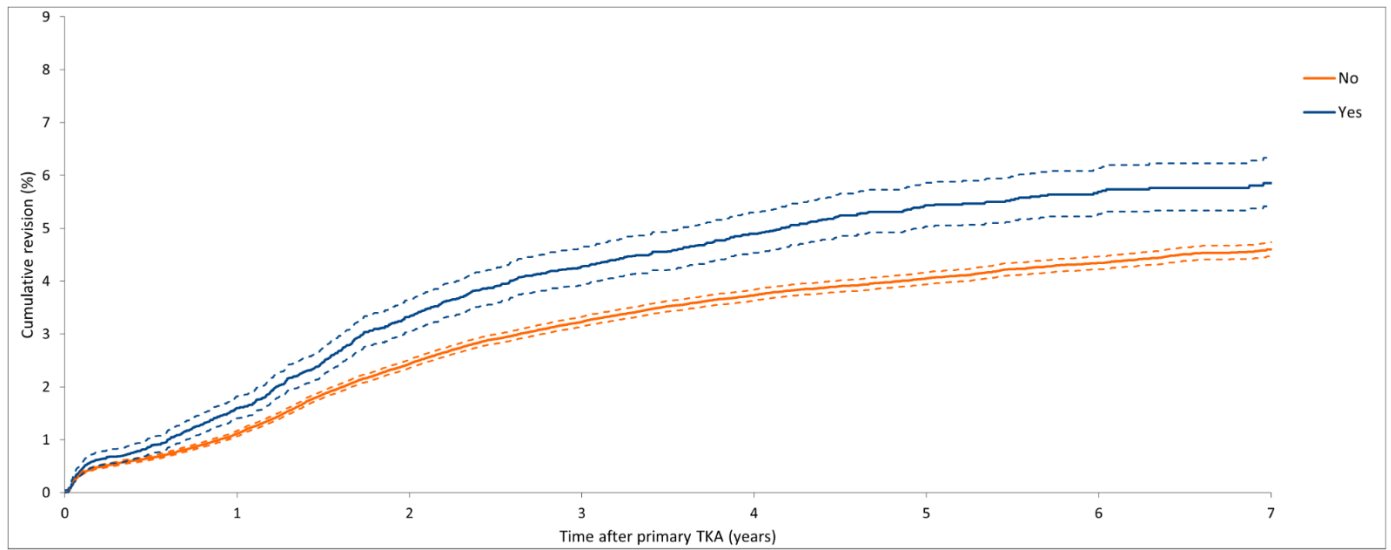


TABLE Cumulative 7-year revision percentage

Smoking	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
No	163,867	4.6 (4.5-4.7)	4.7 (4.6-4.8)
Yes	14,969	5.9 (5.4-6.3)	6.0 (5.5-6.5)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. CI: confidence interval.

Revision per component

Cemented primary TKA – overall revision

TABLE Cumulative revision percentages of cemented primary total knee arthroplasties by prosthesis component combination of patients who underwent a TKA for osteoarthritis in the Netherlands in 2007-2021 (n=249,091)

Femur component	Tibia component	Total primary TKAs (n)	Median (IQR) age (yr)	Total RAs (n)	Type of revision (n)						Cumulative revision percentage Kaplan Meier (95% CI)					
					Total knee (complete revision)	Patella addition	Only femur component	Only tibia component	Only insert/patella	Missing/unknown	1yr	3yr	5yr	7yr	10yr	13yr
All cemented TKAs for osteoarthritis		249,091	69 (63-76)	10,967	3,839	2,116	465	1,000	3,279	268	0.9 (0.9-0.9)	3.2 (3.1-3.3)	4.2 (4.1-4.3)	4.9 (4.8-5.0)	5.7 (5.6-5.8)	6.4 (6.3-6.6)
Genesis II	Genesis II	58,842	69 (63-75)	2,809	677	620	225	201	881	70	1.2 (1.1-1.2)	3.9 (3.7-4.1)	5.0 (4.8-5.2)	5.6 (5.4-5.8)	6.3 (6.0-6.5)	6.8 (6.5-7.1)
NexGen	NexGen	55,960	69 (63-75)	2,326	948	252	70	289	652	60	0.9 (0.8-1.0)	2.8 (2.7-2.9)	3.9 (3.7-4.0)	4.8 (4.6-5.0)	5.9 (5.6-6.1)	6.9 (6.5-7.2)
Vanguard Complete Knee	Vanguard Complete Knee	44,620	69 (62-75)	1,583	543	300	39	129	473	40	0.9 (0.8-1.0)	2.9 (2.7-3.1)	3.7 (3.5-3.9)	4.2 (4.0-4.4)	4.9 (4.6-5.2)	5.3 (5.0-5.7)
PFC / SIGMA	PFC / SIGMA	30,254	70 (63-76)	1,137	345	265	29	86	354	26	0.9 (0.8-1.0)	3.0 (2.8-3.2)	3.8 (3.5-4.0)	4.1 (3.9-4.4)	4.6 (4.3-4.9)	4.9 (4.6-5.2)
LCS	LCS	17,243	70 (63-76)	735	379	73	34	140	91	11	0.6 (0.5-0.7)	3.1 (2.9-3.4)	4.2 (3.8-4.5)	4.7 (4.4-5.1)	5.3 (4.9-5.7)	6.0 (5.4-6.5)
Triathlon	Triathlon	8,852	70 (64-76)	305	93	51	13	27	86	4	1.2 (0.9-1.4)	3.6 (3.1-4.0)	4.5 (3.9-5.0)	5.1 (4.5-5.7)	5.7 (4.9-6.5)	n.a.
AGC V2	AGC V2	4,420*	71 (65-77)	171	99	54	1	2	10	5	0.3 (0.1-0.5)	2.0 (1.6-2.4)	2.6 (2.1-3.1)	3.2 (2.6-3.7)	3.8 (3.2-4.4)	4.7 (4.0-5.5)
balanSys	balanSys	3,642	69 (62-76)	167	59	64	3	8	23	3	0.7 (0.4-1.0)	3.7 (3.0-4.4)	5.0 (4.2-5.8)	5.9 (4.9-6.8)	6.7 (5.6-7.9)	7.9 (6.3-9.5)
TC Plus	TC Plus	3,456	70 (63-76)	108	57	28	2	5	12	4	0.6 (0.3-0.8)	2.3 (1.8-2.8)	3.0 (2.3-3.6)	3.3 (2.7-4.0)	4.2 (3.3-5.1)	4.5 (3.5-5.5)
Attune	Attune	3,261	69 (61-75)	48	10	12	3	10	20	1	0.5 (0.2-0.8)	2.4 (1.7-3.2)	3.2 (2.2-4.1)	n.a.	n.a.	n.a.
Optetrak	Optetrak	3,073*	70 (62-76)	348	196	90	3	33	55	6	1.1 (0.7-1.4)	5.3 (4.5-6.1)	7.1 (6.2-8.0)	9.1 (8.1-10.2)	12.0 (10.8-13.3)	15.3 (13.4-17.2)
Persona	Persona	2,909	68 (62-74)	35	9	4	0	3	29	0	0.6 (0.3-1.0)	3.8 (2.0-5.5)	5.3 (3.1-7.6)	5.9 (3.4-8.3)	n.a.	n.a.
ACS	ACS	2,673	67 (60-73)	139	34	21	9	12	18	8	0.7 (0.4-1.0)	3.8 (3.1-4.5)	4.8 (4.0-5.6)	5.1 (4.2-5.9)	5.5 (4.6-6.5)	n.a.
Scorpio NRG	Scorpio	2,631*	70 (63-76)	137	48	45	10	4	8	1	0.8 (0.5-1.2)	3.2 (2.5-3.8)	4.5 (3.7-5.3)	5.1 (4.3-6.0)	5.7 (4.8-6.7)	n.a.
Scorpio	Scorpio	2,240*	71 (63-76)	114	60	22	3	6	39	4	0.3 (0.1-0.5)	2.4 (1.7-3.0)	3.2 (2.5-3.9)	3.7 (2.9-4.5)	4.7 (3.8-5.6)	5.8 (4.7-6.9)
Journey BCS	Journey BCS	1,362	69 (61-74)	127	17	62	1	3	9	2	1.1 (0.5-1.6)	5.5 (4.2-6.8)	6.8 (5.4-8.3)	8.7 (7.0-10.4)	10.8 (8.8-12.7)	13.9 (11.2-16.5)
MRK	MRK	1,321	69 (62-75)	22	10	7	0	0	7	1	0.2 (0.0-0.4)	1.4 (0.6-2.1)	2.2 (1.2-3.2)	3.2 (1.8-4.7)	n.a.	n.a.
PFC / SIGMA	LCS	1,212*	66 (58-75)	54	27	11	3	1	2	2	0.3 (0.0-0.7)	1.9 (1.1-2.7)	2.9 (1.9-3.9)	3.9 (2.8-5.1)	4.7 (3.4-6.0)	5.7 (4.1-7.3)
NexGen GSF	NexGen	1,190	68 (61-74)	32	18	5	0	1	19	1	0.5 (0.1-0.9)	1.6 (0.9-2.3)	2.6 (1.7-3.6)	2.9 (1.9-3.9)	3.3 (2.1-4.5)	n.a.
Innex	Innex	1,126*	70 (62-77)	38	13	10	0	4	10	0	1.0 (0.4-1.6)	2.2 (1.3-3.0)	2.8 (1.8-3.8)	3.2 (2.2-4.3)	3.5 (2.4-4.6)	3.6 (2.5-4.8)
Journey II BCS	Journey BCS	1,072	66 (60-72)	64	13	26	0	0	6	2	0.4 (0.0-0.8)	4.5 (3.2-5.8)	6.1 (4.6-7.6)	7.1 (5.3-8.9)	n.a.	n.a.
Evolution MP	Evolution MP	837	69 (63-74)	18	5	5	0	0	9	1	0.6 (0.1-1.2)	2.3 (1.1-3.5)	3.4 (1.6-5.2)	n.a.	n.a.	n.a.
Profix	Profix	772*	68 (61-76)	59	40	7	2	2	5	1	0.5 (0.0-1.0)	3.7 (2.3-5.0)	5.6 (3.9-7.2)	6.6 (4.8-8.3)	7.7 (5.8-9.7)	8.9 (6.4-11.4)
Genesis II	Profix / Genesis MB baseplate	622*	67 (60-75)	66	27	30	0	1	7	1	1.0 (0.2-1.8)	6.9 (4.9-8.9)	9.0 (6.7-11.3)	10.3 (7.8-12.7)	11.3 (8.7-13.8)	11.3 (8.7-13.8)
Rotaglide	Rotaglide	428*	72 (65-78)	40	26	3	2	0	7	0	0.9 (0.0-1.9)	4.5 (2.5-6.5)	5.9 (3.7-8.2)	7.2 (4.7-9.6)	10.4 (7.3-13.5)	n.a.
Advance MP	Advance	314*	71 (65-78)	31	6	6	1	5	10	3	1.9 (0.4-3.4)	7.7 (4.7-10.6)	9.0 (5.8-12.1)	9.3 (6.1-12.5)	9.7 (6.4-12.9)	n.a.
Maxim	Vanguard Complete Knee	272*	70 (63-77)	14	3	3	1	2	5	0	1.5 (0.0-2.9)	2.9 (0.9-4.9)	3.3 (1.2-5.4)	4.1 (1.7-6.4)	4.8 (2.3-7.4)	5.2 (2.6-7.8)

* Denotes prosthesis combinations with no reported use in primary TKAs in 2021.

Please note: n.a. if <50 cases were at risk; TKA: total knee arthroplasty; RA: revision 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 TKA – overall revision

TABLE Cumulative revision percentages of uncemented primary total knee arthroplasties by prosthesis component combination of patients who underwent a TKA for osteoarthritis in the Netherlands in 2007-2021 (n=13,002)

Femur component	Tibia component	Total primary TKAs (n)	Median (IQR) age (yr)	Type of revision (n)							Cumulative revision percentage Kaplan Meier (95% CI)					
				Total RAs (n)	Total knee (complete revision)	Patella addition	Only femur component	Only tibia component	Only insert/patella	Missing/unknown	1yr	3yr	5yr	7yr	10yr	13yr
All uncemented TKAs for osteoarthritis		13,002	69 (62-76)	606	215	89	12	113	170	7	1.0 (0.8-1.2)	3.7 (3.3-4.0)	4.6 (4.2-5.0)	5.1 (4.6-5.5)	5.7 (5.2-6.2)	6.3 (5.8-6.9)
LCS	LCS	8,756	69 (63-76)	387	109	44	9	90	110	4	0.9 (0.7-1.1)	3.5 (3.1-3.9)	4.2 (3.7-4.6)	4.5 (4.1-5.0)	5.1 (4.5-5.6)	5.6 (4.9-6.2)
Triathlon	Triathlon	1,648	69 (62-75)	33	11	6	0	2	10	0	0.5 (0.1-0.8)	1.7 (0.9-2.4)	2.4 (1.5-3.4)	3.0 (1.9-4.2)	3.4 (2.0-4.8)	n.a.
ACS	ACS	593	69 (61-75)	30	11	6	1	4	5	0	2.2 (1.0-3.4)	4.9 (3.0-6.7)	5.4 (3.4-7.3)	5.7 (3.6-7.8)	n.a.	n.a.
Duracon	Duracon	296*	69 (61-77)	10	4	1	0	0	4	0	0.4 (0.0-1.0)	0.7 (0.0-1.7)	1.4 (0.0-2.8)	1.4 (0.0-2.8)	3.1 (1.0-5.1)	3.5 (1.2-5.7)
Attune	Attune	269	68 (62-73)	10	2	2	0	0	7	0	2.2 (0.3-4.1)	7.3 (2.6-12.1)	n.a.	n.a.	n.a.	n.a.
Rotaglide	Rotaglide	271*	69 (61-77)	61	38	11	1	1	5	1	1.5 (0.0-3.0)	10.3 (6.6-14.0)	16.3 (11.8-20.8)	19.8 (14.8-24.7)	21.8 (16.6-27.1)	n.a.
ACS LD	ACS LD	249*	70 (61-76)	16	6	3	0	1	3	0	1.3 (0.0-2.8)	5.7 (2.7-8.7)	5.7 (2.7-8.7)	n.a.	n.a.	n.a.
NexGen	NexGen	230	69 (62-77)	17	7	1	1	3	1	0	1.8 (0.1-3.5)	5.0 (2.1-7.9)	7.2 (3.4-10.9)	8.1 (4.0-12.3)	9.3 (4.6-14.0)	n.a.
Genesis II	Genesis II	225	68 (62-75)	11	5	2	0	1	1	1	1.0 (0.0-2.3)	5.2 (2.1-8.4)	5.2 (2.1-8.4)	5.2 (2.1-8.4)	5.2 (2.1-8.4)	n.a.
Vanguard Complete Knee	Vanguard Complete Knee	165*	67 (61-74)	13	6	1	0	4	4	0	2.6 (0.1-5.0)	5.8 (2.1-9.5)	5.8 (2.1-9.5)	7.0 (2.7-11.3)	n.a.	n.a.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2021.

Please note: n.a. if <50 cases were at risk; TKA: total knee arthroplasty; RA: revision 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, femoral head size and articulation of the prosthesis may have influenced the cumulative revision percentages.

Cemented primary TKA – major revision

TABLE Cumulative major revision percentages of cemented primary total knee arthroplasties by prosthesis component combination of patients who underwent a TKA for osteoarthritis in the Netherlands in 2007-2021 (n=249,091)

Femur component	Tibia component	Total primary TKAs (n)	Median (IQR) age (yr)	Major revision ¹ arthroplasties (n)	Cumulative revision percentage Kaplan Meier (95% CI)					
					1yr	3yr	5yr	7yr	10yr	13yr
All cemented TKAs for osteoarthritis		249,091	69 (63-76)	5,903	0.3 (0.3-0.4)	1.6 (1.5-1.6)	2.2 (2.1-2.2)	2.6 (2.6-2.7)	3.2 (3.1-3.3)	3.8 (3.7-3.9)
Genesis II	Genesis II	58,842	69 (63-75)	1,251	0.4 (0.3-0.4)	1.7 (1.5-1.8)	2.2 (2.1-2.4)	2.6 (2.4-2.7)	2.9 (2.8-3.1)	3.2 (3.0-3.4)
NexGen	NexGen	55,960	69 (63-75)	1,430	0.3 (0.3-0.4)	1.5 (1.3-1.6)	2.2 (2.0-2.3)	3.0 (2.8-3.1)	3.9 (3.7-4.2)	4.8 (4.4-5.1)
Vanguard Complete Knee	Vanguard Complete Knee	44,620	69 (62-75)	814	0.4 (0.3-0.4)	1.4 (1.3-1.5)	1.9 (1.7-2.0)	2.2 (2.0-2.4)	2.6 (2.4-2.8)	2.9 (2.6-3.2)
PFC / SIGMA	PFC / SIGMA	30,254	70 (63-76)	521	0.3 (0.2-0.4)	1.2 (1.1-1.3)	1.7 (1.5-1.8)	1.9 (1.7-2.1)	2.2 (2.0-2.4)	2.4 (2.1-2.6)
LCS	LCS	17,243	70 (63-76)	584	0.4 (0.3-0.5)	2.3 (2.1-2.6)	3.2 (2.9-3.5)	3.8 (3.5-4.1)	4.4 (4.0-4.8)	5.0 (4.5-5.5)
Triathlon	Triathlon	8,852	70 (64-76)	148	0.4 (0.3-0.6)	1.7 (1.4-2.0)	2.3 (1.9-2.7)	2.7 (2.2-3.1)	2.9 (2.4-3.5)	n.a.
AGC V2	AGC V2	4,420*	71 (65-77)	109	0.1 (0.0-0.2)	1.1 (0.8-1.4)	1.5 (1.1-1.9)	1.9 (1.5-2.3)	2.4 (1.9-2.9)	3.1 (2.5-3.7)
balanSys	balanSys	3,642	69 (62-76)	76	0.2 (0.1-0.3)	1.4 (1.0-1.8)	2.3 (1.8-2.9)	2.9 (2.2-3.6)	3.2 (2.4-3.9)	3.8 (2.6-4.9)
TC Plus	TC Plus	3,456	70 (63-76)	71	0.4 (0.2-0.6)	1.4 (1.0-1.8)	2.0 (1.5-2.5)	2.4 (1.8-2.9)	2.6 (2.0-3.3)	3.1 (2.2-4.1)
Attune	Attune	3,261	69 (61-75)	24	0.2 (0.0-0.4)	1.2 (0.6-1.7)	1.7 (0.9-2.3)	n.a.	n.a.	n.a.

¹ Revision of at least the femur or tibia component.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2021.

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

TABLE Cumulative major revision percentages of uncemented primary total knee arthroplasties by prosthesis component combination of patients who underwent a TKA for osteoarthritis in the Netherlands in 2007-2021 (n=13,002)

Femur component	Tibia component	Total primary TKAs (n)	Median (IQR) age (yr)	Major revision ¹ arthroplasties (n)	Cumulative revision percentage Kaplan Meier (95% CI)					
					1yr	3yr	5yr	7yr	10yr	13yr
All uncemented TKAs for osteoarthritis		13,002	69 (62-75)	372	0.6 (0.4-0.7)	2.2 (1.8-2.5)	2.7 (2.3-3.0)	2.8 (2.4-3.2)	3.0 (2.6-3.4)	3.3 (2.8-3.8)
LCS	LCS	8,446	69 (63-76)	225	0.6 (0.4-0.7)	2.2 (1.8-2.5)	2.7 (2.3-3.0)	2.8 (2.4-3.2)	3.0 (2.6-3.4)	3.3 (2.8-3.8)
Triathlon	Triathlon	1,56	69 (62-75)	16	0.3 (0.0-0.6)	0.7 (0.2-1.1)	1.2 (0.5-1.9)	1.6 (0.7-2.5)	2.5 (1.0-4.0)	n.a.
ACS	ACS	573	69 (61-75)	18	1.6 (0.6-2.7)	3.1 (1.6-4.6)	3.4 (1.8-4.9)	3.7 (2.0-5.4)	n.a.	n.a.
Duracon	Duracon	282*	69 (61-77)	4	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.4 (0.0-1.1)	0.4 (0.0-1.1)	1.6 (0.0-3.1)	1.6 (0.0-3.1)
Attune	Attune	266	68 (62-73)	2	0.4 (0.0-1.2)	1.5 (0.0-3.6)	n.a.	n.a.	n.a.	n.a.
Rotaglide	Rotaglide	265*	69 (61-77)	45	0.4 (0.0-1.1)	6.5 (3.5-9.5)	11.3 (7.4-15.2)	15.2 (10.7-19.6)	17.3 (12.5-22.1)	n.a.
ACS LD	ACS LD	234*	70 (61-76)	8	1.3 (0.0-2.8)	3.5 (1.1-5.9)	3.5 (1.1-5.9)	n.a.	n.a.	n.a.
NexGen	NexGen	228	69 (62-77)	12	1.3 (0.0-2.8)	3.7 (1.2-6.2)	5.0 (1.9-8.0)	5.9 (2.4-9.5)	5.9 (2.4-9.5)	n.a.
Genesis II	Genesis II	215	68 (62-75)	6	0.5 (0.0-1.4)	3.2 (0.7-5.6)	3.2 (0.7-5.6)	3.2 (0.7-5.6)	3.2 (0.7-5.6)	n.a.
Vanguard Complete Knee	Vanguard Complete Knee	157*	67 (61-74)	10	1.9 (0.0-4.0)	4.5 (1.2-7.8)	4.5 (1.2-7.8)	5.7 (1.7-9.7)	n.a.	n.a.

¹ Revision of at least the femur or tibia component.

* Denotes prosthesis combinations with no reported use in primary TKAs in 2021.

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

TABLE Cumulative revision percentages of the most frequently registered types of bone cement by type of mixing system in primary total knee arthroplasties in the Netherlands in 2007-2021

Bone cement	Total primary TKAs (n)	Total RAs (n)	Cumulative revision percentage Kaplan Meier (95% CI)					
			1yr	3yr	5yr	7yr	10yr	13yr
Separately packed bone cement components	178,368	8,374	0.9 (0.9-0.9)	3.3 (3.2-3.4)	4.3 (4.2-4.4)	5.0 (4.9-5.1)	5.8 (5.7-6.0)	6.5 (6.4-6.7)
Palacos R+G	132,927	6,149	0.9 (0.9-1.0)	3.3 (3.2-3.4)	4.3 (4.2-4.4)	5.0 (4.9-5.1)	5.8 (5.7-6.0)	6.5 (6.3-6.8)
Refobacin Bone Cement R	12,700	610	0.8 (0.6-0.9)	3.0 (2.7-3.3)	4.0 (3.6-4.4)	5.1 (4.7-5.6)	6.4 (5.9-7.0)	7.4 (6.7-8.1)
Palacos MV+G	8,162	356	0.8 (0.6-1.0)	3.1 (2.7-3.4)	4.1 (3.6-4.5)	4.8 (4.3-5.3)	5.2 (4.6-5.7)	n.a.
Simplex ABC EC	5,368*	349	1.0 (0.8-1.3)	3.9 (3.4-4.4)	5.2 (4.6-5.8)	6.2 (5.6-6.9)	7.2 (6.5-8.0)	n.a.
Simplex ABC Tobra	5,121	219	0.8 (0.5-1.0)	2.2 (1.8-2.6)	3.0 (2.6-3.5)	3.6 (3.1-4.2)	4.7 (4.0-5.4)	5.8 (4.7-6.9)
Refobacin Plus Bone Cement	3,155*	197	1.1 (0.7-1.4)	4.3 (3.6-5.1)	5.4 (4.6-6.2)	5.9 (5.1-6.7)	6.4 (5.5-7.3)	6.8 (5.9-7.8)
Palacos R	1,751*	778	0.6 (0.2-0.9)	2.6 (1.8-3.4)	3.3 (2.4-4.1)	3.9 (3.0-4.8)	4.6 (3.6-5.6)	5.2 (3.9-6.5)
Biomet Plus Bone Cement	1,472	64	1.0 (0.5-1.5)	3.5 (2.6-4.5)	4.5 (3.4-5.6)	4.8 (3.6-6.0)	5.2 (3.9-6.5)	n.a.
Palamed G	1,429*	57	0.2 (0.0-0.4)	2.3 (1.5-3.0)	3.1 (2.2-4.1)	3.5 (2.6-4.5)	4.0 (3.0-5.0)	4.2 (3.1-5.2)
Subiton G	1,161	34	1.0 (0.4-1.5)	5.3 (3.2-7.4)	n.a.	n.a.	n.a.	n.a.
Versabond	647*	50	0.6 (0.0-1.2)	5.3 (3.6-7.0)	6.3 (4.4-8.1)	6.8 (4.8-8.7)	7.3 (5.3-9.4)	n.a.
cemSys 1G	636*	43	1.4 (0.5-2.3)	3.8 (2.3-5.3)	6.3 (4.4-8.2)	7.4 (5.1-9.6)	n.a.	n.a.
Biomet Bone Cement R	598	20	0.9 (0.0-1.7)	4.7 (2.3-7.2)	6.3 (3.1-9.6)	7.3 (3.5-11.0)	7.3 (3.5-11)	n.a.
Simplex P	409*	21*	0.0 (0.0-0.0)	2.8 (1.2-4.4)	3.8 (1.9-5.7)	4.4 (2.3-6.4)	5.3 (3-7.5)	5.6 (3.3-8.0)
Simplex HV	382	8	0.8 (0.0-1.7)	2.5 (0.4-4.5)	3.7 (0.5-6.8)	n.a.	n.a.	n.a.
Synicem1G	339*	12	0.6 (0.0-1.4)	3.6 (1.6-5.6)	n.a.	n.a.	n.a.	n.a.
Palamed	250*	14	0.8 (0.0-1.9)	2.8 (0.8-4.8)	4.0 (1.6-6.4)	4.9 (2.2-7.5)	5.3 (2.5-8.1)	5.3 (2.5-8.1)
Bone cement pre-packed in a vacuum mixing system	79,886	2,658	1.0 (0.9-1.1)	3.3 (3.2-3.5)	4.2 (4.0-4.3)	4.8 (4.6-5.0)	5.5 (5.2-5.8)	6.4 (5.8-6.9)
Refobacin Bone Cement R	35,885	1,206	1.1 (1.0-1.2)	3.3 (3.0-3.5)	4.2 (3.9-4.5)	5.0 (4.6-5.3)	5.6 (5.2-6.0)	n.a.
Palacos R+G	26,935	723	1.1 (1.0-1.2)	3.4 (3.1-3.7)	4.1 (3.8-4.4)	4.5 (4.1-5.0)	n.a.	n.a.
Refobacin Plus Bone Cement	15,254	620	0.7 (0.6-0.9)	3.2 (2.9-3.5)	4.0 (3.6-4.3)	4.5 (4.1-4.9)	5.2 (4.7-5.6)	6.0 (5.2-6.7)
Cemex Genta	1,444*	95	1.0 (0.5-1.6)	4.9 (3.8-6.0)	5.6 (4.4-6.8)	6.3 (5.0-7.6)	7.0 (5.6-8.5)	n.a.

* Denotes types of bone cement with no reported use in primary TKAs in 2021.

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

TKA by ODEP 5A or higher

FIGURE Cumulative major revision percentage of total knee arthroplasties by ODEP classification 5A or higher in the Netherlands in 2007-2021 (n= 289,912)

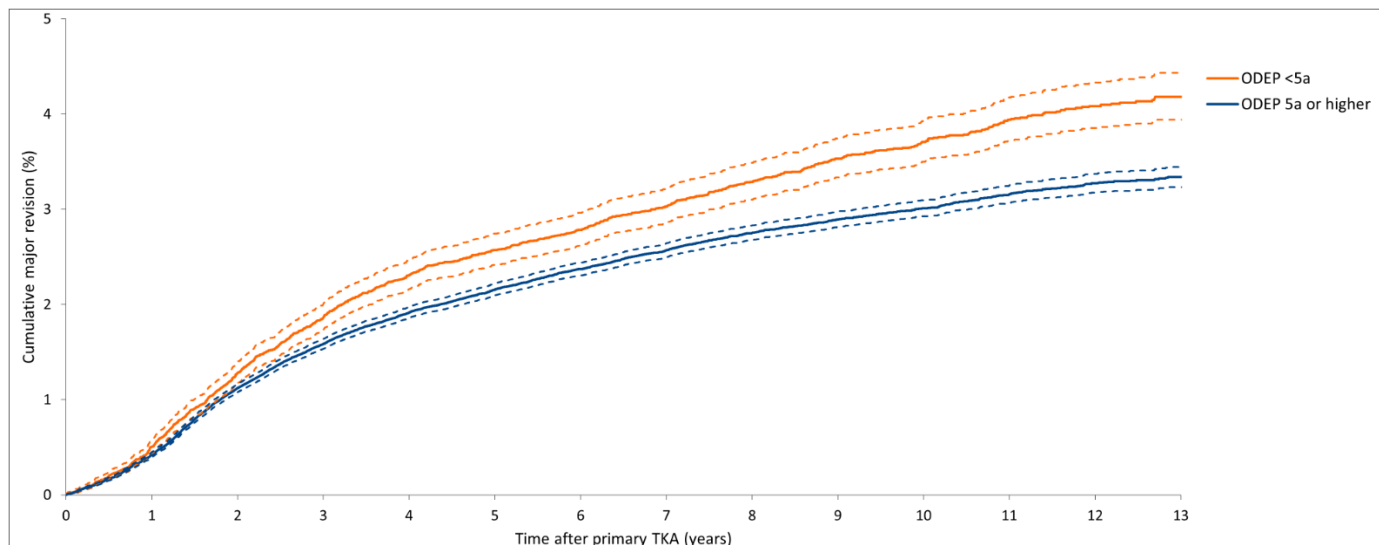


TABLE Cumulative 13-year revision percentage

ODEP	Number (n)	Cumulative 13-year major revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
<5A	40,785	4.2 (3.9-4.4)	4.6 (4.3-4.9)
5A or higher	249,127	3.3 (3.2-3.4)	3.6 (3.5-3.7)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 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.
 ODEP rating: ODEP provides ratings for hip femoral stems, hip acetabular cups and total knee replacement implants. Detailed information can be found at www.odep.org.uk.
 Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval.
 TKA: total knee arthroplasty; CI: confidence interval.

TKA by type of femur

FIGURE Cumulative major revision percentage of total knee arthroplasties by prosthesis design in the Netherlands in 2007-2021 (n=288,993)

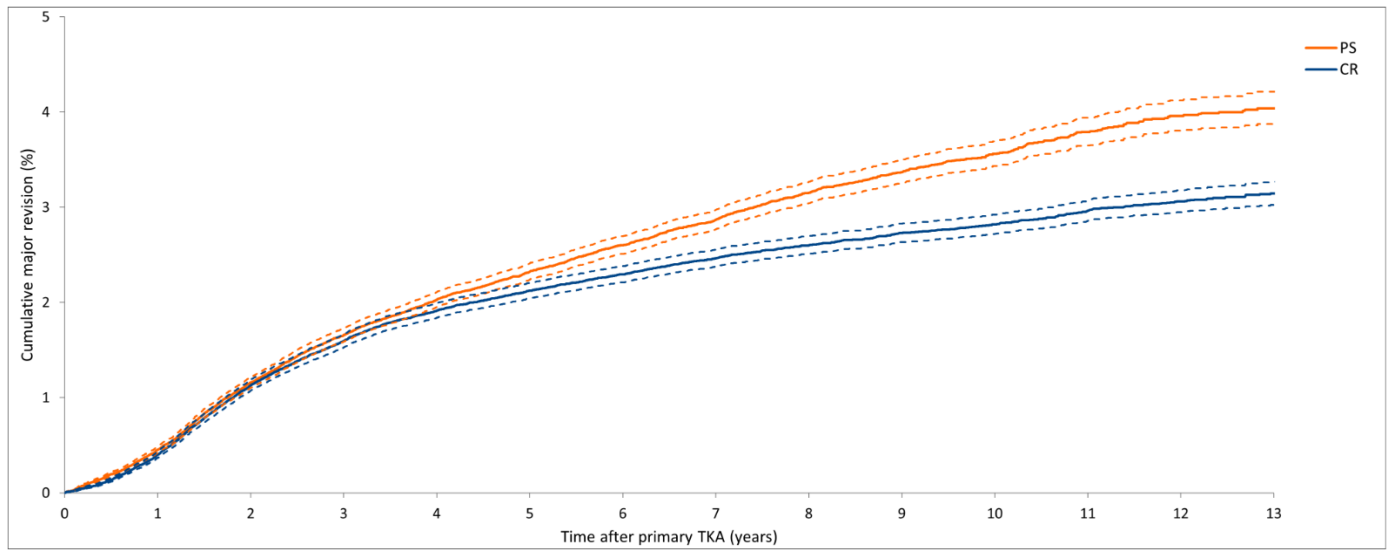


TABLE Cumulative 13-year major revision percentage

Prosthesis design	Number (n)	Cumulative 13-year major revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Posterior stabilised (PS)	150,765	4.0 (3.9-4.2)	4.4 (4.2-4.6)
Cruciate retaining (CR)	138,228	3.1 (3.0-3.3)	3.4 (3.2-3.5)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. 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. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. TKA: total knee arthroplasty; PS: posterior stabilised; CR: cruciate retaining; CI: confidence interval.

Rerevision

Overall second revision

FIGURE Cumulative second revision percentage of total knee arthroplasty after a one-stage first revision in the Netherlands in 2007-2021 (n=9,520)

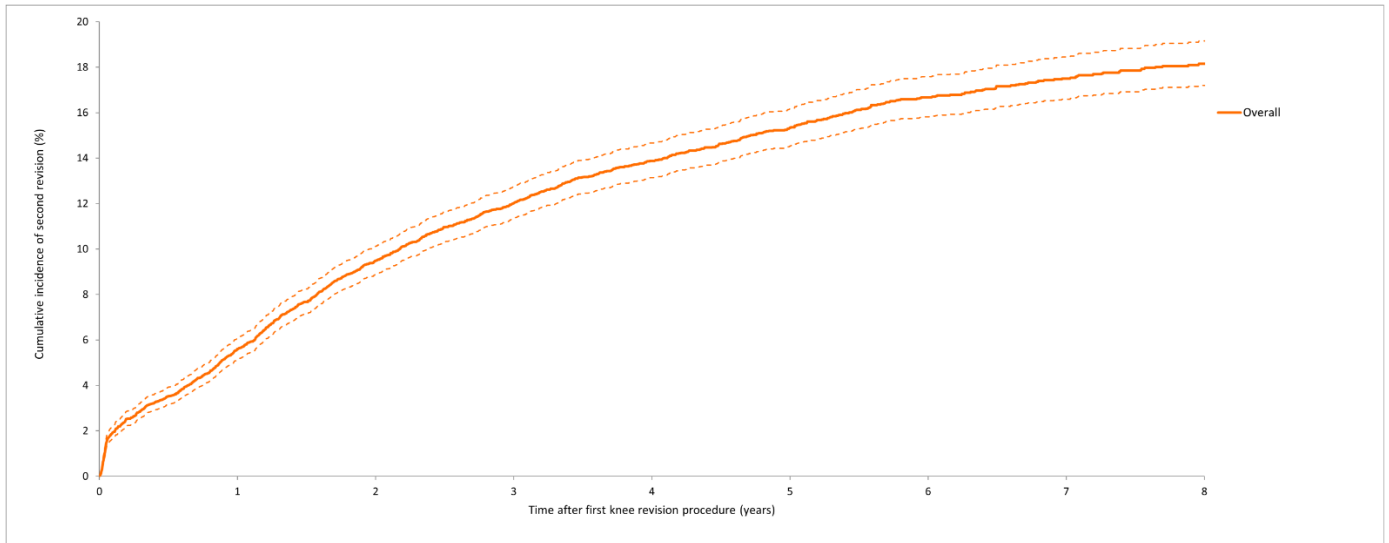


TABLE Cumulative second revision percentages

	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
1-year second revision (%)	8,043	5.6 (5.1-6.0)	5.6 (5.1-6.0)
3-year second revision (%)	5,524	12.0 (11.3-12.7)	12.2 (11.5-12.9)
5-year second revision (%)	3,501	15.3 (14.5-16.2)	15.7 (14.8-16.5)
8-year second revision (%)	1,428	18.2 (17.2-19.2)	18.9 (17.9-19.9)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).
 CI: confidence interval.

By type of first revision

FIGURE Cumulative second revision percentage of total knee arthroplasty after a one-stage first revision by type of first revision in the Netherlands in 2007-2021 (n=9,520)

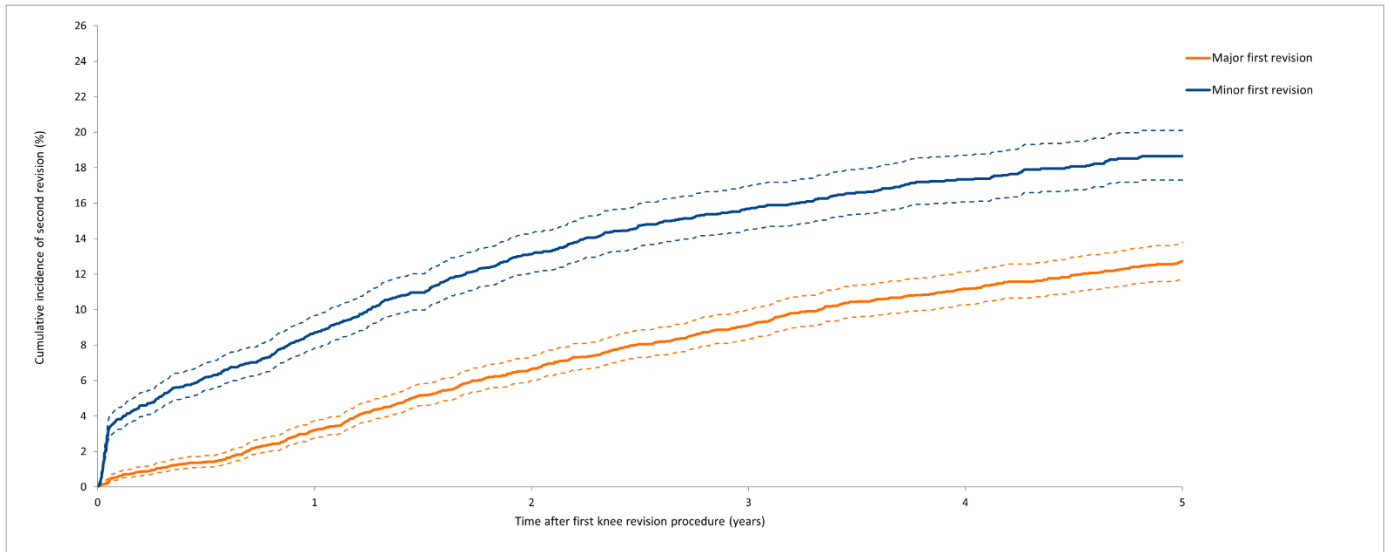


TABLE Cumulative second revision percentages

	Number of first revisions (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Major first revision	5,427			
1-year second revision (%)		4,733	3.2 (2.8-3.7)	3.2 (2.7-3.6)
3-year second revision (%)		3,335	9.1 (8.3-10.0)	9.2 (8.4-10.0)
5-year second revision (%)		2,240	12.7 (11.7-13.8)	13.0 (11.9-14.0)
Minor first revision	3,798			
1-year second revision (%)		3,057	8.6 (7.8-9.6)	8.7 (7.8-9.6)
3-year second revision (%)		2,002	15.7 (14.5-17.0)	16.0 (14.7-17.3)
5-year second revision (%)		1,124	18.6 (17.3-20.1)	19.2 (17.7-20.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).
 Major revision: revision of at least the femur or tibia component.
 Minor revision: only insert and/or patella exchange (excluding patella addition).
 CI: confidence interval.

By time to first revision

FIGURE Cumulative second revision percentage of total knee arthroplasty after a one-stage first revision by time to first revision in the Netherlands in 2007-2021 (n=9,520)

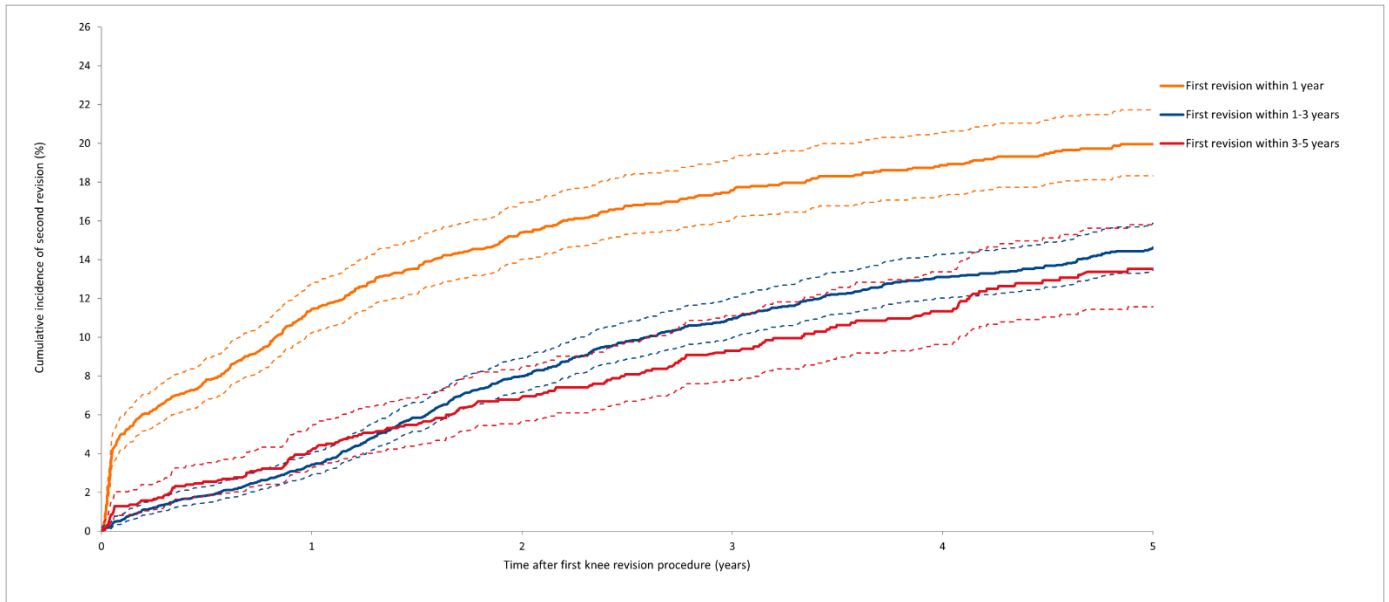


TABLE Cumulative second revision percentages

	Number of first revisions (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
First revision within 1 year	2,486			
1-year second revision (%)		1,983	11.4 (10.2-12.7)	11.4 (10.1-12.7)
3-year second revision (%)		1,409	17.8 (16.1-19.2)	17.8 (16.3-19.4)
5-year second revision (%)		944	20.0 (18.3-21.7)	20.5 (18.7-22.2)
First revision within 1-3 years	4,059			
1-year second revision (%)		3,627	3.4 (2.9-4.0)	3.4 (2.8-3.9)
3-year second revision (%)		2,633	10.9 (10.0-12.0)	11.1 (10.0-12.1)
5-year second revision (%)		1,802	14.6 (13.4-15.8)	14.8 (13.6-16.1)
First revision within 3-5 years	1,400			
1-year second revision (%)		1,197	4.1 (3.2-5.3)	4.1 (3.1-5.2)
3-year second revision (%)		828	9.3 (7.8-11.1)	9.4 (7.8-11.1)
5-year second revision (%)		501	13.5 (11.6-15.8)	13.9 (11.7-16.1)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 One-stage revision: A single revision procedure to change (insertion, replacement and/or removal) one or more components of the prosthesis (excluding patella addition).
 CI: confidence interval.

By procedure year of first major revision

FIGURE Cumulative second revision percentage of total knee arthroplasty after a one-stage first revision by procedure year of first major revision in the Netherlands in 2012-2021 (n=5,427)

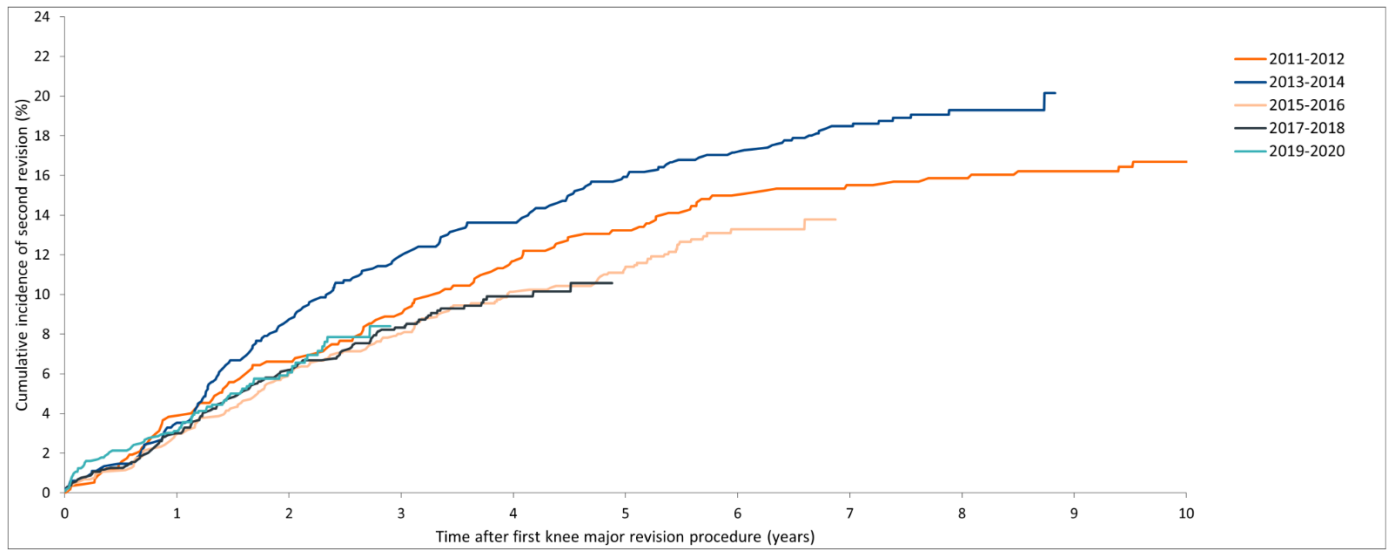


TABLE Cumulative second revision percentages

Cumulative revision percentages - Competing Risk (95% CI)						
Procedure year major revision	Number (n)	1yr	3yr	5yr	7yr	10yr
2011-2012	574	3.8 (2.5-5.8)	8.9 (6.8-11.5)	13.2 (10.7-16.3)	15.5 (12.8-18.8)	16.7 (13.9-20.1)
2013-2014	822	3.5 (2.5-5.0)	11.9 (9.9-14.4)	15.9 (13.6-18.6)	18.5 (16.0-21.3)	n.a.
2015-2016	1,036	2.9 (2.0-4.1)	8.0 (6.5-9.8)	11.4 (9.6-13.5)	n.a.	n.a.
2017-2018	1,033	3.0 (2.1-4.2)	8.3 (6.8-10.2)	n.a.	n.a.	n.a.
2019-2020	1,123	3.1 (2.2-4.3)	n.a.	n.a.	n.a.	n.a.

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

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Reasons for seconds revision by type of first revision

TABLE Reasons for second revision within five 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 2007-2021

Reasons for second revision	Major first revision ¹ (n=550)	Minor first revision ² (n=596)	Any type of first revision ³ (n=1,201)
	Proportion ⁴ (%)	Proportion ⁴ (%)	Proportion ⁴ (%)
Infection	25.3	46.8	36.9
Instability	30.5	27.2	28.5
Loosening of tibia component	20.7	13.6	17.0
Patellar pain	16.9	8.2	12.6
Malalignment	9.5	10.7	10.2
Loosening of femur component	11.1	3.9	7.7
Arthrofibrosis	7.6	4.5	6.1
Patellar dislocation	3.8	4.2	3.9
Loosening of patella component	1.6	1.7	1.7
Insert wear	1.1	1.8	1.6
Periprosthetic fracture	0.9	0.5	0.7
Progression of osteoarthritis	0.0	0.2	0.1
Other	8.5	5.9	7.1

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

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Survival unicondylar knee arthroplasty

UKA overall

FIGURE Cumulative revision percentage of unicondylar knee arthroplasties by type of revision in the Netherlands in 2007-2021 (n=38,992)

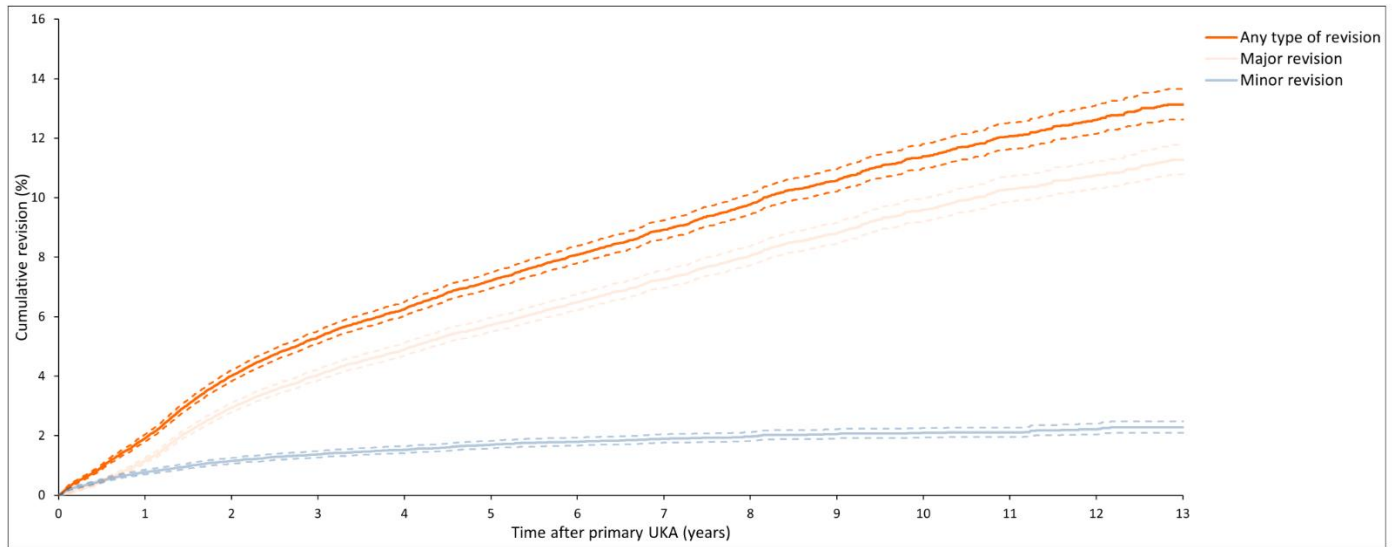


TABLE Cumulative revision percentages

	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Any type of revision			
1-year revision (%)	44,179	1.9 (1.8-2.0)	2.1 (2.0-2.3)
3-year revision (%)	31,057	5.3 (5.1-5.5)	5.6 (5.3-5.9)
5-year revision (%)	20,833	7.2 (7.0-7.5)	7.6 (7.3-7.9)
10-year revision (%)	7,451	11.4 (11.0-11.8)	12.5 (11.9-13.0)
13-year revision (%)	2,688	13.1 (12.6-13.7)	15.1 (14.3-15.8)
Major revision²			
1-year revision (%)	44,484	1.2 (1.1-1.3)	1.3 (1.2-1.4)
3-year revision (%)	31,453	4.0 (3.9-4.2)	4.4 (4.2-4.6)
5-year revision (%)	21,136	5.7 (5.5-6.0)	6.2 (5.9-6.5)
10-year revision (%)	7,584	9.6 (9.2-10.0)	10.8 (10.3-11.3)
13-year revision (%)	2,728	11.3 (10.8-11.8)	13.3 (12.6-14.0)
Minor revision³			
1-year revision (%)	44,697	0.8 (0.7-0.9)	0.9 (0.8-1.0)
3-year revision (%)	32,485	1.4 (1.3-1.5)	1.4 (1.3-1.5)
5-year revision (%)	22,421	1.7 (1.6-1.8)	1.8 (1.6-1.9)
10-year revision (%)	8,577	2.1 (1.9-2.3)	2.2 (2.0-2.3)
13-year revision (%)	3,073	2.3 (2.1-2.5)	2.4 (2.1-2.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.

² First revision of the femur or tibia component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

³ Only insert and/or patella exchange (including patella addition).

UKA: unicondylar knee arthroplasty; CI: confidence interval.

In 2007-2021, 1,659 (4.3%) primary UKAs were implanted in patients who died within thirteen years after the primary diagnosis.

UKA by procedure year

FIGURE Cumulative major revision percentage of unicondylar knee arthroplasties by procedure year of primary UKA in the Netherlands in 2009-2021 (n=38,992)

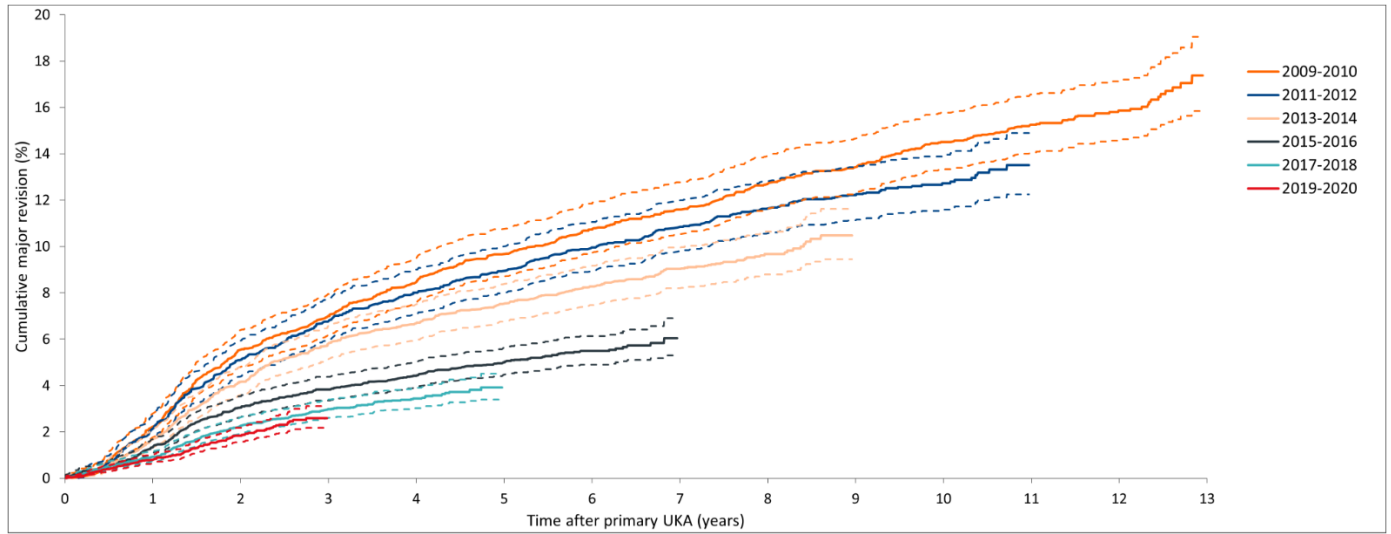


TABLE Cumulative major revision percentages

Cumulative major revision percentages - Competing Risk (95% CI)

Procedure year primary UKA	Number (n)	1yr	3yr	5yr	7yr	10yr
2009-2010	3,205	2.2 (1.8-2.8)	7.0 (6.2-7.9)	9.7 (8.7-10.7)	11.6 (10.5-12.8)	14.5 (13.3-15.8)
2011-2012	3,130	2.1 (1.7-2.7)	6.8 (5.9-7.7)	8.9 (8.0-10.0)	10.8 (9.8-12.0)	12.7 (11.6-14.0)
2013-2014	4,102	1.7 (1.3-2.1)	5.8 (5.1-6.6)	7.5 (6.8-8.4)	9.0 (8.2-10.0)	n.a.
2015-2016	5,435	1.3 (1.1-1.7)	3.8 (3.4-4.4)	5.0 (4.5-5.6)	n.a.	n.a.
2017-2018	7,026	0.9 (0.7-1.2)	3.0 (2.6-3.4)	n.a.	n.a.	n.a.
2019-2020	8,641	0.8 (0.6-1.0)	n.a.	n.a.	n.a.	n.a.

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

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

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.

CI: confidence interval.

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UKA by fixation

FIGURE Cumulative revision percentage of unicondylar knee arthroplasties by fixation of revision in the Netherlands in 2007-2021 (n=37,657)

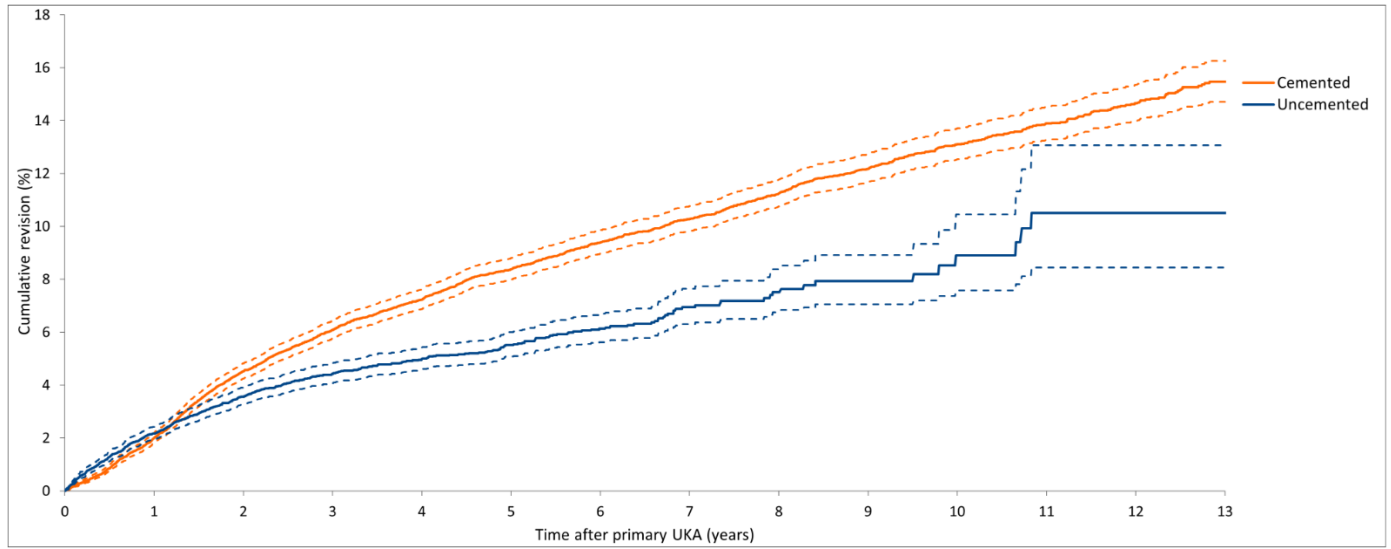


TABLE Cumulative 13-year revision percentage

Fixation	Number (n)	Cumulative 13-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Cemented	22,004	15.5 (14.7-16.3)	16.3 (15.4-17.1)
Uncemented	15,653	10.5 (8.4-13.1)	11.0 (8.5-13.5)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. UKA: unicondylar knee arthroplasty; CI: confidence interval.

TABLE Cumulative revision percentages of primary unicondylar knee arthroplasties by prosthesis component combination of patients who underwent a UKA for osteoarthritis in the Netherlands in 2007-2021 (n=34,632)

Femur component	Tibia component	Total primary UKAs (n)	Median (IQR) age (yr)	Total RAs (n)	Type of revision (n)						Cumulative revision percentage Kaplan Meier (95% CI)					
					Total knee (complete revision)	Patella addition	Only femur component	Only tibia component	Only insert/patella	Missing/unknown	1yr	3yr	5yr	7yr	10yr	13yr
All UKAs for osteoarthritis		38,170	64 (57-70)	2,780	2,095	7	15	66	568	29	2.1 (2.0-2.3)	5.6 (5.3-5.8)	7.6 (7.3-7.9)	9.5 (9.1-9.9)	12.5 (12.0-13.0)	15.1 (14.4-15.9)
Oxford PKR Uncemented	Oxford PKR Uncemented	15,059	64 (58-71)	593	311	0	2	19	217	5	2.1 (1.9-2.3)	4.2 (3.9-4.6)	5.3 (4.9-5.8)	6.7 (6.0-7.3)	8.6 (6.6-10.5)	n.a.
Oxford PKR Cemented	Oxford PKR Cemented	14,480	63 (57-69)	1,505	1,201	5	10	30	196	19	2.1 (1.9-2.3)	6.2 (5.8-6.6)	8.5 (8.0-9.0)	10.5 (9.9-11.1)	13.5 (12.8-14.2)	16.1 (15.2-17.0)
Physica Zimmer Unicompartmental High Flex Knee	Physica Zimmer Unicompartmental High Flex Knee	3,723	62 (57-69)	123	105	0	0	1	12	0	0.8 (0.5-1.1)	3.1 (2.4-3.8)	4.4 (3.4-5.3)	6.1 (4.8-7.4)	9.2 (7.1-11.3)	10.6 (8.0-13.3)
Genesis Uni	Genesis Uni	1,278	62 (56-68)	214	202	1	0	2	6	3	3.1 (2.1-4.0)	9.1 (7.5-10.6)	12.6 (10.8-14.4)	14.9 (12.9-16.9)	17.7 (15.4-19.9)	19.9 (17.2-22.6)
balanSys UNI	balanSys UNI	523	61 (55-68)	58	48	1	0	4	5	0	3.5 (1.9-5.2)	9.7 (6.8-12.5)	11.2 (8.1-14.2)	12.2 (8.9-15.4)	16.4 (12.1-20.6)	n.a.
Journey Uni	Journey Uni	445	62 (56-69)	26	22	0	2	1	0	1	1.6 (0.4-2.8)	5.4 (3.1-7.8)	8.6 (5.2-12.1)	n.a.	n.a.	n.a.
Oxford PKR Uncemented	Oxford PKR Cemented	437	66 (57-72)	29	17	0	0	0	9	0	4.0 (2.1-5.9)	6.0 (3.5-8.4)	8.6 (5.3-11.9)	n.a.	n.a.	n.a.
Oxford PKR Cemented	Oxford PKR Uncemented	207	66 (59-72)	15	7	0	1	0	1	0	3.0 (0.6-5.3)	6.6 (3.0-10.2)	8.3 (3.4-13.3)	n.a.	n.a.	n.a.
Triathlon	Triathlon	197*	60 (54-65)	21	20	0	0	0	5	0	1.5 (0.0-3.2)	7.8 (3.9-11.7)	9.7 (5.0-14.4)	n.a.	n.a.	n.a.
HLS uni	HLS Uni	171*	58 (52-65)	36	35	0	0	0	1	0	2.3 (0.1-4.6)	8.8 (4.5-13.0)	16.5 (10.9-22.0)	19.4 (13.5-25.4)	20.7 (14.6-26.8)	n.a.
Allegretto	Allegretto	108*	57 (51-65)	21	18	0	0	3	0	0	7.4 (2.5-12.3)	13.0 (6.7-19.4)	17.5 (10.1-24.8)	n.a.	n.a.	n.a.

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 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.

UKA by pre-PROM

FIGURE Cumulative revision percentage of unicondylar knee arthroplasties by valid pre-operative PROM of patients who underwent a UKA for osteoarthritis in the Netherlands in 2014-2021 (n=28,412)

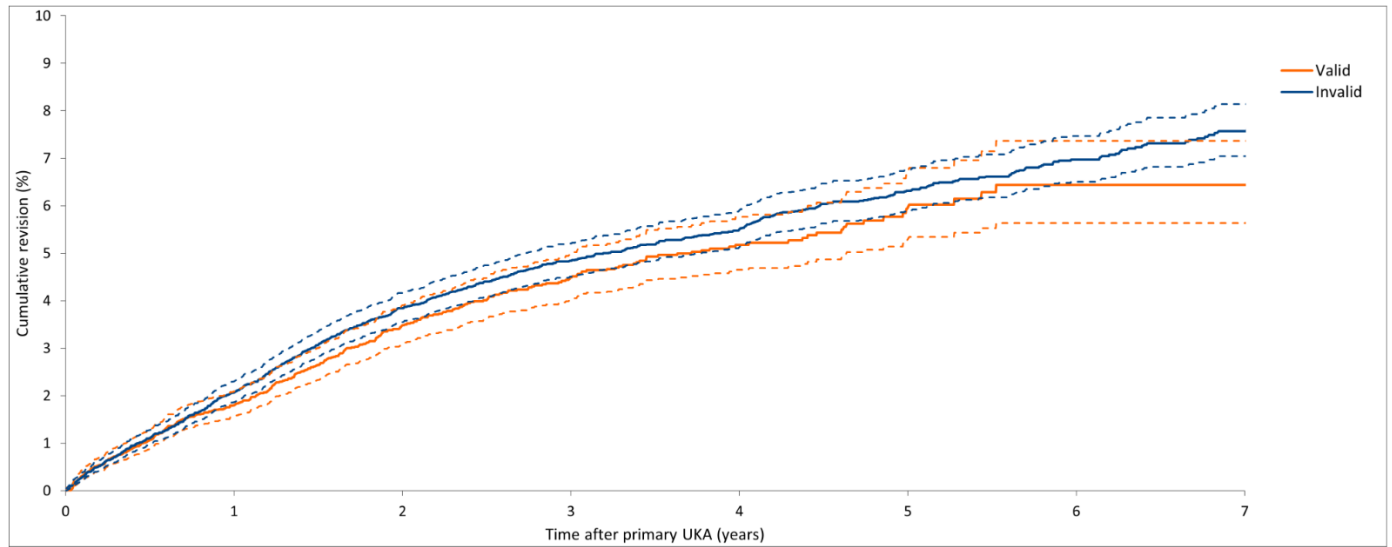


TABLE Cumulative 7-year revision percentage

Pre-PROM	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Valid	10,801	6.4 (5.6-7.4)	6.5 (5.7-7.4)
Invalid	17,611	7.6 (7.0-8.1)	7.7 (7.2-8.3)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
Valid: pre-operative PROM reported; Invalid: non-responders to pre-operative PROM; PROM: patient reported outcome measure.
UKA: unicondylar knee arthroplasty; CI: confidence interval.

PROMs

Response TKA

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a TKA for osteoarthritis per pre-operative PROMs registering hospital (n=93) in the Netherlands in 2014-2021

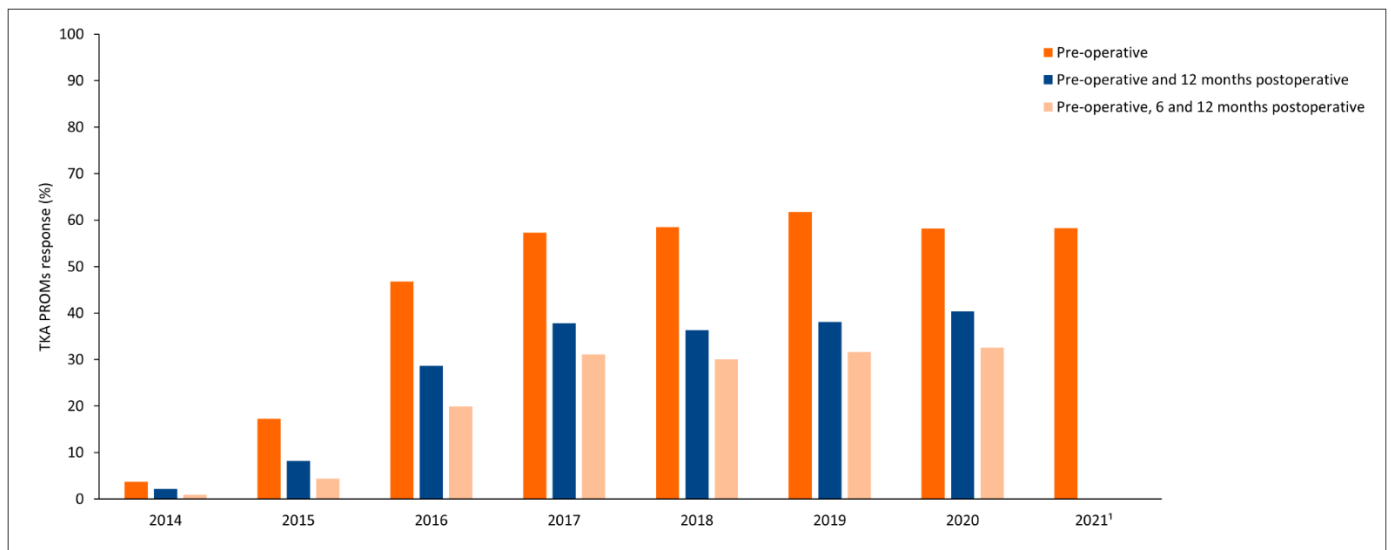


TABLE PROMs response percentages

Year	2014	2015	2016	2017	2018	2019	2020	2021 ¹
TKA for osteoarthritis (n)	22,103	22,104	22,301	22,407	23,437	23,311	16,812	19,515
TKA PROMs response (%)								
Pre-operative	3,7	17,3	46,8	57,3	58,5	61,7	58,2	58,3
Pre-operative and 12 months postoperative	2,2	8,2	28,7	37,8	36,3	38,1	40,4	n.a.
Pre-operative, 6 and 12 months postoperative	0,9	4,4	19,9	31,1	30,1	31,6	32,6	n.a.

¹ The 12 months postoperative PROMs response percentage is not (yet) available for 2021.
TKA: total knee arthroplasty, PROM: patient reported outcome measure.

Response UKA

FIGURE Pre-operative, 6 months and 12 months postoperative response percentage of patients who underwent a UKA per pre-operative PROMs registering hospital (n=89) in the Netherlands in 2014-2021

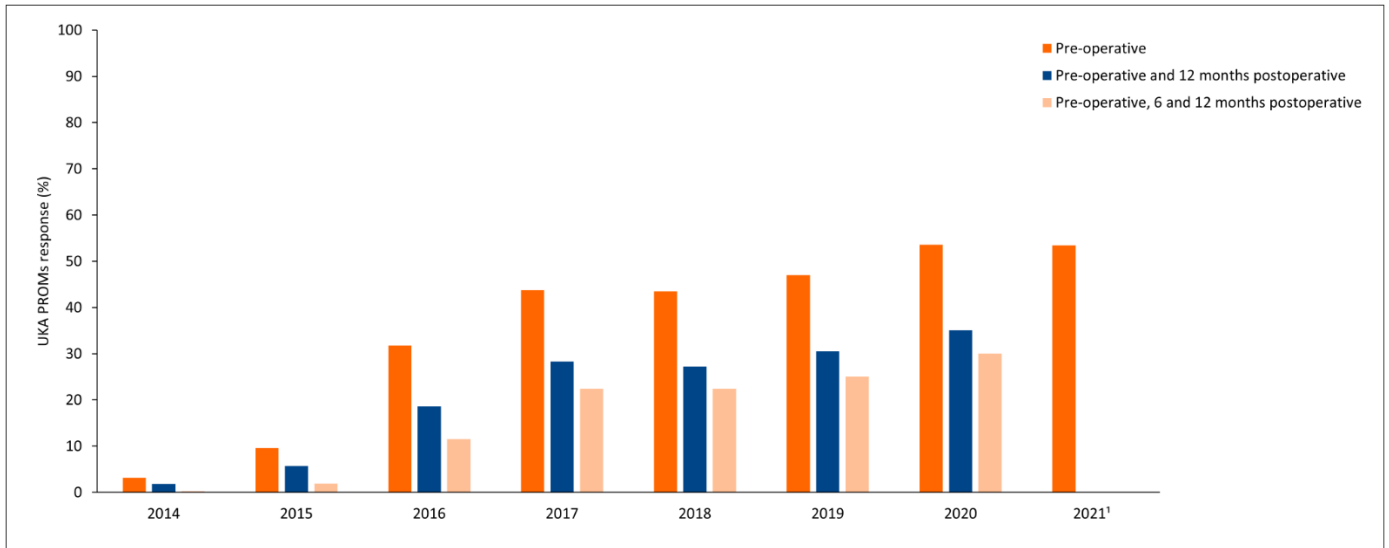


TABLE PROMs response percentages

Year	2014	2015	2016	2017	2018	2019	2020	2021 ¹
UKA (n)	2,199	2,492	2,697	3,136	3,587	4,288	3,919	5,175
UKA PROMs response (%)								
Pre-operative	3,1	9,6	31,8	43,8	43,5	47,0	53,6	53,4
Pre-operative and 12 months postoperative	1,8	5,7	18,6	28,3	27,2	30,5	35,1	n.a.
Pre-operative, 6 and 12 months postoperative	0,3	1,9	11,5	22,4	22,4	25,1	30,0	n.a.

¹ The 12 months postoperative PROMs response percentage is not (yet) available for 2021.
UKA: unicompartmental knee arthroplasty; PROM: patient reported outcome measure.

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

NRS (rest)

FIGURE Mean pre-operative, 6 months and 12 months postoperative NRS (rest) scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2020

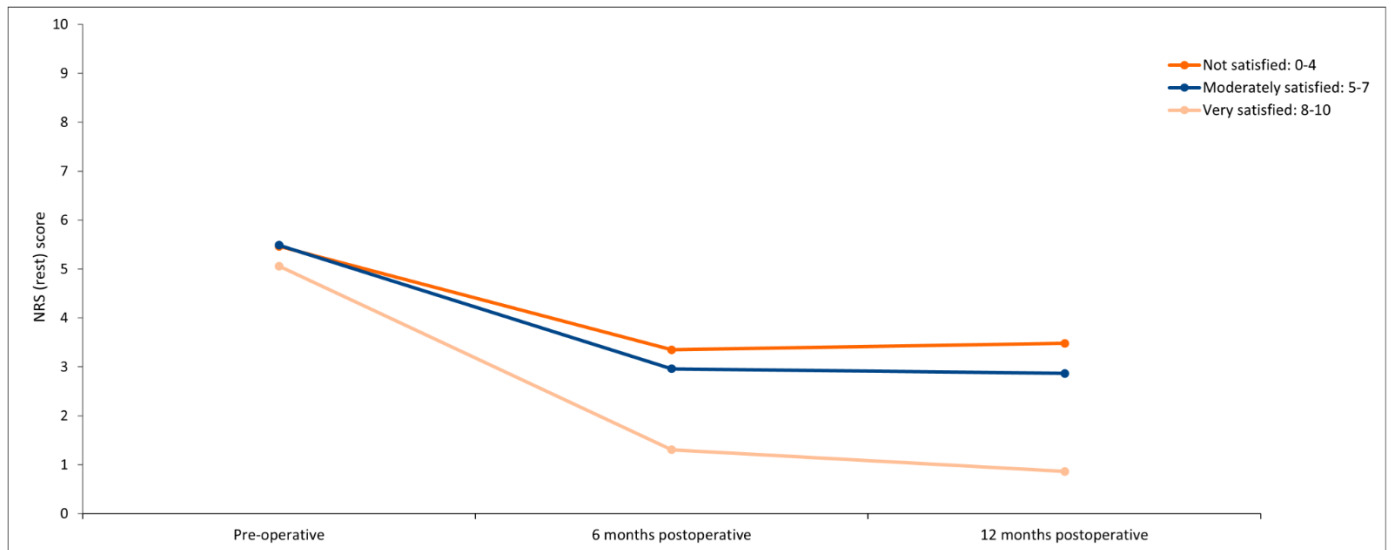


TABLE Mean NRS (rest) scores

NRS (rest) score	Pre-operative		6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,013	5.4 (5.3-5.6)	2,016	3.3 (3.2-3.5)	2,059	3.5 (3.4-3.6)
Moderately satisfied: 5-7	6,109	5.5 (5.4-5.5)	6,221	3.0 (2.9-3.0)	6,285	2.9 (2.8-2.9)
Very satisfied: 8-10	20,043	5.1 (5.0-5.1)	20,383	1.3 (1.3-1.3)	20,683	0.9 (0.8-0.9)
Total	30,739	5.2 (5.2-5.2)	31,280	1.8 (1.8-1.8)	31,424	1.5 (1.5-1.5)

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

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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 pre-operative, 6 months and 12 months postoperative NRS (activity) scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2020

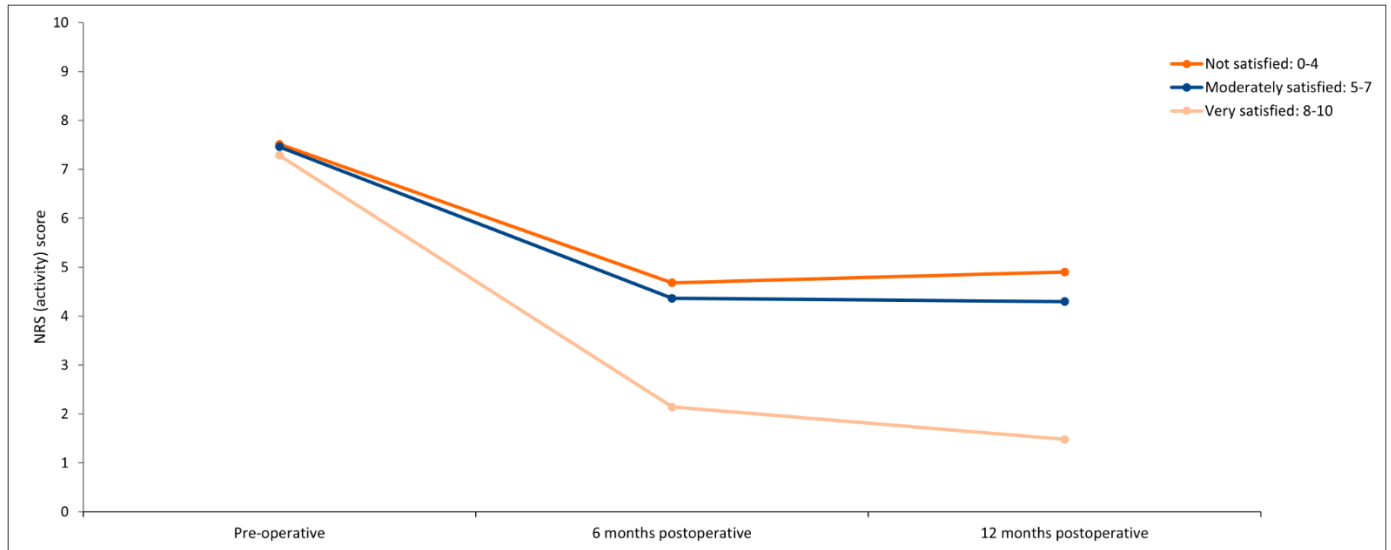


TABLE Mean NRS (activity) scores

NRS (activity) score	Pre-operative		6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,011	7.5 (7.4-7.6)	2,013	4.7 (4.6-4.8)	2,062	4.9 (4.8-5.0)
Moderately satisfied: 5-7	6,107	7.5 (7.4-7.5)	6,220	4.4 (4.3-4.4)	6,286	4.3 (4.2-4.4)
Very satisfied: 8-10	20,033	7.3 (7.3-7.3)	20,371	2.1 (2.1-2.2)	20,683	1.5 (1.5-1.5)
Total	30,722	7.3 (7.3-7.3)	31,266	2.8 (2.8-2.8)	31,422	2.3 (2.3-2.4)

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

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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.

EQ5D index score

FIGURE Mean pre-operative, 6 months and 12 months postoperative EQ-5D index scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2020

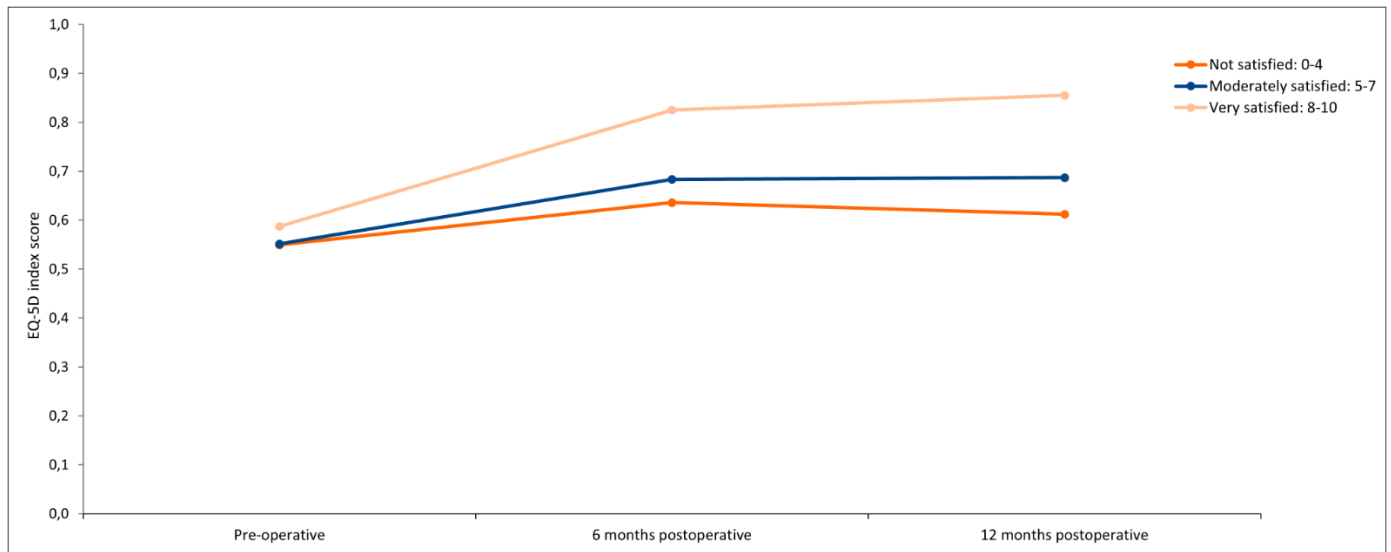


TABLE Mean EQ-5D index scores

EQ-5D Index score	Pre-operative		6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,038	0.55 (0.54-0.56)	1,998	0.64 (0.63-0.65)	2,021	0.61 (0.60-0.62)
Moderately satisfied: 5-7	6,240	0.55 (0.55-0.56)	6,215	0.68 (0.68-0.69)	6,235	0.69 (0.68-0.69)
Very satisfied: 8-10	20,624	0.59 (0.58-0.59)	20,492	0.82 (0.82-0.83)	20,558	0.89 (0.85-0.86)
Total	31,912	0.58 (0.58-0.58)	31,757	0.78 (0.78-0.78)	31,501	0.80 (0.80-0.80)

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

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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.

EQ5D thermometer

FIGURE Mean pre-operative, 6 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2020

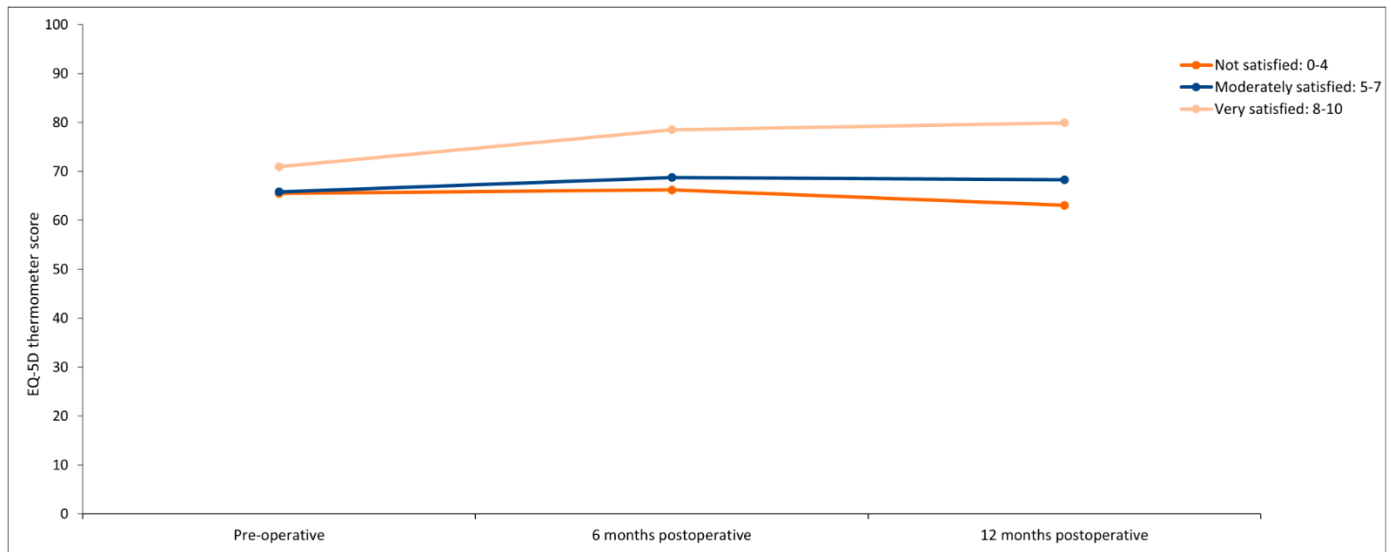


TABLE Mean EQ-5D thermometer scores

EQ-5D thermometer score	Pre-operative		6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,047	65.5 (64.7-66.4)	2,017	66.2 (65.3-67.1)	2,030	63.1 (62.1-64.1)
Moderately satisfied: 5-7	6,257	65.8 (65.4-66.3)	6,259	68.8 (68.3-69.2)	6,273	68.3 (67.9-68.7)
Very satisfied: 8-10	20,642	71.0 (70.7-71.2)	20,636	78.5 (78.3-78.8)	20,661	79.9 (79.9-80.2)
Total	32,013	69.2 (69.0-69.4)	31,975	75.4 (75.2-75.6)	31,722	75.9 (75.7-76.1)

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

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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 pre-operative, 6 months and 12 months postoperative KOOS-PS scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2020

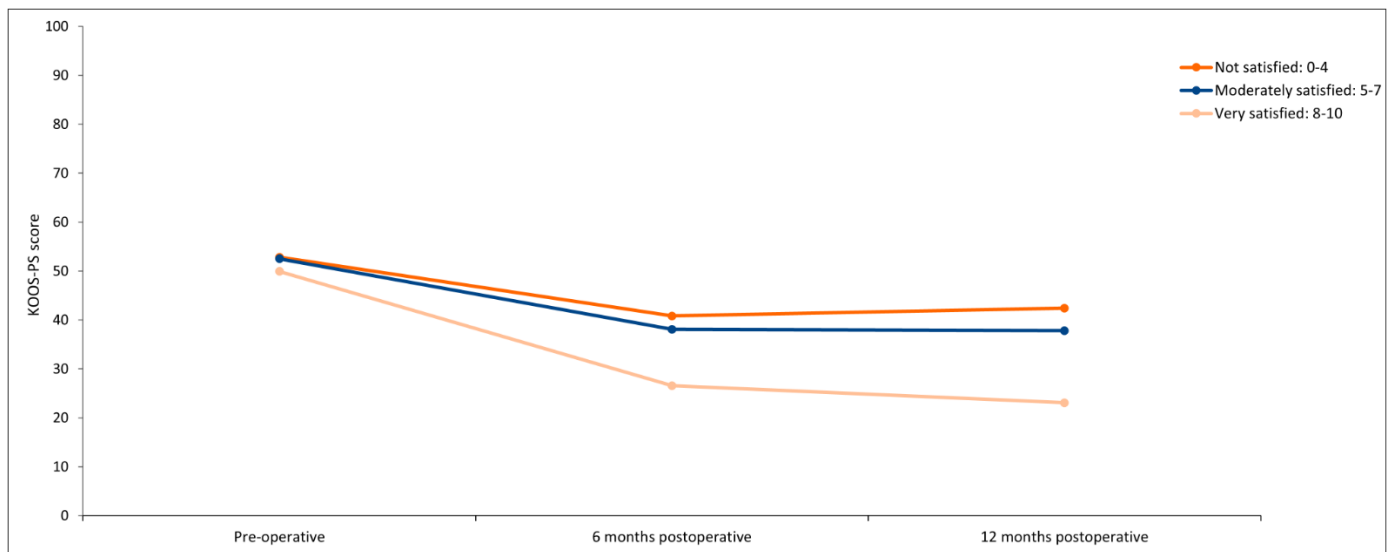


TABLE Mean KOOS-PS scores

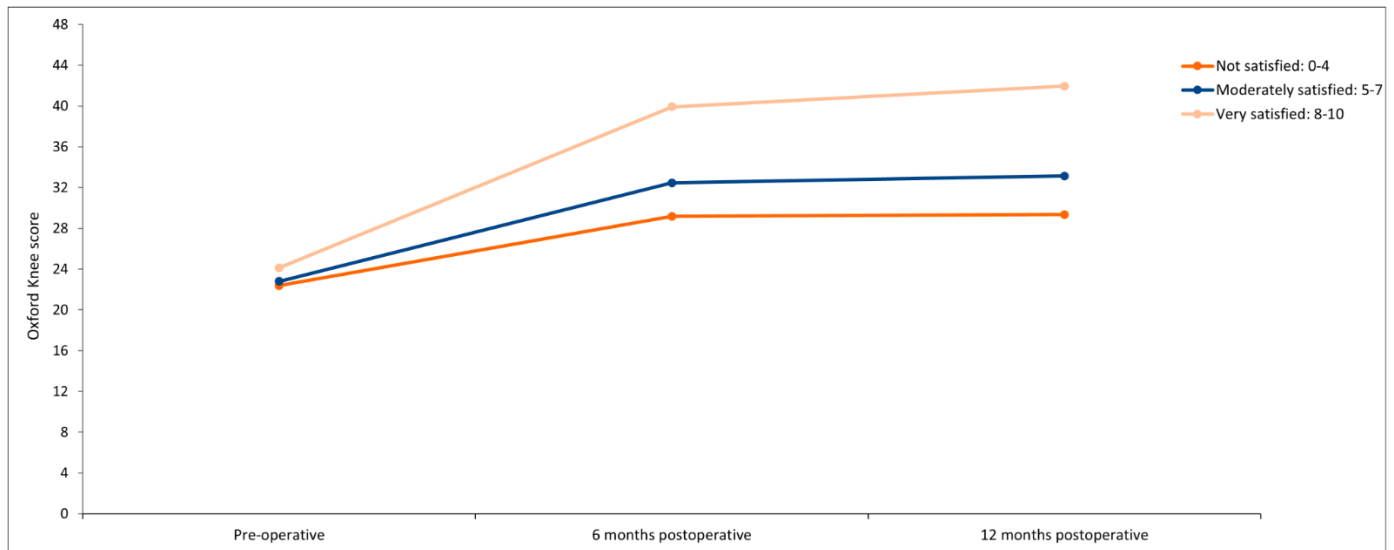
KOOS-PS score	Pre-operative		6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	2,029	52.7 (52.0-53.3)	1,976	40.7 (40.0-41.5)	1,999	42.4 (41.6-43.2)
Moderately satisfied: 5-7	6,202	52.6 (52.2-52.9)	6,052	38.1 (37.8-38.4)	6,097	37.8 (37.5-38.1)
Very satisfied: 8-10	20,440	50.0 (49.8-50.2)	20,048	26.6 (26.4-26.7)	20,124	23.1 (22.9-23.3)
Total	31,639	50.8 (50.6-50.9)	31,074	30.2 (30.1-30.4)	30,883	27.8 (27.6-28.0)

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

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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 pre-operative, 6 months and 12 months postoperative Oxford Knee scores of patients who underwent a TKA for osteoarthritis by NRS satisfaction score in the Netherlands in 2014-2020**TABLE** Mean Oxford Knee scores

Oxford Knee score	Pre-operative		6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
Not satisfied: 0-4	1,961	22.4 (22.1-22.7)	1,931	29.2 (28.7-29.6)	1,949	29.4 (28.9-29.8)
Moderately satisfied: 5-7	5,916	22.8 (22.6-23.0)	5,892	32.5 (32.3-32.6)	5,932	33.1 (32.9-33.3)
Very satisfied: 8-10	19,449	24.1 (24.0-24.2)	19,414	39.9 (39.8-40.0)	19,539	42.0 (41.9-42.0)
Total	29,978	23.7 (23.6-23.8)	29,850	37.5 (37.4-37.6)	29,604	39.2 (39.1-39.3)

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

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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 6 months and 12 months postoperative NRS (satisfaction) scores of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2020

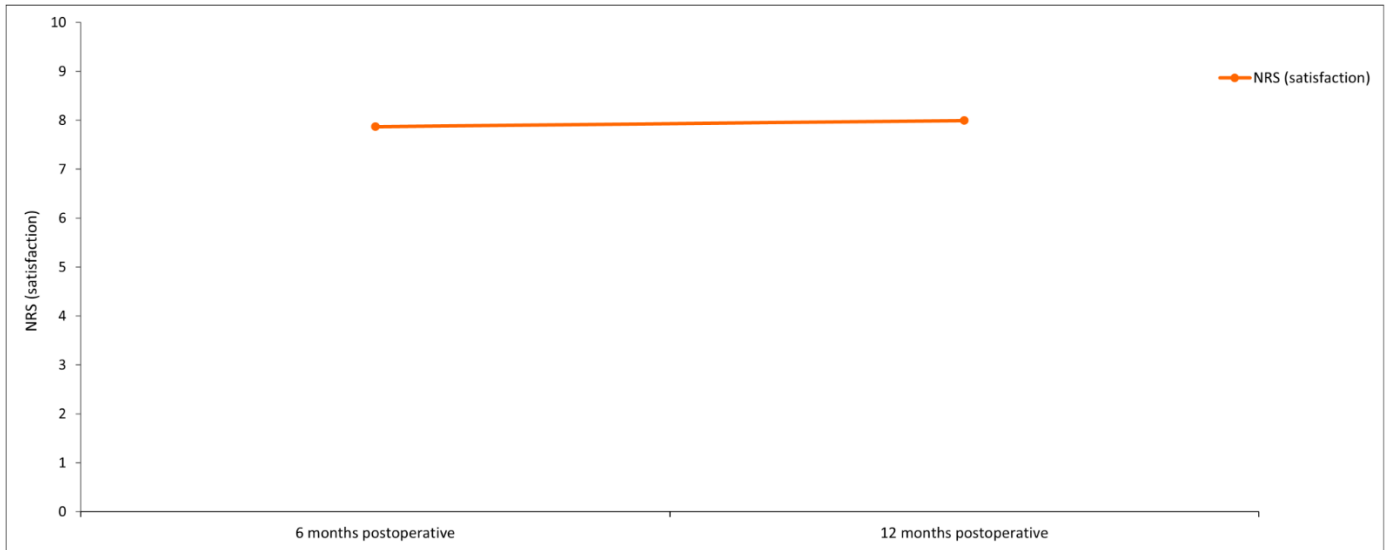


TABLE Mean NRS (satisfaction) scores

	6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)
NRS satisfaction	29,292	7.9 (7.8-7.9)	29,280	8.0 (8.0-8.0)

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.

Anchor questions

FIGURE Mean 6 months and 12 months postoperative change in daily functioning and pain of patients who underwent a TKA for osteoarthritis in the Netherlands in 2014-2020

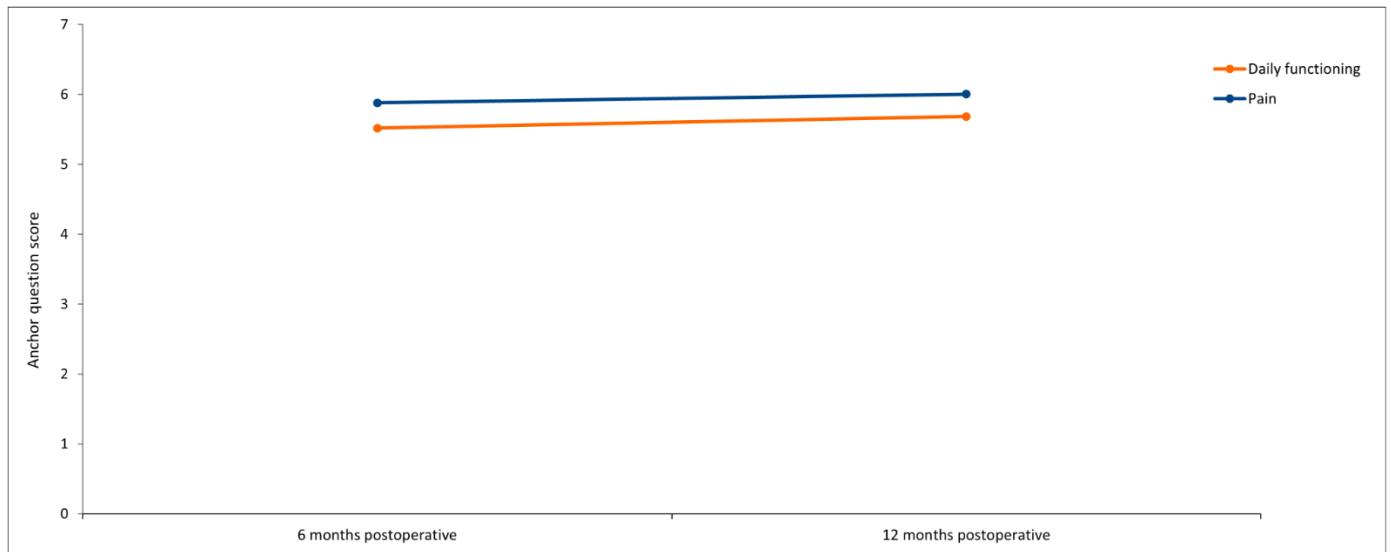


TABLE Mean anchor questions

Anchor question score	6 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)
Daily functioning	30,733	5.5 (5.5-5.5)	30,816	5.8 (5.8-5.8)
Pain	28,952	5.9 (5.9-5.9)	29,000	6.0 (6.0-6.0)

TKA: total knee arthroplasty; CI: confidence interval.

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

Ankle arthroplasty

Numbers

Registered procedures

TABLE Number of registered ankle arthroplasties per year of surgery (2014-2021) in the LROI in April 2022

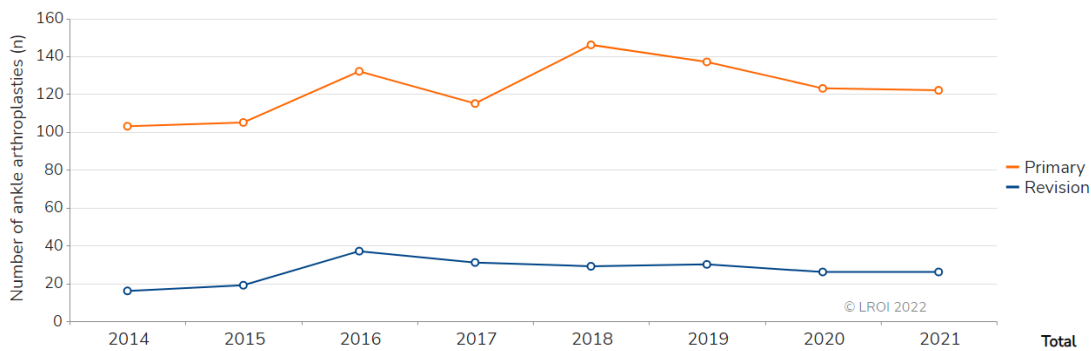
Year of surgery	Type of ankle arthroplasty			Total ¹ (n)
	Total arthroplasty (n)	Other (n)	Revision arthroplasty (n)	
2014	102	0	16	119
2015	105	0	19	124
2016	125	6	37	169
2017	111	3	31	146
2018	143	1	29	175
2019	134	2	30	167
2020	122	0	26	149
2021	122	0	26	148
Total	964	12	214	1,197

¹ In 0.6% (n=7) primary ankle arthroplasties the type of primary ankle prosthesis has not been registered.

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Type of procedures

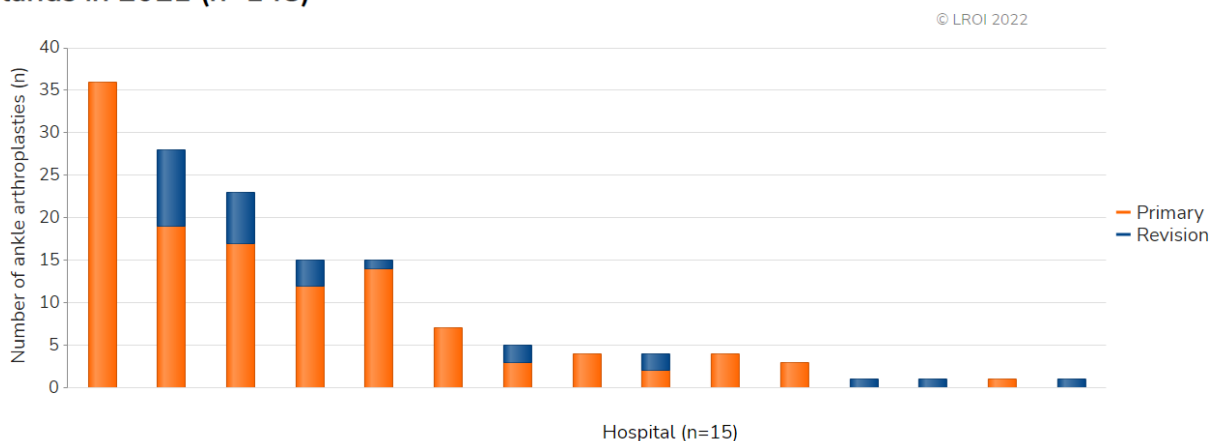
FIGURE Number of primary ankle arthroplasties and ankle revision arthroplasties registered in the LROI in the Netherlands in 2014-2021



Year	2014	2015	2016	2017	2018	2019	2020	2021	Total
Primary	103	105	132	115	146	137	123	122	983
Revision	16	19	37	31	29	30	26	26	214
Total:	119	124	169	146	175	167	149	148	1,197

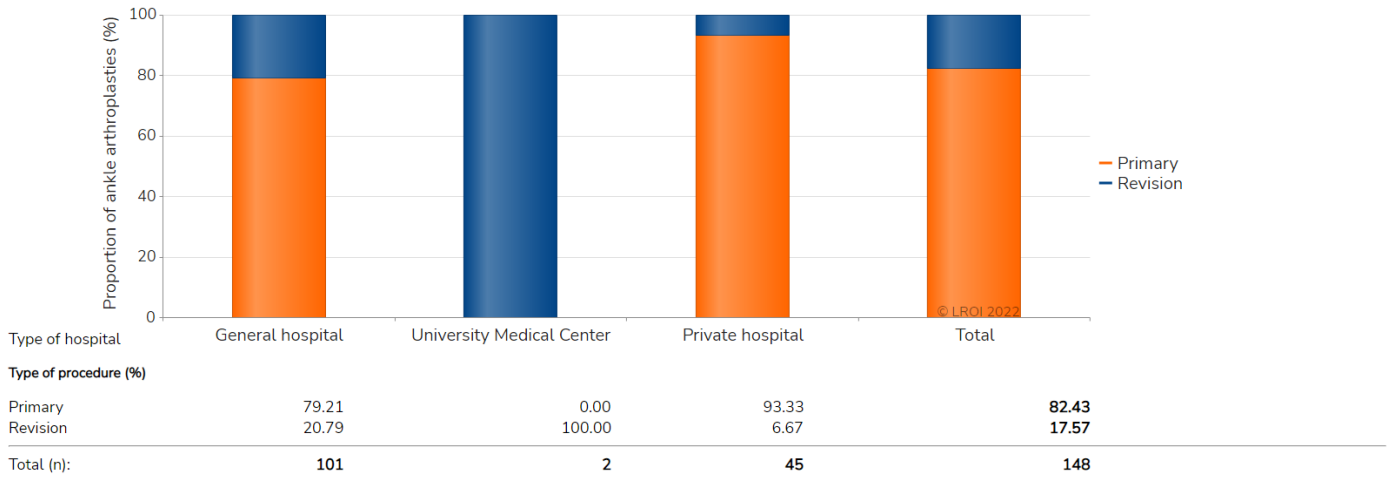
Type of procedure per hospital

FIGURE Number of primary ankle arthroplasties and ankle revision arthroplasties per hospital in the Netherlands in 2021 (n=148)



Type of hospital

FIGURE Primary ankle arthroplasties and ankle revision arthroplasties (proportion [%] per category) by type of hospital in the Netherlands in 2021



Please note: In 2021, 9 general hospitals, 2 UMCs and 4 private hospitals performed ankle arthroplasties.
 General: general hospital; UMC: university medical centre; Private: private hospital.

Primary ankle arthroplasty

Demographics

Patient characteristics by diagnosis

TABLE Patient characteristics of all patients with a registered primary ankle arthroplasty by diagnosis in the Netherlands in 2021

	Osteoarthritis (n=109)	No osteoarthritis ¹ (n=13)	Total (n=122)
Mean age (years) (SD)	70.6 (7.2)	62.7 (8.8)	69.7 (7.7)
Age (years) (%)			
<50	1	8	2
50-59	5	31	7
60-69	34	31	34
70-79	51	31	49
≥80	9	0	8
Gender (%)			
Men	56	69	57
Women	44	31	43
ASA score (%)			
I	12	8	11
II	78	69	77
III-IV	10	23	11
Type of hospital (%)			
General	62	92	66
UMC	0	0	0
Private	38	8	34
Charnley-score (%)			
A One ankle joint affected	63	92	66
B1 Both ankle joints affected	18	0	16
B2 Contralateral ankle joint with a total ankle prosthesis	2	0	2
C Multiple joints affected or chronic disease that affects quality of life	17	8	16
Mean Body Mass Index (kg/m ²) (SD)	27.6 (4.2)	27.7 (4.3)	27.6 (4.2)
Body Mass Index (kg/m ²) (%)			
Underweight (≤18,5)	0	0	0
Normal weight (>18,5-25)	28	23	28
Overweight (>25-30)	52	62	53
Obesity (>30-40)	18	15	18
Morbid obesity (>40)	1	0	1
Smoking (%)			
No	94	92	93
Yes	6	8	7

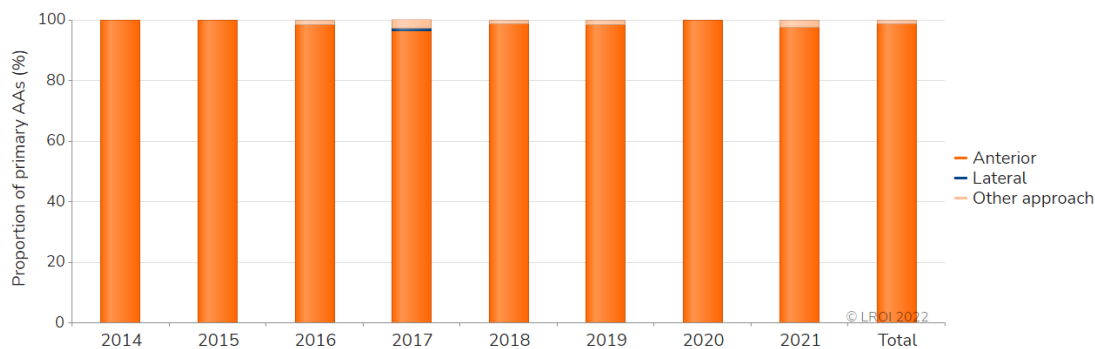
¹ Another diagnosis than osteoarthritis registered as primary diagnosis, specifically post-traumatic (n=9), rheumatoid arthritis (n=3) or other primary diagnosis (n=1).
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Surgery and prosthesis

Surgical approach

FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary ankle arthroplasty in the Netherlands in 2014-2021

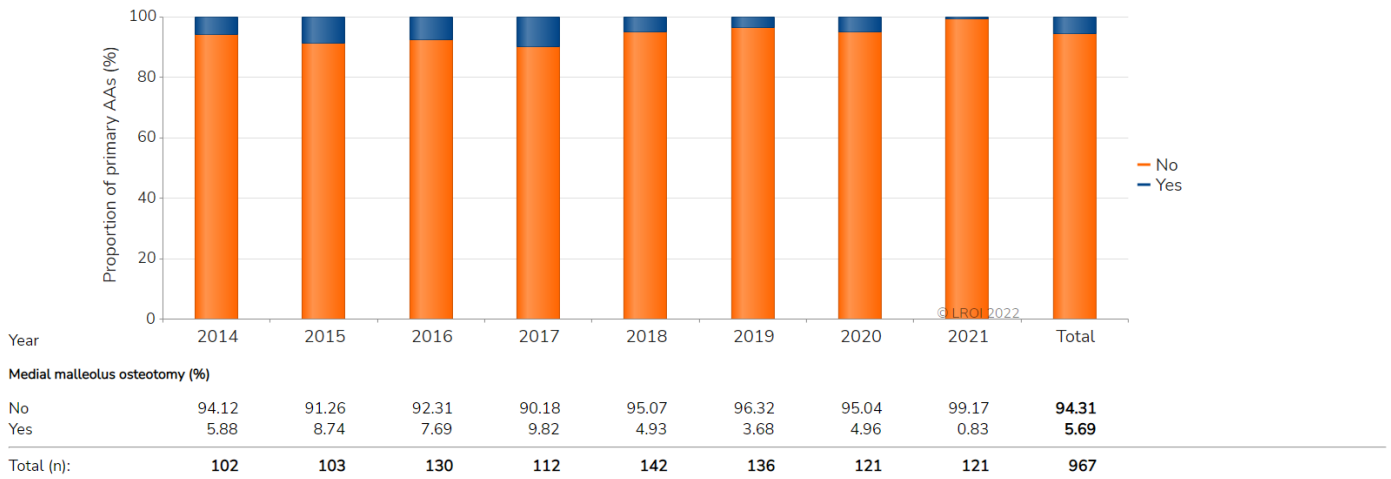


Surgical approach (%)	2014	2015	2016	2017	2018	2019	2020	2021	Total
Anterior	100.00	100.00	98.46	96.43	98.60	98.51	100.00	97.54	98.65
Lateral	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.10
Other approach	0.00	0.00	1.54	2.68	1.40	1.49	0.00	2.46	1.25
Total (n):	101	101	130	112	143	134	120	122	963

AA: ankle arthroplasty.

Medial malleolus osteotomy

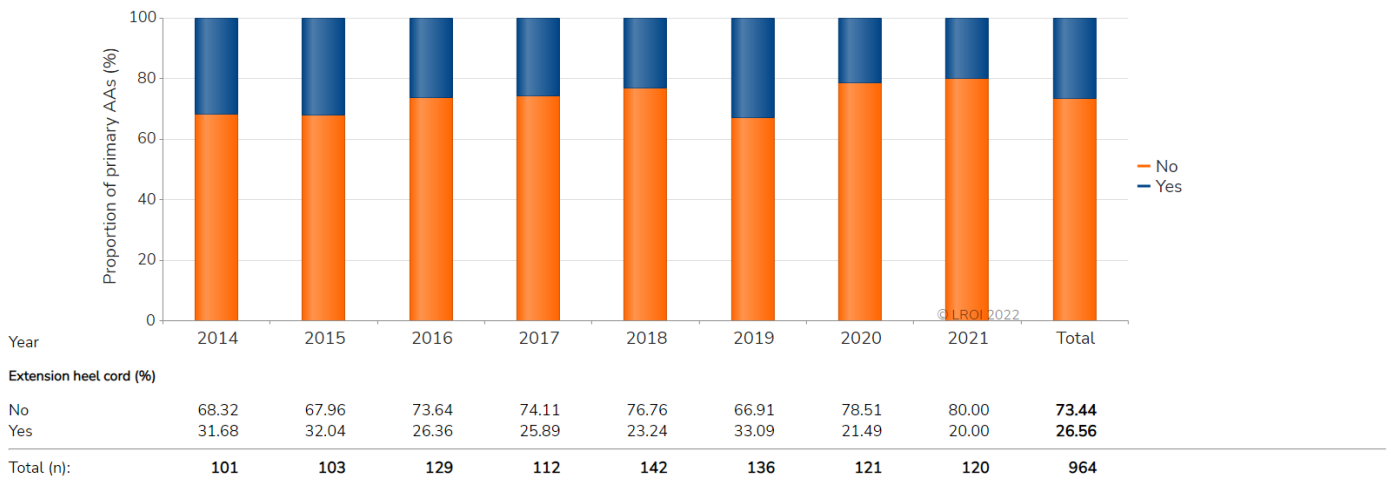
FIGURE Trend (proportion [%] per year) in medial malleolus osteotomy in primary ankle arthroplasties in the Netherlands in 2014-2021



AA: ankle arthroplasty.

Extension heel cord

FIGURE Trend (proportion [%] per year) in heel cord extension in primary ankle arthroplasties in the Netherlands in 2014-2021



AA: ankle arthroplasty.

Most frequently registered ankle prostheses

TABLE The most frequently registered primary ankle arthroplasties in the Netherlands in 2021 (n=108)

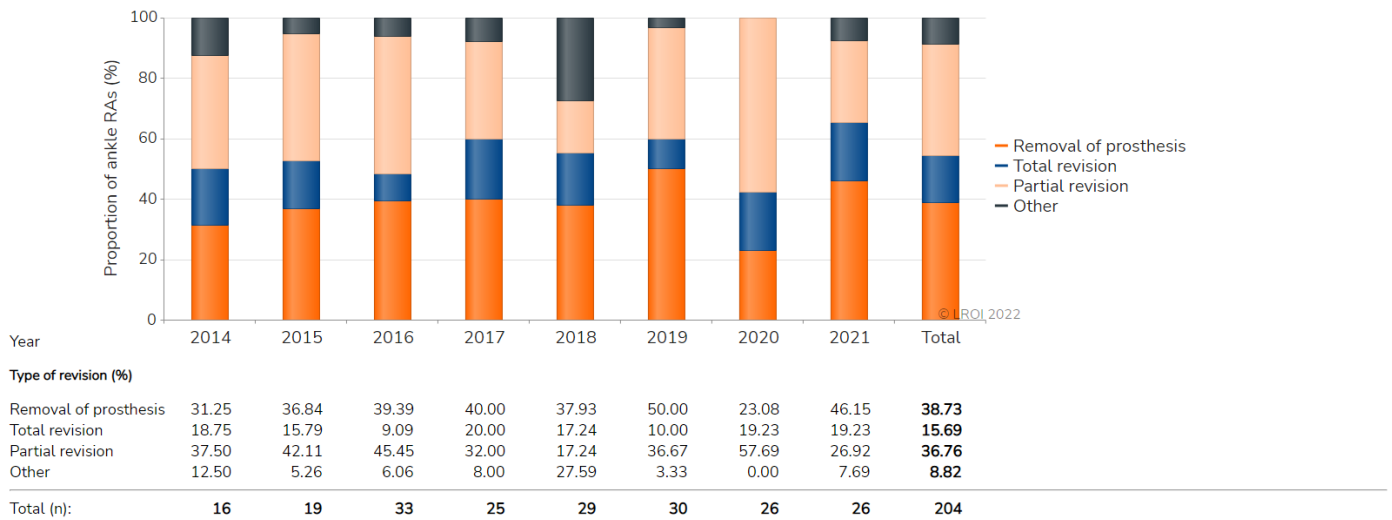
Name	Proportion (%)
Salto	58.3
Infinity	34.3
Cadence	3.7
AAA OSG	1.9
Inbone	1.9

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Ankle revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision arthroplasty of ankle revision arthroplasties in the Netherlands in 2014-2021



Please note: In 10 (4.2%) ankle revision arthroplasties, the type of revision was not registered.
RA: revision arthroplasty.

Reasons for revision

TABLE Trend (proportion [%] per year) reasons for revision in patients who underwent an ankle revision arthroplasty in the Netherlands in 2016-2021

Year	2016	2017	2018	2019	2020	2021	Total
Ankle revision arthroplasty (n)	37	31	29	30	26	26	179
Reasons for revision; Proportion¹ (%)							
Cyst formation	21.6	41.9	41.4	53.3	23.1	53.9	38.6
Inlay wear	35.1	45.2	31.0	40.0	30.8	30.8	35.8
Loosening of talus component	29.7	38.7	37.9	40.0	11.5	30.8	31.8
Loosening of tibia component	18.9	22.6	34.5	26.7	19.2	23.1	24.0
Malalignment	8.1	29.0	24.1	26.7	11.5	15.4	19.0
Instability	8.1	25.8	20.7	26.7	19.2	7.7	17.9
Infection	13.5	3.2	24.1	10.0	11.5	15.4	12.9
Arthrofibrosis	5.4	9.7	3.5	6.7	23.1	26.9	11.7
Dislocation	5.4	9.7	6.9	10.0	7.7	3.9	7.3
Peri-prosthetic fracture	0.0	3.2	3.5	3.3	7.7	0.0	2.8
Other	5.4	0.0	10.3	10.0	15.4	3.9	7.3

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

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Survival

Overall

FIGURE Cumulative revision percentage of primary ankle arthroplasties in the Netherlands in 2014-2021 (n=982)

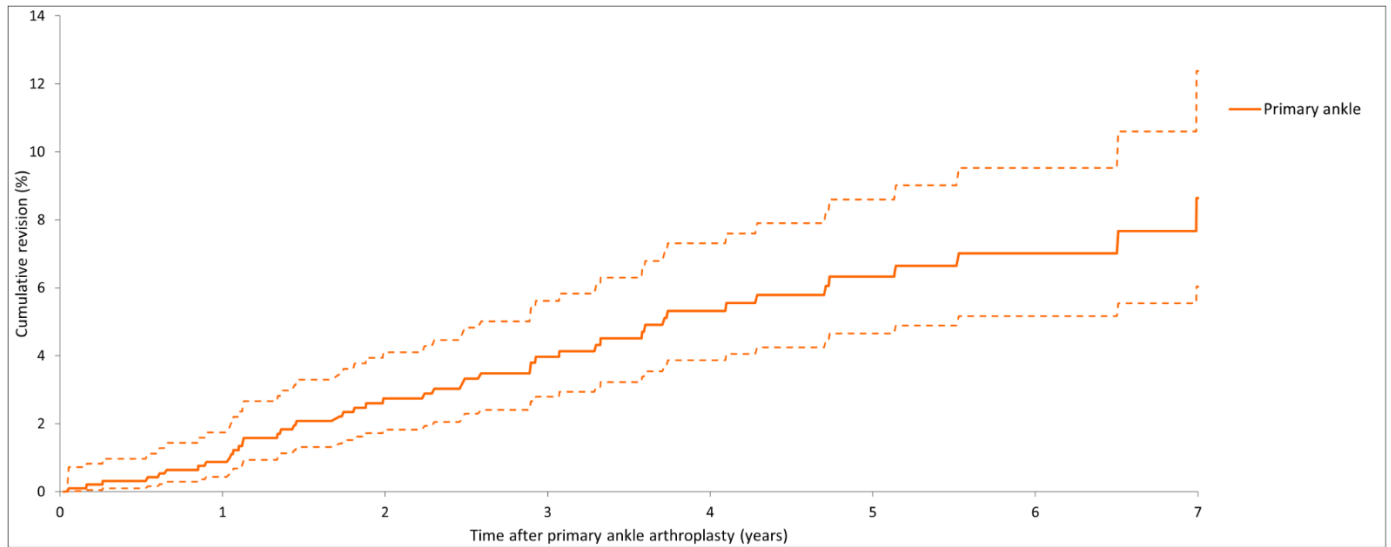


TABLE Cumulative 7-year revision percentage

	Number (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Primary ankle arthroplasty	982			
1-year revision (%)		850	0.9 (0.4-1.7)	0.9 (0.3-1.5)
3-year revision (%)		560	4.0 (2.8-5.6)	4.0 (2.6-5.4)
5-year revision (%)		294	6.3 (4.7-8.6)	6.5 (4.5-8.5)
7-year revision (%)		84	8.6 (6.0-12.4)	8.0 (5.3-10.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 CI: confidence interval.
 Please note: The number of registered ankle revision arthroplasties is not complete.

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In 2014-2021, 45 (4.6%) primary ankle arthroplasties were implanted in patients who died within seven years after the primary procedure.

Shoulder arthroplasty

Numbers

Registered procedures

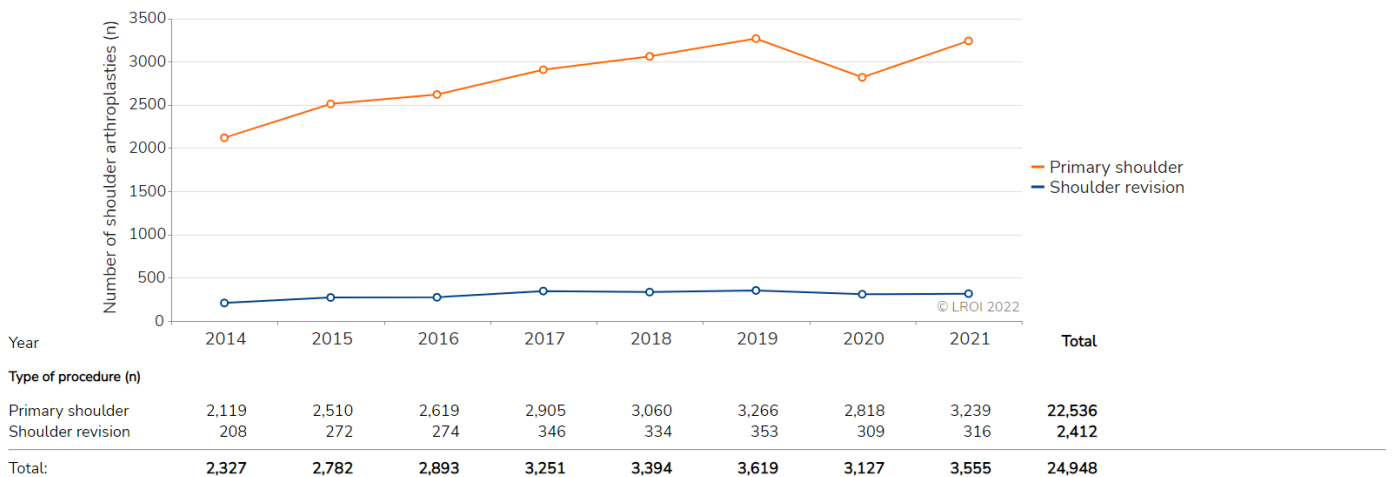
TABLE Number of registered shoulder arthroplasties per year of surgery (2014-2021) in the LROI in April 2022

Year of surgery	Type of shoulder arthroplasty					Total (n)
	Reversed arthroplasty (n)	Total anatomical arthroplasty (n)	Hemi-arthroplasty (n)	Unknown/missing (n)	Revision arthroplasty (n)	
2014	1,238	395	473	13	208	2,327
2015	1,570	505	428	7	272	2,782
2016	1,742	518	345	14	274	2,893
2017	1,978	562	351	14	346	3,251
2018	2,130	631	293	6	334	3,394
2019	2,409	614	240	3	353	3,619
2020	2,155	481	178	4	309	3,127
2021	2,444	582	176	37	316	3,555
Total	15,666	4,288	2,484	98	2,412	24,948

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Procedures

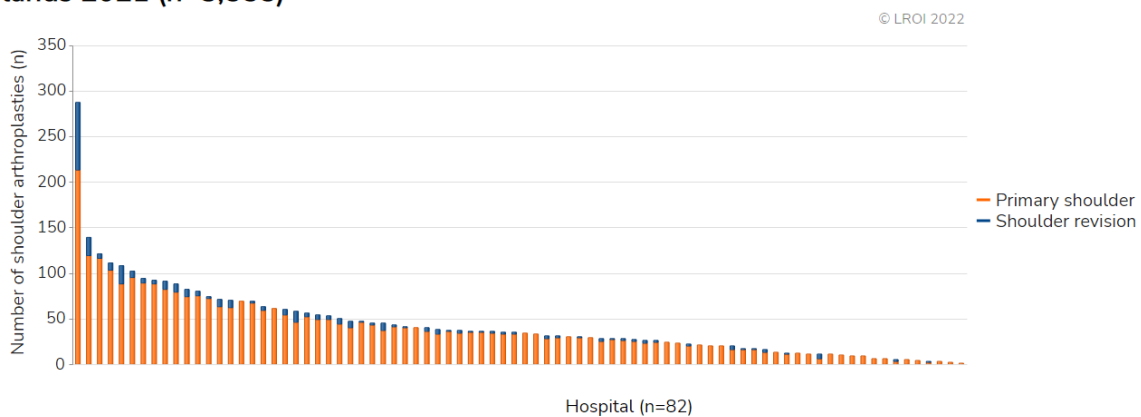
FIGURE Number of primary shoulder arthroplasties and shoulder revision arthroplasties registered in the LROI in the Netherlands 2014-2021



Out of 3,239 primary shoulder arthroplasties that were performed in 2021, 1% (n=40) was performed bilaterally.

Type of procedure per hospital

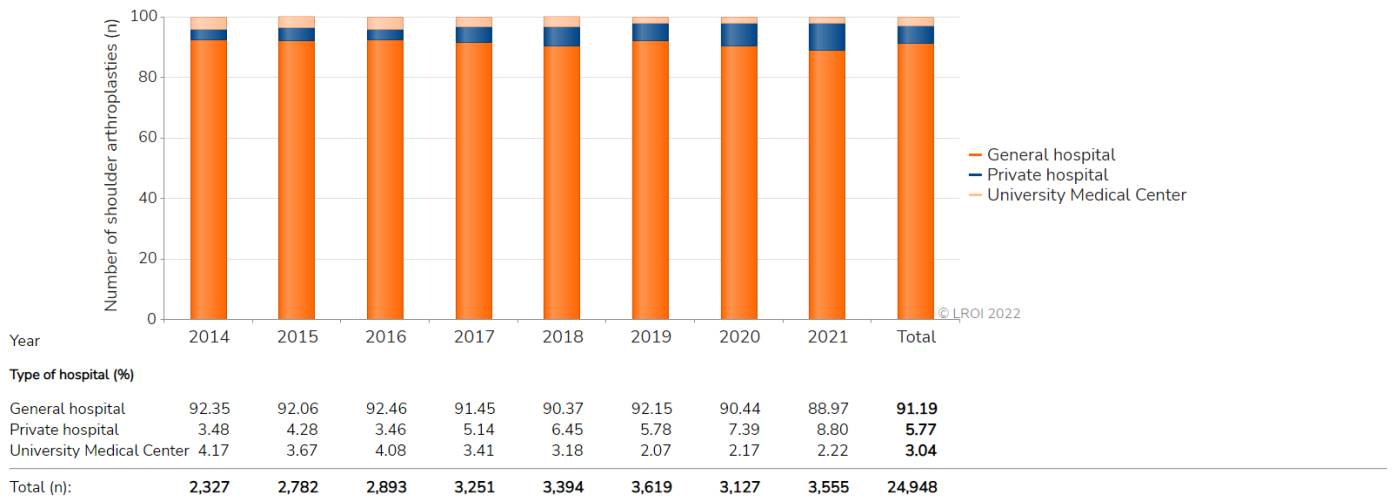
FIGURE Number of primary shoulder arthroplasties and shoulder revision arthroplasties per hospital in the Netherlands 2021 (n=3,555)



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Type of hospital

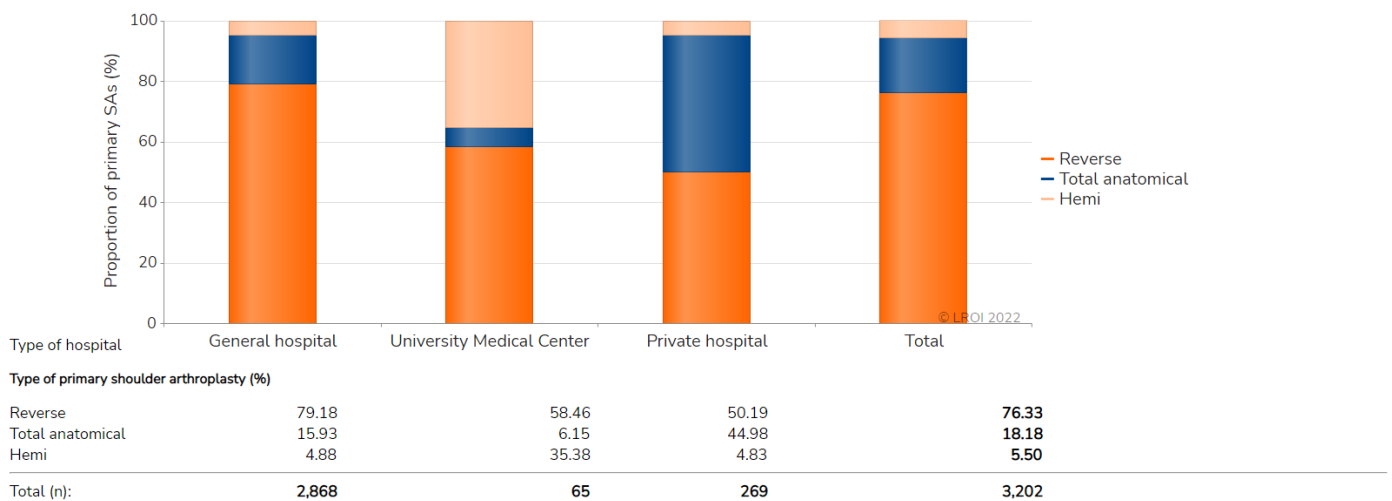
FIGURE Trend (proportion [%] per year) in type of hospital performing primary and revision shoulder arthroplasties in the Netherlands in 2012-2021



Please note: The number of general hospitals that performed shoulder arthroplasties decreased from 67 to 63 between 2012-2021; the number of private hospitals increased from 8 to 13 and the number of University Medical Centers decreased from 7 to 6 between 2012-2021.

Type of primary shoulder prosthesis by type of hospital

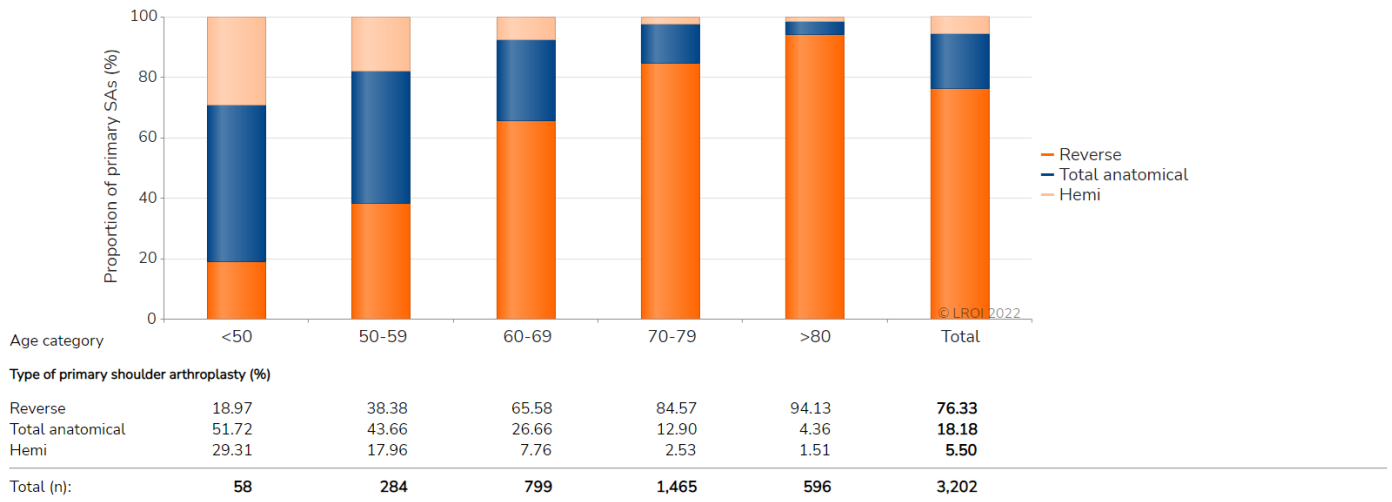
FIGURE Type of primary shoulder arthroplasty (proportion [%] per category) by type of hospital in the Netherlands in 2021



Please note: In 37 (1.1%) primary shoulder arthroplasties, the type of primary shoulder arthroplasty was not registered in 2021.
 SA: shoulder arthroplasty; Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.
 General: general hospital; UMC: university medical centre; Private: private hospital.

Type of primary shoulder prosthesis by age category

FIGURE Type of primary shoulder arthroplasty (proportion [%] per category) by age category in patients with a primary shoulder arthroplasty in the Netherlands in 2021



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

Primary shoulder arthroplasty

Demographics

Patient characteristics by type of shoulder prosthesis

TABLE Patient characteristics of all patients with a registered primary shoulder arthroplasty by type of primary shoulder arthroplasty in the Netherlands in 2021

N (%)	Reverse 2,444 (75)	Total anatomical 582 (18)	Hemi 176 (5)	Total [†] 3,239
Mean age (years) (SD)	73.6 (10.1)	65.4 (9.3)	63.0 (10.1)	71.5 (9.1)
Age (years) (%)				
<50	0	5	10	2
50-59	5	21	29	9
60-69	21	37	35	25
70-79	51	33	21	46
≥80	23	4	5	19
Gender (%)				
Men	24	32	34	26
Women	76	68	66	74
ASA score (%)				
I	5	14	13	7
II	54	67	59	56
III-IV	41	19	28	37
Type of hospital (%)				
General	93	78	80	89
UMC	2	1	7	2
Private	5	21	13	9
Specialism (%)				
Orthopaedic surgeon	100	100	98	99
Trauma surgeon	0	0	2	1
Diagnosis (%)				
Osteoarthritis	34	87	47	45
Fracture	23	2	31	19
Cuff arthropathy	21	2	1	16
Post-traumatic	11	4	8	9
Cuff rupture	6	1	0	5
Rheumatoid arthritis	2	1	0	2
Osteonecrosis	1	2	9	2
Tumour	0	0	3	0
Other	2	1	1	2
Walch score (%)				
A1	46	30	55	43
A2	29	35	18	30
B1	10	19	6	12
B2	8	13	8	9
B3	3	1	9	3
C	2	1	4	2
Mean Body Mass Index (kg/m ²) (SD)	28.2 (5.4)	28.8 (5.3)	28.4 (5.2)	28.3 (5.4)
Body Mass Index (kg/m²) (%)				
Underweight (≤18,5)	1	1	0	1
Normal weight (>18,5-25)	30	26	29	29
Overweight (>25-30)	38	37	38	38
Obesity (>30-40)	27	33	31	29
Morbid obesity (>40)	3	3	3	3
Smoking (%)				
No	91	90	87	91
Yes	9	10	13	9

[†] Also contains 37 (1.1%) primary shoulder arthroplasties of which the type of prosthesis had not been registered.

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

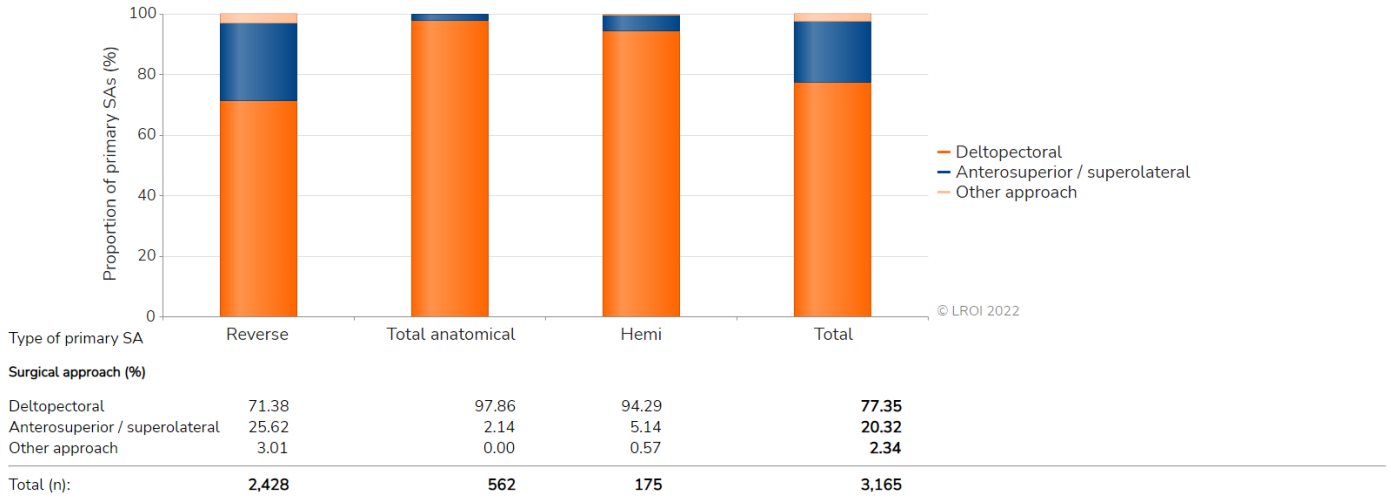
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The number of registered shoulder hemiarthroplasties in the LROI is not complete, since these procedures are also performed by trauma surgeons.

Surgical techniques

Surgical approach by type of shoulder prosthesis

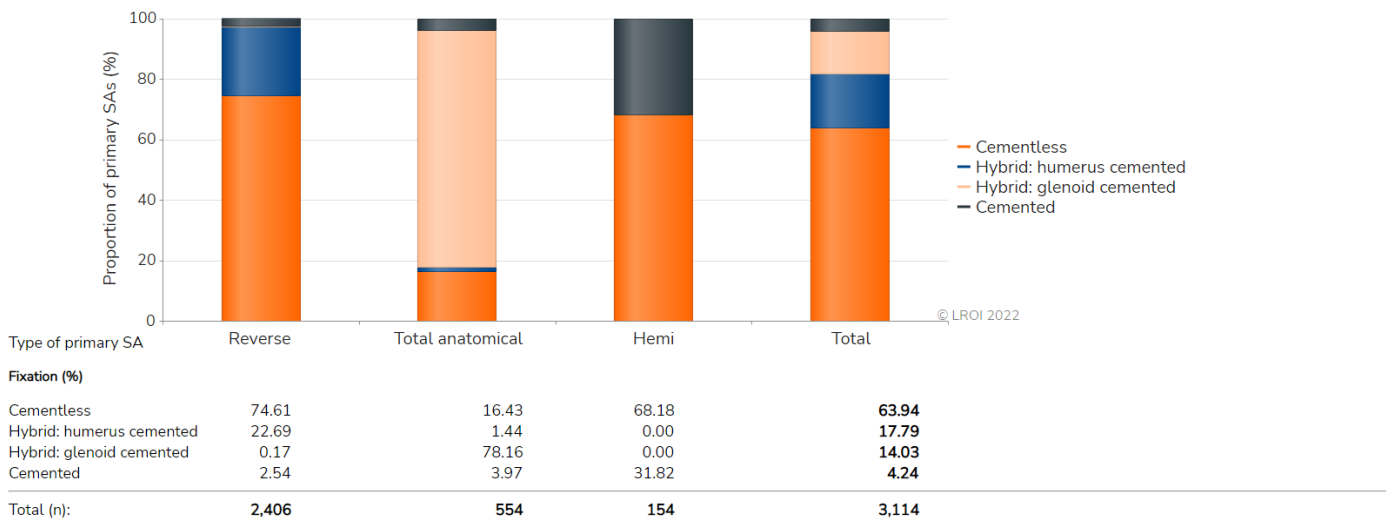
FIGURE Surgical approach (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2021



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

Fixation by type of shoulder prosthesis

FIGURE Type of fixation (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2021

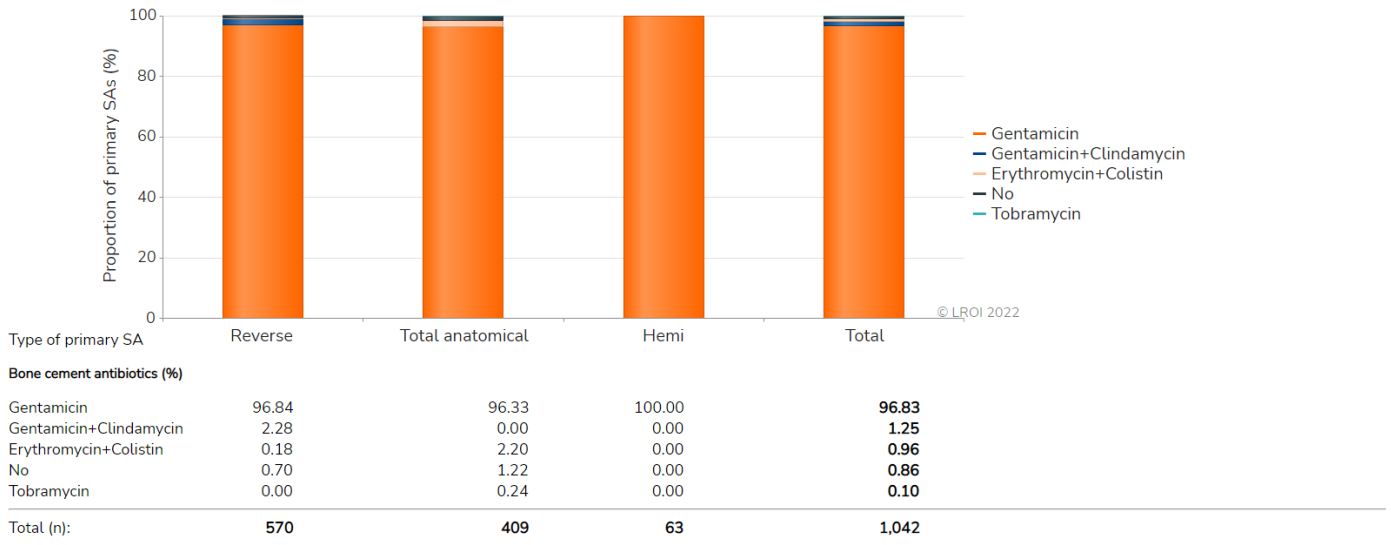


SA: shoulder arthroplasty. Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

Bone cement

Antibiotics by type of shoulder prosthesis

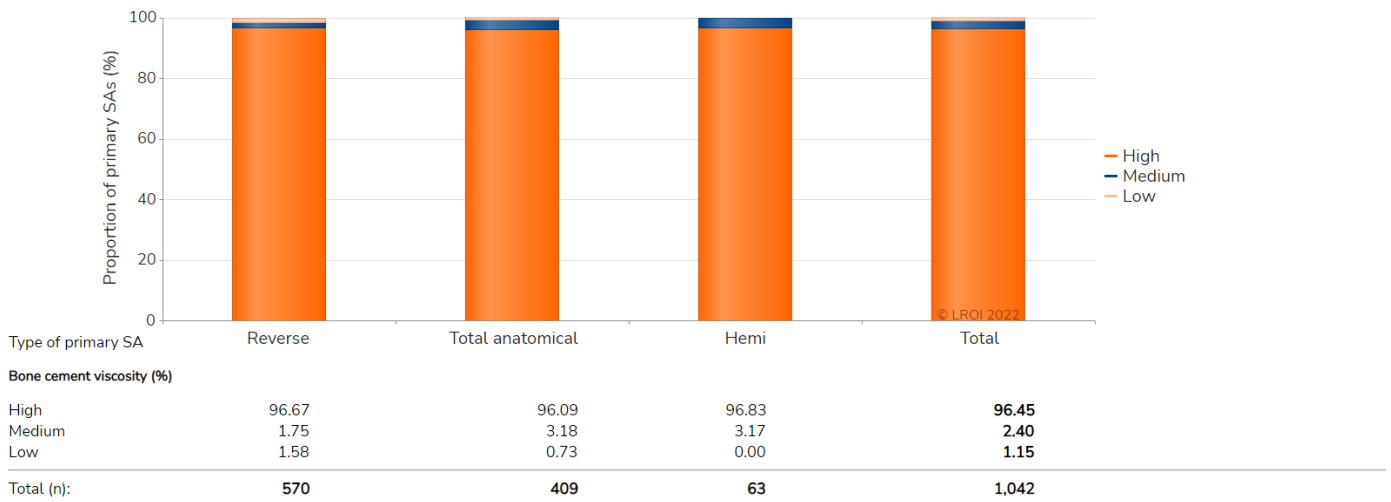
FIGURE Use of antibiotics in bone cement (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2021



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

Viscosity by type of shoulder prosthesis

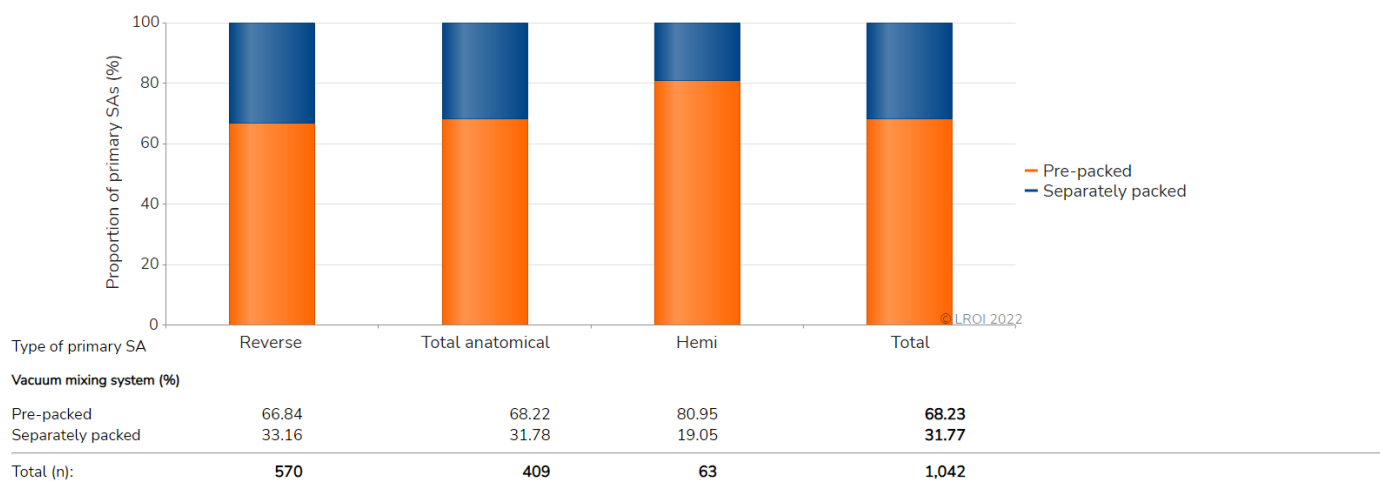
FIGURE Bone cement viscosity (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2021



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

Vacuum mixing system by type of shoulder prosthesis

FIGURE Bone cement pre-packed in a vacuum mixing system (proportion [%] per category) by type of primary shoulder arthroplasty in patients with a primary shoulder arthroplasty in the Netherlands in 2021



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

Most frequently registered components

Reverse total shoulder arthroplasty

TABLE The most frequently registered humeral stems, humeral liners, glenospheres, metaphyses and glenoid baseplates in primary reverse total shoulder arthroplasties in the Netherlands in 2021

Humeral stem (n=2,322)		Humeral liner (n=2,264)	
Name	Proportion (%)	Name	Proportion (%)
Delta X-tend	27.8	Delta X-tend	32.2
Tornier Flex Shoulder System	17.3	Tornier Flex Shoulder System	20.2
Comprehensive	10.8	Comprehensive	12.1
Aequalis Reversed Fracture	7.1	Aequalis Reversed Fracture	6.6
Aequalis Reversed	5.9	Aequalis Reversed	6.5

Glenosphere (n=2,230)		Metaphysis (n=1,812)	
Name	Proportion (%)	Name	Proportion (%)
Delta X-tend	27.6	Delta X-tend	27.7
Aequalis Reversed	26.3	Tornier Flex Shoulder System	23.8
Comprehensive	12.4	Comprehensive	14.1
Tornier Perform Reversed	9.6	Aequalis Reversed	7.5
TM Reverse Glenoid Heads	6.9	Equinox	6.4

Glenoid baseplate (n=2,255)	
Name	Proportion (%)
Delta X-tend	29.8
Aequalis Reversed	26.1
Comprehensive	12.3
Tornier Perform Reversed	9.4
Trabecular Metal Baseplate	6.7

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*Total anatomical shoulder arthroplasty***TABLE** The most frequently registered humeral stems, humeral heads and glenoid components in primary total anatomical shoulder arthroplasties in the Netherlands in 2021

Humeral stem (n=513)		Humeral head (n=527)	
Name	Proportion (%)	Name	Proportion (%)
Tornier Flex Shoulder System	37.2	Tornier Flex Shoulder System	36.8
Comprehensive	14.8	Comprehensive	14.6
Global Unite	8.4	Global Unite/ Global AP	12.7
Affinis Short	7.8	SMR head	7.6
Global Icon	6.6	Affinis Short	7.4

Glenoid (n=538)	
Name	Proportion (%)
Tornier Perform Anatomic Glenoid	38.3
Global APG+	18.0
Comprehensive	15.1
Affinis Vitamys	5.2
Anatomical Shoulder Glenoids	
ZimmerBiomet	5.0

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*Shoulder hemiarthroplasty***TABLE** The most frequently registered humeral stems and humeral heads in primary shoulder hemiarthroplasties in the Netherlands in 2021

Humeral stem (n=155)		Humeral head (n=160)	
Name	Proportion (%)	Name	Proportion (%)
Tornier Flex Shoulder System	23.9	Comprehensive	18.1
Comprehensive	18.7	Tornier Pyrocarbon Humeral Head	15.6
Aequalis Fractuur hemi	9.7	SMR head	11.3
SMR stem	8.4	Tornier Flex Shoulder System	10.0
Sidus Baseplate	7.1	Aequalis humerus kop	8.8

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*Most frequently registered types of bone cement**Reverse total shoulder arthroplasty***TABLE** The most frequently registered types of bone cement by type of mixing system used during primary reverse total shoulder arthroplasties in the Netherlands in 2021

Separately packed bone cement (n=189)		Bone cement pre-packed in a vacuum mixing system (n=381)	
Name	Proportion (%)	Name	Proportion (%)
Palacos R+G	77.8	Palacos R+G	58.5
Copal G+C	6.3	Refobacin Bone Cement R	34.6
Palacos LV+G	4.8	Refobacin Plus Bone Cement	6.8
Palacos MV+G	4.2		
Refobacin Bone Cement R	3.2		

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*Total anatomical shoulder arthroplasty***TABLE** The most frequently registered types of bone cement by type of mixing system used during primary total anatomical shoulder arthroplasties in the Netherlands in 2021

Separately packed bone cement (n=130)		Bone cement pre-packed in a vacuum mixing system (n=279)	
Name	Proportion (%)	Name	Proportion (%)
Palacos R+G	78.5	Refobacin Bone Cement R	48.8
Simplex ABC EC	6.9	Palacos R+G	44.4
Refobacin Bone Cement R	5.4	Refobacin Plus Bone Cement	6.8
Biomet Bone Cement R	3.9		
Palacos LV+G	2.3		
Subiton G	2.3		

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Shoulder hemiarthroplasty

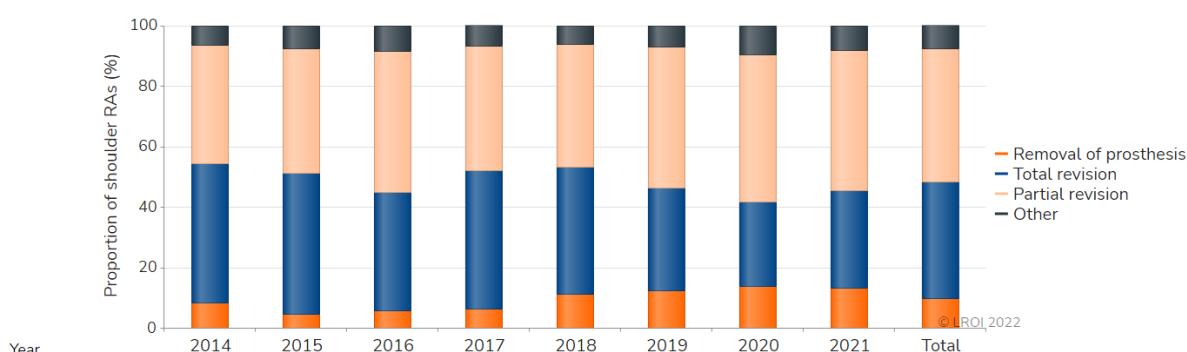
TABLE The most frequently registered types of bone cement by type of mixing system used during primary shoulder hemiarthroplasties in the Netherlands in 2021

Separately packed bone cement (n=12)		Bone cement pre-packed in a vacuum mixing system (n=51)	
Name	Proportion (%)	Name	Proportion (%)
Palacos R+G	83.3	Palacos R+G	47.1
Palacos MV+G	16.7	Refobacin Bone Cement R	39.2
		Refobacin Plus Bone Cement	13.7

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Shoulder revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in shoulder revision arthroplasties in the Netherlands in 2014-2021

Type of shoulder revision (%)

Type of shoulder revision (%)	2014	2015	2016	2017	2018	2019	2020	2021	Total
Removal of prosthesis	8.33	4.62	5.70	6.33	11.21	12.36	13.77	13.29	9.71
Total revision	46.08	46.54	39.16	45.78	42.06	33.91	27.87	32.28	38.74
Partial revision	39.22	41.15	46.77	41.27	40.50	46.55	48.85	46.20	44.02
Other	6.37	7.69	8.37	6.63	6.23	7.18	9.51	8.23	7.54
Total (n):	204	260	263	332	321	348	305	316	2,349

RA: revision arthroplasty.

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent a shoulder revision arthroplasty by type of shoulder arthroplasty in the Netherlands in 2014-2021

Year	2014	2015	2016	2017	2018	2019	2020	2021	Total
Shoulder revision (n)	208	272	274	346	334	353	309	316	2,412
Reasons for revision; Proportion ¹ (%)									
Infection	19.2	16.5	22.3	21.4	24.9	28.1	28.8	31.0	24.4
Instability	12.5	15.4	23.4	26.3	22.2	22.7	24.0	20.9	21.4
Progression of osteoarthritis	24.0	24.6	16.8	16.8	15.0	12.2	10.4	11.4	15.8
Cuff rupture	13.9	15.1	11.0	14.5	12.0	11.3	10.0	11.4	12.3
Loosening of glenoid component	12.5	13.2	10.6	13.0	11.1	11.3	10.4	13.9	12.0
Cuff arthropathy	12.5	13.2	13.5	11.9	9.6	11.6	9.7	7.9	11.1
Malalignment	12.0	12.9	8.4	8.3	6.0	6.2	9.4	6.0	8.4
Loosening of humeral component	7.8	7.7	11.0	4.6	7.2	5.4	8.7	8.2	7.4
Peri-prosthetic fracture	2.3	5.6	5.1	4.6	6.6	6.2	5.8	8.9	5.9
Other	10.6	11.8	12.0	9.3	12.6	11.9	17.5	13.0	12.4

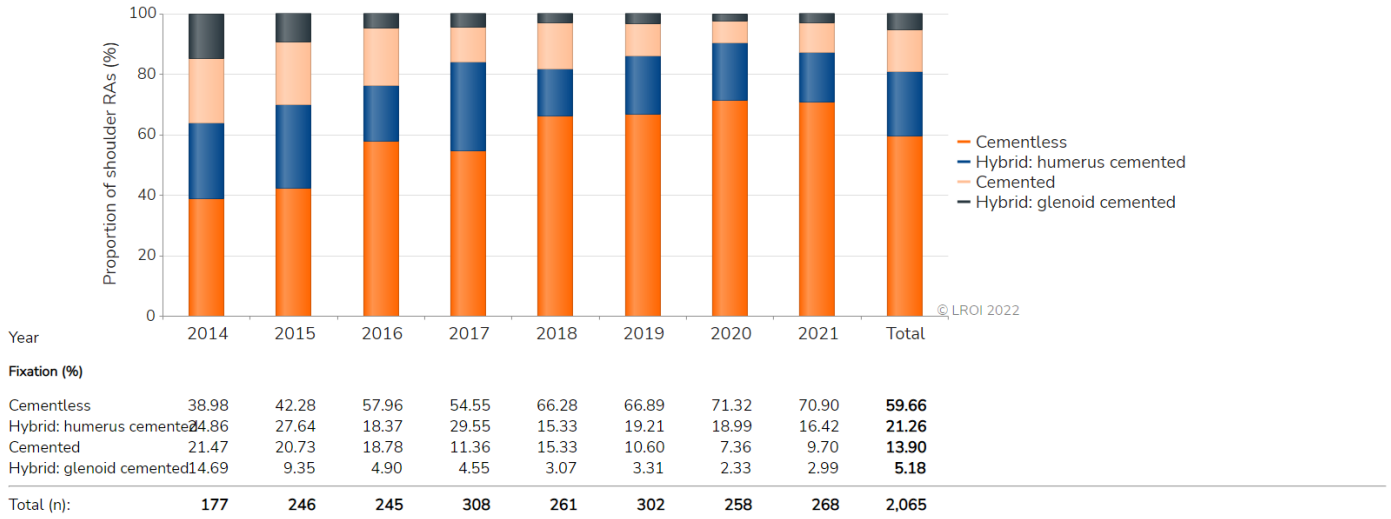
¹ One patient may have more than one reason for revision. As such, the total proportion is over 100%.

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Surgical techniques

Fixation

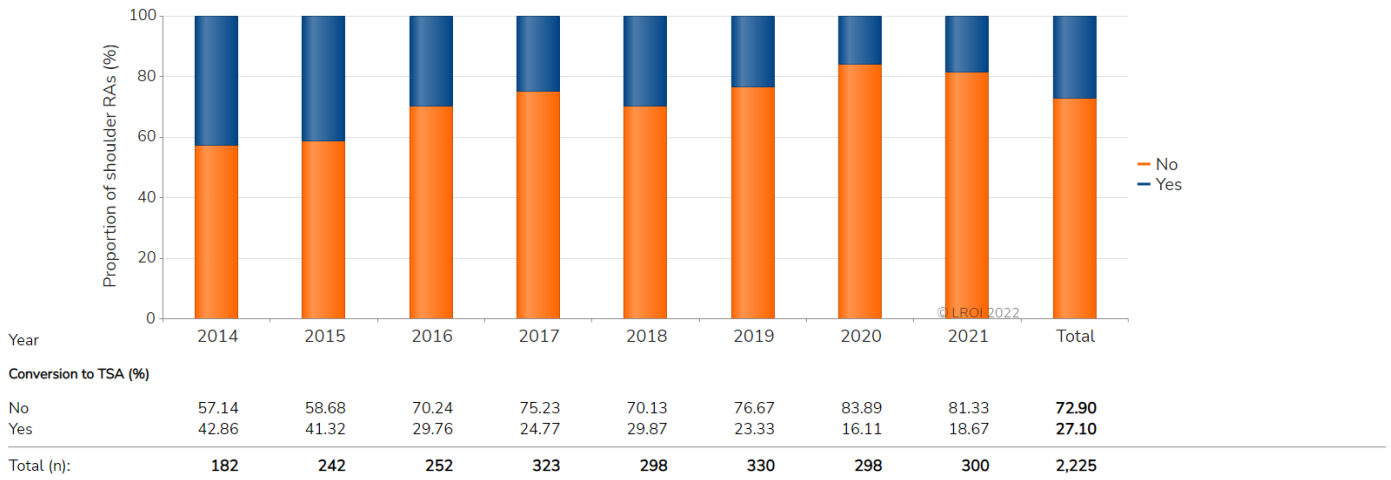
FIGURE Trend (proportion [%] per year) in type of fixation in shoulder revision arthroplasties in the Netherlands in 2014-2021



RA: revision arthroplasty.

Conversion to TSA

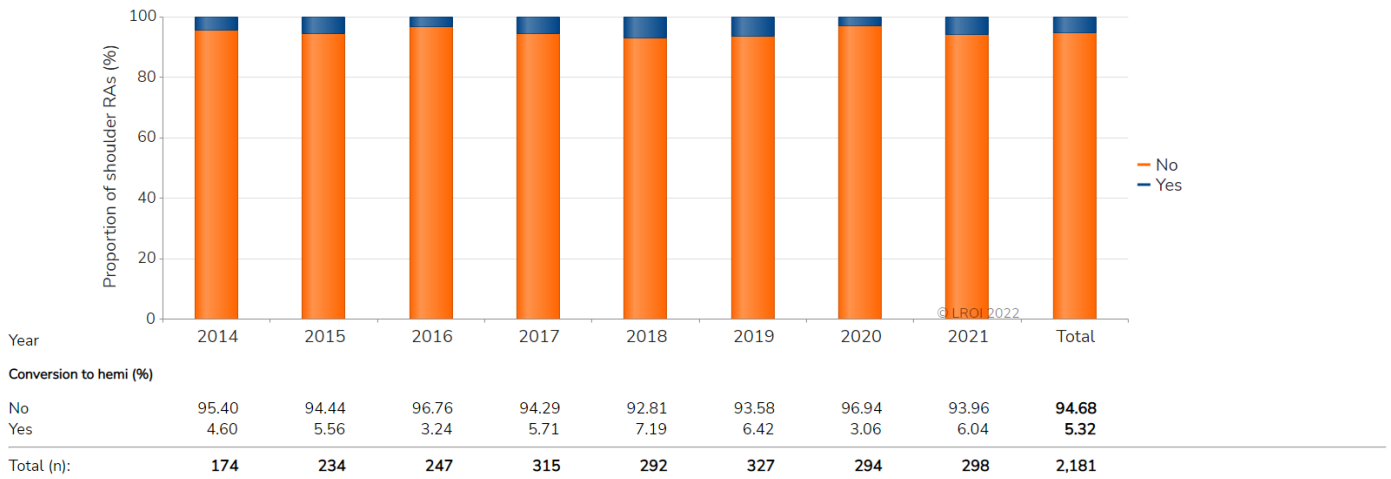
FIGURE Trend (proportion [%] per year) in conversion of a shoulder hemiprosthesis to a total (anatomical or reverse) shoulder arthroplasty in the Netherlands in 2014-2021



RA: revision arthroplasty, TSA: total shoulder arthroplasty.

Conversion to hemi

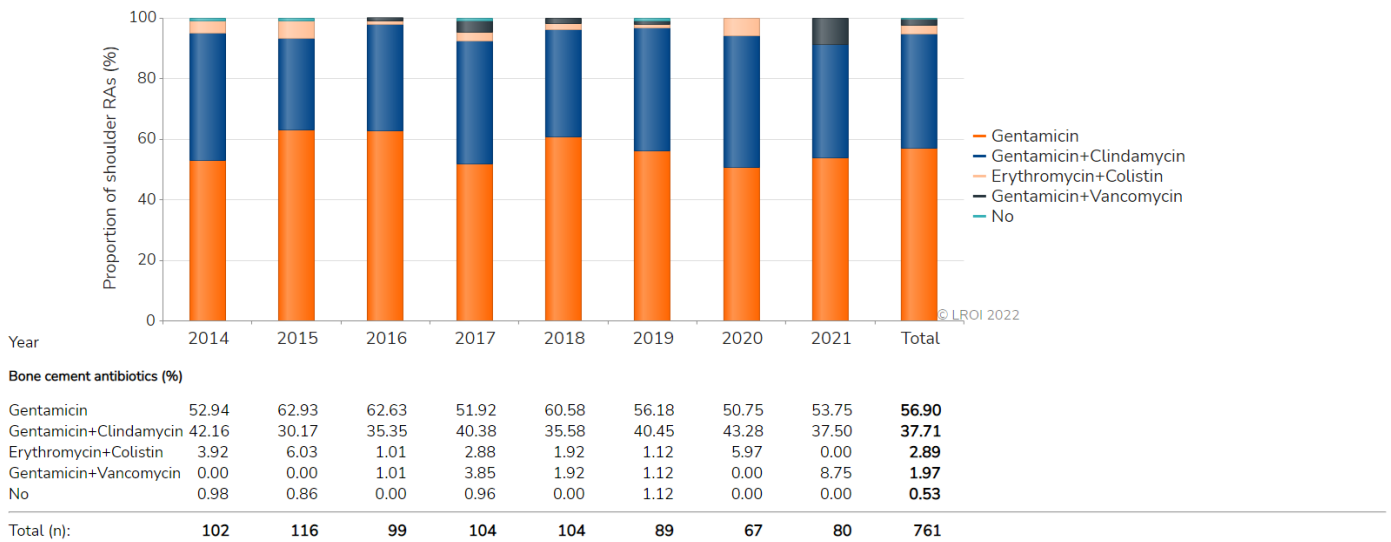
FIGURE Trend (proportion [%] per year) in conversion of a total (anatomical or reverse) shoulder arthroplasty to a shoulder hemiprosthesis in the Netherlands in 2014-2021



RA: revision arthroplasty.

Bone cement antibiotics

FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in shoulder revision arthroplasties in the Netherlands in 2014-2021



RA: revision arthroplasty.

Most frequently registered

Components

TABLE The most frequently registered humeral stems, humeral heads, humeral liners, glenoid baseplates, glenospheres and metaphyses in shoulder revision arthroplasties in the Netherlands in 2021

Humeral stem (n=73)		Humeral head (n=32)	
Name	Proportion (%)	Name	Proportion (%)
Delta X-tend	46.6	Tornier Flex Shoulder System	28.1
Aequalis Flex Revive	11.0	Global AP	15.6
SMR stem	9.6	SMR head	12.5
Tornier Flex Shoulder System	8.2	Aequalis humerus kop	6.3
Global Unite	8.2	Anatomical Shoulder Bipolar Heads	6.3

Humeral liner (n=190)		Glenoid baseplate (n=109)	
Name	Proportion (%)	Name	Proportion (%)
Delta X-tend	49.5	Delta X-tend	41.3
Tornier Flex Shoulder System	17.4	Aequalis Reversed	14.7
Comprehensive	9.5	Comprehensive	12.8
Aequalis Reversed	5.8	Tornier Perform Reversed	10.1
Equinoxe	3.2	SMR uncemented glenoid	5.5

Glenosphere (n=158)		Metaphysis (n=120)	
Name	Proportion (%)	Name	Proportion (%)
Delta X-tend	36.1	Tornier Flex Shoulder System	26.7
Aequalis Reversed	13.9	Delta X-tend	23.3
Tornier Perform Reversed	10.8	Comprehensive	16.7
Comprehensive	10.1	Aequalis Flex Revive	5.0
TM Reverse Glenoid Heads	5.7	Anatomical inverse Humeral Cups	5.0

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Types of bone cement

TABLE The most frequently registered types of bone cement used during shoulder revision arthroplasties in the Netherlands in 2021 (n=69)

Name	Proportion (%)
Copal G+C	37.7
Palacos R+G	36.2
Refobacin Bone Cement R	17.4
Refobacin Revision	4.3
Copal G+V	2.9

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Survival

Revision within 1 year

By type of shoulder arthroplasty

TABLE Cumulative 1-year revision percentage of primary shoulder arthroplasties by type of shoulder arthroplasty in the Netherlands in 2016-2020 (n=14,545)

Type of primary shoulder arthroplasty	Number (n)	Cumulative 1-year revision percentage	
		Competing Risk (95% CI)	Kaplan Meier (95% CI)
Reverse	10,378	2.5 (2.2-2.8)	2.6 (2.2-2.9)
Total anatomical	2,771	1.6 (1.2-2.1)	1.6 (1.1-2.0)
Hemi	1,396	3.0 (2.2-4.1)	3.0 (2.1-3.9)

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

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In 2016-2020, 247 (1.7%) primary shoulder arthroplasties were implanted in patients who died within one year after the primary procedure.

Reasons for revision

TABLE Reasons for revision within one year in patients that underwent a shoulder revision arthroplasty by type of shoulder arthroplasty in the Netherlands in 2016-2020

Reason for revision	Type of shoulder arthroplasty		
	Reverse (n=266) Proportion ¹ (%)	Total anatomical (n=44) Proportion ¹ (%)	Hemi (n=42) Proportion ¹ (%)
Instability	47.0	31.8	23.8
Infection	29.7	0.0	14.3
Cuff rupture	n.a.	31.8	28.6
Malalignment	4.1	6.8	23.8
Cuff arthroplasty	n.a.	13.6	26.2
Loosening of glenoid component	8.7	9.1	0.0
Loosening of humeral component	3.0	2.3	7.1
Peri-prosthetic fracture	6.4	6.8	0.0
Progression of osteoarthritis	1.5	2.3	16.7
Other	11.7	13.6	21.4

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

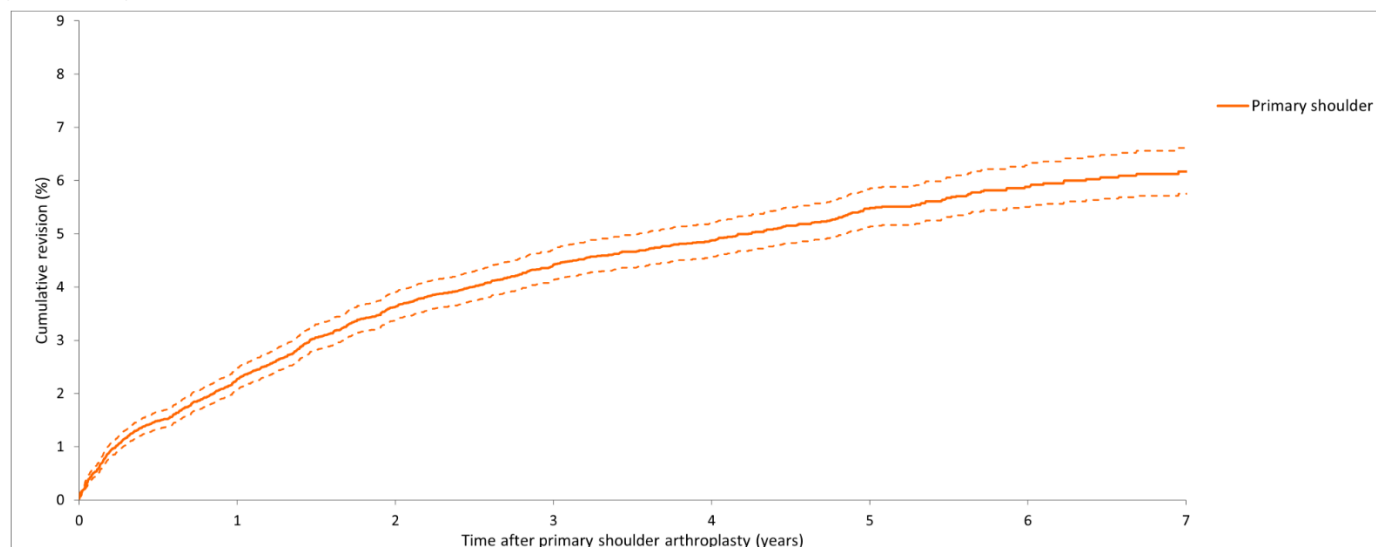
Reverse: reverse total shoulder arthroplasty; Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty.

¹One patient may have more than one reason of revision.

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Revision within 7 years

Overall

FIGURE Cumulative revision percentage of primary shoulder arthroplasties in the Netherlands in 2014-2021 (n=22,429)**TABLE** Cumulative revision percentages of primary shoulder arthroplasties

	Number (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Primary shoulder arthroplasty	22,429			
1-year revision (%)		18,580	2.2 (2.1-2.5)	2.2 (2.0-2.4)
3-year revision (%)		11,904	4.4 (4.1-4.7)	4.5 (4.2-4.8)
5-year revision (%)		5,989	5.5 (5.1-5.8)	5.7 (5.3-6.1)
7-year revision (%)		1,636	6.2 (5.8-6.6)	6.5 (6.1-7.0)

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

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In 2014-2021, 2,070 (9.2%) primary shoulder arthroplasties were implanted in patients who died within seven years after the primary procedure.

By type of shoulder arthroplasty

FIGURE Cumulative revision percentage of primary shoulder arthroplasties by type of shoulder arthroplasty in the Netherlands in 2014-2021 (n=22,287)

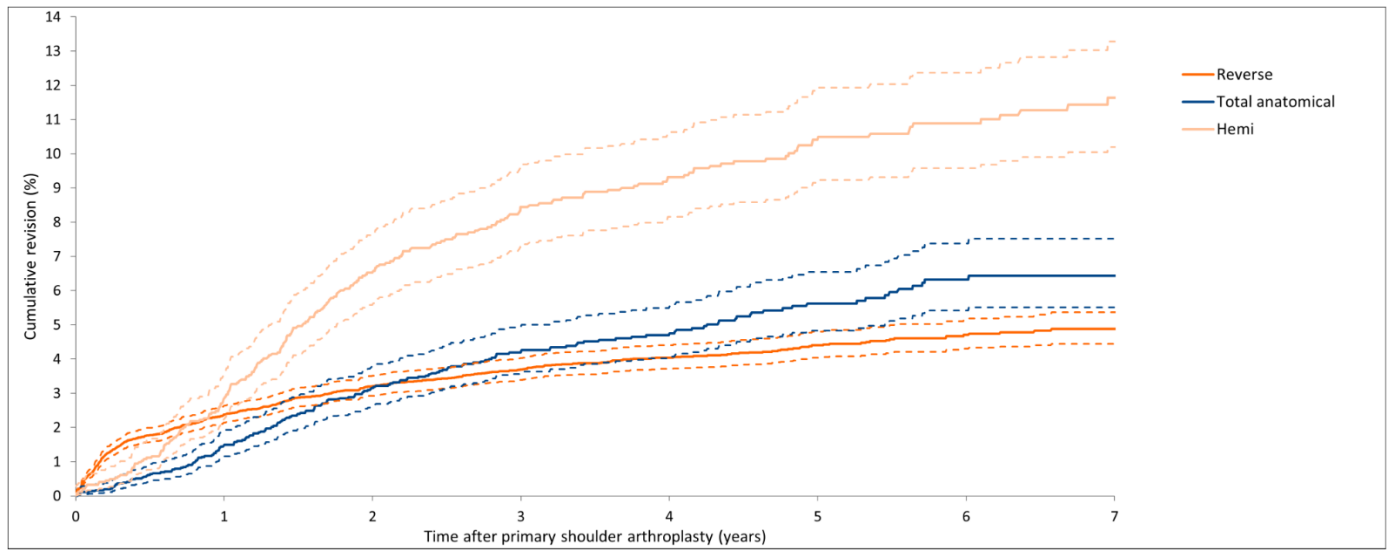


TABLE Cumulative revision percentages of primary shoulder arthroplasties

	Number (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
By type of primary shoulder arthroplasty				
Reverse	15,585			
1-year revision (%)		12,688	2.4 (2.1-2.6)	2.4 (2.1-2.6)
3-year revision (%)		7,786	3.7 (3.4-4.0)	3.8 (3.5-4.1)
5-year revision (%)		3,720	4.4 (4.0-4.8)	4.6 (4.2-5.0)
7-year revision (%)		927	4.9 (4.4-5.4)	5.3 (4.7-5.8)
Total anatomical	4,236			
1-year revision (%)		3,620	1.5 (1.1-1.9)	1.2 (0.8-1.5)
3-year revision (%)		2,463	4.2 (3.6-4.9)	4.2 (3.5-4.9)
5-year revision (%)		1,286	5.6 (4.8-6.5)	5.7 (4.8-6.5)
7-year revision (%)		361	6.4 (5.5-7.5)	6.6 (5.6-7.6)
Hemi	2,466			
1-year revision (%)		2,194	2.8 (2.2-3.6)	2.3 (1.7-2.9)
3-year revision (%)		1,607	8.4 (7.4-9.7)	8.4 (7.2-9.6)
5-year revision (%)		957	10.4 (9.2-11.8)	10.7 (9.3-12.1)
7-year revision (%)		343	11.6 (10.2-13.3)	12.1 (10.5-13.7)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Reverse: reverse total shoulder arthroplasty, Total anatomical: total anatomical shoulder arthroplasty; Hemi: shoulder hemiarthroplasty. CI: confidence interval

By procedure year

FIGURE Cumulative revision percentage of total (anatomical or reverse) shoulder arthroplasties by procedure year of primary shoulder arthroplasty in the Netherlands in 2015-2021 (n=18,202)

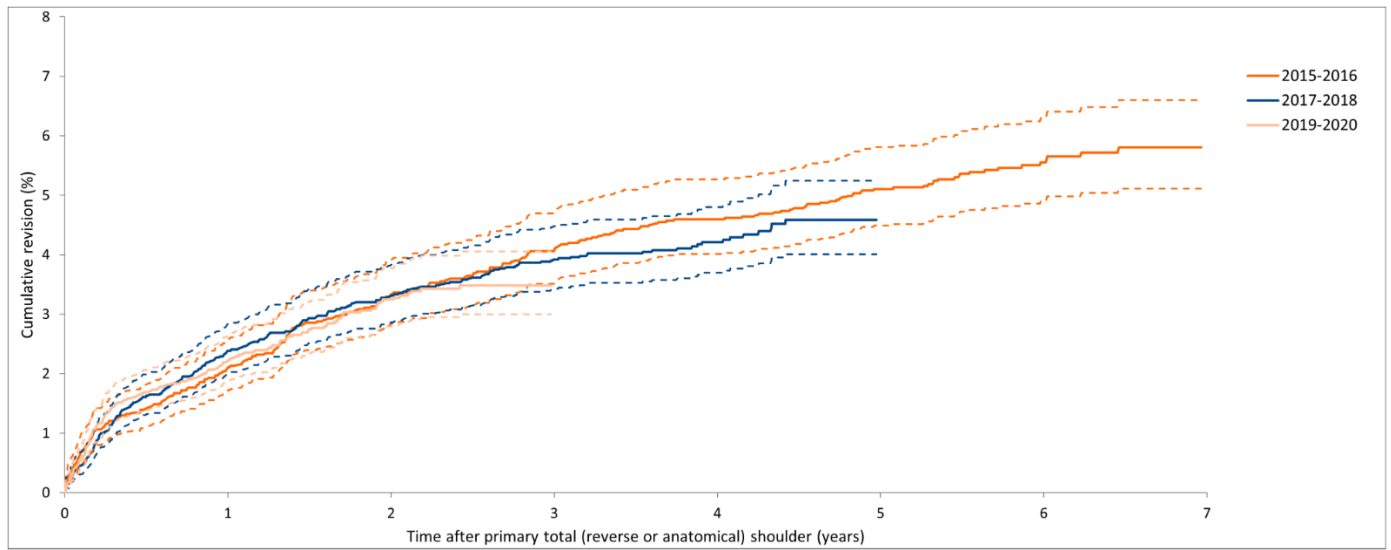


TABLE Cumulative revision percentages

Cumulative revision percentages - Competing Risk (95% CI)

Procedure year primary shoulder	Number (n)	1yr	2yr	3yr	4yr	5yr	6yr
2015-2016	4,308	2.1 (1.7-2.6)	3.3 (2.8-3.9)	4.1 (3.5-4.7)	4.6 (4.0-5.3)	5.1 (4.5-5.8)	5.6 (4.9-6.3)
2017-2018	5,279	2.4 (2.0-2.8)	3.3 (2.9-3.8)	3.9 (3.4-4.5)	4.2 (3.7-4.8)	n.a.	n.a.
2019-2020	5,612	2.2 (1.9-2.6)	3.2 (2.8-3.8)	n.a.	n.a.	n.a.	n.a.

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

Survival reverse total shoulder arthroplasty

Reverse TSA by gender

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by gender in the Netherlands in 2014-2021 (n=15,572)

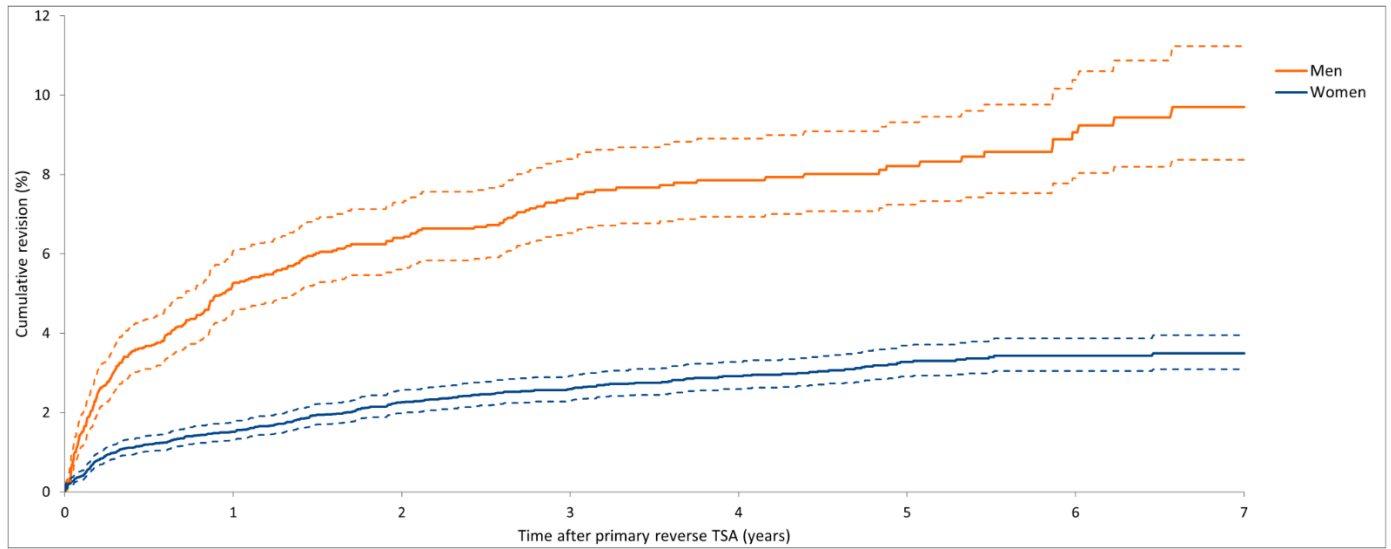


TABLE Cumulative 7-year revision percentage

Gender	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Men	3,596	9.7 (8.4-11.2)	10.6 (8.9-12.3)
Women	11,976	3.5 (3.1-4.0)	3.8 (3.3-4.2)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by age category

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by age category in the Netherlands in 2014-2021 (n=15,570)

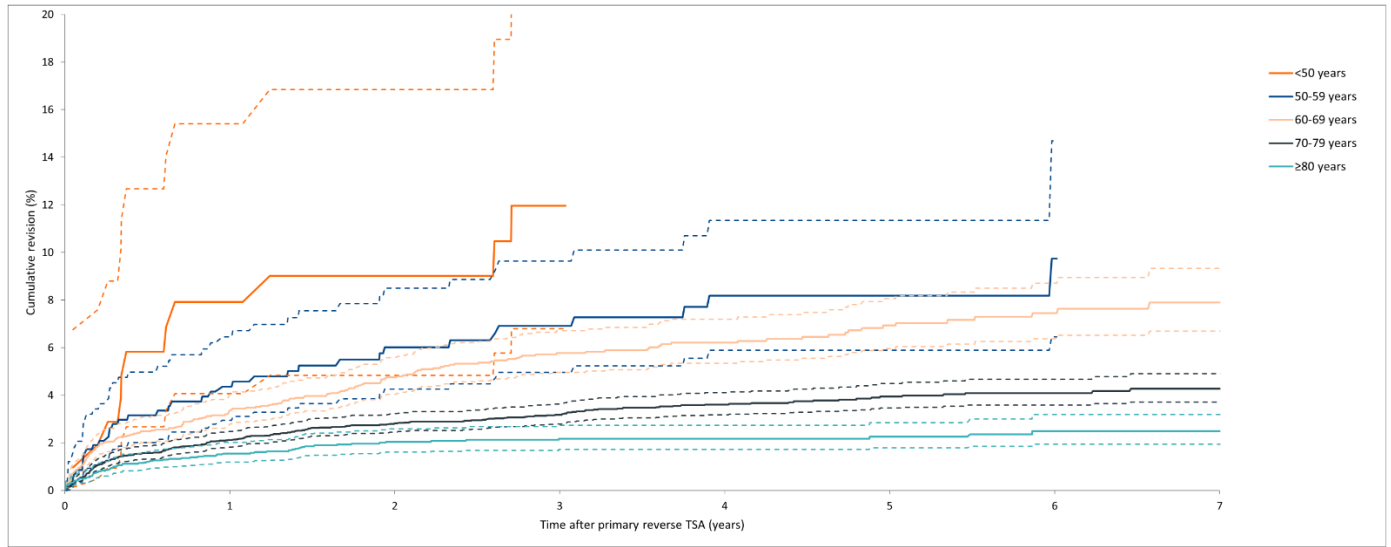


TABLE Cumulative 7-year revision percentage

Age (years)	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
<50	104	n.a.	n.a.
50-59	585	9.7 (6.5-14.7)	10.1 (5.8-14.3)
60-69	3,356	7.9 (6.7-9.3)	8.3 (6.9-9.7)
70-79	7,878	4.3 (3.7-4.9)	4.6 (3.9-5.2)
≥80	3,647	2.5 (1.9-3.2)	2.8 (2.1-3.6)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by diagnosis

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by diagnosis in the Netherlands in 2014-2021 (n=15,532)

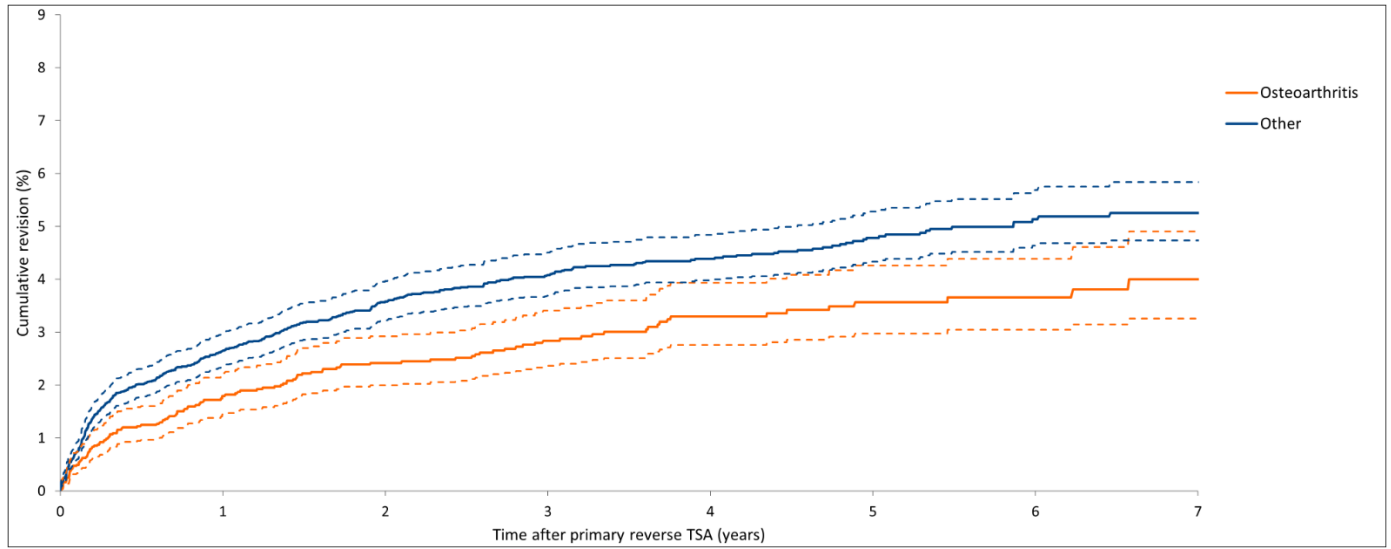


TABLE Cumulative 7-year revision percentage

Diagnosis	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Osteoarthritis	4,857	4.0 (2.2-4.9)	4.3 (3.4-5.3)
Other	10,675	5.3 (4.7-5.8)	5.6 (5.0-6.3)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by ASA score

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by ASA score in the Netherlands in 2014-2021 (n=15,412)

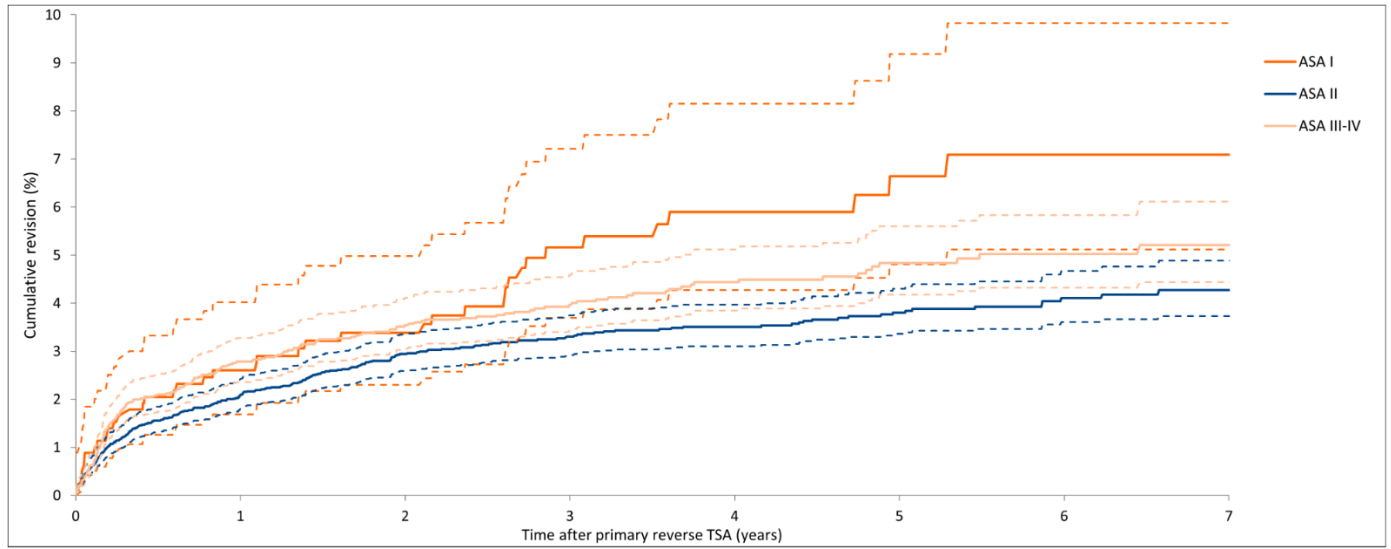


TABLE Cumulative 7-year revision percentage

ASA score	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
I	827	7.1 (5.1-9.8)	7.4 (5.0-9.7)
II	8,984	4.3 (3.7-4.9)	4.7 (4.0-5.3)
III-IV	5,601	5.2 (4.4-6.1)	6.0 (5.0-7.0)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by BMI category

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by BMI category in the Netherlands in 2014-2021 (n=15,304)

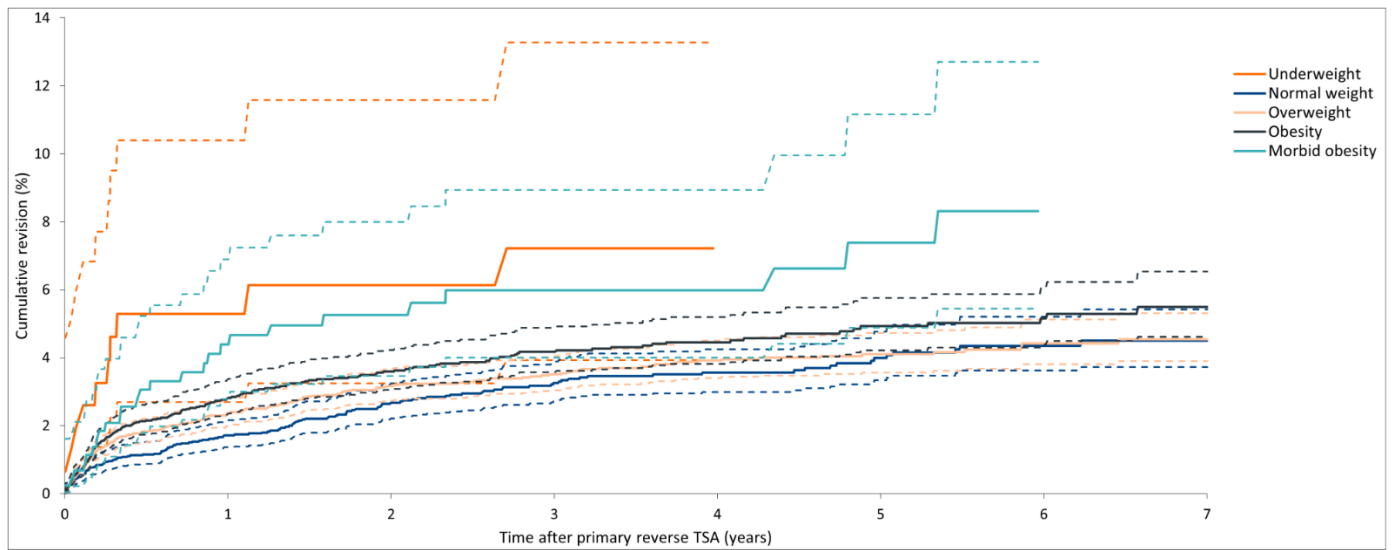


TABLE Cumulative 7-year revision percentage

Body Mass Index (kg/m ²)	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Underweight ($\leq 18,5$)	154	n.a.	n.a.
Normal weight ($>18,5-25$)	4,432	4.5 (3.7-5.4)	4.9 (4.0-5.9)
Overweight ($>25-30$)	6,003	4.5 (3.9-5.3)	4.9 (4.1-5.6)
Obesity ($>30-40$)	4,276	5.5 (4.6-6.5)	5.8 (4.8-6.9)
Morbid obesity (>40)	439	n.a.	n.a.

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by Walch score

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by walch score in the Netherlands in 2014-2021 (n=12,808)

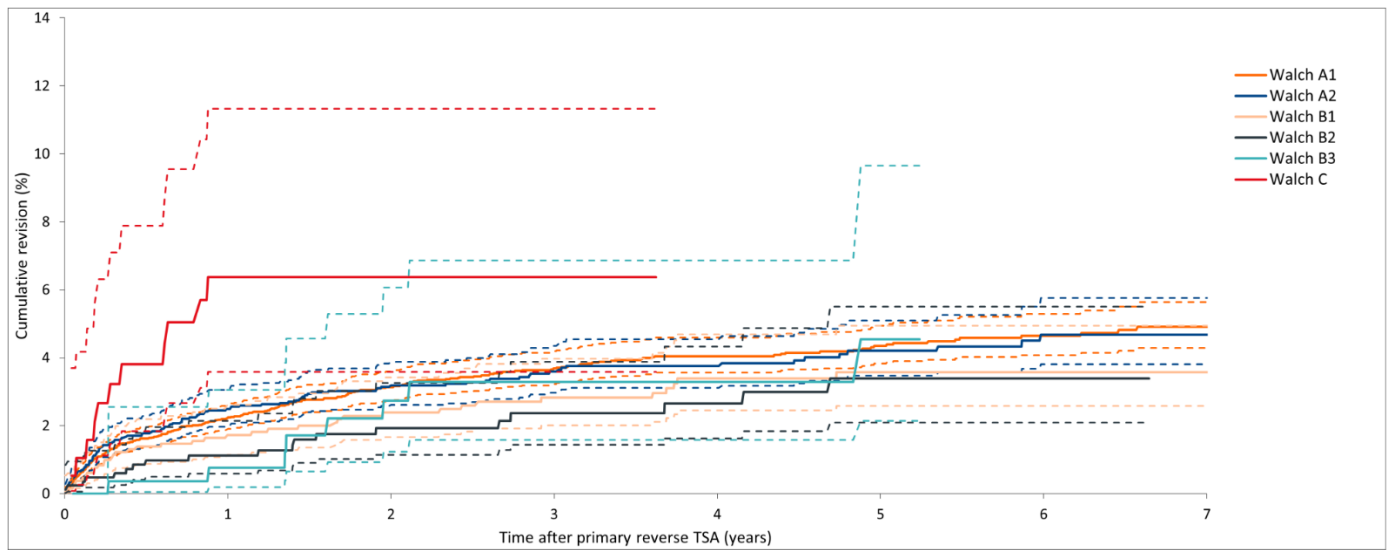


TABLE Cumulative 7-year revision percentage

Walch-score	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
A1	6,790	4.9 (4.3-5.6)	5.3 (4.5-6.0)
A2	3,352	4.7 (3.8-5.8)	5.0 (3.9-6.1)
B1	1,330	3.6 (2.6-4.9)	3.9 (2.6-5.1)
B2	845	3.4 (2.1-5.5)	3.6 (1.8-5.3)
B3	300	n.a.	n.a.
C	191	n.a.	n.a.

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Reverse TSA by smoking

FIGURE Cumulative revision percentage of reverse total shoulder arthroplasties by smoking in the Netherlands in 2014-2021 (n=15,269)

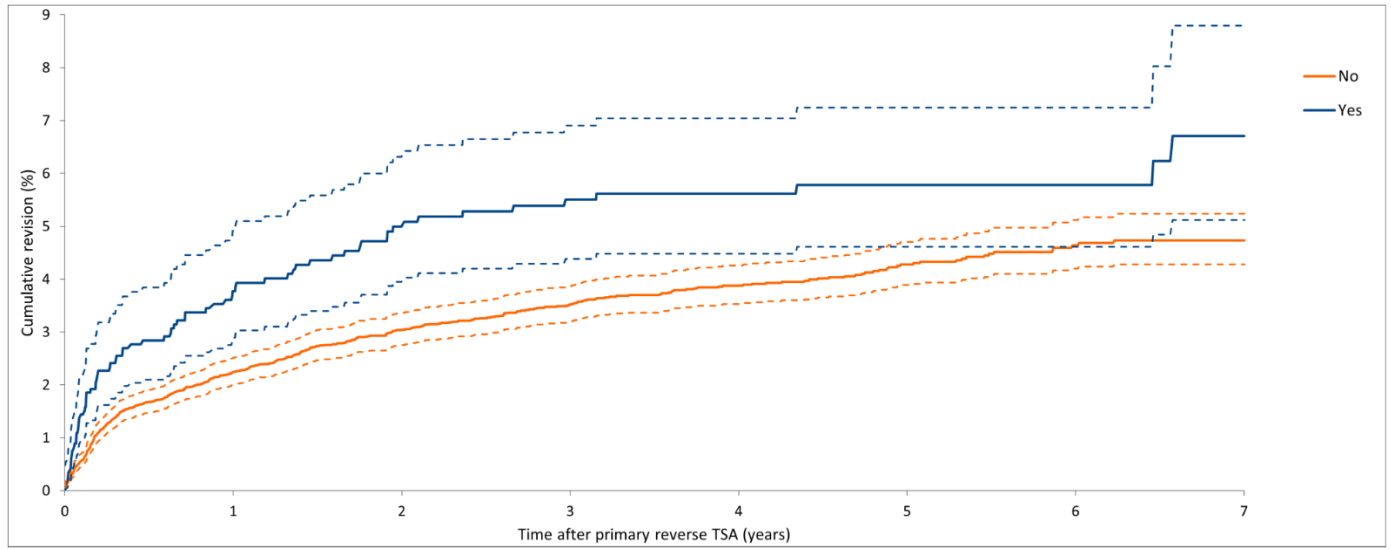


TABLE Cumulative 7-year revision percentage

Smoking	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
No	13,805	4.7 (4.3-5.2)	5.1 (4.5-5.6)
Yes	1,464	6.7 (5.1-8.8)	7.2 (5.0-9.4)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Survival total anatomical shoulder arthroplasty

Anatomical TSA by gender

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by gender in the Netherlands in 2014-2021 (n=4,236)

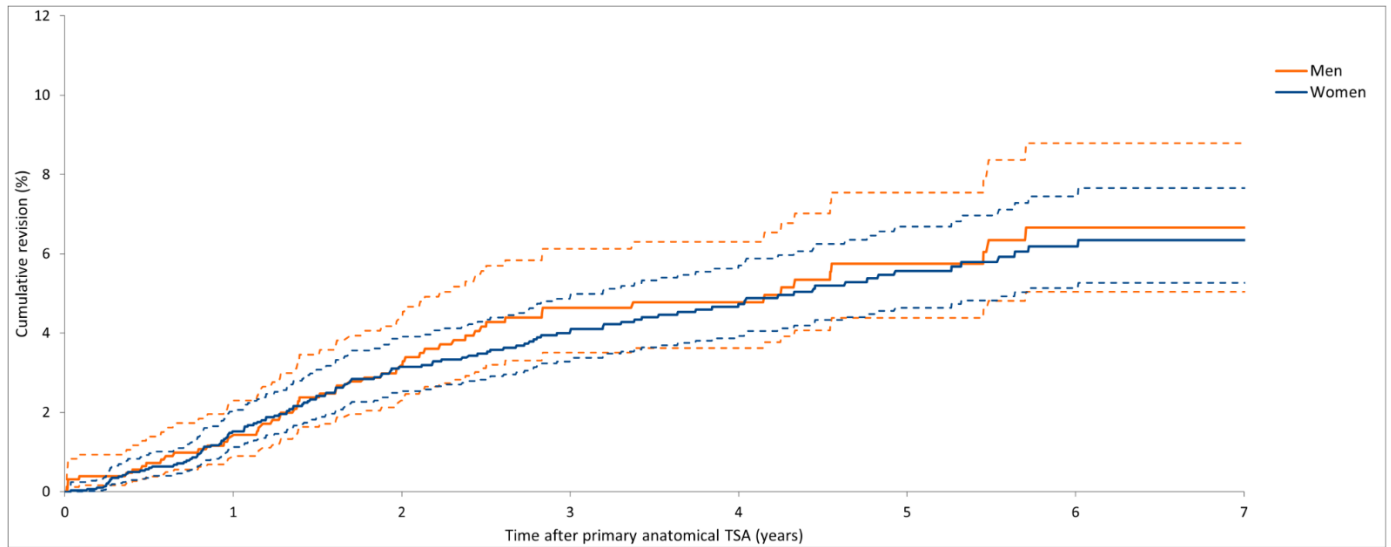


TABLE Cumulative 7-year revision percentage

Gender	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Men	1,283	6.7 (5.0-8.8)	6.8 (4.9-8.7)
Women	2,951	6.3 (5.3-7.7)	6.5 (5.3-7.8)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by age category

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by age category in the Netherlands in 2014-2021 (n=4,234)

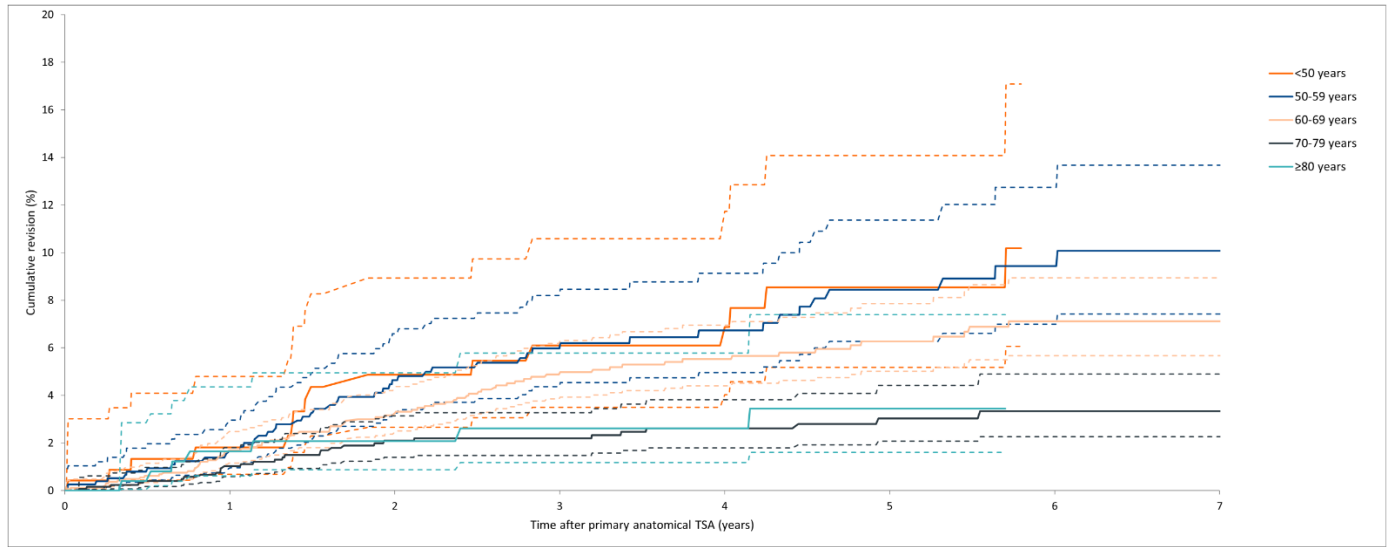


TABLE Cumulative 7-year revision percentage

Age (years)	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
<50	235	n.a.	n.a.
50-59	773	10.1 (7.4-13.7)	10.3 (7.1-13.5)
60-69	1,672	7.1 (5.7-8.9)	7.3 (5.6-8.9)
70-79	1,292	3.3 (2.3-4.9)	3.4 (2.1-4.7)
≥80	262	n.a.	n.a.

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by diagnosis

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by diagnosis in the Netherlands in 2014-2021 (n=4,217)

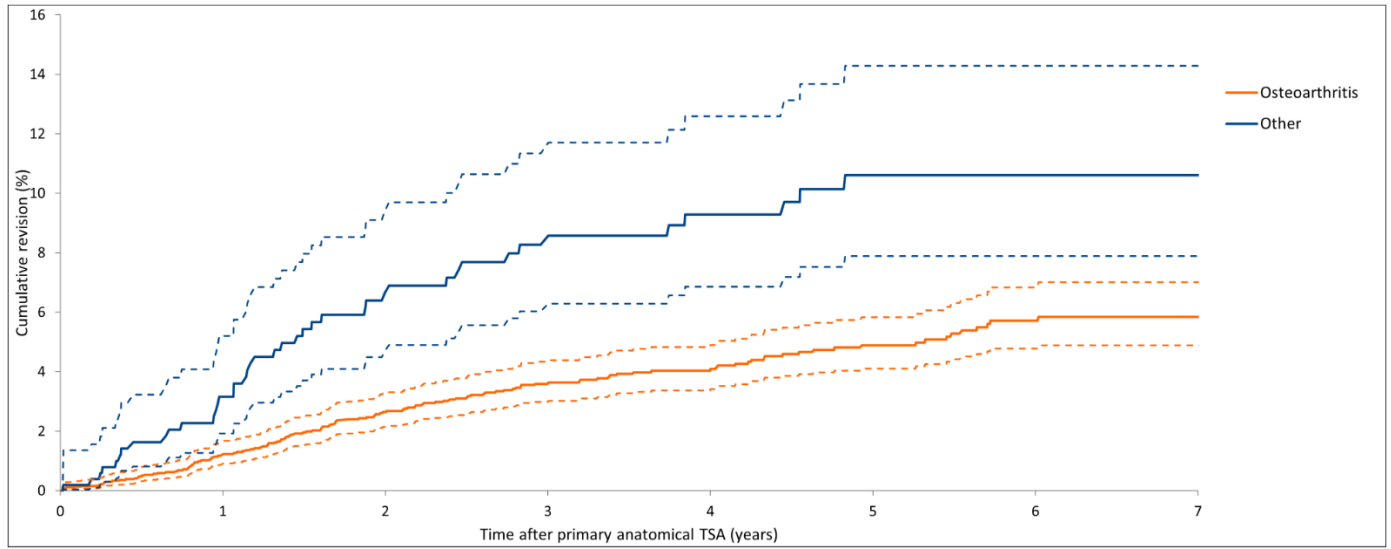


TABLE Cumulative 7-year revision percentage

Diagnosis	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Osteoarthritis	3,695	5.8 (4.9-7.0)	6.0 (4.9-7.1)
Other	522	10.6 (7.9-14.3)	10.8 (7.6-14.1)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by ASA score

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by ASA score in the Netherlands in 2014-2021 (n=4,914)

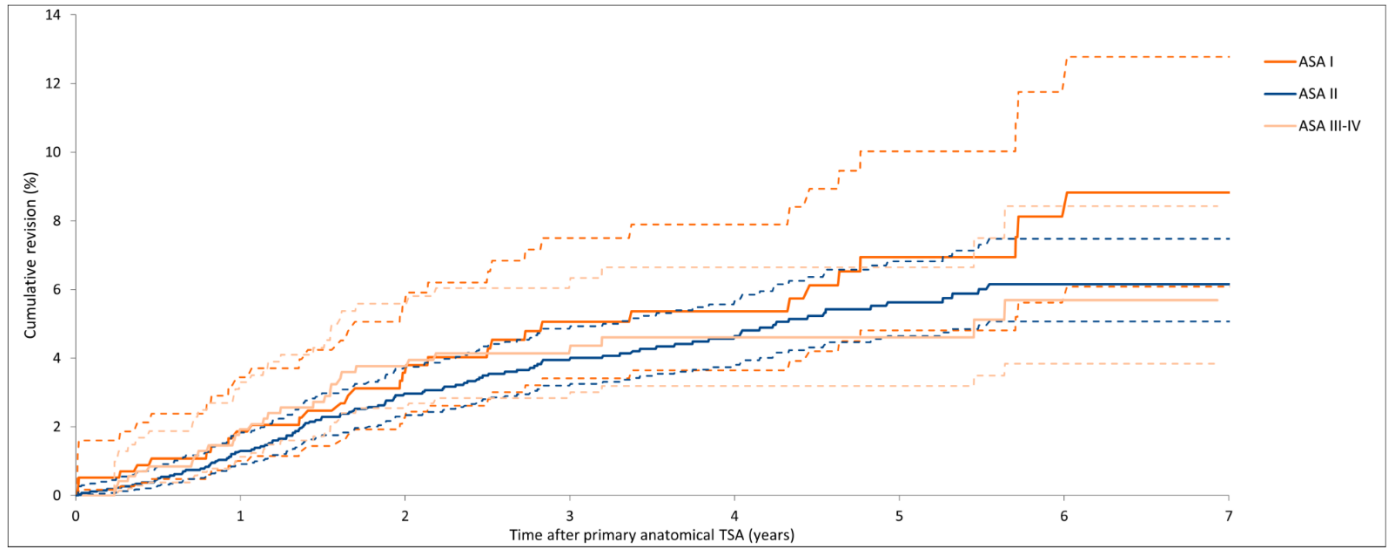


TABLE Cumulative 7-year revision percentage

ASA score	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
I	604	8.8 (6.1-12.8)	8.7 (5.5-11.9)
II	2,805	6.2 (5.1-7.5)	6.3 (5.1-7.5)
III-IV	785	5.7 (3.8-8.4)	5.8 (3.5-8.2)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by BMI category

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by BMI category in the Netherlands in 2014-2021 (n=4,159)

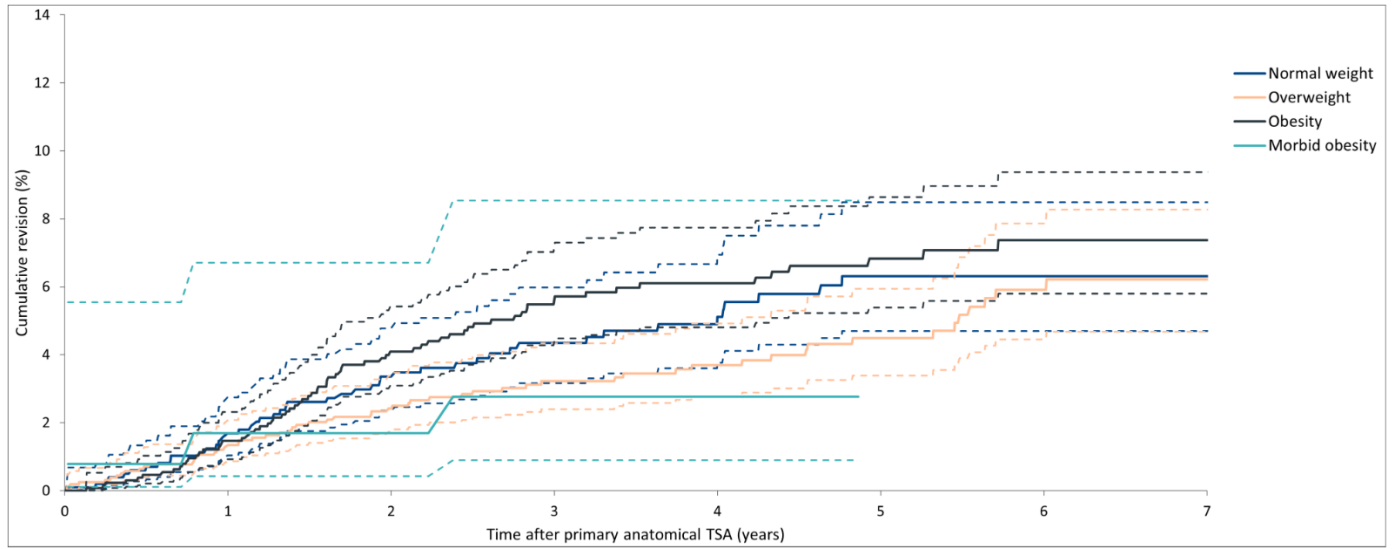


TABLE Cumulative 7-year revision percentage

Body Mass Index (kg/m ²)	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Underweight ($\leq 18,5$)	23	n.a.	n.a.
Normal weight ($>18,5-25$)	1,045	6.3 (4.7-8.5)	6.4 (4.5-8.3)
Overweight ($>25-30$)	1,604	6.2 (4.7-8.3)	6.4 (4.6-8.3)
Obesity ($>30-40$)	1,360	7.4 (5.8-9.4)	7.6 (5.7-9.4)
Morbid obesity (>40)	127	n.a.	n.a.

¹⁴⁸ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by Walch score

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by walch score in the Netherlands in 2014-2021 (n=3,989)

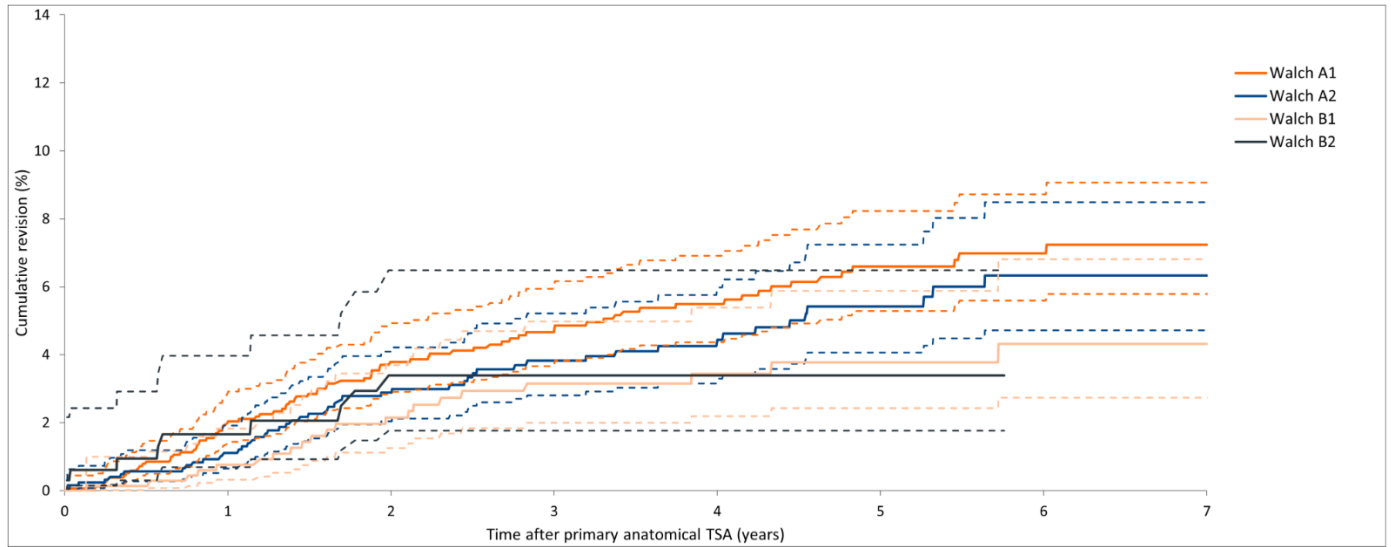


TABLE Cumulative 7-year revision percentage

Walch-score	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
A1	1,584	7.2 (5.8-9.1)	7.4 (5.7-9.1)
A2	1,275	6.3 (4.7-8.5)	6.5 (4.5-8.4)
B1	725	4.3 (2.7-6.8)	4.4 (2.4-6.5)
B2	328	n.a.	n.a.
B3	52	n.a.	n.a.
C	25	n.a.	n.a.

149 The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

Anatomical TSA by smoking

FIGURE Cumulative revision percentage of total anatomical shoulder arthroplasties by smoking in the Netherlands in 2014-2021 (n=4,188)

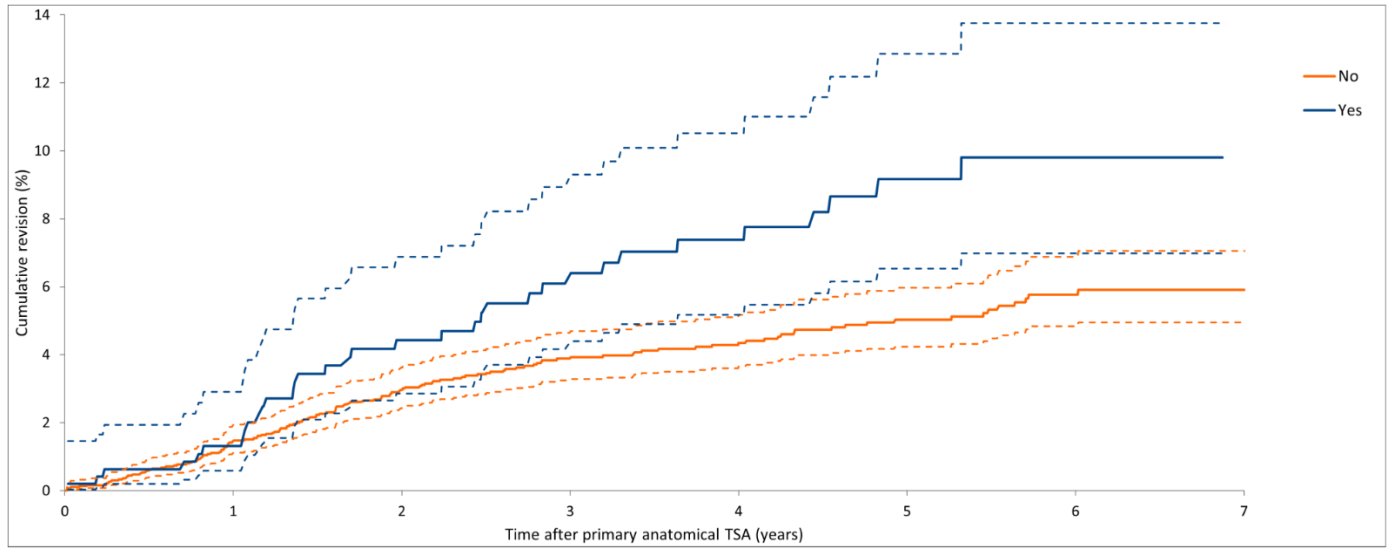


TABLE Cumulative 7-year revision percentage

Smoking	Number (n)	Cumulative 7-year revision percentage	
		Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
No	3,701	5.9 (4.9-7.1)	6.0 (5.0-7.1)
Yes	487	9.8 (7.0-13.8)	10.3 (6.8-13.8)

¹ The cumulative revision percentage using the competing risk method is shown in the figure. Please note: Dotted lines represent the upper and lower limits of the 95% confidence interval. Please note: n.a. if <50 cases were at risk; CI: confidence interval.

PROMs

Response

FIGURE Pre-operative, 3 months and 12 months postoperative response percentage of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty per pre-operative PROMs registering hospital (n=68) in the Netherlands in 2014-2021

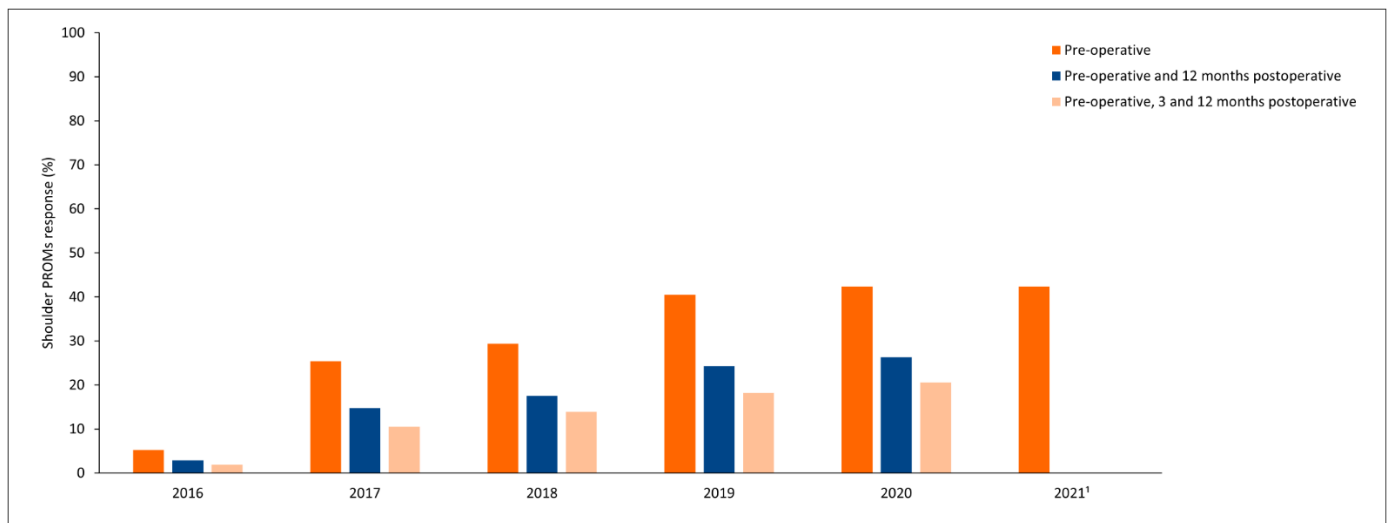


TABLE PROMs response percentages

Year	2016	2017	2018	2019	2020	2021 ¹
Total (anatomical or reverse) shoulder arthroplasty (n)	1,836	2,059	2,302	2,519	2,147	2,495
PROMs response (%)						
Pre-operative	5.2	25.4	29.4	40.5	42.3	42.3
Pre-operative and 12 months postoperative	2.9	14.7	17.5	24.3	26.3	n.a.
Pre-operative, 3 and 12 months postoperative	1.9	10.5	13.9	18.2	20.5	n.a.

¹ The 12 months postoperative PROMs response percentage is not (yet) available for 2021. PROM: patient reported outcome measure.

Mean scores (pre-operative, 3 months and 12 months)

NRS (rest)

FIGURE Mean pre-operative, 3 months and 12 months postoperative NRS (rest) scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2020

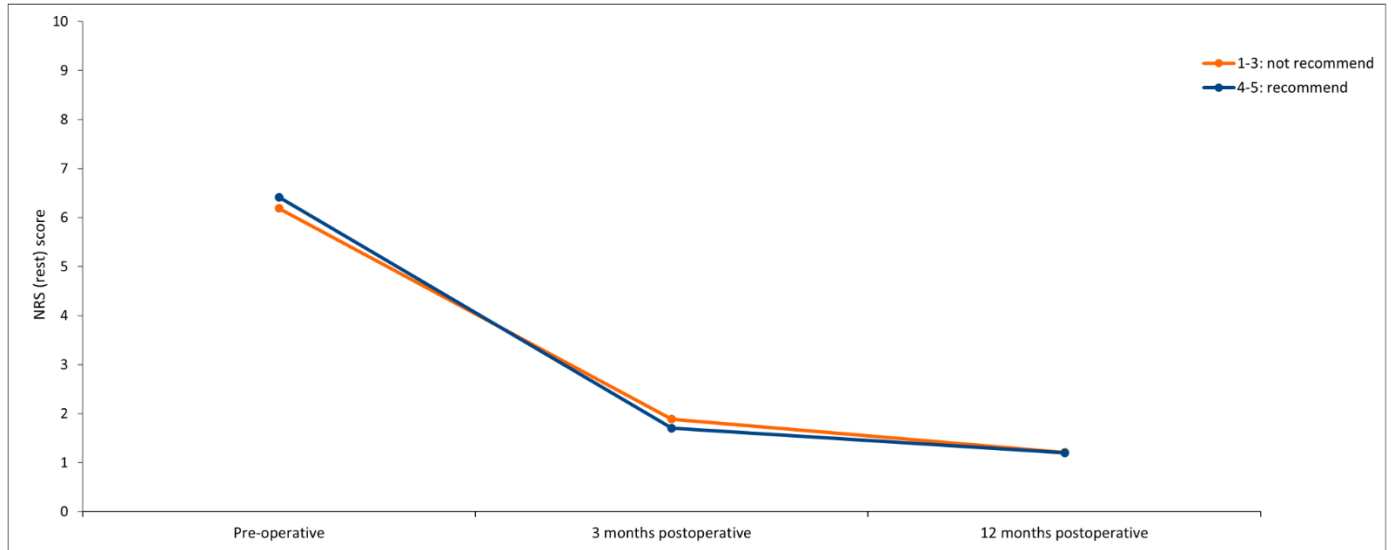


TABLE Mean NRS (rest) scores

NRS (rest) score Recommendation score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	558	6.2 (6.0-6.4)	557	1.9 (1.7-2.1)	560	1.2 (1.0-1.4)
4-5: recommend	154	6.4 (6.0-6.8)	154	1.7 (1.4-2.0)	155	1.2 (0.9-1.5)
Total	757	6.2 (6.0-6.3)	759	1.9 (1.7-2.0)	759	1.2 (1.1-1.4)

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 disagreement and 5.0 representing totally agreement.
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 pre-operative, 3 months and 12 months postoperative NRS (activity) scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2020

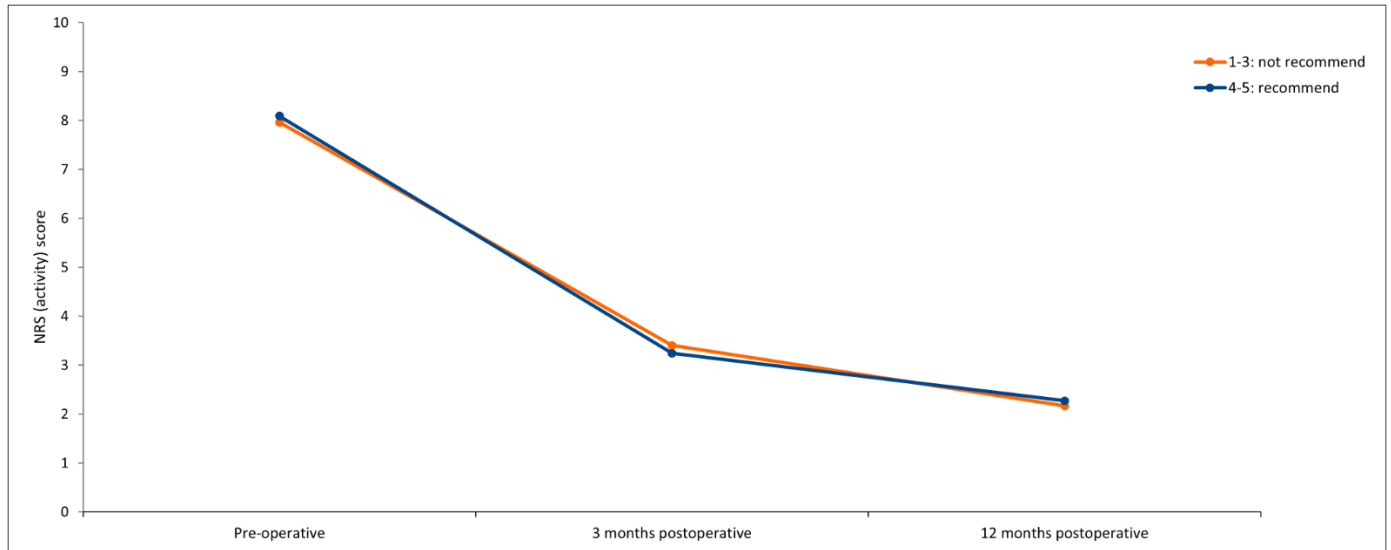


TABLE Mean NRS (activity) scores

NRS (activity) score Recommendation score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	558	8.0 (7.8-8.1)	557	3.4 (3.2-3.6)	560	2.2 (2.0-2.4)
4-5: recommend	155	8.1 (7.8-8.4)	154	3.2 (2.8-3.6)	154	2.3 (1.9-2.7)
Total	758	7.9 (7.8-8.1)	758	3.4 (3.2-3.5)	758	2.2 (2.0-2.3)

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 disagreement and 5.0 representing totally agreement.
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.

EQ5D index score

FIGURE Mean pre-operative, 3 months and 12 months postoperative EQ-5D index scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2020

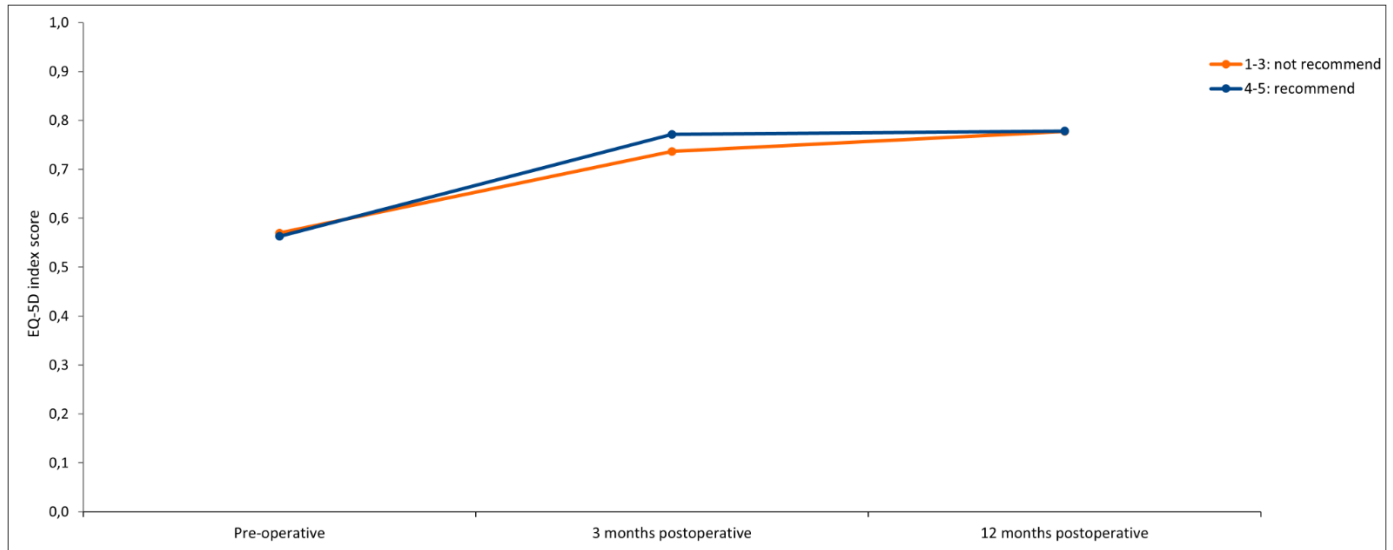


TABLE Mean EQ-5D Index scores

EQ-5D Index score Recommendation score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	548	0.57 (0.55-0.59)	532	0.74 (0.72-0.75)	526	0.78 (0.76-0.79)
4-5: recommend	136	0.56 (0.53-0.60)	137	0.77 (0.74-0.80)	152	0.78 (0.75-0.81)
Total	741	0.57 (0.55-0.58)	728	0.74 (0.73-0.76)	731	0.78 (0.76-0.79)

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 disagreement and 5.0 representing totally agreement.
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.

EQ5D thermometer

FIGURE Mean pre-operative, 3 months and 12 months postoperative EQ-5D thermometer scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2020

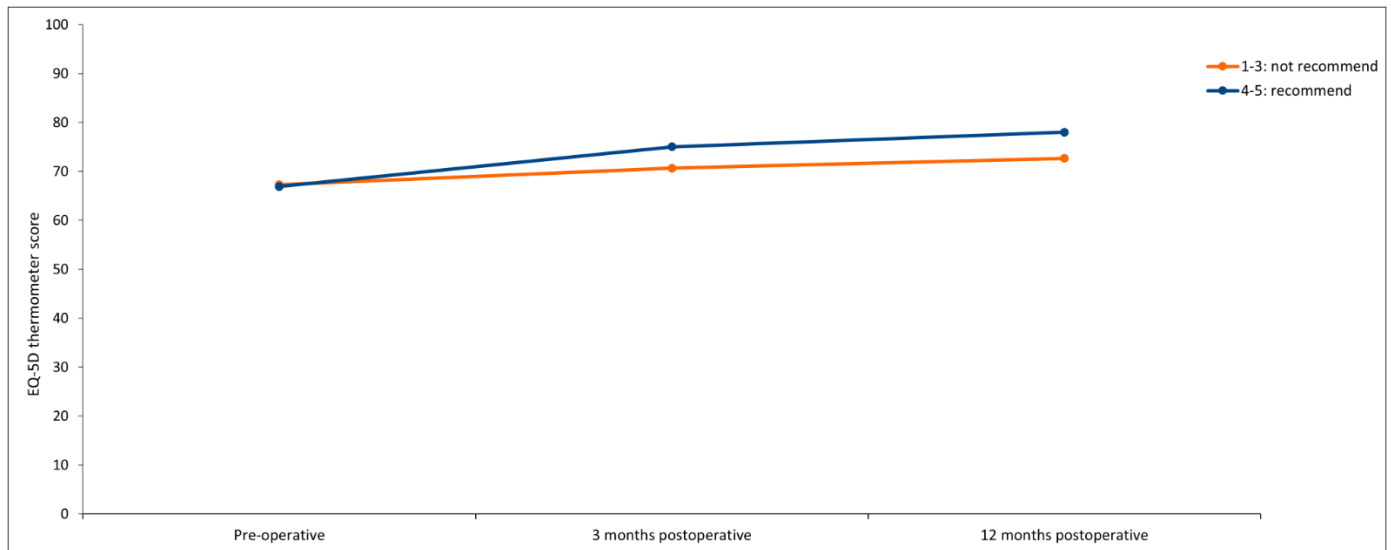


TABLE Mean EQ-5D thermometer scores

EQ-5D thermometer Recommendation score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	551	67.3 (65.7-68.9)	541	70.6 (68.8-72.5)	537	72.7 (70.9-74.4)
4-5: recommend	138	66.9 (63.6-70.2)	142	75.0 (71.8-78.3)	153	78.0 (75.6-80.4)
Total	748	66.8 (65.5-68.2)	742	72.0 (70.5-73.5)	742	73.9 (72.4-75.3)

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 disagreement and 5.0 representing totally agreement.
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 pre-operative, 3 months and 12 months postoperative Oxford Shoulder scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis by recommendation score in the Netherlands in 2016-2020

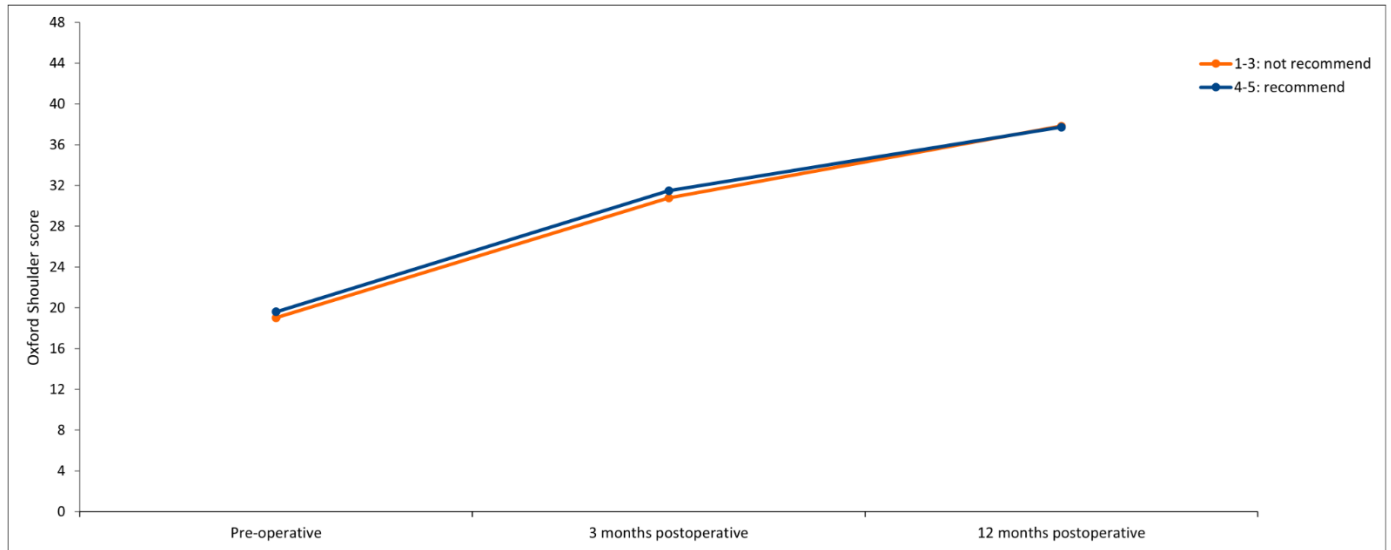


TABLE Mean Oxford Shoulder Scores (OSS)

Oxford Shoulder score Recommendation score	Pre-operative		3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)	n	Mean (95% CI)
1-3: not recommend	553	19.0 (18.4-19.7)	545	30.8 (29.9-31.7)	549	37.8 (37.0-38.6)
4-5: recommend	151	19.6 (18.3-20.9)	151	31.5 (29.8-33.1)	150	37.7 (36.1-39.3)
Total	753	19.2 (18.7-19.8)	748	30.9 (30.1-31.6)	741	37.9 (37.2-38.6)

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 disagreement and 5.0 representing totally agreement.
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.

Recommendation

FIGURE Mean 3 months and 12 months postoperative recommendation scores of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis in the Netherlands in 2016-2020

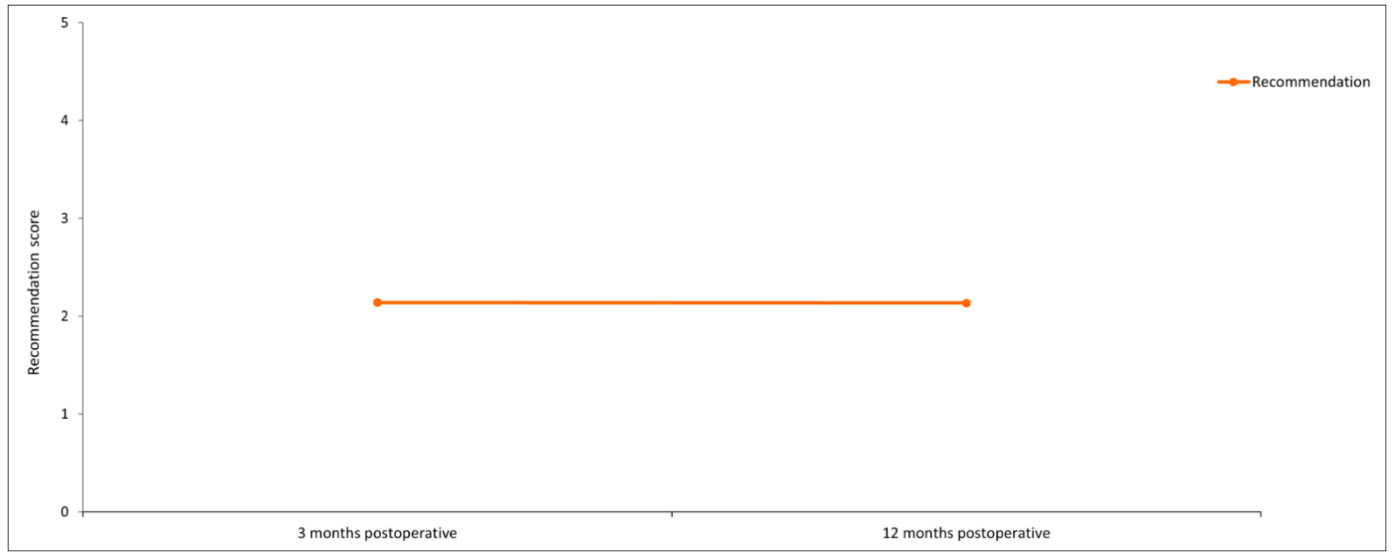


TABLE Mean recommendation

	3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)
Recommendation score	719	2.14 (2.03-2.24)	715	2.13 (2.02-2.24)

CI: confidence interval.

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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 disagreement and 5.0 representing totally agreement.

Anchor questions

FIGURE Mean 3 months and 12 months postoperative change in daily functioning and pain of patients who underwent a primary total (anatomical or reverse) shoulder arthroplasty for osteoarthritis in the Netherlands in 2016-2020

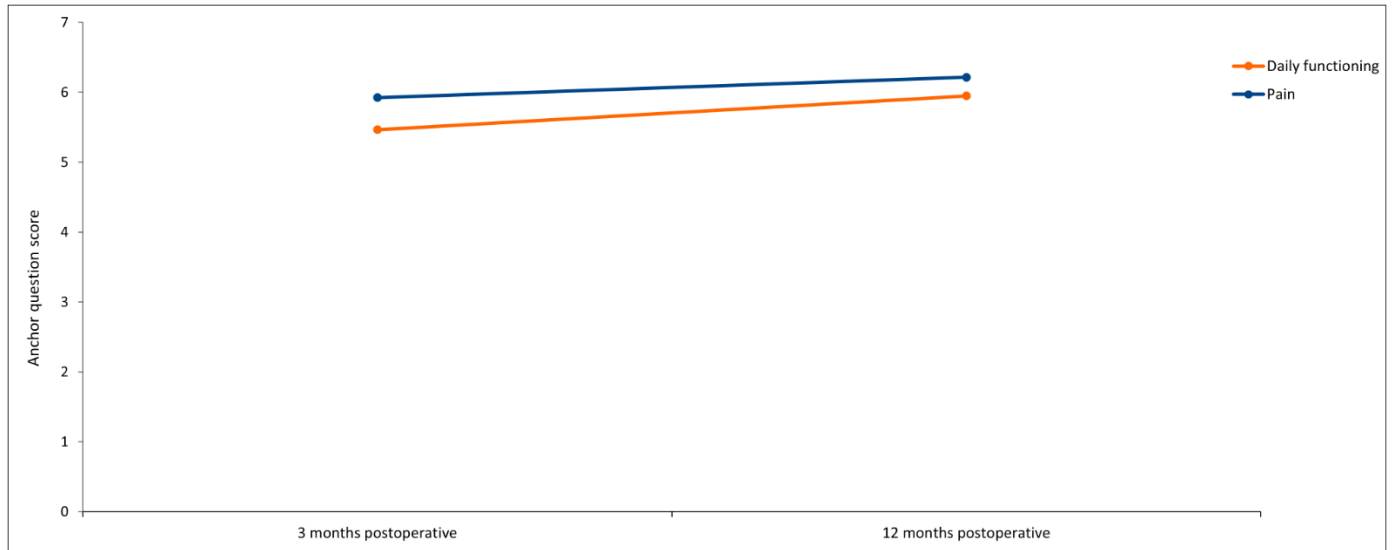


TABLE Mean anchor questions: Daily functioning and Pain

Anchor question score	3 months postoperative		12 months postoperative	
	n	Mean (95% CI)	n	Mean (95% CI)
Daily functioning	723	5.5 (4.4-5.6)	724	5.9 (5.9-6.0)
Pain	712	5.9 (5.8-6.0)	719	6.2 (6.1-6.3)

CI: confidence interval.

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

Elbow arthroplasty

Numbers

Registered procedures

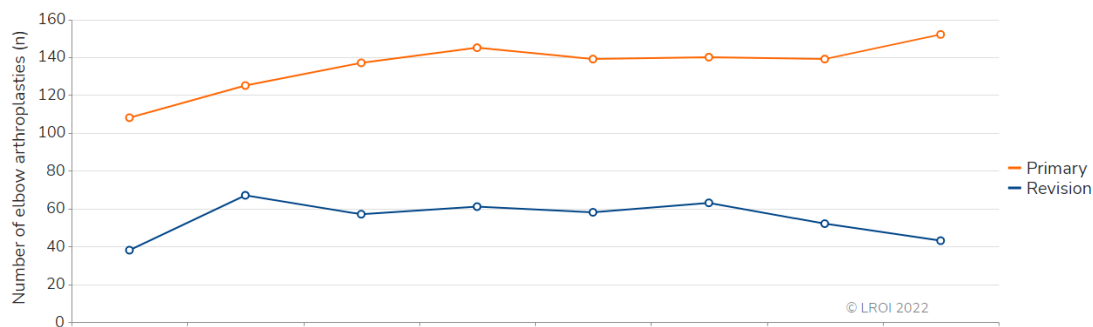
TABLE Number of registered elbow arthroplasties per year of surgery (2014-2021) in the LROI in April 2022

Year of surgery	Type of elbow arthroplasty							Total (n)
	Total arthroplasty (n)	Distal hemihumeral arthroplasty (n)	Radial head arthroplasty (n)	Radiocapitellar arthroplasty (n)	Other (n)	Unknown/missing (n)	Revision arthroplasty (n)	
2014	72	5	23	0	0	8	38	146
2015	78	4	41	1	0	1	67	192
2016	67	2	45	13	2	8	57	194
2017	67	1	41	13	0	23	61	206
2018	73	5	54	2	2	3	58	197
2019	79	2	57	0	0	2	63	203
2020	78	3	54	0	3	1	53	191
2021	73	7	72	0	0	0	43	195
Total	587	29	387	29	7	46	439	1,524

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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 2014-2021

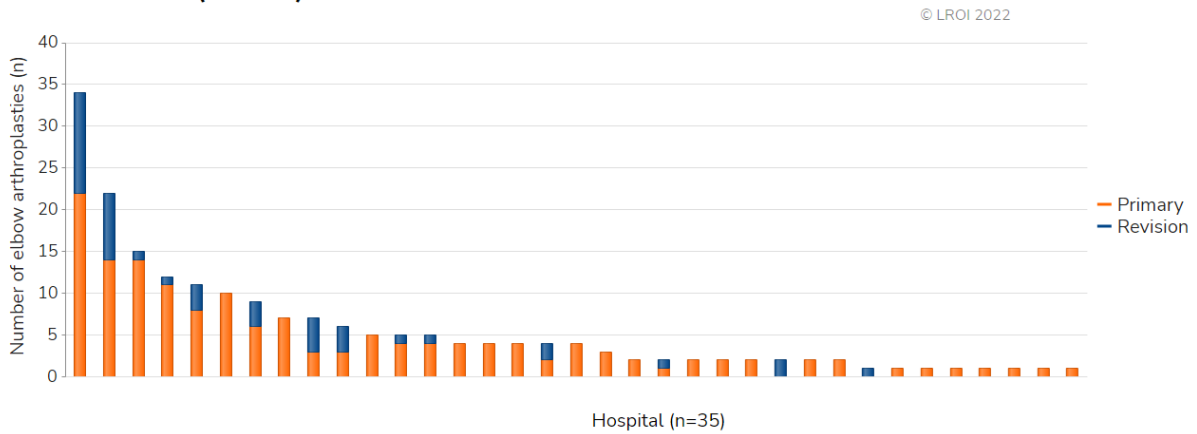


Year	2014	2015	2016	2017	2018	2019	2020	2021	Total
Primary	108	125	137	145	139	140	139	152	1,085
Revision	38	67	57	61	58	63	52	43	439
Total:	146	192	194	206	197	203	191	195	1,524

Out of 152 primary elbow arthroplasties that were performed in 2021, 1% (n=1) was performed bilaterally.

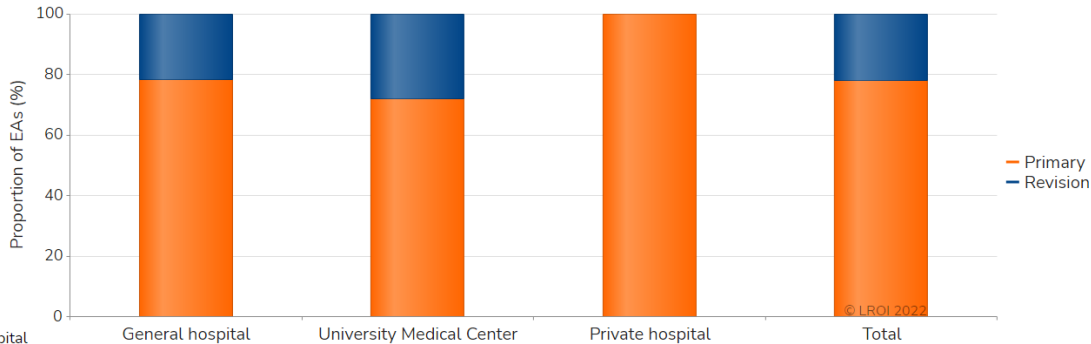
Type of procedure per hospital

FIGURE Number of primary elbow arthroplasties and elbow revision arthroplasties per hospital in the Netherlands in 2021 (n=195)



Type of hospital

FIGURE Primary elbow arthroplasties and elbow revision arthroplasties (proportion [%] per category) by type of hospital in the Netherlands in 2021



Type of hospital	General hospital	University Medical Center	Private hospital	Total
Type of procedure (%)				
Primary	78.31	72.00	100.00	77.95
Revision	21.69	28.00		22.05
Total (n):	166	25	4	195

Please note: In 2021, 29 general hospitals, 5 UMCs and 1 private hospital performed elbow arthroplasties.
EA: elbow arthroplasty; General: general hospital; UMC: university medical centre.

Primary elbow arthroplasty

Demographics

Patient characteristics by type of elbow prosthesis

TABLE Patient characteristics of all patients with a registered primary elbow arthroplasty by type of elbow arthroplasty in the Netherlands in 2021

	Total arthroplasty ¹ (n=80)	Radial head arthroplasty (n=72)	Total (n=152)
Mean age (years) (SD)	69.6 (9.7)	59.3 (13.5)	64.7 (12.7)
Age (years) (%)			
<50	3	18	10
50-59	11	29	20
60-69	31	32	32
70-79	43	19	32
≥80	13	1	7
Gender (%)			
Men	25	28	26
Women	75	72	74
ASA score (%)			
I	6	24	14
II	66	49	58
III-IV	28	28	28
Type of hospital (%)			
General	82	89	85
UMC	14	10	12
Private	4	1	3
Diagnosis (%)			
Acute fracture	13	68	39
Late post-traumatic	31	25	28
Osteoarthritis	21	1	12
Rheumatoid arthritis	23	0	12
Inflammatory arthritis	1	0	1
Osteonecrosis	0	0	0
Hemophilic arthropathy	0	0	0
Tumour	0	0	0
Other	11	6	9
Mean Body Mass Index (kg/m²)	27.4 (5.5)	27.6 (5.3)	27.5 (5.4)
Body Mass Index (kg/m²) (%)			
Underweight (≤18,5)	3	0	1
Normal weight (>18,5-25)	32	37	35
Overweight (>25-30)	44	34	39
Obesity (>30-40)	20	28	24
Morbid obesity (>40)	1	1	1
Smoking (%)			
No	92	90	91
Yes	8	10	9

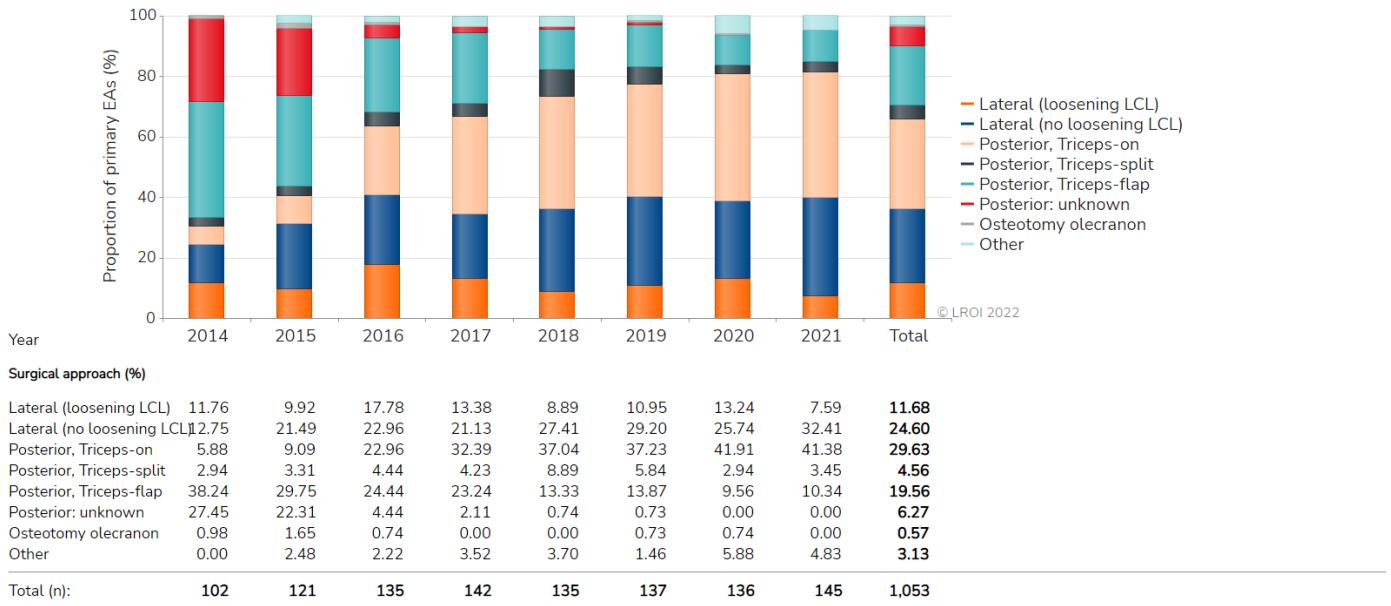
¹ Including distal humeral prostheses (n=7).

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

Surgical techniques

Surgical approach

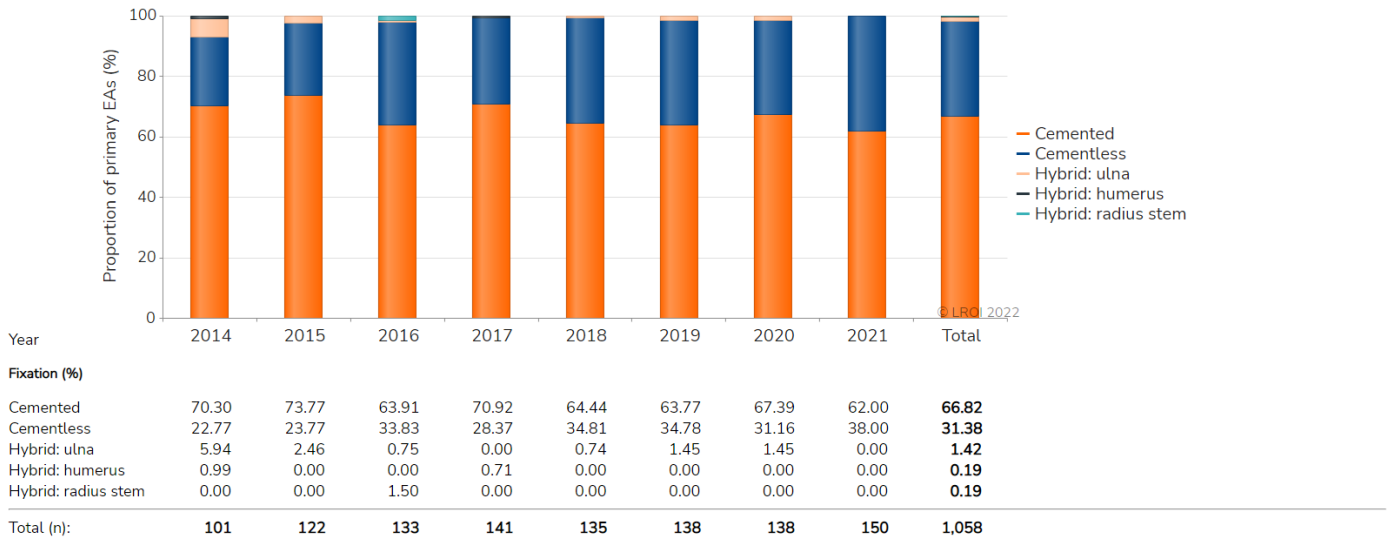
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary elbow arthroplasty in the Netherlands in 2014-2021



EA: elbow arthroplasty.

Fixation

FIGURE Trend (proportion [%] per year) in type of fixation in primary elbow arthroplasties in the Netherlands in 2014-2021

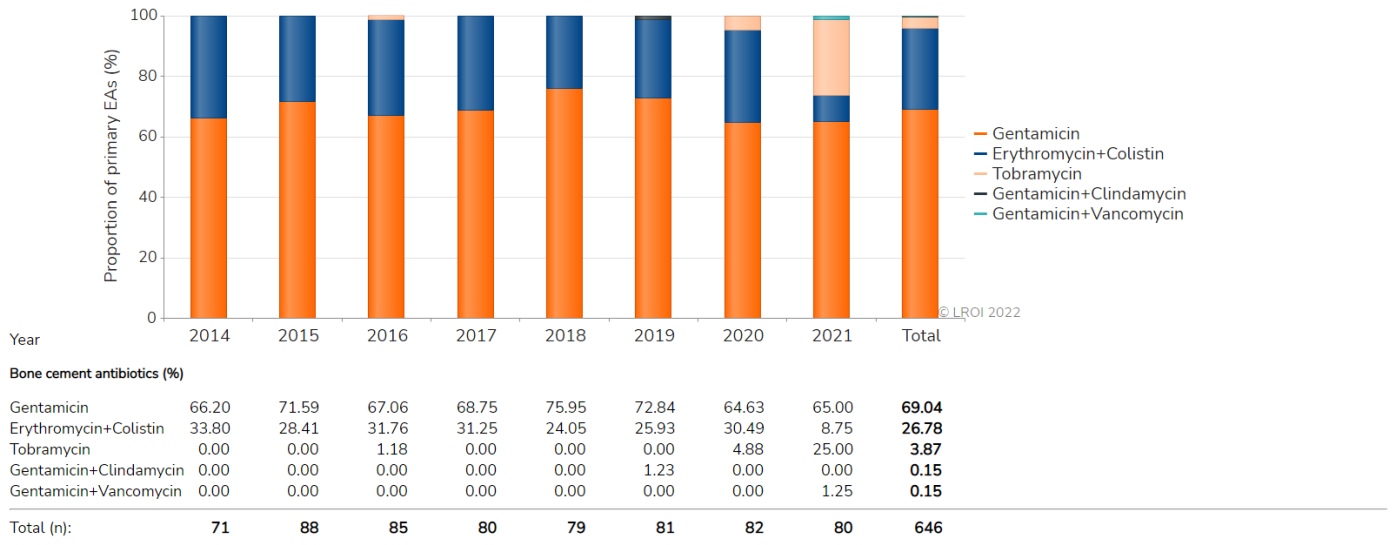


EA: elbow arthroplasty.

Bone cement

Antibiotics

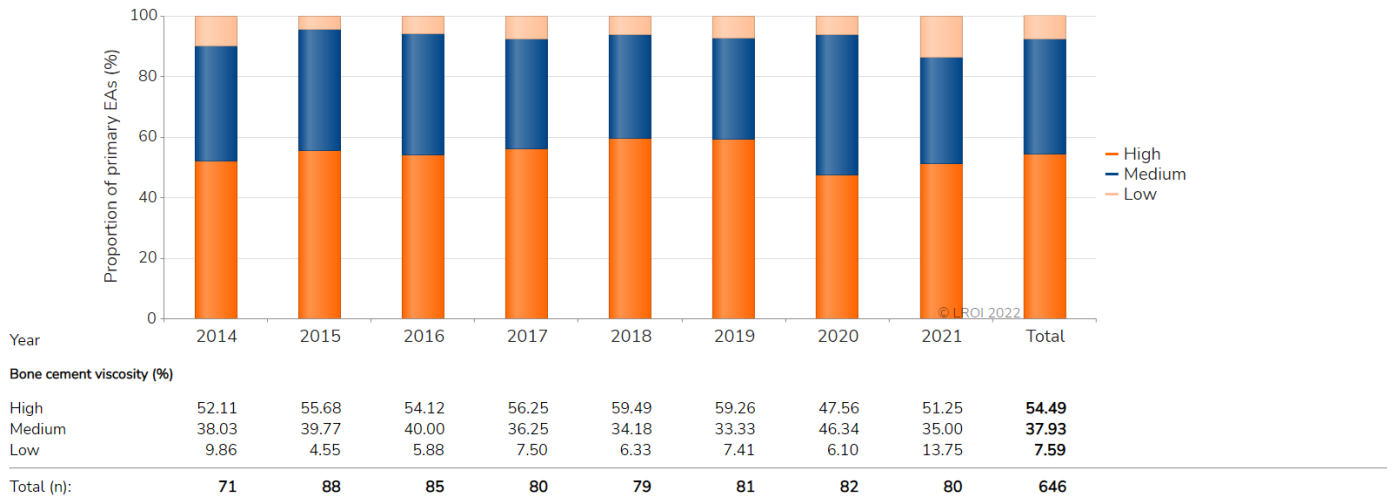
FIGURE Trend (proportion [%] per year) in use of antibiotics in bone cement in primary elbow arthroplasties in the Netherlands in 2014-2021



EA: elbow arthroplasty.

Viscosity

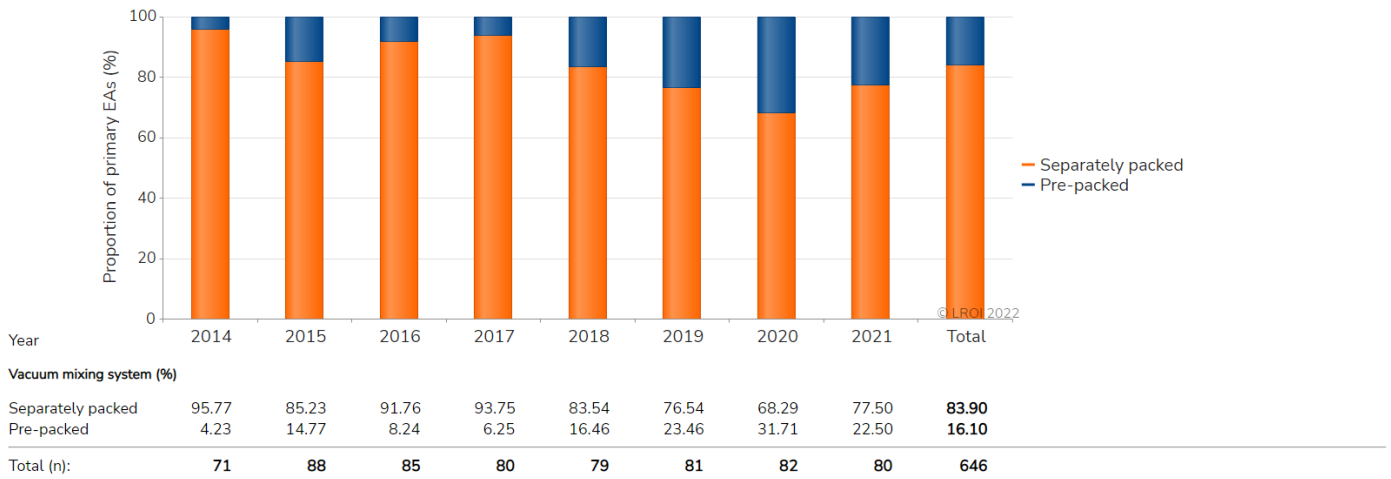
FIGURE Trend (proportion [%] per year) in bone cement viscosity in primary elbow arthroplasties in the Netherlands in 2014-2021



EA: elbow arthroplasty.

Vacuum mixing system

FIGURE Trend (proportion [%] per year) in use of bone cement pre-packed in a vacuum mixing system in primary elbow arthroplasties in the Netherlands in 2014-2021



EA: elbow arthroplasty; Separately packed: separately packed bone cement components; Pre-packed: Bone cement pre-packed in a vacuum mixing system.

Most frequently registered

Elbow prostheses

TABLE The most frequently registered total elbow arthroplasties and radial head arthroplasties in primary elbow arthroplasties in the Netherlands in 2021

Total elbow arthroplasties ¹ (n=70)			Radial head arthroplasties (n=59)		
Name	Number (n)	Proportion (%)	Name	Number (n)	Proportion (%)
Latitude EV	42	60	RHS	38	64
Coonrad/Morrey	12	17	Explor	11	19
Latitude	9	13	ICARA	4	7
NES	5	7	Anatomic Radial Head	3	5
Discovery	2	3	Radial Head Replacement System	2	3
			Evolve Radial Head	1	2

¹ Including distal humeral prostheses (n=5).

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Types of bone cement

TABLE The registered types of bone cement used during primary elbow arthroplasties in the Netherlands in 2021 (n=80)

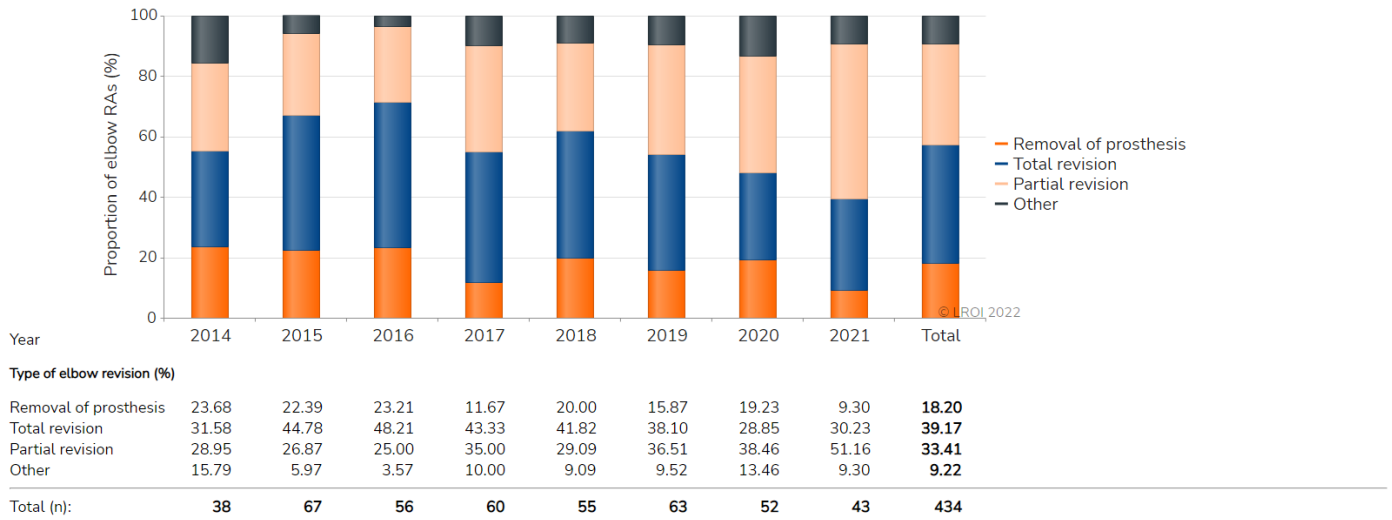
Name	Number (n)	Proportion (%)
Palacos R+G	23	29
Simplex ABC TOBRA	20	25
Refobacin Bone Cement R	15	19
Palacos LV+G	11	14
Simplex ABC EC	7	9
Refobacin Plus Bone Cement	2	3
Copal G+V	1	1
Palacos MV+G	1	1

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Elbow revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision in elbow revision arthroplasties in the Netherlands in 2014-2021



RA: revision arthroplasty.

Reasons for revision

TABLE Trend (proportion [%] per year) in reasons for revision in patients who underwent an elbow revision arthroplasty in the Netherlands in 2016-2021

Year	2016	2017	2018	2019	2020	2021	Total
Elbow revision arthroplasty (n)	57	61	58	63	52	43	334
Reasons for revision; Proportion¹ (%)							
Polyethylene wear	28.1	27.9	27.6	22.2	15.4	16.3	23.4
Instability	21.1	41.0	15.5	20.6	5.8	20.9	21.3
Metallosis	22.8	23.0	22.4	23.8	13.5	20.9	21.3
Loosening of humeral component	15.8	14.8	15.5	12.7	30.8	20.9	18.0
Loosening of ulnar component	15.8	18.0	17.2	17.5	23.1	14.0	17.7
Loosening of radial head component	21.1	18.0	20.7	15.9	15.4	14.0	17.7
Peri-prosthetic fracture	3.5	18.0	19.0	19.1	17.3	16.3	15.6
Infection	14.0	3.3	15.5	15.9	23.1	18.6	14.7
Other	12.3	24.6	10.3	14.3	13.5	16.3	15.3

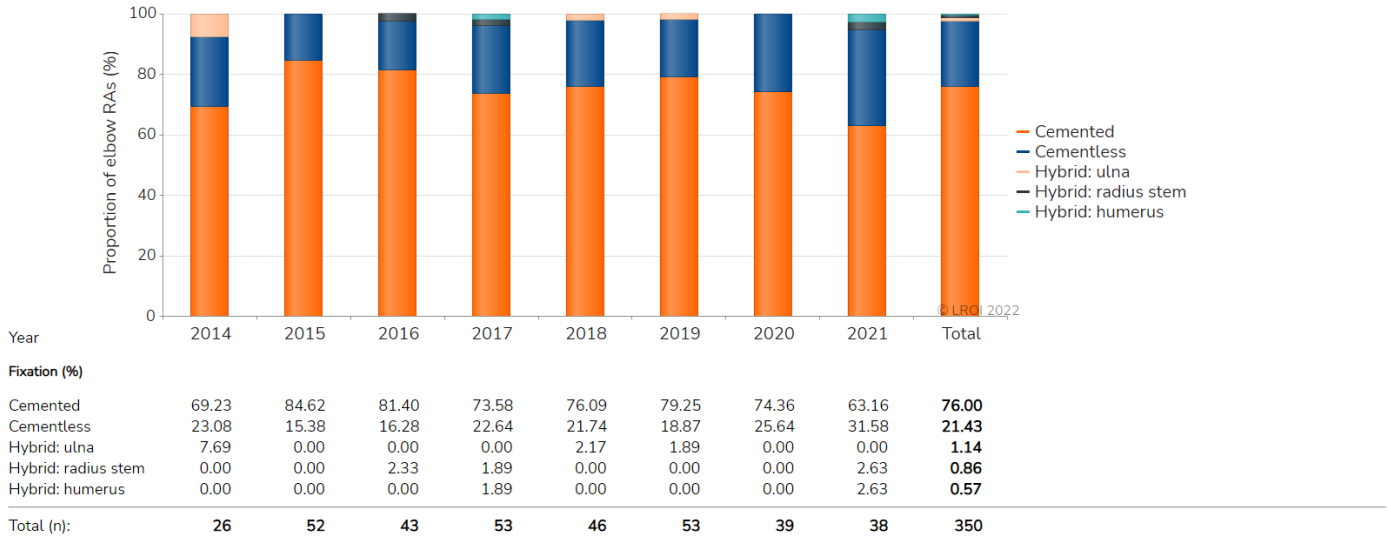
¹ One patient may have more than one reason for revision. As such, the total proportion is over 100%.

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Surgery and prosthesis

Fixation

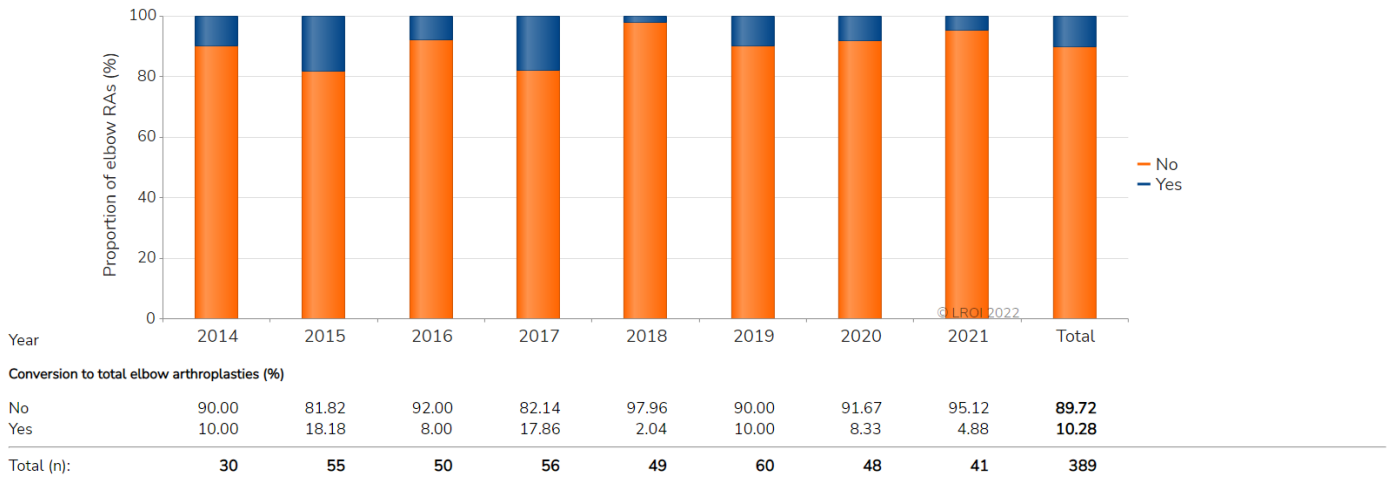
FIGURE Trend (proportion [%] per year) in type of fixation in elbow revision arthroplasties in the Netherlands in 2014-2021



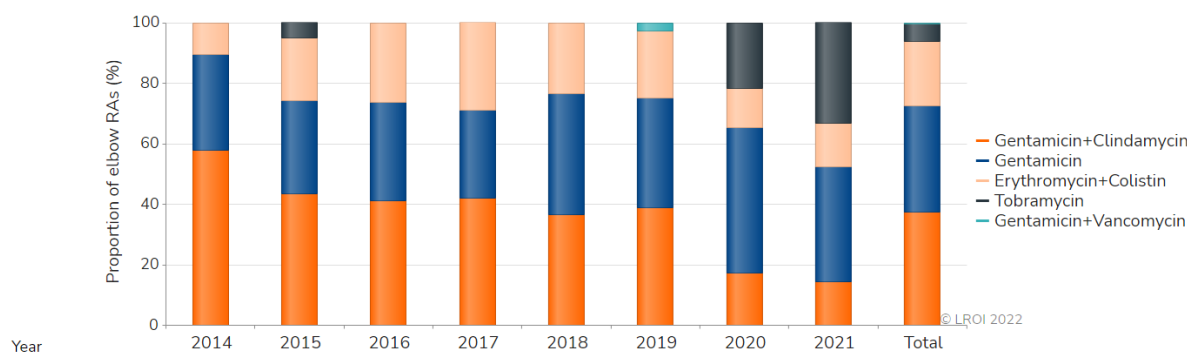
RA: revision arthroplasty.

Conversion to TEA

FIGURE Trend (proportion [%] per year) in conversion of a radial head arthroplasty to a total elbow arthroplasty in the Netherlands in 2014-2021



RA: revision arthroplasty.

*Bone cement antibiotics***FIGURE** Trend (proportion [%] per year) in use of antibiotics in bone cement in elbow revision arthroplasties in the Netherlands in 2014-2021**Bone cement antibiotics (%)**

Gentamicin+Clindamycin	57.89	43.59	41.18	42.11	36.67	38.89	17.39	14.29	37.50
Gentamicin	31.58	30.77	32.35	28.95	40.00	36.11	47.83	38.10	35.00
Erythromycin+Colistin	10.53	20.51	26.47	28.95	23.33	22.22	13.04	14.29	21.25
Tobramycin	0.00	5.13	0.00	0.00	0.00	0.00	21.74	33.33	5.83
Gentamicin+Vancomycin	0.00	0.00	0.00	0.00	0.00	2.78	0.00	0.00	0.42
Total (n):	19	39	34	38	30	36	23	21	240

RA: revision arthroplasty.

*Most frequently registered components***TABLE** The most frequently registered humerus, ulna, radial head and radial stem components in elbow revision arthroplasties in the Netherlands in 2021

Humerus (n=14)	Number (n)	Proportion (%)
Latitude EV	6	43
Coonrad/Morrey	4	29
NES	3	21
Mutars	1	7

Ulna (n=12)	Number (n)	Proportion (%)
Latitude EV	6	50
Coonrad/Morrey	5	42
Mutars	1	8

Radial head (n=6)	Number (n)	Proportion (%)
RHS	5	83
ICARA	1	17

Radial stem (n=4)	Number (n)	Proportion (%)
RHS	3	75
ICARA	1	25

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*Most frequently registered types of bone cement***TABLE** The most frequently registered types of bone cement used during elbow revision arthroplasties in the Netherlands in 2021 (n=21)

Name	Number (n)	Proportion (%)
Simplex ABC Tobra	7	33
Palacos R+G	4	19
Refobacin Bone Cement R	3	14
Refobacin Revision	3	14
Simplex ABC EC	3	14
Palacos LV+G	1	5

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Survival

Mid- and long-term revision

Overall

FIGURE Cumulative revision percentage of primary elbow arthroplasties in the Netherlands in 2014-2021 (n=1,079)

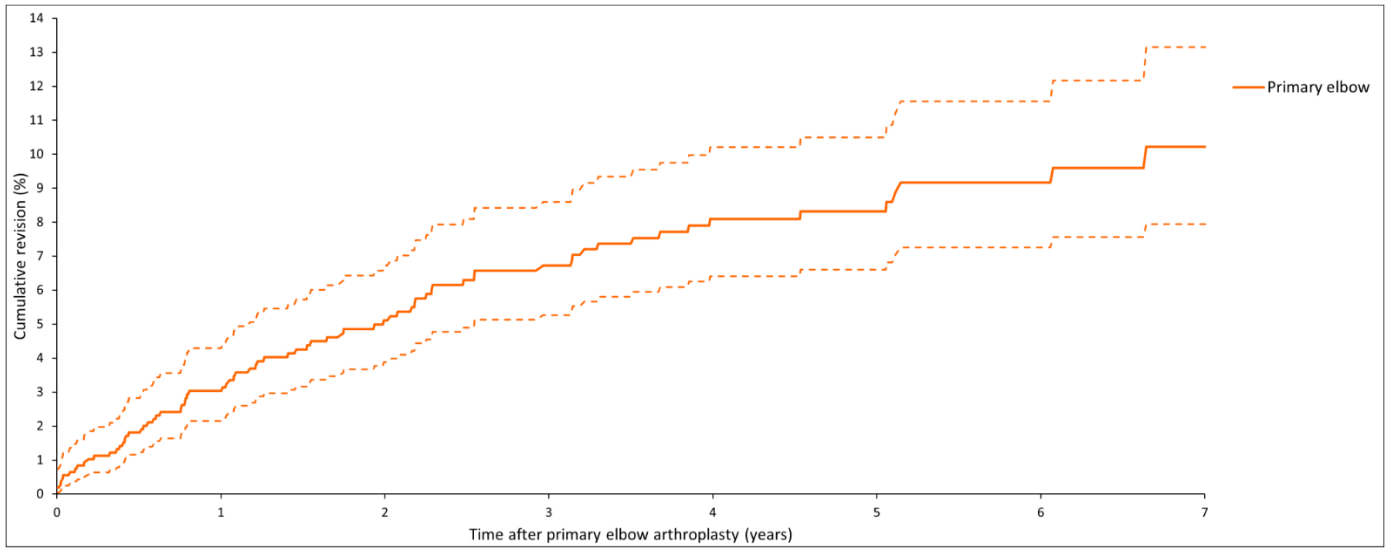


TABLE Cumulative revision percentages of primary elbow arthroplasties

	Number (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Primary elbow arthroplasty	1,079			
1-year revision (%)		893	3.0 (2.1-4.3)	3.2 (2.1-4.2)
3-year revision (%)		578	6.7 (5.3-8.6)	6.8 (5.1-8.5)
5-year revision (%)		315	8.3 (6.6-10.5)	8.7 (6.7-10.7)
7-year revision (%)		86	10.2 (7.9-13.2)	10.9 (8.0-13.7)

¹ The cumulative revision percentage using the competing risk method is shown in the figure (>50 cases were at risk).
CI: confidence interval.

In 2014-2021, 73 (6.8%) primary elbow arthroplasties were implanted in patients who died within seven years after the primary procedure.

By type of elbow arthroplasty

FIGURE Cumulative revision percentage of primary elbow arthroplasties by type of elbow arthroplasty in the Netherlands in 2014-2021 (n=970)

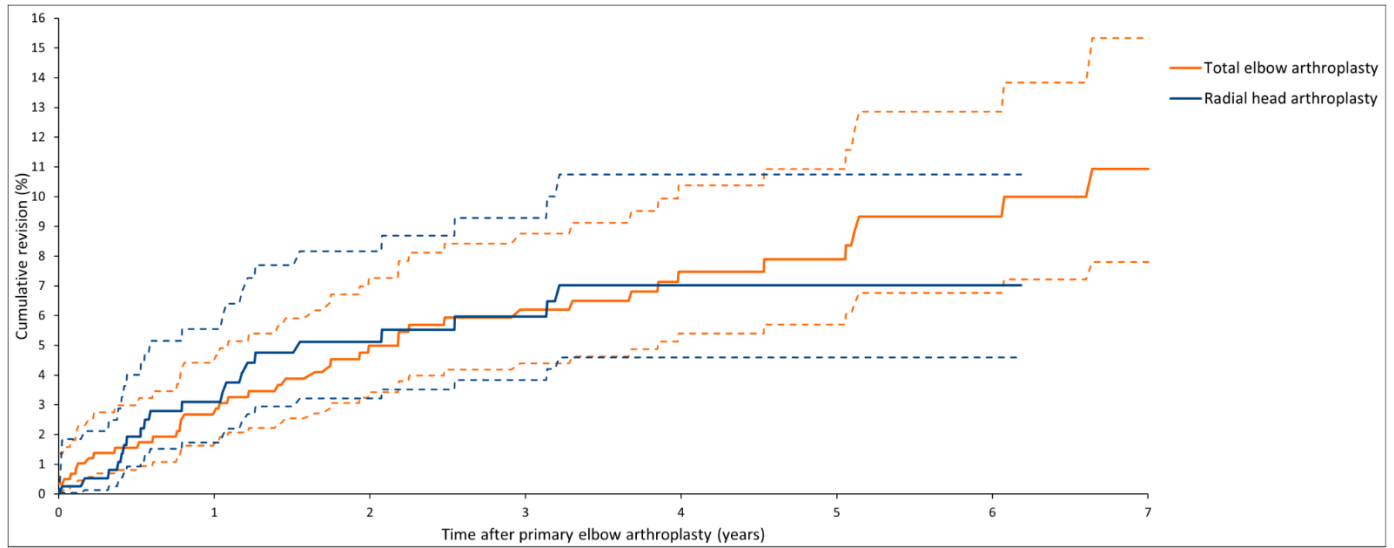


TABLE Cumulative revision percentages of primary elbow arthroplasties

	Number (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
By type of elbow arthroplasty				
Total elbow arthroplasty	586			
1-year revision (%)		493	2.7 (1.6-4.4)	2.7 (1.4-4.1)
3-year revision (%)		319	6.2 (4.4-8.8)	6.1 (4.0-8.3)
5-year revision (%)		179	7.9 (5.7-10.9)	8.3 (5.6-11.0)
7-year revision (%)		57	10.9 (7.8-15.3)	11.9 (7.7-16.1)
Radial head arthroplasty	384			
1-year revision (%)		304	3.1 (1.7-5.5)	3.4 (1.5-5.2)
3-year revision (%)		183	6.0 (3.8-9.3)	6.2 (3.5-8.9)
5-year revision (%)		101	7.0 (4.6-10.7)	7.3 (4.3-10.4)
7-year revision (%)		20	n.a.	n.a.

¹ The cumulative revision percentage using the competing risk method is shown in the figure (>50 cases were at risk).
CI: confidence interval.

Wrist arthroplasty

Numbers

Registered procedures

TABLE Number of registered wrist arthroplasties per year of surgery (2017-2021) in the LROI in April 2022

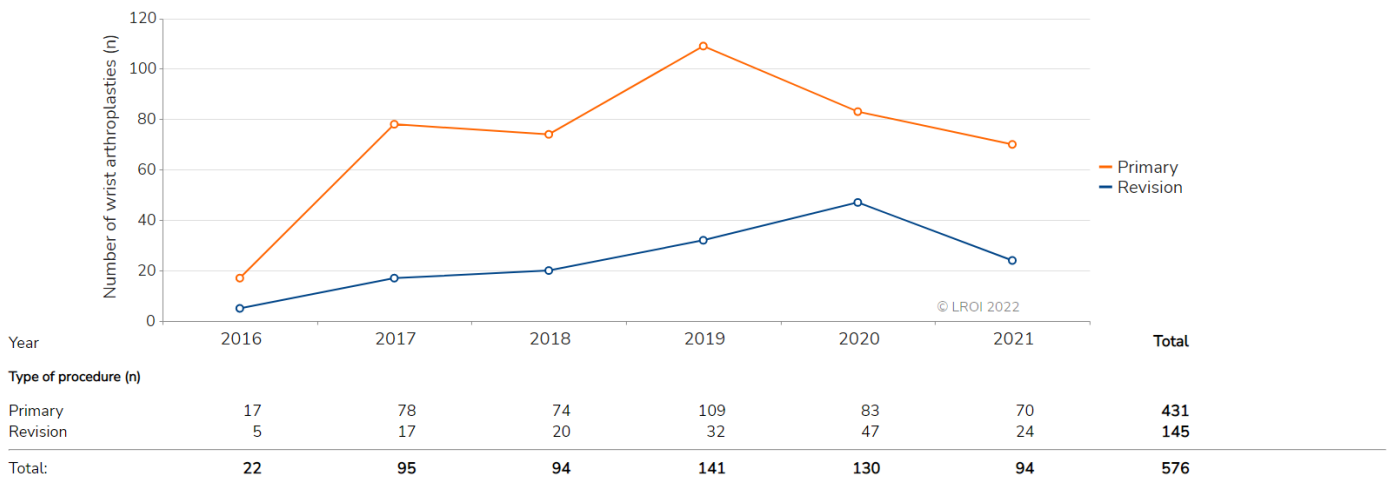
Year of surgery	Type of wrist arthroplasty				Total ¹ (n)
	Total arthroplasty (n)	Ulnar head/ DRU arthroplasty (n)	Other (n)	Revision arthroplasty (n)	
2017	35	24	10	17	95
2018	37	25	7	20	94
2019	43	40	20	32	141
2020	32	27	16	47	130
2021	27	20	13	24	94
Total	177	136	66	145	576

¹ In 4.7% (n=27) primary wrist arthroplasties the type of primary wrist prosthesis has not been registered.

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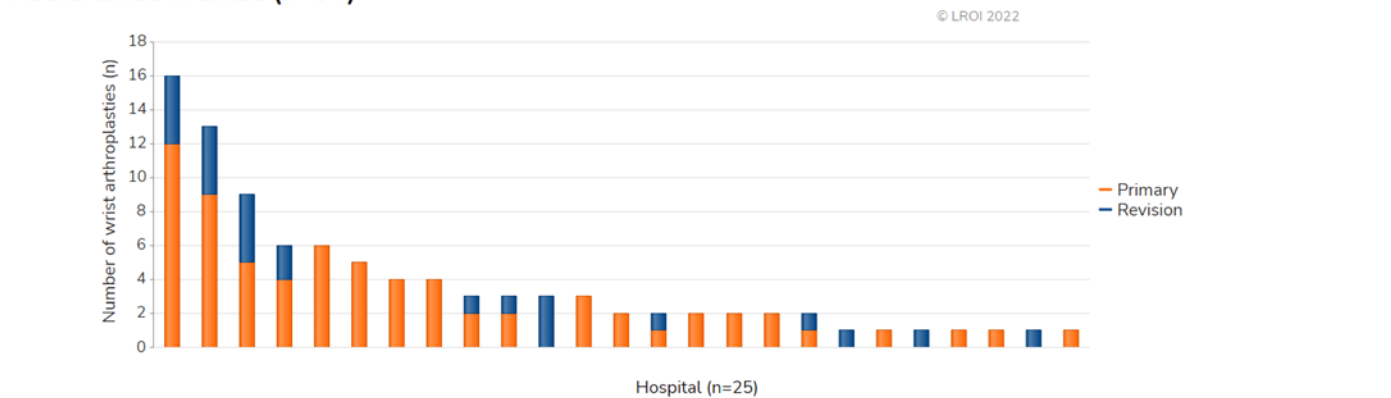
Type of procedure

FIGURE Number of primary wrist arthroplasties and wrist revision arthroplasties registered in the LROI in the Netherlands in 2017-2021



Type of procedure per hospital

FIGURE Number of primary wrist arthroplasties and wrist revision arthroplasties per hospital in the Netherlands in 2021 (n=94)



Please note: In 2021, 20 general hospitals, 4 university medical centres and 1 private hospitals performed wrist arthroplasties.

Primary wrist arthroplasty

Demographics

Patient characteristics

TABLE Patient characteristics of all patients with a registered primary wrist arthroplasty in the Netherlands in 2021

	Plastic surgeon (n=39)	Orthopaedic surgeon (n=30)	Total (n=70)
Mean age (years) (SD)	57.6 (13.7)	64.3 (11.1)	60.6 (12.9)
Age (years) (%)			
<50	15	17	16
50-59	33	13	24
60-69	31	37	34
70-79	21	27	23
≥80	0	7	3
Gender (%)			
Men	51	33	44
Women	49	67	56
ASA score (%)			
I	31	17	24
II	66	53	59
III-IV	3	30	17
Type of hospital (%)			
General	77	97	86
UMC	8	3	6
Private	15	0	9
Diagnosis (%)			
Osteoarthritis	69	37	55
Post-traumatic	6	7	6
Rheumatoid arthritis	11	27	18
Osteonecrosis	0	0	0
Inflammatory arthritis	0	0	0
Other	14	30	21
Mean Body Mass Index (kg/m ²) (SD)	27.6 (5.2)	30.0 (6.1)	28.8 (5.7)
Body Mass Index (kg/m²) (%)			
Underweight (≤18,5)	0	0	0
Normal weight (>18,5-25)	41	17	28
Overweight (>25-30)	34	37	35
Obesity (>30-40)	21	43	33
Morbid obesity (>40)	3	3	3
Smoking (%)			
No	77	87	82
Yes	23	13	18

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

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Surgery and prosthesis

Most frequently registered components

TABLE The most frequently registered carpal, radial stem and ulnar head components in primary wrist arthroplasties in the Netherlands in 2021

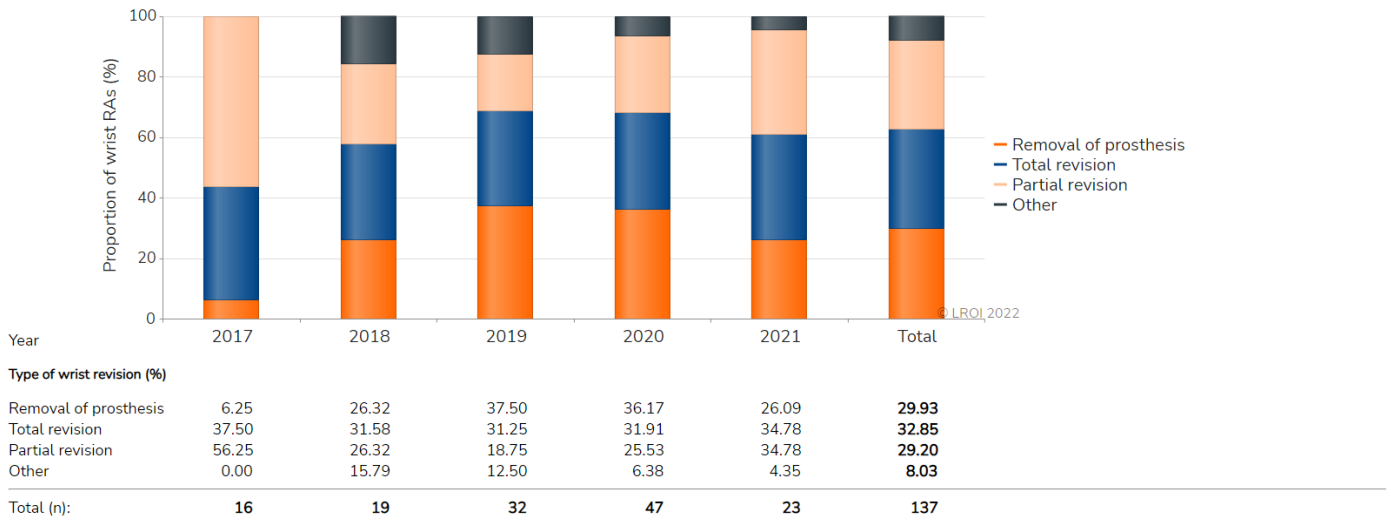
Carpal (n=38)		Radial stem (n=29)	
Name	Number (n)	Name	Number (n)
Freedom	28	Freedom	18
RCPI	6	Distal radioulnar joint	8
Remotion	2	Remotion	2
Distal radioulnar joint	1	Motec	1
Motec	1		
Ulnar head (n=2)			
Name	Number (n)		
UHP prothese	1		
Motec	1		

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Wrist revision arthroplasty

Type of revision

FIGURE Type of revision arthroplasty of wrist revision arthroplasties in the Netherlands in 2017-2021



RA: revision arthroplasty.

Reasons for revision

TABLE Reasons for revision in patients who underwent a wrist revision arthroplasty in the Netherlands in 2021 (n=24)

Reasons for revision	Number ¹ (n)
Lysis of components	10
Loosening of carpal component	9
Loosening of radial component	6
Instability	6
Dislocation	5
Peri-prosthetic fracture	3
Implant fracture	2
Infection	1
Loosening of ulnar component	1
Other	5

¹ One patient may have more than one reason for revision or re-surgery.

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Most frequently registered components

TABLE The most frequently registered carpal, radial stem and ulnar head components in wrist revision arthroplasties in the Netherlands in 2021 (n=24)

Carpal (n=20)		Radial stem (n=7)	
Name	Number (n)	Name	Number (n)
Freedom	9	Freedom	3
Motec	5	Distal radioulnar join	3
Universal2	4	Motec	1
Remotion	2		

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Survival

Overall

FIGURE Cumulative revision percentage of primary wrist arthroplasties in the Netherlands in 2017-2021 (n=414)

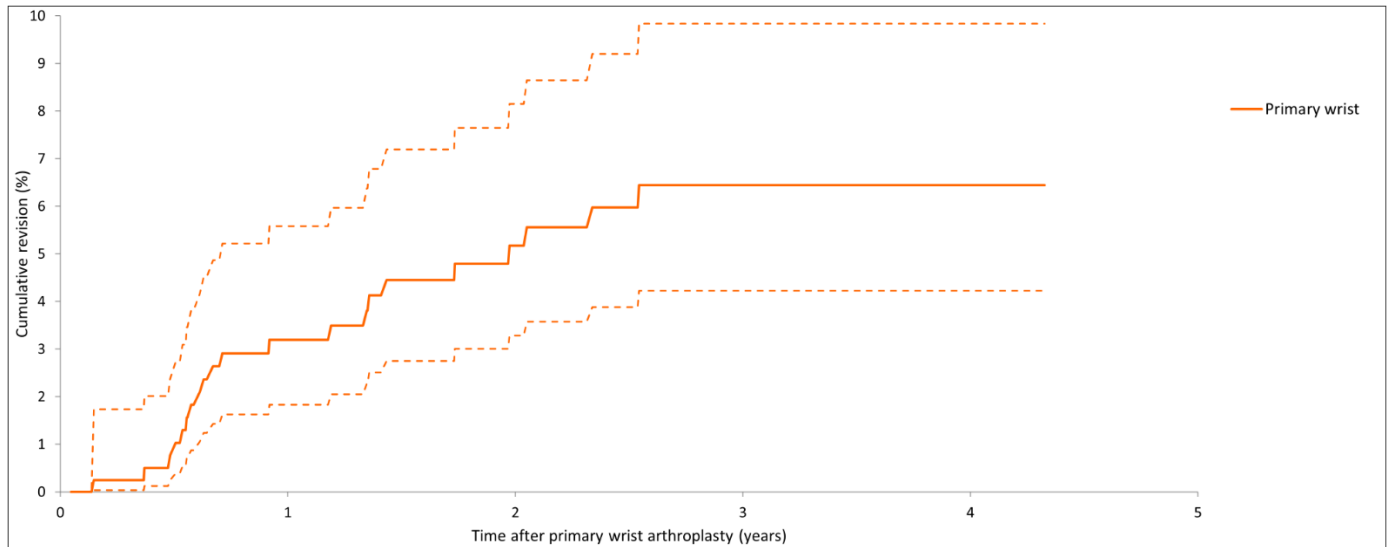


TABLE Cumulative revision percentages

	Number (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Primary wrist arthroplasty	414			
1-year revision (%)		333	3.2 (1.8-5.6)	3.2 (1.4-5.0)
2-year revision (%)		242	5.2 (3.3-8.1)	5.2 (2.9-7.6)
3-year revision (%)		140	6.4 (4.2-9.8)	6.5 (3.8-9.3)
4-year revision (%)		72	6.4 (4.2-9.8)	6.5 (3.8-9.3)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 CI: confidence interval.
 Please note: The number of registered primary wrist and revision arthroplasties is not complete.

In 2017-2021, 11 (2.7%) primary wrist arthroplasties were implanted in patients who died within four years after the primary procedure.

Finger arthroplasty

Numbers

Registered procedures

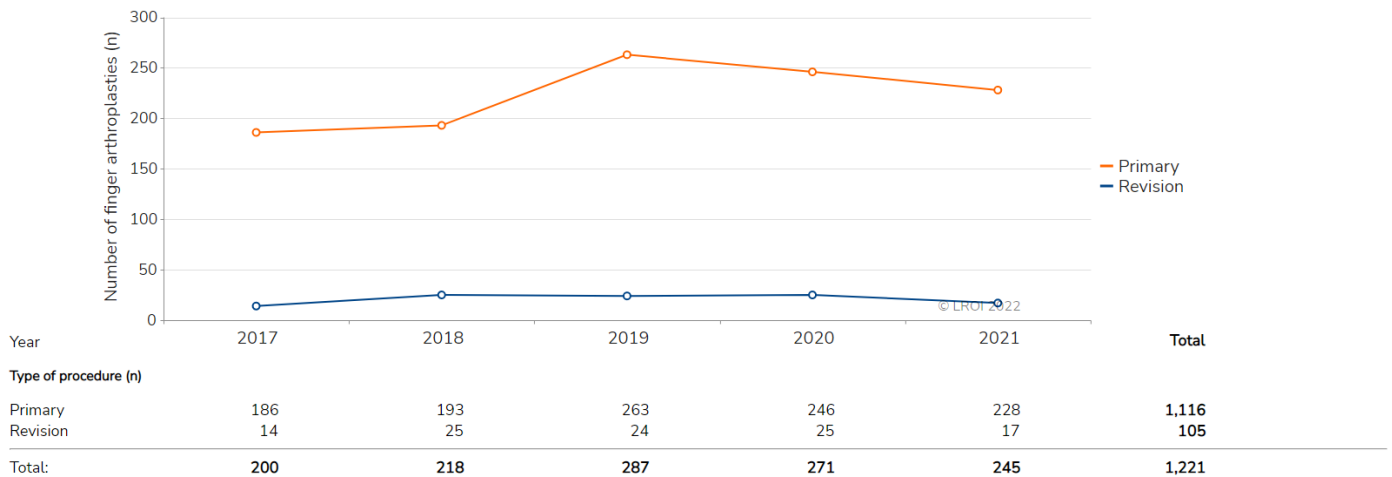
TABLE Number of registered finger arthroplasties per year of surgery (2017-2021) in the LROI in April 2022

Year of surgery	Type of finger arthroplasty		Total (n)
	Total arthroplasty (n)	Revision arthroplasty (n)	
2017	186	14	200
2018	193	25	218
2019	263	24	287
2020	246	25	271
2021	228	17	245
Total	1,130	105	1,235

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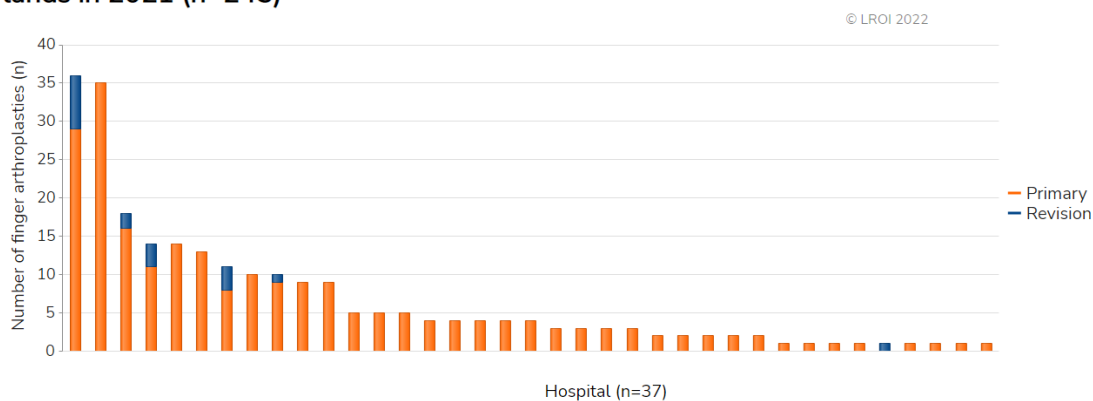
Type of procedure

FIGURE Number of primary finger arthroplasties and finger revision arthroplasties registered in the LROI in the Netherlands in 2017-2021



Type of procedure per hospital

FIGURE Number of primary finger arthroplasties and finger revision arthroplasties per hospital in the Netherlands in 2021 (n=245)



Please note: In 2021, 30 general hospitals, 4 university medical centres and 3 private hospitals performed finger arthroplasties.

Type of primary finger prosthesis

TABLE Type of primary finger prosthesis in primary finger arthroplasties in the Netherlands in 2021 (n=228)

Finger joint	Type of finger					Total (n)
	Thumb (n)	Index (n)	Middle (n)	Ring (n)	Small (n)	
CMC	43	n.a.	n.a.	n.a.	n.a.	43
MCP	0	18	17	7	8	50
PIP	n.a.	29	43	44	18	134
DIP	1	0	0	0	0	1
Total (n)	44	47	60	51	26	228

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Primary finger arthroplasty

Demographics

Patient characteristics by specialism

TABLE Patient characteristics of all patients with a registered primary finger arthroplasty in the Netherlands in 2021

	Plastic surgeon (n=159)	Orthopaedic surgeon (n=67)	Total (n=228)
Mean age (years) (SD)	63.4 (10.6)	64.7 (11.1)	63.9 (10.7)
Age (years) (%)			
<50	6	8	7
50-59	29	22	27
60-69	35	33	34
70-79	27	34	29
≥80	3	3	4
Gender (%)			
Men	24	21	23
Women	76	79	77
ASA score (%)			
I	29	4	22
II	56	69	60
III-IV	14	27	18
Type of hospital (%)			
General	69	94	77
UMC	4	6	4
Private	27	0	19
Diagnosis (%)			
Osteoarthritis	84	60	76
Rheumatoid arthritis	8	34	16
Post-traumatic	6	3	5
Inflammatory arthritis	2	1	2
Osteonecrosis	0	1	0
Other	1	0	0
Mean Body Mass Index (kg/m ²) (SD)	26.4 (4.2)	26.6 (4.4)	26.5 (4.2)
Body Mass Index (kg/m ²) (%)			
Underweight (≤18,5)	1	0	0
Normal weight (>18,5-25)	46	42	45
Overweight (>25-30)	35	33	35
Obesity (>30-40)	18	25	20
Morbid obesity (>40)	0	0	0
Smoking (%)			
No	90	88	89
Yes	10	12	11

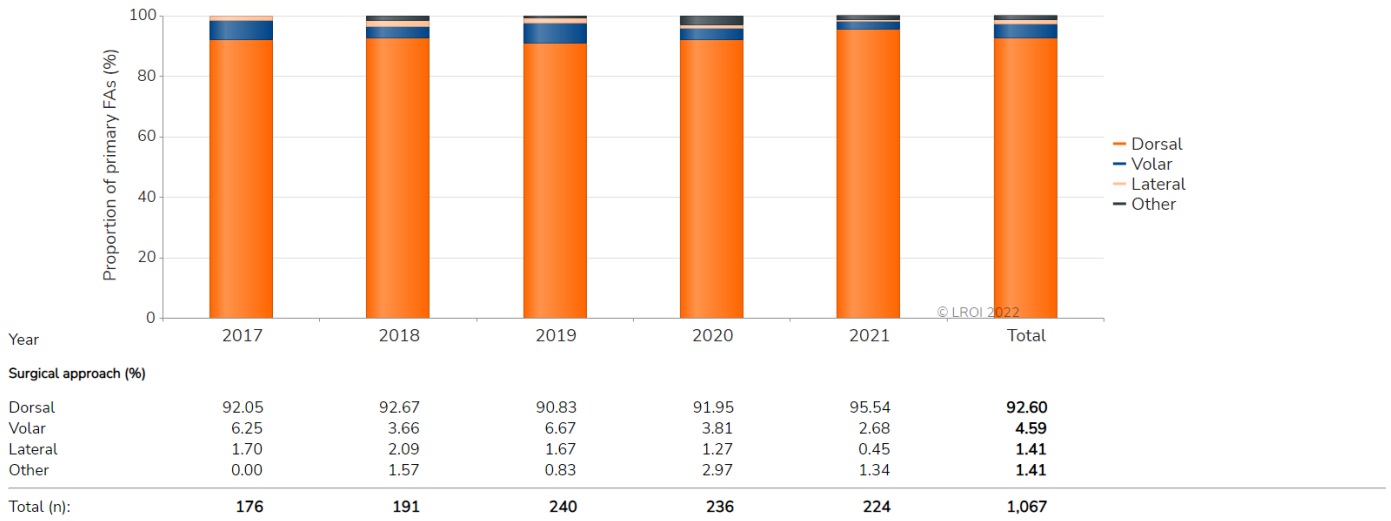
General: general hospital; UMC: university medical centre; Private: private hospital; SD: standard deviation.

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Surgery and prosthesis

Surgical approach

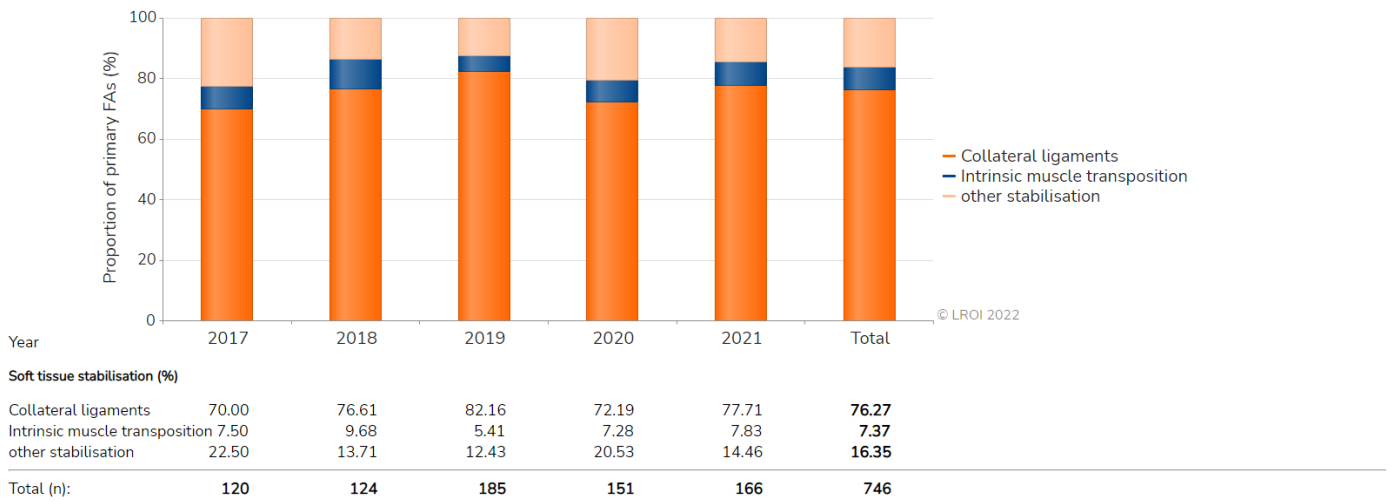
FIGURE Trend (proportion [%] per year) in surgical approach for performing a primary finger arthroplasty in the Netherlands in 2017-2021



FA: finger arthroplasty.

Soft tissue stabilisation

FIGURE Trend (proportion [%] per year) in type of stabilisation in primary finger arthroplasty in the Netherlands in 2017-2021



FA: finger arthroplasty.

Most frequently registered components

TABLE The most frequently registered proximal and distal components in primary finger arthroplasties in the Netherlands in 2021

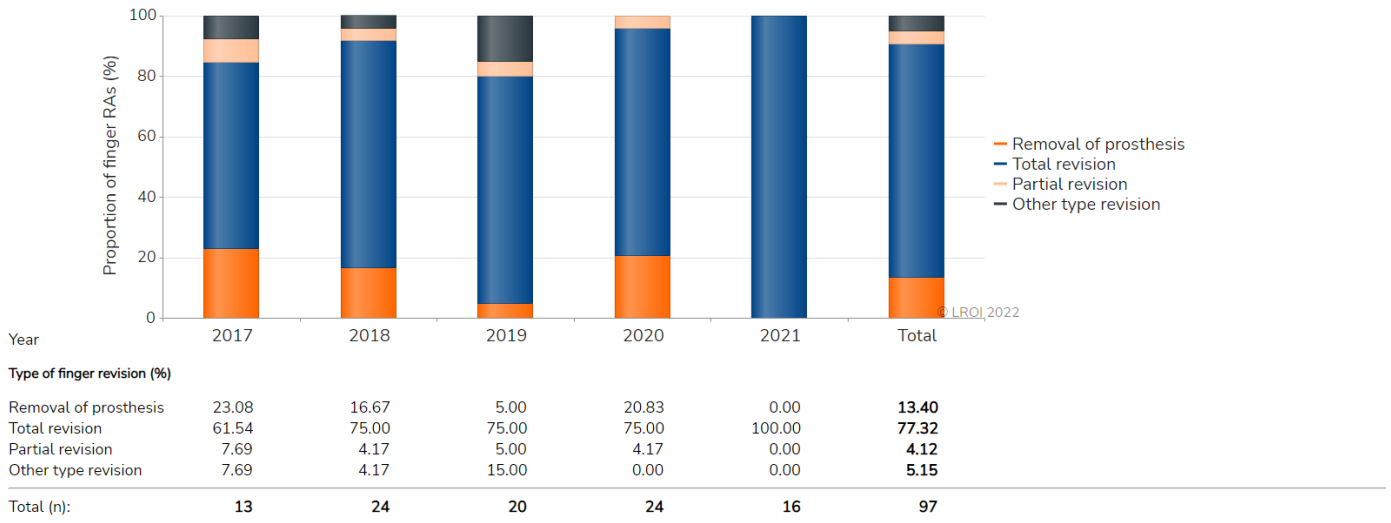
Proximal (n=166)		Distal (n=9)	
Name	Proportion (%)	Name	Proportion (%)
Silicone PIP Integra	39.2	Cap Flex PIP prothese	44.4
Silicone PIP Stryker	21.1	PIP Implant Integra	33.3
Silicone MCP Integra	13.3	ARPE	11.1
Swanson	7.8	MCP Implant Integra	11.1
MCP Implant Stryker	7.2		
Cap Flex PIP prothese	2.4		

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Finger revision arthroplasty

Type of revision

FIGURE Trend (proportion [%] per year) in type of revision arthroplasty of finger revision arthroplasties in the Netherlands in 2017-2021



RA: revision arthroplasty.

Reasons for revision

TABLE Reasons for revision in patients who underwent a finger revision arthroplasty in the Netherlands in 2021 (n=17)

Reasons for revision	Number ¹ (n)
Implant fracture	9
Instability	6
Dislocation	5
Bone resorption of proximal component	2
Bone resorption of distal component	1
Loosening of distal component	0
Loosening of proximal component	0
Infection	0
Peri-prosthetic fracture	0
Other	7

¹ One patient may have more than one reason for revision.

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Survival

Overall

FIGURE Cumulative revision percentage of primary finger arthroplasties in the Netherlands in 2017-2021 (n=1,114)

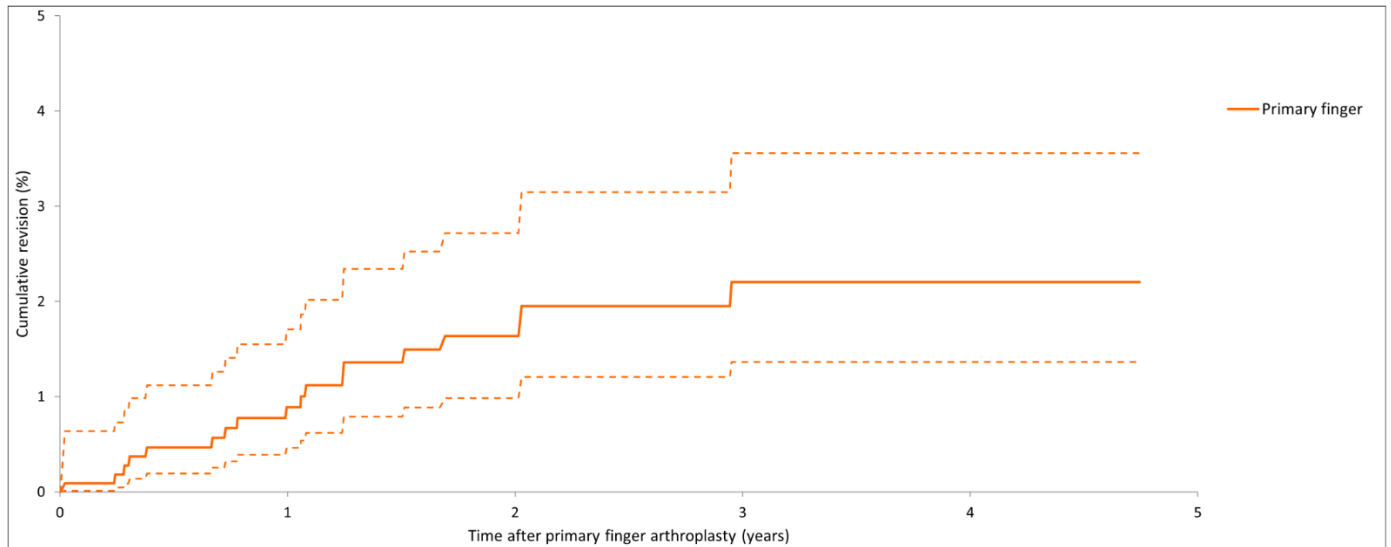


TABLE Cumulative revision percentages

	Number (n)	Number at risk (n)	Competing Risk ¹ (95% CI)	Kaplan Meier (95% CI)
Primary finger arthroplasty	1,114			
1-year revision (%)		878	0.9 (0.5-1.7)	0.8 (0.2-1.3)
2-year revision (%)		623	1.6 (1.0-2.7)	1.6 (0.8-2.4)
3-year revision (%)		363	2.2 (1.4-3.6)	2.2 (1.2-3.3)
4-year revision (%)		178	2.2 (1.4-3.6)	2.2 (1.2-3.3)

¹ The cumulative revision percentage using the competing risk method is shown in the figure.
 CI: confidence interval.
 Please note: The number of registered primary finger and revision arthroplasties is not complete.

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In 2017-2021, 15 (1.3%) primary finger arthroplasties were implanted in patients who died within four years after the primary procedure.

Data quality

Completeness

Coverage and completeness

TABLE Completeness of registering hospitals and completeness of registered arthroplasties in the LROI based on the hospital information system in 2021

	Number of hospitals in LROI ¹ (n)	Completeness of registering hospitals ² (%)	Median [range] number of registrations	Completeness of registrations ³ (%)
Hip arthroplasties		100		
Primary total hip arthroplasties	93		283 [1-899]	99
Primary hip hemiarthroplasties (orthopaedic surgeon)	69		48 [1-263]	96
Primary hip hemiarthroplasties (trauma surgeon)	40		40 [1-154]	74
Hip revision arthroplasties	84		33 [1-316]	98
Knee arthroplasties		100		
Primary knee arthroplasties	90		264 [3-866]	97
Knee revision arthroplasties	85		25 [2-359]	97
Ankle arthroplasties				
Primary ankle arthroplasties	12	Unknown	7 [1-36]	95
Ankle revision arthroplasties	9		2 [1-9]	96
Shoulder arthroplasties		100		
Primary shoulder arthroplasties (orthopaedic surgeon)	81		33 [1-206]	97
Primary shoulder arthroplasties (trauma surgeon)	3		5 [2-10]	25
Shoulder revision arthroplasties	56		3 [1-83]	79
Elbow arthroplasties		Unknown		
Primary elbow arthroplasties	34		3 [1-22]	89
Elbow revision arthroplasties	15		2 [1-12]	78
Wrist arthroplasties		Unknown		
Primary wrist arthroplasties (orthopaedic surgeon)	10		2 [1-9]	73
Primary wrist arthroplasties (plastic surgeon)	10		3 [1-12]	75
Wrist revision arthroplasties (orthopaedic surgeon)	9		1 [1-4]	93
Wrist revision arthroplasties (plastic surgeon)	4		2 [1-4]	75
Finger arthroplasties		Unknown		
Primary finger arthroplasties (orthopaedic surgeon)	12		4 [1-16]	81
Primary finger arthroplasties (plastic surgeon)	24		4 [1-35]	84
Finger revision arthroplasties (orthopaedic surgeon)	2		3 [2-3]	83
Finger revision arthroplasties (plastic surgeon)	4		2 [1-7]	100

¹ Number of hospitals that performed arthroplasties in accordance with their hospital information system in 2021.

² Proportion of total number of hospitals that performed arthroplasties in 2021 (based on Vektis data).

³ Completeness of number of registered arthroplasties in the LROI in October 2022, compared to the total number of arthroplasties performed (based on the hospital information system) in 2021. This pertains only to hospitals that submitted data for comparison.

Overall completeness per arthroplasty

FIGURE Completeness (proportion [%] per joint) of the registration of procedures in the LROI in 2021

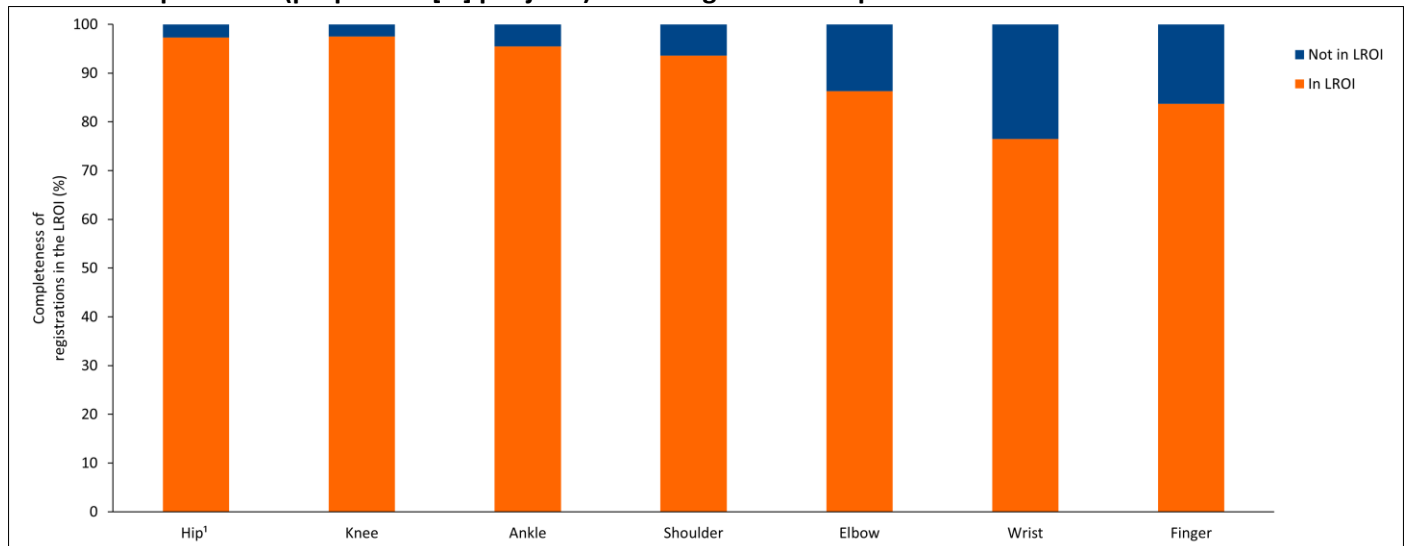


TABLE Completeness (proportion [%] per joint)

	Hip ¹	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Number of procedures in HIS (n)	40,413	29,642	156	3,611	211	119	221
Completeness of registrations in the LROI ² (%)	97.3	97.5	95.5	93.6	86.3	76.5	83.7

¹ Includes primary total hip arthroplasties, primary hip hemiarthroplasties and hip revision arthroplasties.

² Completeness of number of registered arthroplasties (orthopaedic, trauma and plastic surgery) in the LROI in October 2022, compared to the total number of arthroplasties performed (based on the hospital information system) in 2021. This pertains only to hospital that submitted data for comparison.

Completeness per year

TABLE Completeness (proportion [%] per joint) of the registration of procedures in the LROI in 2013-2021

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Hip arthroplasties									
Primary total hip arthroplasties	97	96	98	99	99	99	99	99	99
Primary hip hemiarthroplasties (orthopaedic surgeon)	71	84	88	95	96	96	94	97	96
Primary hip hemiarthroplasties (trauma surgeon)	n.a.	n.a.	n.a.	50	64	65	63	68	74
Hip revision arthroplasties	88	93	97	97	98	97	97	98	98
Knee arthroplasties									
Primary knee arthroplasties	95	96	98	99	100	99	99	99	97
Knee revision arthroplasties	90	93	98	98	98	97	97	98	97
Ankle arthroplasties									
Primary ankle arthroplasties	n.a.	80	91	92	100	98	98	95	95
Ankle revision arthroplasties	n.a.	55	67	94	87	83	55	95	96
Shoulder arthroplasties									
Primary shoulder arthroplasties (orthopaedic surgeon)	n.a.	78	94	94	98	91	96	96	97
Primary shoulder arthroplasties (trauma surgeon)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	32	25
Shoulder revision arthroplasties	n.a.	74	90	92	90	78	91	93	79
Elbow arthroplasties									
Primary elbow arthroplasties	n.a.	70	85	88	91	89	85	92	89
Elbow revision arthroplasties	n.a.	55	86	93	87	85	83	91	78
Wrist arthroplasties									
Primary wrist arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	71	29	55	70	73
Primary wrist arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	64	62	50	56	75
Wrist revision arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	18	83	77	100	93
Wrist revision arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	25	50	50	86	75
Finger arthroplasties									
Primary finger arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	53	63	66	65	81
Primary finger arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	67	68	60	82	84
Finger revision arthroplasties (orthopaedic surgeon)	n.a.	n.a.	n.a.	n.a.	17	100	90	41	83
Finger revision arthroplasties (plastic surgeon)	n.a.	n.a.	n.a.	n.a.	24	40	57	67	100

Completeness: Number of registered arthroplasties in the LROI compared to the total number of arthroplasties performed based on the hospital information system (HIS). This pertains only to hospitals that submitted data for comparison.

Please note: Ankle, shoulder and elbow arthroplasties were registered since 2014; wrist and finger arthroplasties were registered since 2016.

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The completeness of number of registered arthroplasties in the LROI is determined every year in October. Improving data completeness and data quality by registering missing data is an ongoing process.

Validity

Overall validity

FIGURE Validity (proportion [%] per joint) of the registration of procedures in the LROI in 2021

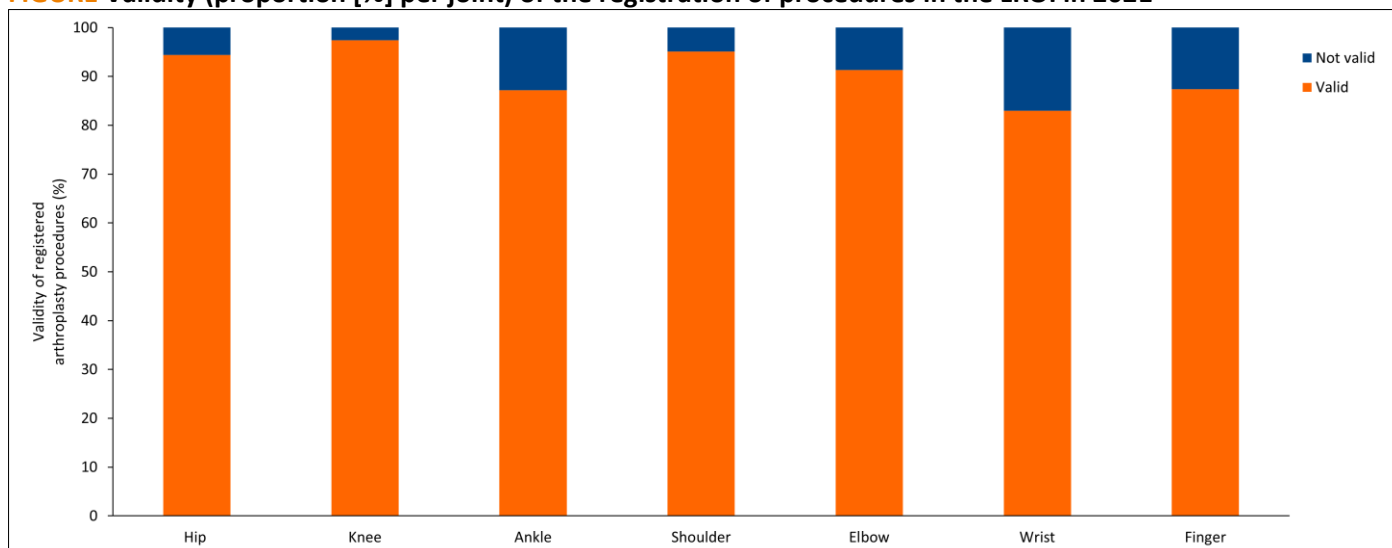


TABLE Validity (proportion [%] per joint)

	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Number of procedures (n)	41,084	29,790	148	3,555	195	94	245
Valid registered procedures (%)	94.4	97.4	87.2	95.1	91.3	83.0	87.4

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Validity per variable

TABLE Overview of validity by variable for each joint of hip, knee, ankle, shoulder, wrist and finger arthroplasties registered in the LROI in the Netherlands in 2021

	Hip	Knee	Ankle	Shoulder	Elbow	Wrist	Finger
Number of arthroplasties (n)	41,084	29,790	148	3,555	195	94	245
Number of primary arthroplasties (n)	37,549	27,217	122	3,239	152	78	214
Number of revision arthroplasties (n)	3,535	2,573	26	316	43	16	31
General characteristics	%	%	%	%	%	%	%
Gender	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Encrypted citizen service number	99.8	99.9	100.0	99.9	100.0	100.0	100.0
HIS patient number	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Date of birth	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Type of procedure	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Operating side	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Postal code	99.4	99.8	100.0	98.7	98.0	89.4	96.3
BMI	97.9	99.6	100.0	99.0	98.0	88.3	93.1
Smoking	97.9	99.4	99.3	99.2	98.0	89.4	94.7
ASA score	99.7	99.8	100.0	99.7	100.0	91.5	97.6
Fixation	99.8	99.8	99.3	98.8	98.46	88.3	95.9
Primary arthroplasty characteristics	%	%	%	%	%	%	%
Diagnosis	98.7	99.5	100.0	99.4	100.0	94.3	96.9
Charnley/Walch score	98.5	99.2	100.0	97.2	n.a.	n.a.	n.a.
Prosthesis	99.9	100.0	100.0	98.9	100.0	90.0	100.0
Surgical approach	99.3	99.5	100.0	98.2	99.3	85.7	98.3
Revision arthroplasty characteristics	%	%	%	%	%	%	%
Type of revision	99.6	99.0	100.0	100.0	100.0	95.8	94.1
Charnley score	100.0	100.0	n.a.	n.a.	n.a.	n.a.	n.a.
Reason for revision	98.5	98.3	100.0	99.4	100.0	95.8	94.1

Please note: Validity by variable as determined in April 2022.
HIS: hospital information system; BMI: body mass index.

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General

Methodology of survival analyses

The life span of a joint prosthesis is the time between implantation of a primary prosthesis and the time of the first revision. However, patients may die before the prosthesis needs to be revised (Figure).

Link between primary and revision arthroplasties

In order to assess a prosthesis' life span, follow-up time of all primary prostheses was examined. This was done by linking revision arthroplasties to the primary arthroplasties in the LROI by means of the encrypted Citizen Service Number (BSN). In this way, the correct revision arthroplasty can be linked anonymously to a primary arthroplasty. In about 11% of the arthroplasties, the encrypted BSN was not entered into the system, mainly in the first years of registration. Links between these primary and revision arthroplasties were established based on the LROI hospital number and the LROI patient number. As such, revision arthroplasties have been linked to primary arthroplasties of a patient when the patient underwent primary and revision arthroplasty on the same joint in the same hospital.

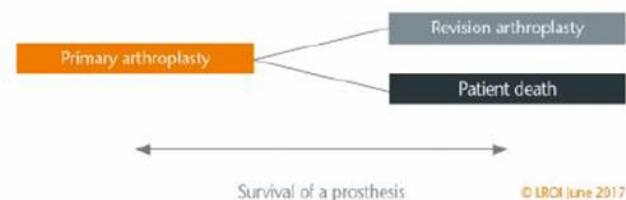
Kaplan Meier survival analysis

Survival of a prosthesis may be determined in various ways. Traditionally, the Kaplan Meier method is used. This method was developed for situations with one possible end point (such as death of the patient). However, in order to calculate survival of a prosthesis at least two end points are important: revision of the prosthesis and death of the patient. The Kaplan Meier method estimates the proportion of failed prostheses if patients would live on forever. However, a number of patients dies before the prosthesis requires revision. Consequently, fewer revisions are carried out than could be expected based on the model. That is why this method overrates the chance of revision.

Competing risk survival analysis

The competing risk method allows monitoring for several end points. When an end point occurs (such as death), other end points will no longer be available (such as prosthesis revision). The cumulative incidence (summed occurrence of an end point) will be calculated. Death of a patient is a final end point, the

FIGURE SURVIVAL OF A PROSTHESIS.



prosthesis will no longer be revised and this finalizes the period that a prosthesis lasts. The time at risk will be the period from primary implantation to death.

Method comparison

In order to get a clearer picture of the difference in results between the Kaplan Meier method and competing risk method we have calculated the revision percentage within 10 years using both methods. The revision percentage was calculated for patients who underwent a total hip arthroplasty according to age group over the period 2007-2018.

This comparison shows that the revision percentage calculated by means of the Kaplan Meier method results in a higher chance of revision within 10 years. The difference is more pronounced in groups of patients with a higher chance of the competing event (death of the patient), as we can see in the groups of elderly patients (Table). This difference is still relatively minor, but will increase as follow-up extends. Consequently, this Annual Report estimates the chance of revision of a prosthesis by means of the competing risk method. However, for comparability with other arthroplasty registries Kaplan Meier revision rates are also shown.

TABLE CUMULATIVE 10-YEAR REVISION PERCENTAGE OF PRIMARY TOTAL HIP ARTHROPLASTIES BY AGE IN THE NETHERLANDS IN 2007-2018.

Age (years)	Number (n)	Cumulative 10-year revision percentage	
		Competing Risk (95% CI)	Kaplan Meier (95% CI)
<50	13,021	7.4 (6.8-8.2)	7.6 (6.9-8.3)
50-59	35,737	6.4 (6.0-6.9)	6.6 (6.2-7.1)
60-69	92,371	5.1 (4.8-5.3)	5.3 (5.1-5.5)
70-79	106,347	4.1 (4.0-4.3)	4.5 (4.3-4.6)
≥80	43,909	2.8 (2.6-3.0)	3.1 (2.9-3.4)

Please note: The primary outcome in a Kaplan Meier analysis is prosthesis survival, while this is the revision percentage of prostheses in the competing risk method. In order to compare methods, survival as determined by means of the Kaplan Meier analysis is converted into the revision percentage (100% - survival% = revision%). CI: confidence interval.

Participating hospitals

General hospitals

Admiraal de Ruyter ziekenhuis H(O) K S
Albert Schweitzer Ziekenhuis H(O+T) K S W(P) F(P)
Arijne Ziekenhuis H(O) K A S F(P)
Amphia Ziekenhuis H(O) K S E
Antonius Ziekenhuis H(O) K S
Bernhoven H(O) K S E
BovenIJ Ziekenhuis H(O+T) K
Bravis Ziekenhuis H(O) K S E
Canisius-Wilhelmina Ziekenhuis H(O+T) K S
Catharina Ziekenhuis H(O) K S
Centraal Militair Hospitaal H(O)
Deventer Ziekenhuis H(O+T) K S E F(P)
Diakonessenhuis H(O) K S E W(P) F(P)
Dijklander Ziekenhuis H(O) K S E
Elisabeth-TweeSteden Ziekenhuis H(O) K S E W(O)
Elkerliek Ziekenhuis H(O+T) K S F(P)
Flevoziekenhuis H(O+T) K A S E
Franciscus Gasthuis & Vlietland H(O+T) K S E W(O) F(O+P)
GelreZiekenhuizen, location Apeldoorn H(O+T) K S W(O) F(O+P)
GelreZiekenhuizen, location Zutphen H(O) K S E
Groene Hart Ziekenhuis H(O) K S
Haaglanden Medisch Centrum H(O+T) K S E
HagaZiekenhuis H(T) F(P)
Het Van Weel-Bethesda Ziekenhuis H(O+T) K S
IJsselland Ziekenhuis H(O) K S
Ikazia Ziekenhuis H(O) K S
Isala Klinieken H(O+T) K S W(P) F(P)
Jeroen Bosch Ziekenhuis H(O+T) K S F(P)
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Martini Ziekenhuis H(O) K A S E W(P) F(P)
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Meander Medisch Centrum H(O+T) K S W(P)
Medisch Centrum Leeuwarden H(O+T) K S W(P) F(P)
Medisch Spectrum Twente H(O) K S
Noordwest Ziekenhuisgroep H(O+T) K A S E W(O) F(O+P)
OCON H(O) K S E W(O) F(O)
OLVG H(O+T) K A S E
Ommelander Ziekenhuisgroep Groningen H(O+T) K S E
Reinier de Graaf Gasthuis H(O+T)
Reinier Haga Orthopedisch Centrum H(O) K A S W(O) F(O)
Rijnstate H(O+T) K S E W(P) F(P)
Rivas Beatrixziekenhuis H(O) K S
Rode Kruis Ziekenhuis H(O+T) K S E
Saxenburgh Medisch Centrum H(O) K S
Sint Maartenskliniek, location Boxmeer H(O) K
Sint Maartenskliniek, location Nijmegen H(O) K A S E W(O) F(O)
Slingeland Ziekenhuis H(O+T) K S
Spaarne Gasthuis H(O) K A S F(P)
Spijkenisse Medisch Centrum H(O) K S

St. Anna Ziekenhuis H(O) K S
 St. Antonius Ziekenhuis H(O) K S E
 St. Jans Gasthuis H(O) K S E
 Streekziekenhuis Koningin Beatrix H(O+T) K S E
 Tergooi H(O+T) K S E W(O) F(O)
 Treant Zorggroep H(O+T) K S E
 VieCuri MC H(O+T) K S F(P)
 Wilhelmina Ziekenhuis H(O) K S
 Zaans Medisch Centrum H(O) K S
 ZGT H(T)
 Ziekenhuis Amstelland H(O) K S
 Ziekenhuis Gelderse Vallei H(O+T) K S
 Ziekenhuis Nij Smellinghe H(O) K S W(P)
 Ziekenhuis Rivierenland H(O+T) K S
 Ziekenhuis St. Jansdal H(O) K S
 Ziekenhuis Tjongerschans H(O+T) K S
 ZorgSaam Ziekenhuis H(O) K A S E F(O)
 Zuyderland Medisch Centrum H(O) K S E W(O) F(O)

University medical centres

Amsterdam UMC H(O+T) K A S E
 Erasmus MC H(O+T) K S E F(O)
 Leids Universitair Medisch Centrum H(O) K S E W(O)
 Maastricht UMC+ H(O+T) K S E W(O+P) F(O)
 Radboudumc H(O+T) K S
 Universitair Medisch Centrum Groningen H(O) K A S E W(O+P) F(O)
 Universitair Medisch Centrum Utrecht H(O+T) K

Private hospitals

Acibadem International Medical Center H(O) K A S
 Annadal Kliniek H(O) K
 Annatommie MC H(O) K S
 Berne Kliniek F(P)
 Bergman Clinics H(O) K A S
 CortoClinics H(O) K
 Eisenhower Kliniek H(O) K S
 FlexClinics H(O) K
 Kliniek ViaSana H(O) K S
 Kneeclinik K
 Medische Kliniek Velsen H(O) K S E
 OrthoDirect H(O) K S
 Orthoparc H(O) K
 Park Medisch Centrum H(O) K
 The Hand Clinic W(P) F(P)
 Xpert Clinics H(O) K A S F(P)

H: hip; K: knee; A: ankle; S: shoulder; E: elbow; W: wrist; F: finger.
 O: orthopaedic surgery; T: trauma surgery; P: plastic surgery.

Definitions and abbreviations

Definitions

Acetabulum component

The part of a hip prosthesis that is implanted into the acetabulum – the socket part of a ball and socket joint

Allograft

Transplant of bone tissue from a different body

Anchor question

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

Arthrodesis

A procedure in which a natural joint is fused together

Arthrofibrosis

Rigidity of the joint as a consequence of connective tissue adhesion

Arthroscopy

Keyhole surgery to examine and treat joint disorders

Arthrotomy

Opening a joint during surgery

Articulation

The two surfaces that move together (articulate) in a total joint replacement

ASA score

The American Society of Anaesthesiologists (ASA) score is a scoring system for grading the overall physical condition of the patient, as follows: I – fit and healthy; II – mild disease, not incapacitating; III – incapacitating systemic disease; IV – life threatening disease

Autograft

Transplant of bone tissue originating from the patient's own body

Bilaterality

Replacing the same joint on both sides of the body by means of a prosthesis within a specific period

Body Mass Index

Index for weight compared to body length (kg/m²); ≤18.5: underweight; >18.5-25: normal weight; >25-30: overweight; >30-40: obesity; >40: morbid obesity

Bonegraft

Bone transplant

Bone resorption

Process by which osteoclasts break down bone tissue

Carpal component

Part of a wrist prosthesis that is implanted in the patient's carpal bones

Case mix

Term used to describe variation in the population, relating to factors such as diagnosis, patient age, gender and health condition

Cement

Material (polymethyl methacrylate) used to fixate joint replacements to bone

Charnley score

Clinical classification system; A: one joint affected; B1: both joints affected; B2: contralateral joint with a prosthesis; C: several joints affected or a chronic disease that affects quality of life

Competing risk survival analyse

Method to calculate survival taking into account various outcomes, in this case revision and death

Completeness

The completeness of the number of registered procedures in the LROI, based on a comparison with the hospital information system of every hospital that performs hip and/or knee arthroplasty in the Netherlands

Completeness PROM trajectory

A PROM trajectory is considered complete when preoperative, 3-months (hip, shoulder) or 6-months (knee) postoperative and 12-months postoperative PROMs are reported

Cuff arthropathy

Osteoarthritis of the shoulder joint as a consequence of the tendons around the shoulder joint being affected

Cuff rupture

Rupture of a tendon of the muscles that are around the shoulder joint

Cumulative incidence

The added up incidence over a specific period of an event (such as revision of a prosthesis or death of a patient)

Cumulative revision percentage

Added up revision percentage over a specific time period

Difference score

Difference in calculating score between pre-operative and 3, 6 or 12 months postoperative scores

Distal component

Part of a finger prosthesis that replaces the distal phalanx

Distal hemihumeral prosthesis

Elbow prosthesis in which the distal part of the humerus (upper arm bone) is replaced

Dual mobility cup

Acetabular component that consists of a dual cup and, therefore, has two independent articulation points

EQ-5D index score

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

EQ-5D thermometer score

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

Femur component

Part of a hip or knee prosthesis that is implanted into the femur (thigh bone)

Femoral head component

Part of a hip prosthesis that is implanted on top of the femoral component of a hip prosthesis and moves inside the acetabular component or the cup of the hip joint

Flail elbow

Situation after removal of an elbow prosthesis in which no joint is present any more between the upper and lower arm

Girdlestone situation

Revision procedure to a hip in which the hip joint or hip prosthesis is removed and no new prosthesis is implanted (often because of a bacterial infection)

Glenoid baseplate

Part of a reversed shoulder prosthesis: a metal plate that is screwed into the glenoid (shoulder cup) of the shoulder blade, on which the glenosphere is fixed

Glenoid component

The part of a shoulder prosthesis that is placed in the glenoid; the cup-shaped notch of the shoulder blade

Glenoid liner

Intermediate component (inside layer) of a total anatomical shoulder prosthesis that will be placed in a glenoid component (most often a metal one)

Glenosphere

The part of a reversed shoulder prosthesis that is placed on the glenoid baseplate which is screwed into the glenoid and is spherical in shape

HOOS-PS score

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

Hybrid fixation

Fixation of a prosthesis in which (most often) one of both parts of a prosthesis is cemented and the other one uncemented

Humerus component

The part of a shoulder or elbow prosthesis that replaces the humerus (upper arm bone). The humeral component of a shoulder prosthesis may consist of two parts: the humeral head and the humeral stem component

Humeral liner

Intermediate component (inner layer) of a reversed shoulder prosthesis that will be placed in a metaphysical component

Inlay

Intermediate component (inner layer), made of polyethylene

Insert

Intermediate component (inner layer), made of polyethylene that is placed in the tibial component of a knee prosthesis

Kaplan Meier survival analysis

Method to calculate survival, in which only one end point is possible, in this case revision

KOOS-PS score

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

Lateral collateral ligament

Lateral (outer) knee ligament or elbow ligament

Lateral resurfacing arthroplasty

Elbow prosthesis in which only the lateral side of the joint is replaced

Major revision (journey)

Revision of at least the acetabular or femoral component (hip) or femoral or tibial component (knee). Journey: First revision of the acetabulum or femur/tibial component, regardless of whether a minor revision has already taken place. Therefore, the first three revision procedures were reviewed.

Malalignment

Strain on a part of the body due to an abnormal position of a joint component with respect to other components

Medial malleolus osteotomy

Surgical approach of the ankle in which the medial malleolus (protruding part of the tibia on the inside of the ankle) is incised and later re-fixed to be able to have better access to the inside of the joint

Meniscectomy

Meniscus removal

Metallosis

Deposition of metal debris in soft tissues of the body

Metaphysis component

The part of a shoulder prosthesis that replaces the metaphysis (upper part) of the humerus (upper arm bone)

Minor revision

Revision of only inlay and/or femoral head component (hip) or only insert and/or patella exchange (knee)

NRS score

Numeric Rating Scale score. The NRS (rest) score measures pain during rest. The NRS (activity) score measures pain during activity. The score has a range of 0.0 to 10.0, with 0.0 representing no pain and 10.0 representing the most possible pain. The NRS (satisfaction) score measures patients' satisfaction with the outcome of joint replacement. The score has a range of 0.0 to 10.0, with 0.0 representing very unsatisfied and 10.0 representing very satisfied.

ODEP rating

Orthopaedic Data Evaluation Panel. ODEP provides ratings for hip femoral stems, hip acetabular cups and total knee replacement implants. An ODEP rating consists of a number and a letter (A or B), and a star (optional). The number represents the number of years for which the product's performance had been evidenced. The letter represents the strength of evidence presented by the manufacturer (A represents strong evidence and B represents acceptable evidence). A Star (*) represents very strong evidence above A and B. Detailed information can be found at www.odep.org.uk

Olecranon

The most proximal part of the ulna

One-stage revision

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

Open Reduction and Internal Fixation surgery

Type of surgery to treat a bone fracture where the broken bone is reduced or put back into place, followed by internal fixation using devices (screws, plates, rods, or pins) to hold the broken bone together

Osteoarthritis

Disorder in which the cartilage of a joint is affected

Osteochondral bone defect

Defect of the joint surface in which both cartilage and underlying bone are affected

Osteonecrosis

Cellular death of bone tissue

Osteosynthesis

Securing broken bone parts together with plates, pins and/or screws

Osteotomy

Incise the bone in order to correct the position, to shorten or lengthen the bone

Oxford Hip score

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

Oxford Knee score

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

Patella addition

Knee revision procedure in which only a patella component was added to the primary knee prosthesis

Patella component

Part of a knee prosthesis that is implanted on the inner side of the knee cap

Patellofemoral prosthesis

Two-piece knee prosthesis that provides a prosthetic (knee) articulation surface between the patella and trochlea (furrow) of the thigh bone (femur)

Primary prosthesis

The first time (primary) a prosthesis is implanted to replace the original joint

PROMs

Patient Reported Outcome Measures

Proximal component

Part of a finger prosthesis that replaces the proximal phalanx

Radial head component

Part of an elbow prosthesis that replaces the head of the radius (spoke-bone)

Radial head prosthesis

Elbow prosthesis in which only the head of the radius (spoke-bone) is replaced

Radial stem component

Part of an elbow or wrist prosthesis that is implanted in the shaft of the patient's radius (spoke-bone)

Recommendation score

The recommendation score measures to what 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

ASA	American Society of Anaesthesiologists
AA	Ankle arthroplasty
AO	Antioxidant
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