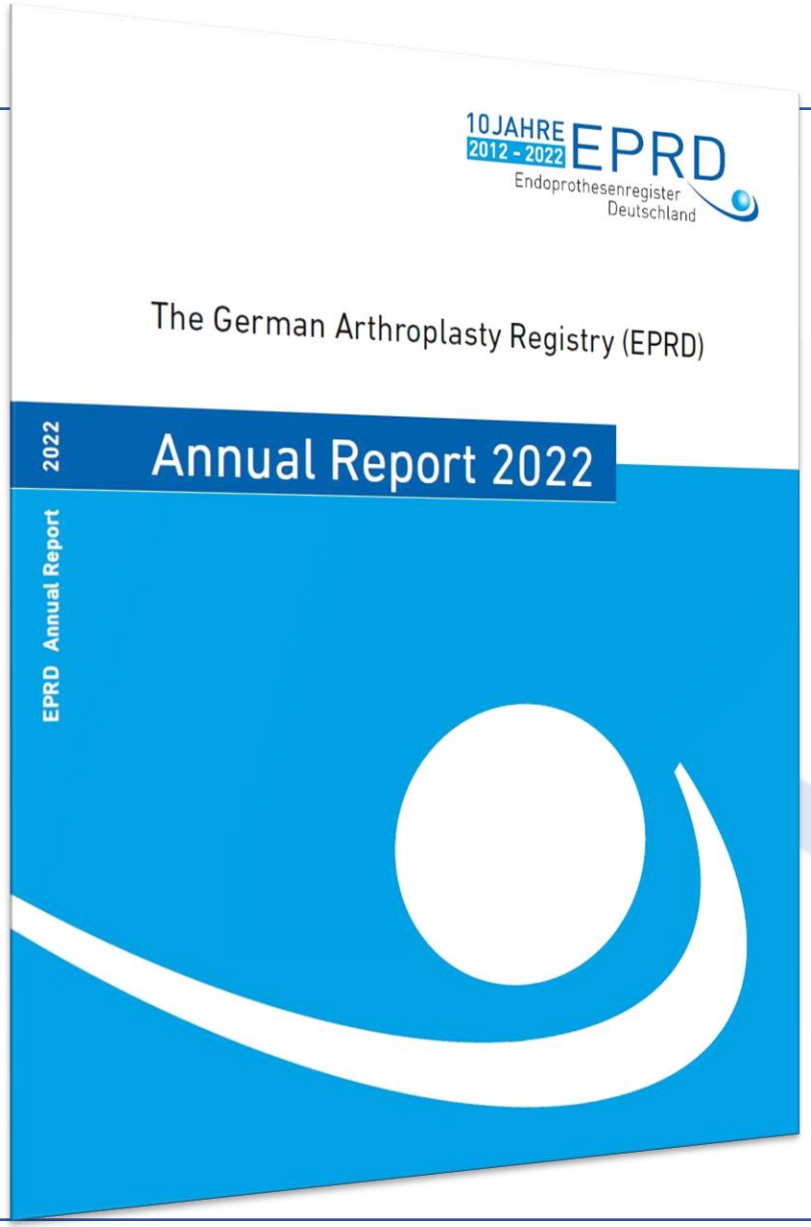

EPRD Annual Report 2022

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Registry development

Registry development (I)

What is new in the 2022 report:

- Anniversary: Reflecting on 10 years of the EPRD
- Results in international comparison
- Specific analysis: Patellar resurfacing is not required for all primary TKAs

Future developments:

- In 2023, the EPRD will introduce patient surveys and start compiling PROMs
- Regular operation of the hip and knee arthroplasty database of the national German Implant Registry (IRD) will not start until 2025

Registry development (II)

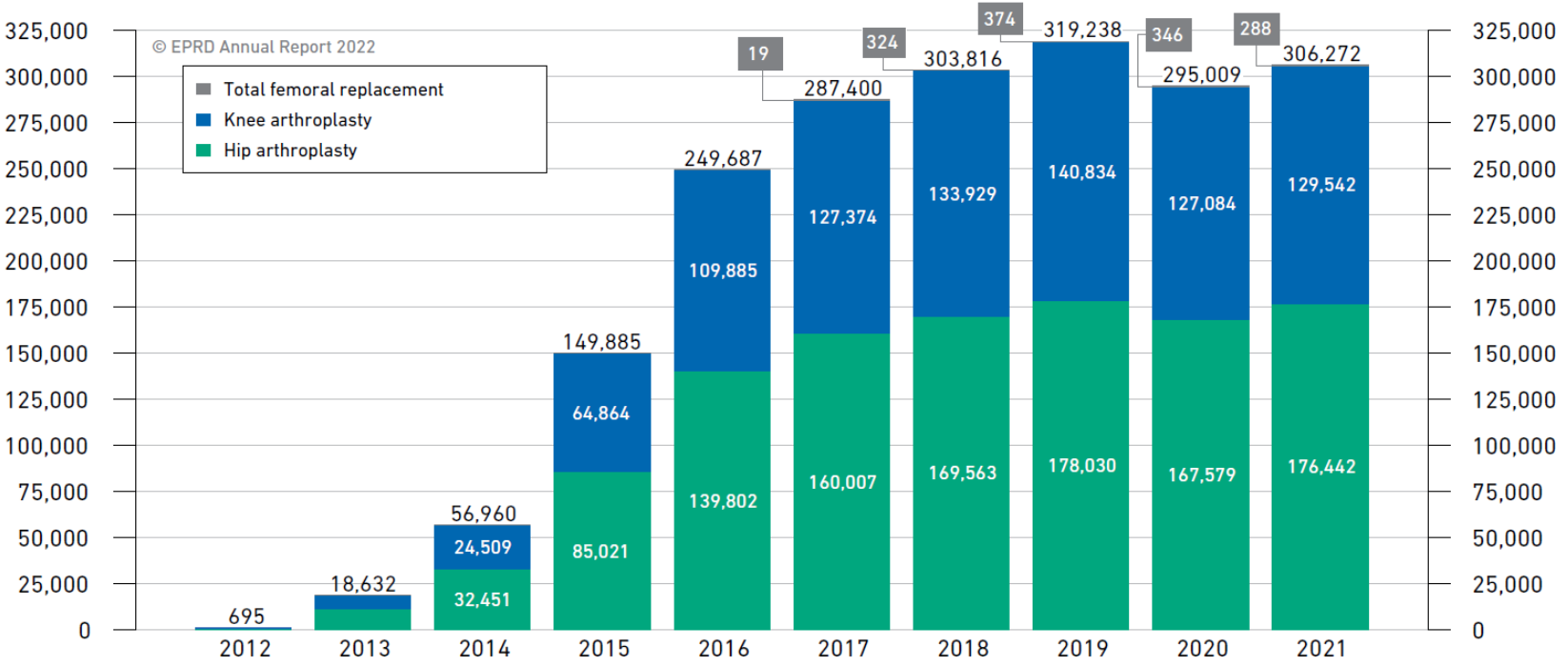

Figure 1: Annual procedure volume by operation date. The total number of documented procedures is shown above the respective bar. The respective number of total femoral replacements are indicated in grey.

- Until the end of 2021 data on almost 2 million hip and knee arthroplasty procedures collected
- For 2021 about 306,000 operations in the EPRD → 3.8 % more than in 2020

Registry development (III)

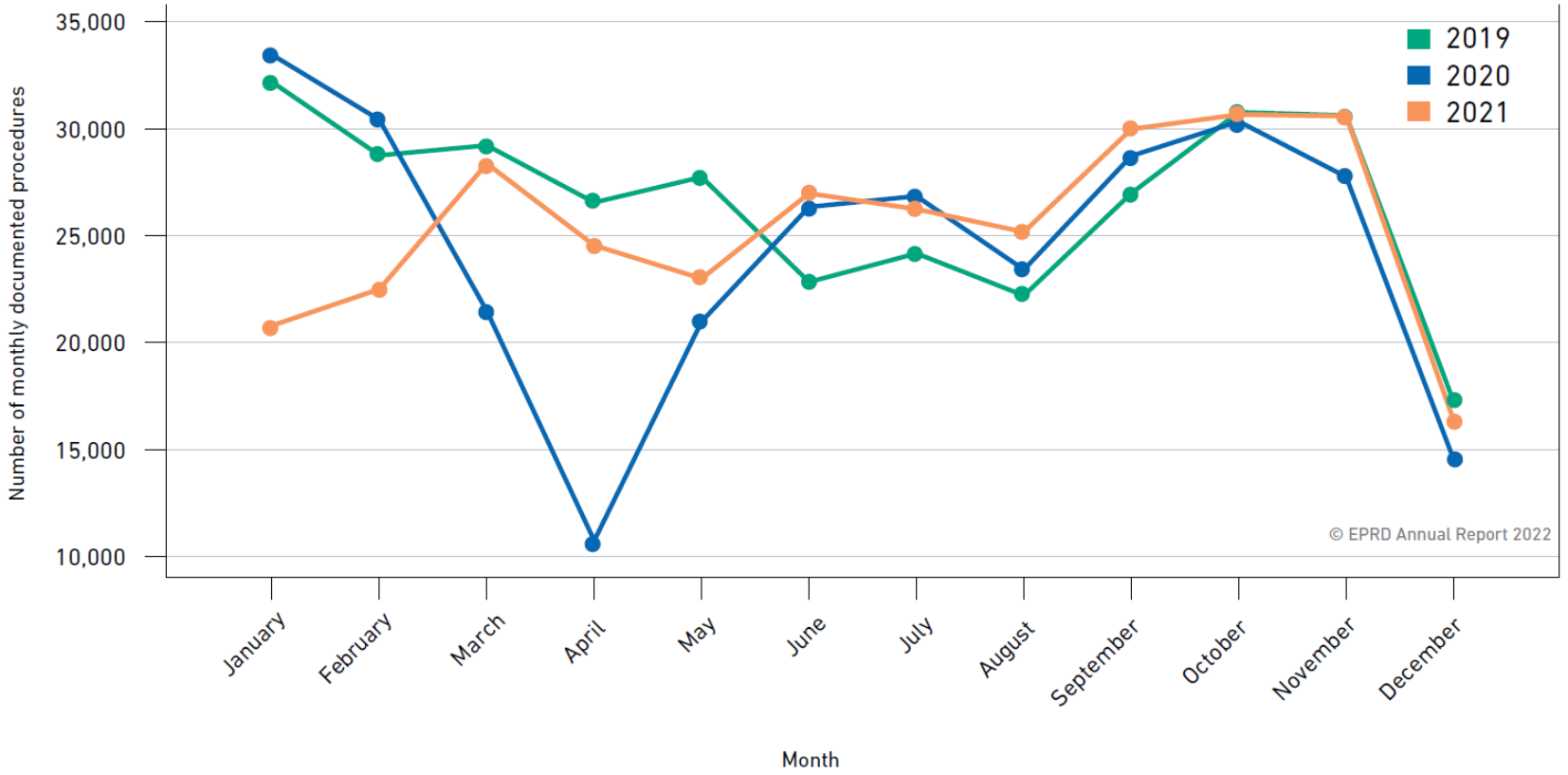

Figure 2: Comparison of monthly numbers of documented surgical procedures submitted to the EPRD from 2019 to 2021

➢ Annual documentation rate is still below 2019, the last pre-pandemic year

Registry development (IV)

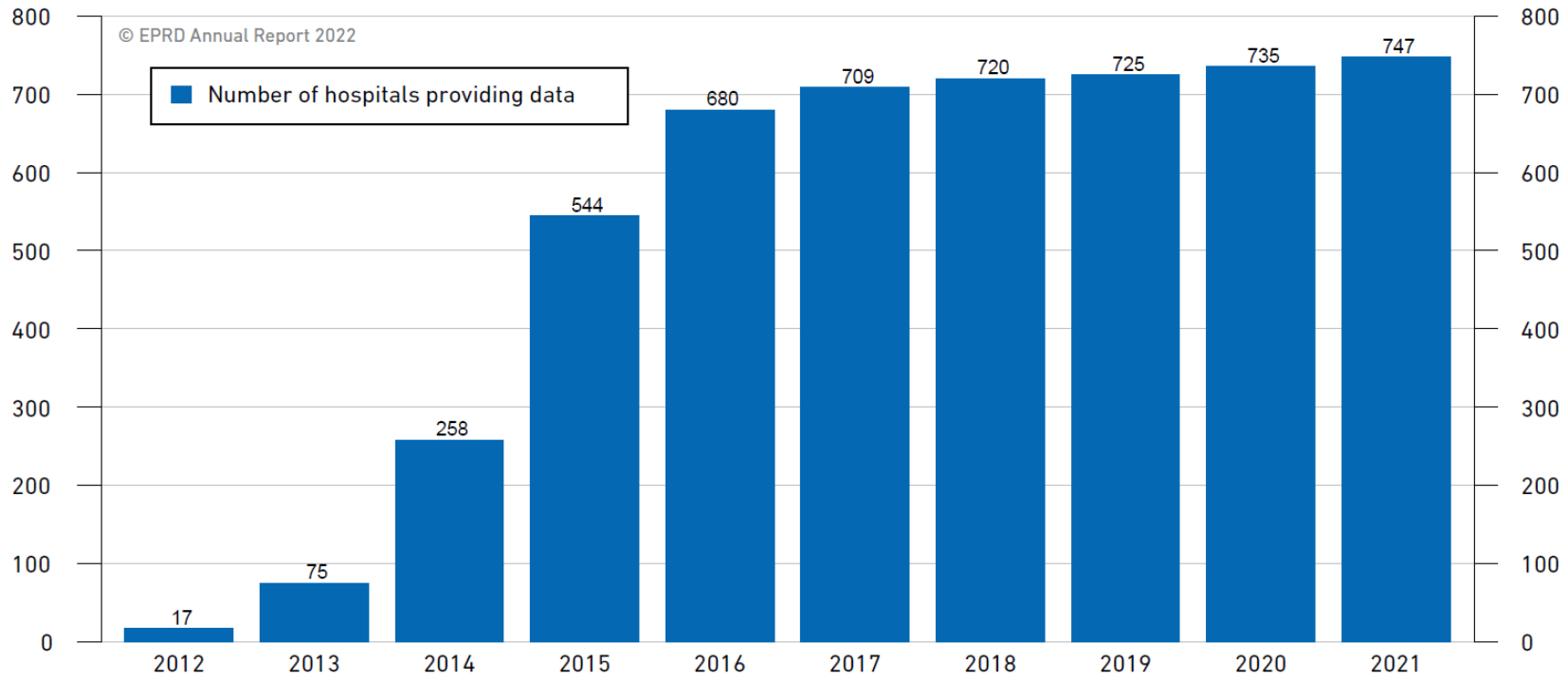

Figure 3: The number of hospitals that submit data each year. A hospital is considered "a data provider", if it submitted at least one surgical document to the EPRD during the calendar year.

- Commitment still high: the number of hospitals providing data has been rising continuously since 2012

The 2021 operating year

Primary hip arthroplasty (I)

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In brief

- Steady marked trend favouring highly cross-linked PE insert components (25 % increase since 2014)
- Use of short stems increases to 12 % (> 5 % increase since 2015)
- More 36 mm heads than ever before (currently 44.4 %, a 2.8 % increase since 2020)

Primary hip arthroplasty (II)

- Highly cross-linked polyethylene insert components are used more and more each year

hXLPE
hXLPE+antioxidant
Ceramic
PE
mXLPE
Metal
mXLPE+antioxidant
Unknown

Proportion [%]	Age	m/f [%]	BMI	ASA
57.4	70	40 / 60	27.3	2.2
20.8	69	42 / 58	27.5	2.2
8.1	63	47 / 53	27.5	2.1
6.7	78	33 / 67	26.3	2.4
6.6	73	42 / 58	27.1	2.2
0.1	58	96 / 4	27.8	1.8
<0.1	73	67 / 33	25.4	3.0
0.2	76	30 / 70	27.3	2.2

Table 13: Acetabular bearing materials in primary total hip arthroplasties in 2021

Primary hip arthroplasty (III)

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Endoprothesenregister Deutschland

- Short stems reached a new high of 12.0 %

	Proportion [%]	Age	m/f [%]	BMI	ASA
Femoral stem with modular head	85.6	71	40 / 60	27.2	2.2
Short stem	12.0	63	48 / 52	27.8	2.0
Femoral neck prosthesis	1.1	61	47 / 53	27.4	1.9
Revision or tumour stem	0.5	76	38 / 62	25.7	2.7
Modular stem	0.3	75	31 / 69	26.6	2.3
Surface replacement	0.1	58	96 / 4	27.8	1.8
Unknown	0.3	71	33 / 67	27.6	2.3

Table 7: Stem types in primary total hip arthroplasties in 2021

Primary hip arthroplasty (IV)

- The trend favouring larger head components is just as consistent. Compared to the previous year, 36 mm heads increased by 2.8 % to 44.4 %.

	Proportion [%]	Age	m/f [%]	BMI	ASA
28 mm	5.2	72	17 / 83	26.3	2.3
32 mm	49.9	71	30 / 70	27.1	2.2
36 mm	44.4	69	55 / 45	27.6	2.2
Other diameters	0.5	68	42 / 58	26.2	2.1
Unknown	<0.1	76.5	0 / 100	24.7	2.0

Table 11: Head sizes in primary total hip arthroplasties in 2021

Hip arthroplasty reoperations

- In at least three quarters of reoperations, at least one component with bony fixation was replaced

	Proportion [%]	Age	m/f [%]	BMI	ASA
Stem, head, cup, insert	27.5	73	48 / 52	27.3	2.6
Head, cup, insert	22.1	77	33 / 67	26.4	2.5
Head, insert	17.7	74	45 / 55	27.8	2.5
Stem, head	15.4	79	38 / 62	26.4	2.6
Head	7.6	78	39 / 61	27.0	2.6
Stem, head, insert	6.9	74	49 / 51	27.4	2.5
Cup, insert	1.6	77	32 / 68	26.2	2.5
Insert	0.7	74.5	39 / 61	27.5	2.5
Accessory parts only (e.g., screws)	0.5	73	47 / 53	28.4	2.6

Table 19: Components replaced or complemented[4] in hip reoperations in 2021

4 Only surgical documentation identifying all items in the product database are considered here. Explantations in two-stage revision procedures are counted as total replacements. In single-stage revisions the EPRD only registers the components implanted, but not those explanted. The explanted components are inferred based on the products documented at the time of the reoperation. If, for example, a new acetabular component is documented, it may be assumed that the existing acetabular component had to be explanted.

- Reasons for hip reoperations:
  - Loosening (24.4 %)
  - Infection (16.7 %)
  - Periprosthetic fracture(14.3 %)
  - Dislocation (13 %)
- Component failure is seldom mentioned as a reason for hip reoperations (2.2 %)

Primary knee arthroplasty (I)

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In brief

- 95 % of primary total knee arthroplasties and 90 % of unicondylar arthroplasties were fully cemented
- Continued decrease in the use of mobile bearings

Primary knee arthroplasty (II)

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- Continuing trend towards fully cemented systems

	Proportion [%]	Age	m/f [%]	BMI	ASA
Cemented implants	95.2	70	39 / 61	29.8	2.2
Hybrid implants	3.5	69	41 / 59	30.3	2.1
Uncemented implants	1.2	66	43 / 57	30.0	2.1
Reverse hybrid implants	<0.1	63.5	19 / 81	29.5	2.1
Unknown	0.2	68.5	28 / 72	27.8	2.4

Table 24: Fixations in primary total knee arthroplasties in 2021

	Proportion [%]	Age	m/f [%]	BMI	ASA
Cemented implants	90.3	63	50 / 50	29.3	2.1
Uncemented implants	9.0	63	57 / 43	29.3	1.9
Hybrid implants	0.6	66	39 / 61	28.3	2.0
Unknown	0.1	65.5	72 / 28	30.5	2.1

Table 25: Fixations in primary unicondylar knee arthroplasties in 2021

Primary knee arthroplasty (III)

- Continued decrease in the use of mobile bearings: in total knee arthroplasty by 8.8 % since 2016, in unicondylar knee arthroplasty by 17.8 % since 2014

	Proportion [%]	Age	m/f [%]	BMI	ASA
Fixed bearing	89.3	69	39 / 61	29.9	2.2
Mobile bearing	10.7	69	40 / 60	29.9	2.3
Unknown	<0.1	78.5	44 / 56	28.4	2.4

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Table 26: Bearing mobility in primary total knee arthroplasties in 2021

	Proportion [%]	Age	m/f [%]	BMI	ASA
Mobile bearing	53.8	63	48 / 52	29.4	2.0
Fixed bearing	46.2	63	53 / 47	29.1	2.1

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Table 27: Bearing mobility in primary unicondylar knee arthroplasties in 2021

Knee arthroplasty reoperations

	Proportion [%]	Age	m/f [%]	BMI	ASA
Infection	15.0	71	52 / 48	30.0	2.6
Loosening	23.5	70	39 / 61	30.1	2.4
Femoral component	4.4	71	42 / 58	29.8	2.4
Tibial tray	9.4	68	36 / 64	30.6	2.3
Patellar component	0.6	71	42 / 58	31.6	2.3
Several components	9.1	71	41 / 59	29.7	2.4
Osteolysis with fixed component	1.0	69	49 / 51	30.1	2.3
Femoral component	0.3	70	54 / 46	30.0	2.3
Tibial tray	0.3	69	40 / 60	30.8	2.5
Patellar component	0.1	62	50 / 50	29.1	2.2
Several components	0.3	68	51 / 49	29.7	2.3
Periprosthetic fracture	4.2	80	21 / 79	28.7	2.7
Ligament instability	8.4	66.5	30 / 70	30.9	2.3
Wear	5.5	70.5	40 / 60	30.0	2.2
Component failure	2.0	68	45 / 55	30.9	2.3
Prosthetic malalignment / Malrotation	1.6	67	31 / 69	29.5	2.3
Restricted mobility	5.4	67	40 / 60	30.0	2.2
Progression of arthrosis	6.0	68	39 / 61	30.1	2.3
Condition after removal	12.7	70	50 / 50	29.7	2.6
Other reasons	14.8	68	41 / 59	30.1	2.2

Table 36: Reasons for knee reoperations in 2021

- In more than half of reoperations, all of prior arthroplasty components were exchanged – often with a switch to a more constrained system.
- Reasons for knee revisions:
  - Loosening (23.5 %)
  - Infection (15 %)
- Component failure is rare (2 %), wear (5 %)

Hip and knee arthroplasty survival

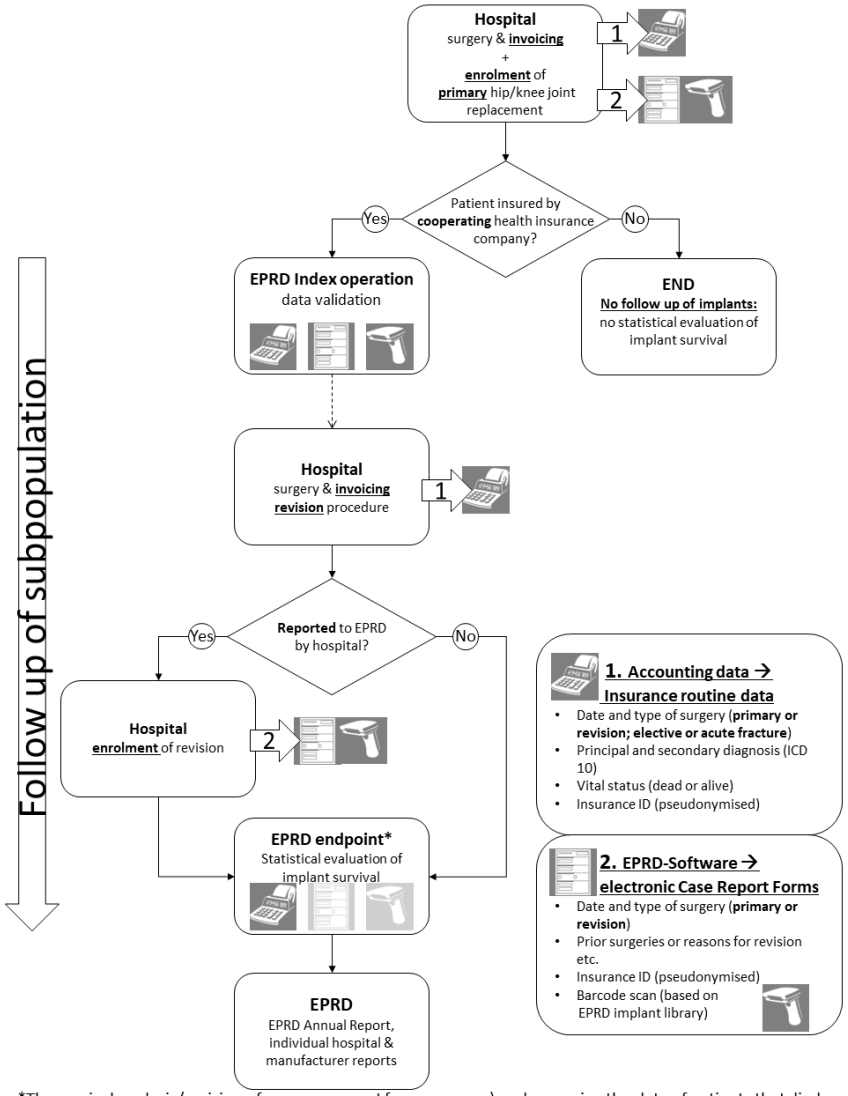
Study population in follow-up (I)

Arthroplasty survival calculations:

Only data from patients insured with one of the regional health insurance providers (AOK) or one of the other statutory health insurance providers (Ersatzkassen) and for whom billing data are available are included in the arthroplasty survival calculations.

Even though this means that only a part of the total number of data sets compiled in the EPRD is available for the arthroplasty survival analysis, an almost complete coverage of reoperations is guaranteed for this population.

This „Completeness of Revision“ is an essential quality feature of the EPRD.



*The survival analysis (revision of any component for any reason) and censoring the data of patients that died or suffered an amputation of the involved limb only requires (1) Accounting data -> insurance routine data.

Study population in follow-up (II)

Arthroplasty survival analysis:

- Based on 798,000 primary procedures and almost 26,000 first revision arthroplasties followed up
- In addition to Revision probabilities, Reoperation probabilities are also examined.

Hip and knee arthroplasty survival

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<u>Important: Arthroplasty survival not only dependent on the implant used!</u>

- Patient-specific parameters such as age, sex, BMI and comorbidities have a significant impact on the probability of revision surgery
- Higher patient volumes per hospital tend to reduce the risk of revision arthroplasty
  - But, in individual cases, hospitals with high case volumes and poorer outcomes, as well as hospitals with lower case volumes and very good outcomes are also observed

Non-implant-related factors: Patient (I)

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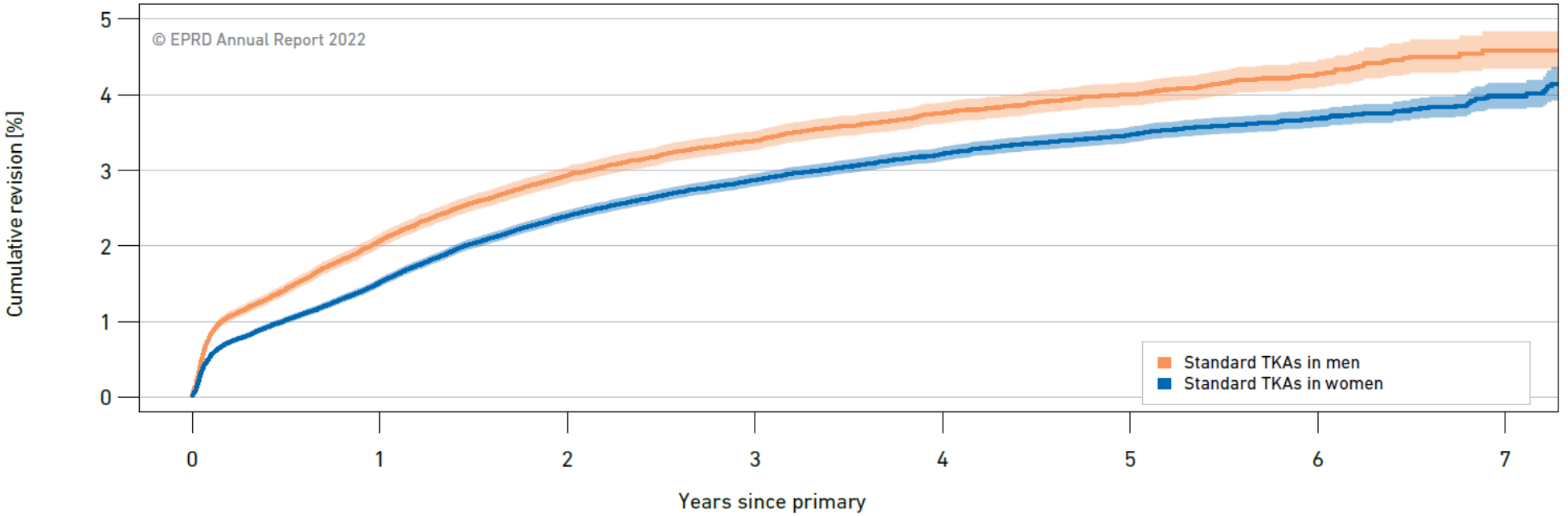
- Higher revision probabilities in male TKA (and THA) patients



Numbers at risk								
Standard TKAs in men	100,115	81,099	63,268	45,588	29,553	16,336	6,584	1,776
Standard TKAs in women	193,141	159,700	127,475	94,211	63,263	36,056	14,967	3,970

Figure 14: Revision probabilities of standard total knee arthroplasties by patient sex *($p < 0.0001$)*

Non-implant-related factors: Patient (II)

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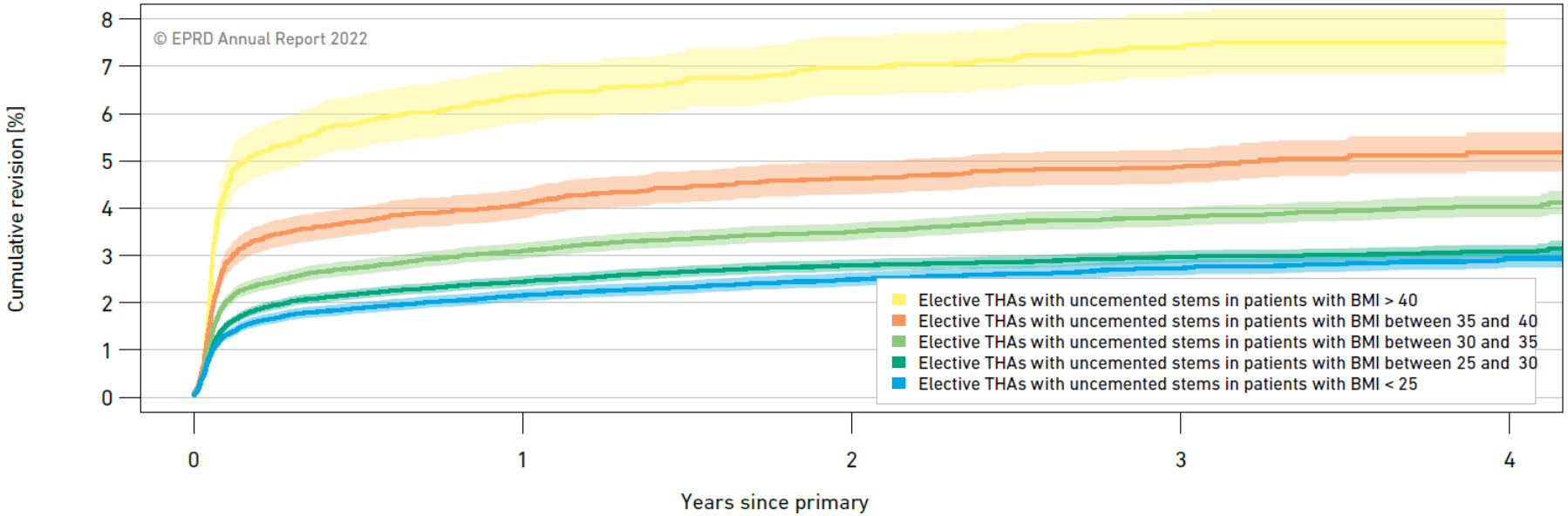
- Patient body mass index is significant in specific types of arthroplasties



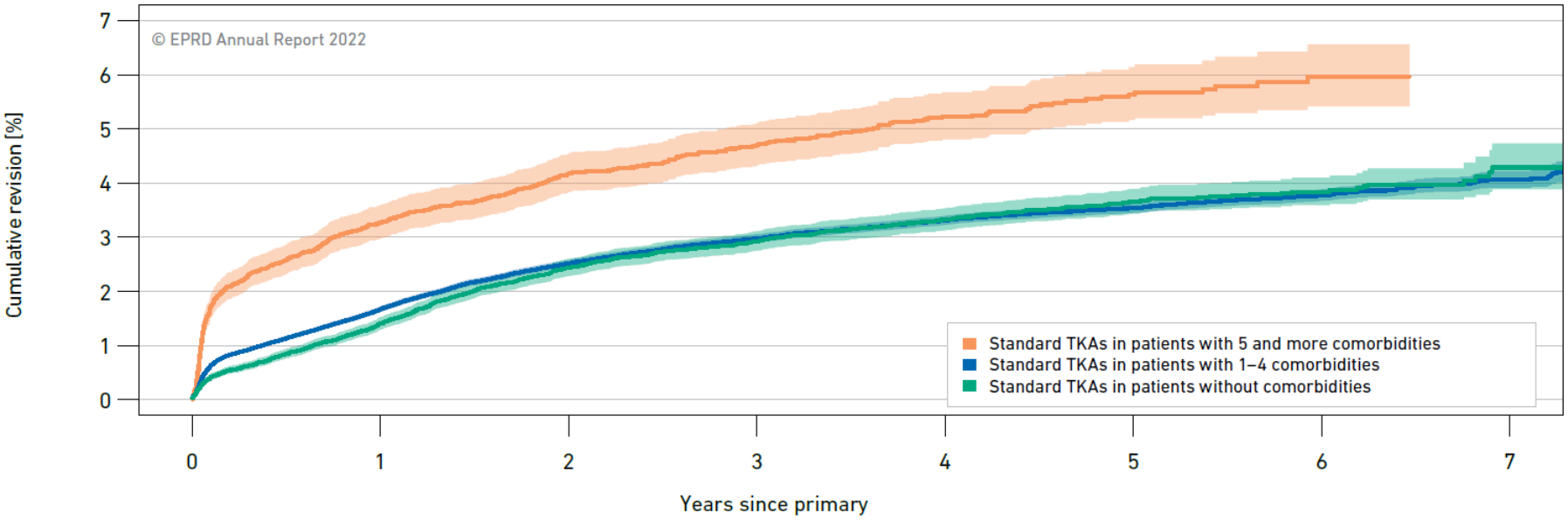
Numbers at risk

7,021	4,909	3,412	1,900	
16,371	11,830	8,143	4,413	1,114
44,787	33,108	22,767	12,418	3,233
75,533	56,704	39,412	21,734	5,655
51,268	38,106	26,233	14,306	3,666

Figure 17: Revision probabilities of elective total hip arthroplasties with uncemented stems by patient body mass index *(p < 0.0001)*

Non-implant-related factors: Patient (III)

- Good general health enhances chance of treatment success

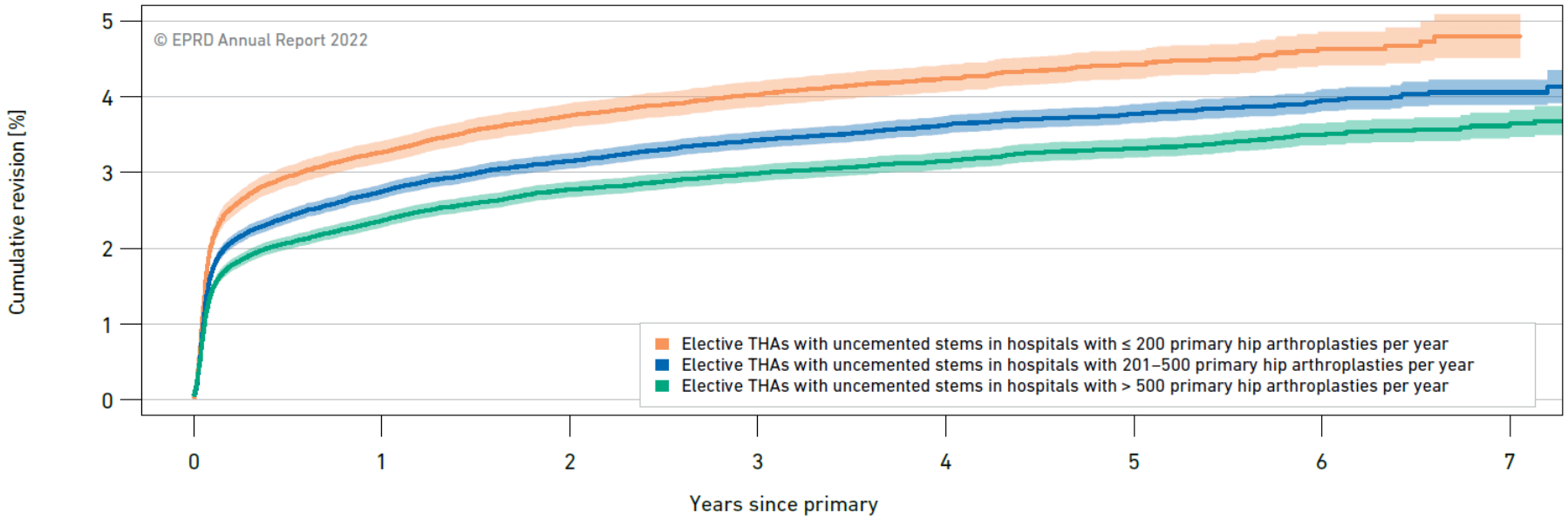


Numbers at risk								
	13,663	10,975	8,557	6,170	3,972	2,232	882	
	236,819	194,793	154,566	113,198	75,081	42,484	17,375	4,534
	42,774	35,031	27,620	20,431	13,763	7,676	3,294	978

Figure 18: Revision probabilities of standard total knee arthroplasties by concomitant disease diagnoses included in the Elixhauser Comorbidity Score *($p < 0.0001$)*

Non-implant-related factors: Hospital (I)

- Revision probabilities of elective THAs with uncemented stems by the hospital's annual volume of primary hip arthroplasties

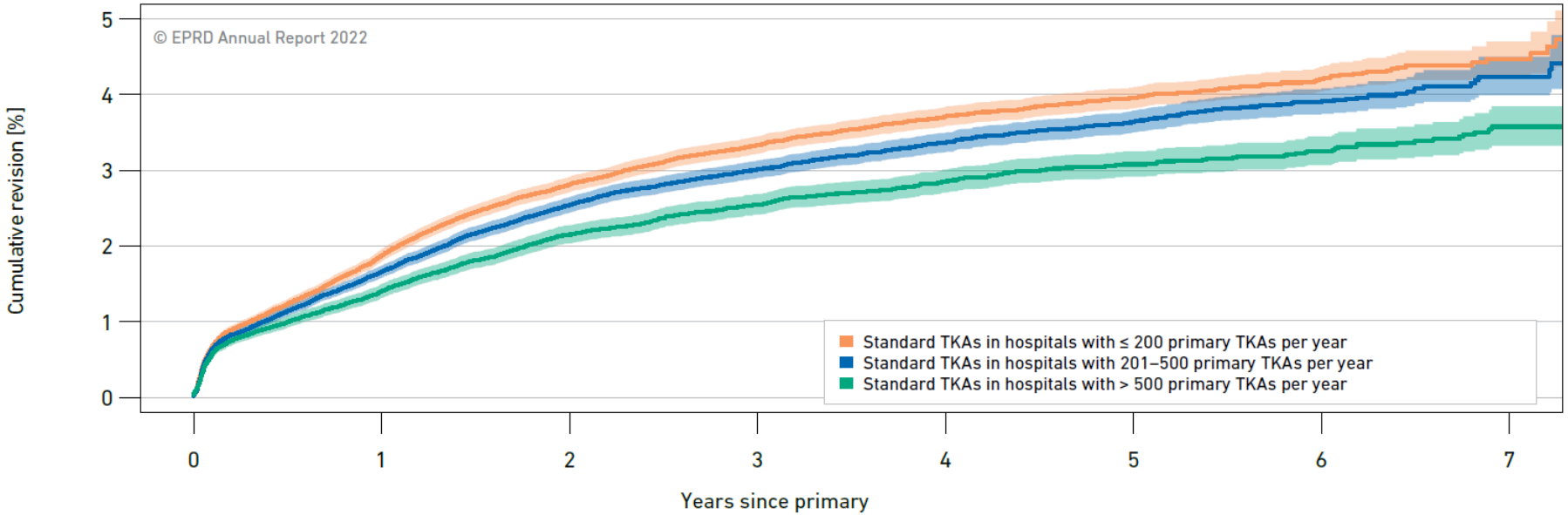


Numbers at risk								
Elective THAs with uncemented stems in hospitals with ≤ 200 primary hip arthroplasties per year	60,715	48,437	38,309	28,178	18,501	9,967	3,518	586
Elective THAs with uncemented stems in hospitals with 201–500 primary hip arthroplasties per year	119,157	96,333	76,324	56,194	37,548	21,137	8,532	1,851
Elective THAs with uncemented stems in hospitals with > 500 primary hip arthroplasties per year	108,883	88,132	69,458	50,310	33,781	19,619	8,351	3,236

Figure 19: Revision probabilities of elective total hip arthroplasties with uncemented stems by the hospital's annual volume of primary hip arthroplasties *($p < 0.0001$)*

Non-implant-related factors: Hospital (II)

- Revision probabilities of standard TKAs by the hospital's annual volume of primary TKAs

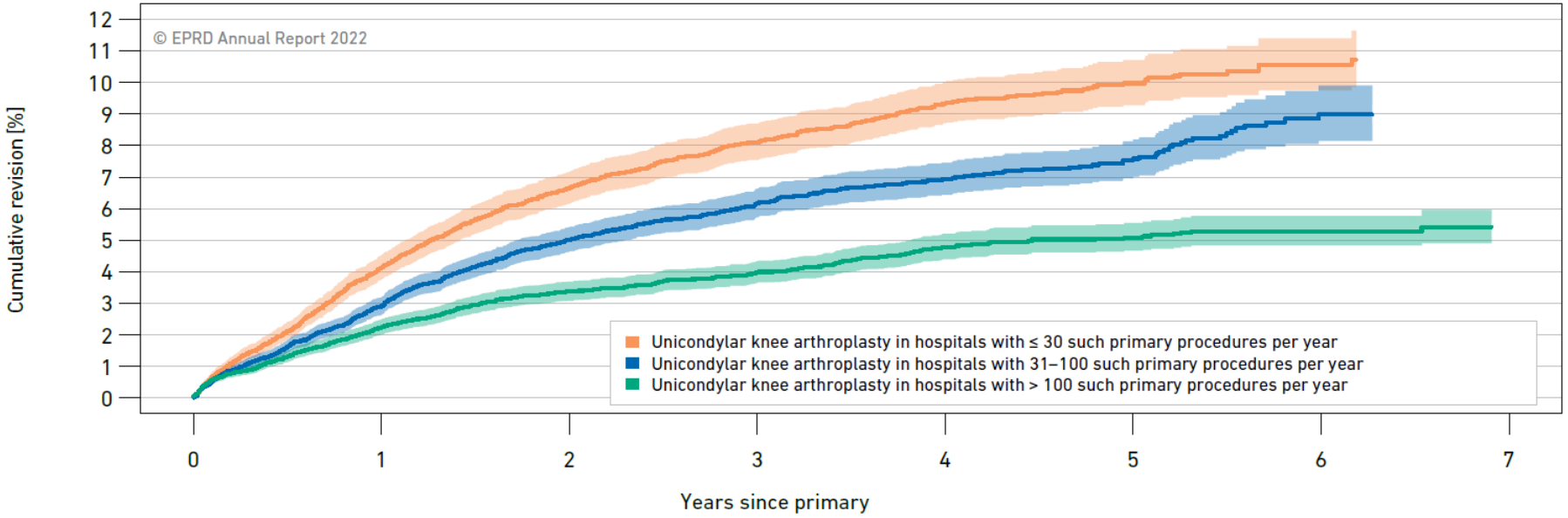


Numbers at risk								
Standard TKAs in hospitals with ≤ 200 primary TKAs per year	118,396	97,289	77,084	56,234	36,688	20,286	7,714	1,572
Standard TKAs in hospitals with 201–500 primary TKAs per year	103,521	85,416	67,861	49,901	32,949	18,357	7,317	1,546
Standard TKAs in hospitals with > 500 primary TKAs per year	65,937	53,580	42,024	30,635	20,981	12,426	5,944	2,437

Figure 20: Revision probabilities of standard total knee arthroplasties by the hospital's annual volume of primary total knee arthroplasties ($p < 0.0001$)

Non-implant-related factors: Hospital (III)

- Revision probabilities of unicondylar knee arthroplasties by the number of primary unicondylar knee arthroplasties performed



Numbers at risk							
11,367	8,961	6,809	4,990	3,210	1,674	637	
14,895	11,765	8,683	5,829	3,529	1,785	657	
15,781	12,993	10,284	7,507	4,929	2,793	1,055	

Figure 21: Revision probabilities of unicondylar knee arthroplasties by the number of primary unicondylar knee arthroplasties *(p < 0.0001)*

Revision probabilities hip arthroplasty (I)

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In brief

- Revision probabilities significantly higher for non-elective procedures
- Larger heads and shorter head-neck lengths generally linked to lower revision probabilities during the early phase
- To date, good outcomes have been observed with short-stem femoral components

Revision probabilities hip arthroplasty (II)

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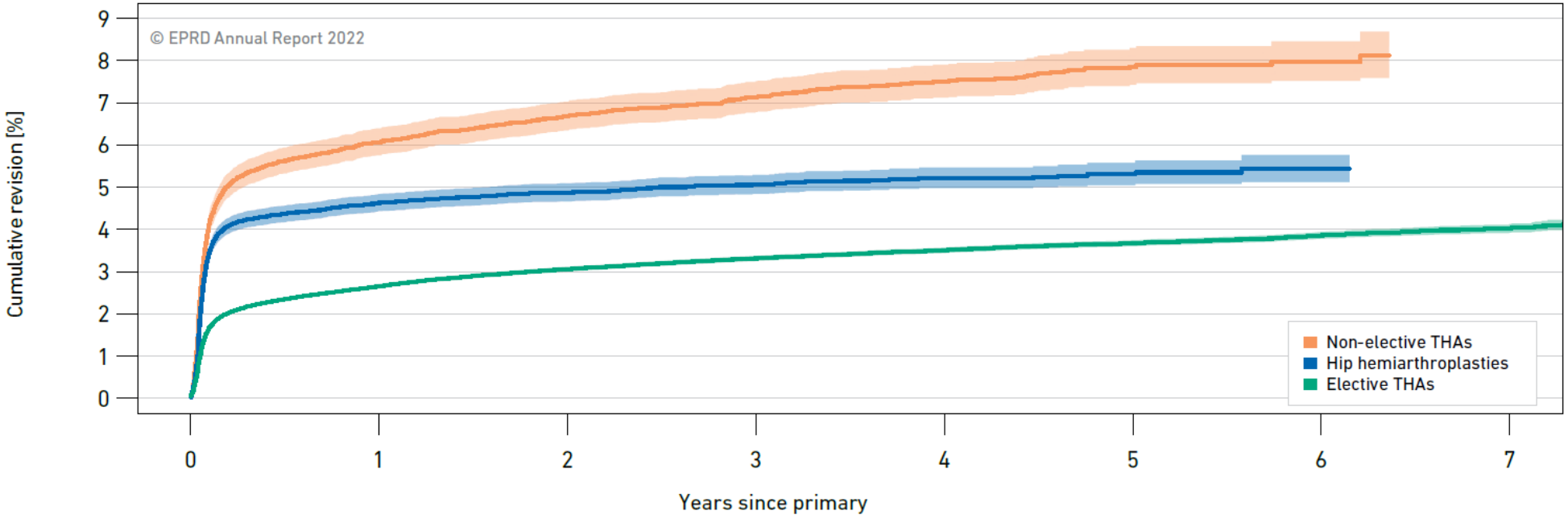
- Differences between types of hip arthroplasties become apparent at an early stage

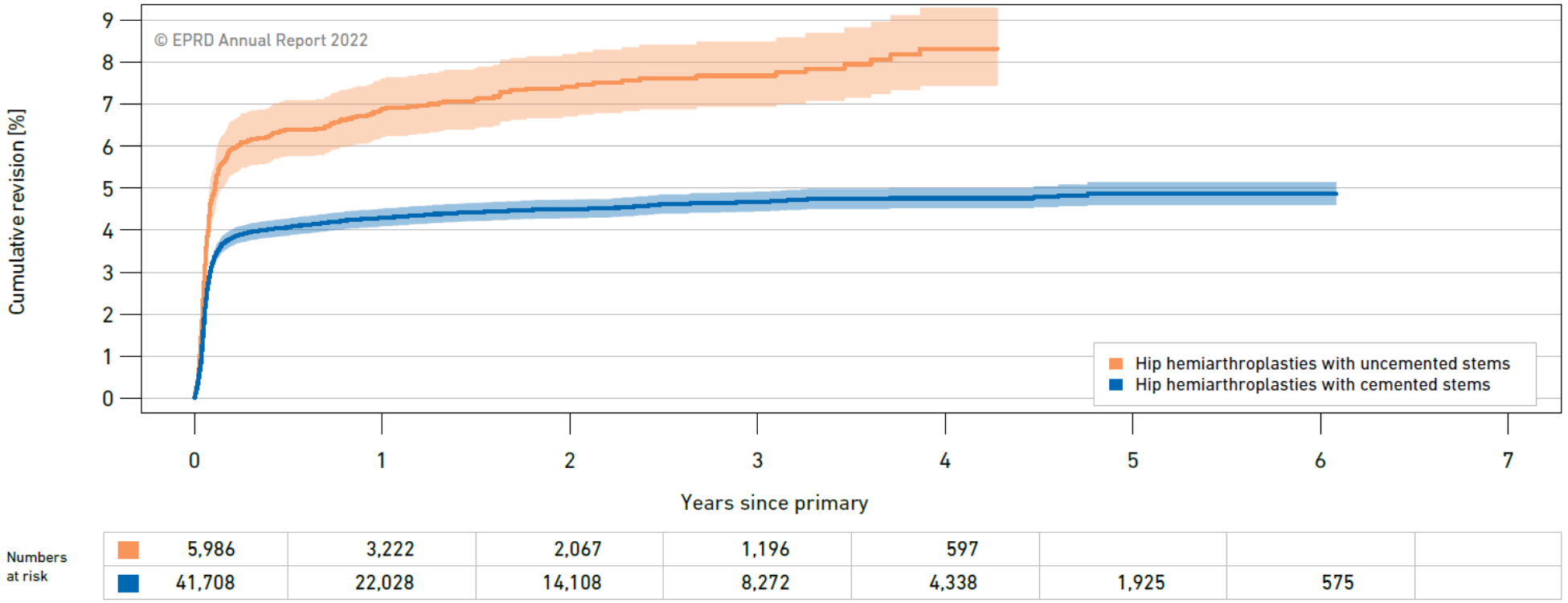


Numbers at risk								
Non-elective THAs	23,575	15,905	11,492	7,615	4,664	2,370	833	
Hip hemiarthroplasties	47,898	25,355	16,238	9,513	4,957	2,183	638	
Elective THAs	374,869	301,372	238,041	174,168	116,408	65,934	26,925	7,467

Figure 4: Revision probabilities of elective and non-elective hip arthroplasties *($p < 0.0001$)*

Revision probabilities hip arthroplasty (III)

- In the EPRD lower revision probabilitiy for arthroplasties with cemented femoral components



Numbers at risk								
Hip hemiarthroplasties with uncemented stems	5,986	3,222	2,067	1,196	597			
Hip hemiarthroplasties with cemented stems	41,708	22,028	14,108	8,272	4,338	1,925	575	

Figure 5: Revision probabilities of uncemented and cemented partial hip arthroplasties *($p < 0.0001$)*

Revision probabilities hip arthroplasty (IV)

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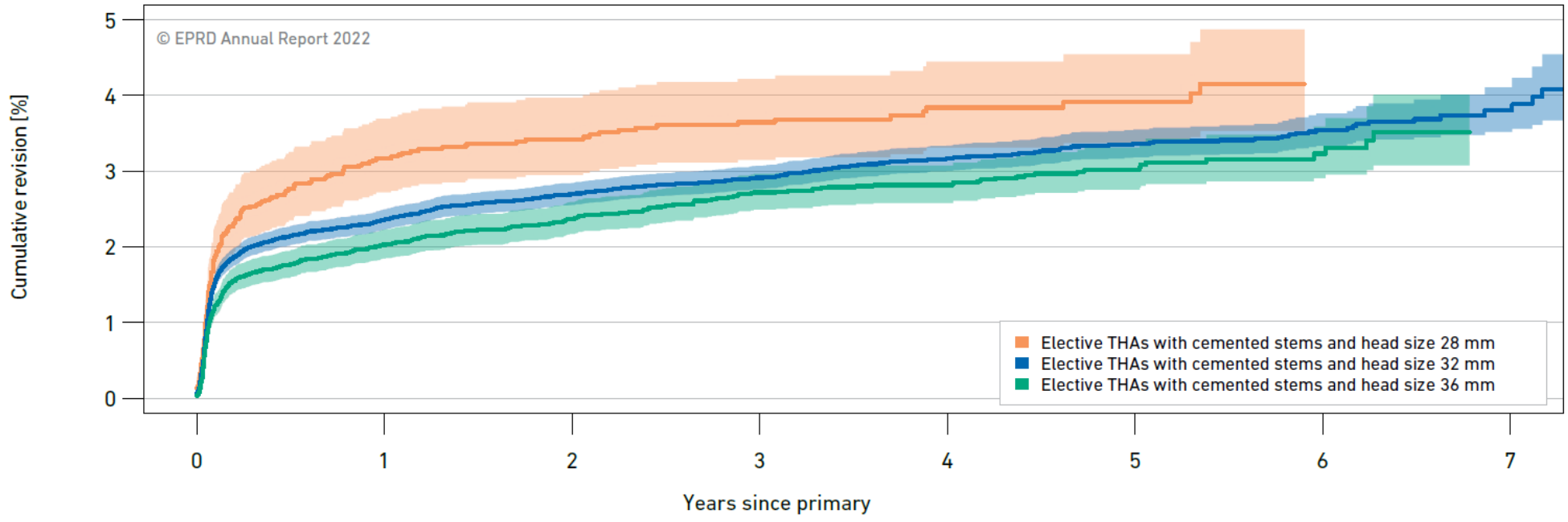
- Lower revision probabilities in early phase with larger heads



Numbers at risk								
	5,297	4,109	3,291	2,479	1,739	1,031		
	51,782	41,963	33,341	24,572	16,781	9,792	4,299	1,195
	22,282	17,105	13,053	9,167	5,847	3,116	1,267	

Figure 6: Revision probabilities of elective total hip arthroplasties with cemented stems by head size *(p = 0.0004)*

Revision probabilities hip arthroplasty (V)

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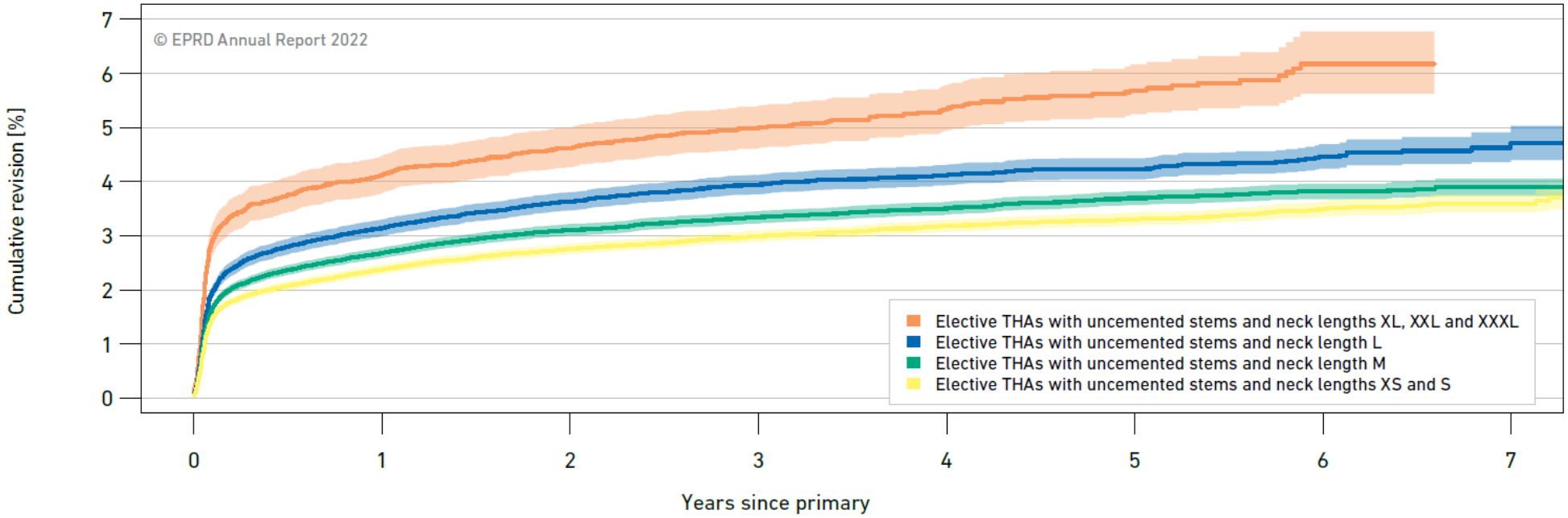
- Lower revision probabilities in early phase with shorter head-neck lengths

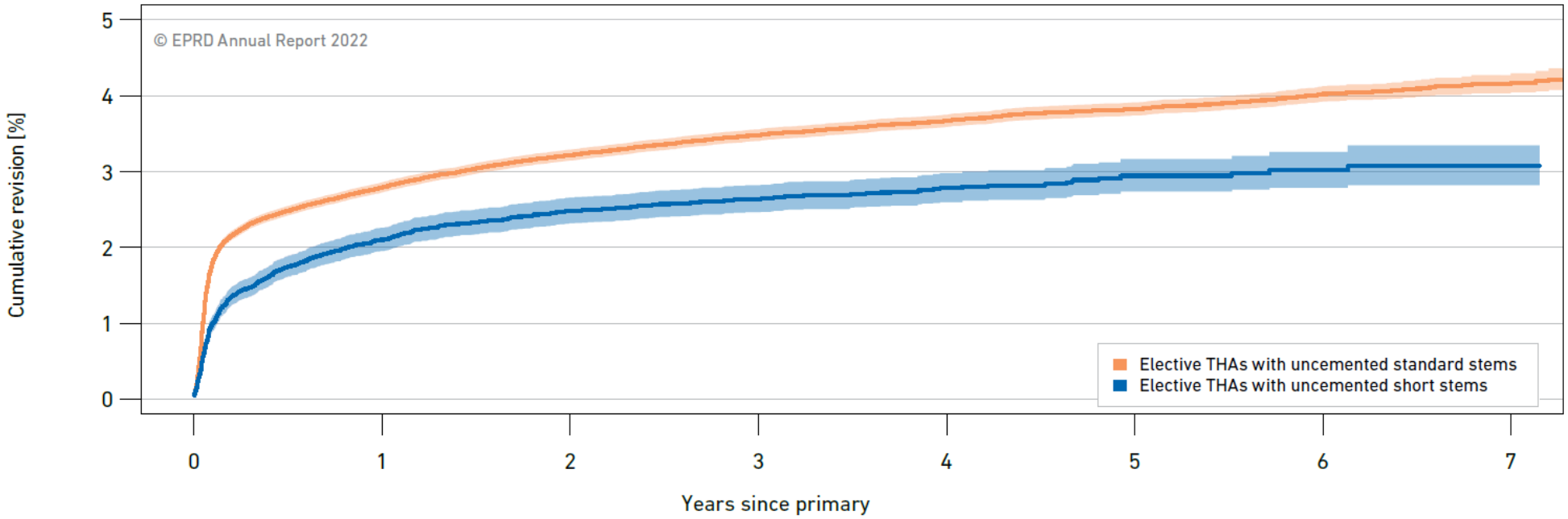


Numbers at risk								
Elective THAs with uncemented stems and neck lengths XL, XXL and XXXL	13,391	10,742	8,521	6,360	4,278	2,526	1,006	
Elective THAs with uncemented stems and neck length L	50,936	41,508	33,430	25,240	17,414	10,328	4,386	1,195
Elective THAs with uncemented stems and neck length M	109,608	88,533	69,963	51,206	34,437	19,682	7,894	2,222
Elective THAs with uncemented stems and neck lengths XS and S	117,646	94,538	74,291	53,678	35,040	19,014	7,456	2,081

Figure 7: Revision probabilities of elective total hip arthroplasties with uncemented stems by head-neck length *($p < 0.0001$)*

Revision probabilities hip arthroplasty (VI)

- In the EPRD lower revision probabilitiy for arthroplasties with uncemented short-stem femoral components



Numbers at risk								
Elective THAs with uncemented standard stems	249,867	202,756	160,984	118,191	79,275	45,086	18,402	5,139
Elective THAs with uncemented short stems	36,502	28,199	21,417	15,024	9,366	4,808	1,884	592

Figure 8: Revision probabilities of elective total hip arthroplasties with uncemented stems by stem type *($p < 0.0001$)*

Revision probabilities knee arthroplasty (I)

10 JAHRE 2012 - 2022 EPRD Endoprothesenregister Deutschland

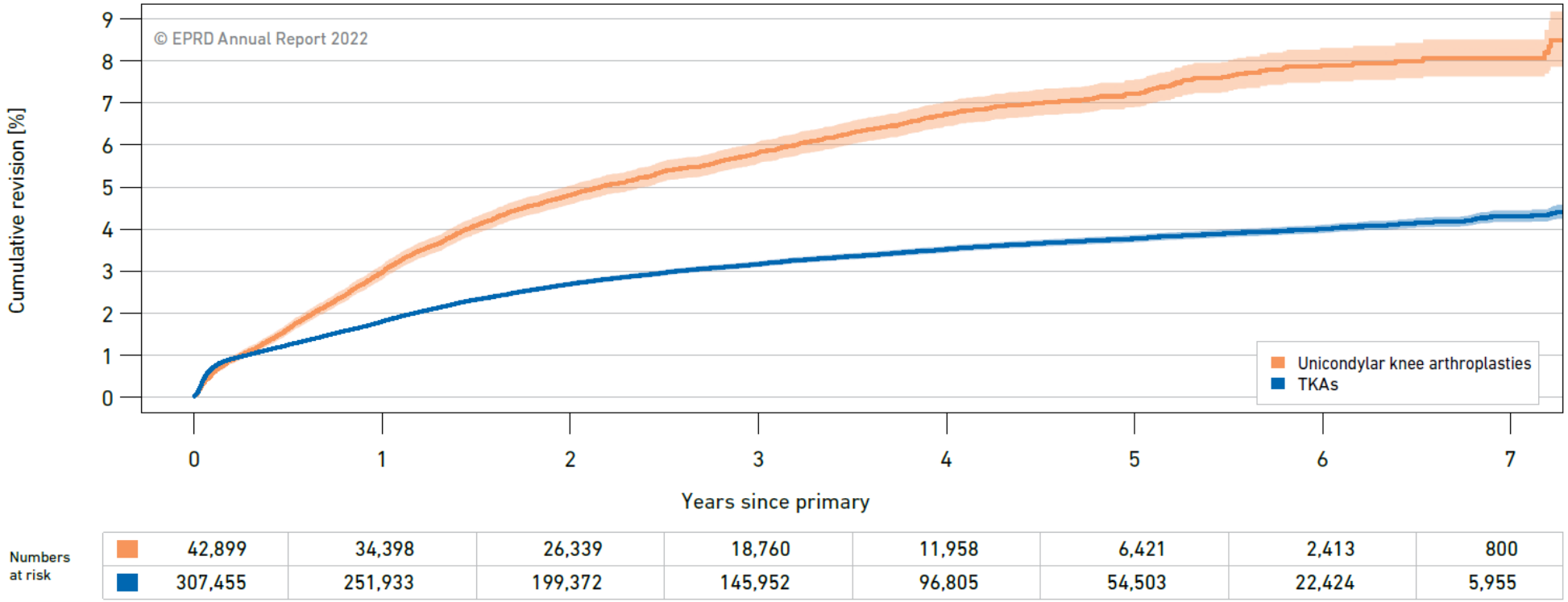
In brief

- Revision probabilities of unicondylar arthroplasties are almost twice as high as those of total knee arthroplasties after seven years
- Higher probability of revision in the period analysed for total knee arthroplasties with mobile bearings than for those with fixed bearings

Revision probabilities knee arthroplasty (II)

10 JAHRE 2012 - 2022 EPRD Endoprothesenregister Deutschland

- Higher revision probabilities with unicondylar arthroplasties compared to TKAs



Numbers at risk								
Unicondylar knee arthroplasties	42,899	34,398	26,339	18,760	11,958	6,421	2,413	800
TKAs	307,455	251,933	199,372	145,952	96,805	54,503	22,424	5,955

Figure 9: Revision probabilities of total and unicondylar knee arthroplasties *($p < 0.0001$)*

Revision probabilities knee arthroplasty (III)

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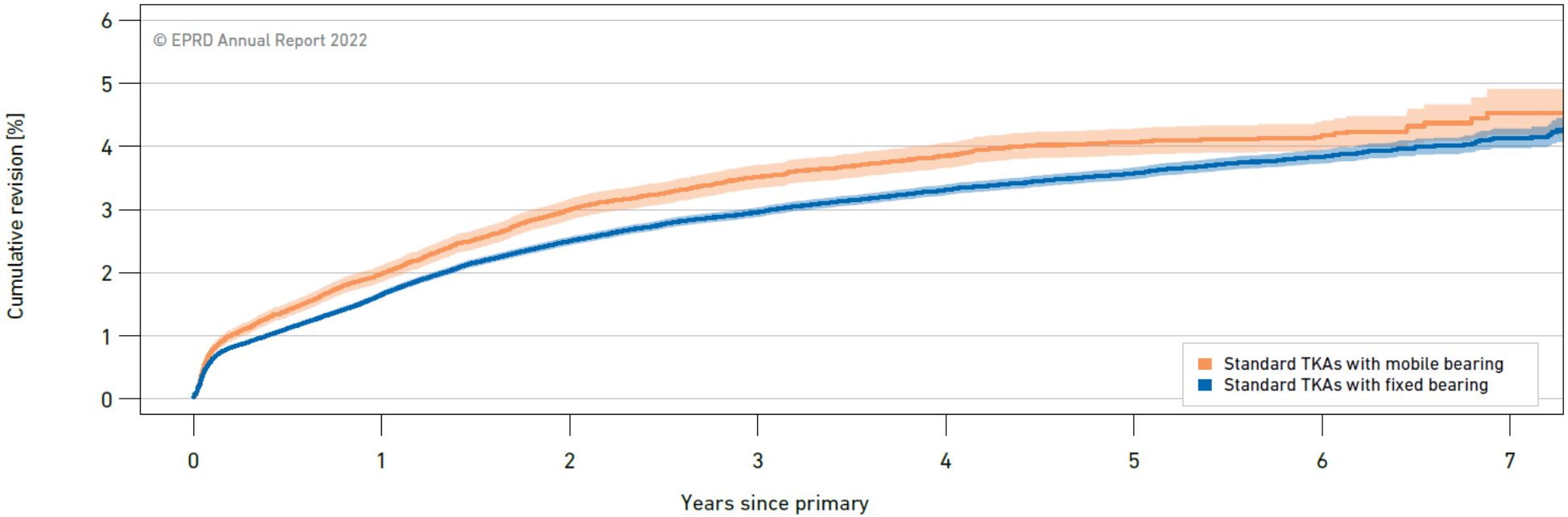
- In general lower revision probabilities for knee systems with fixed bearings



Numbers at risk								
Standard TKAs with mobile bearing	46,312	39,739	32,932	25,434	17,744	10,224	3,790	833
Standard TKAs with fixed bearing	246,944	201,060	157,811	114,365	75,072	42,168	17,761	4,913

Figure 13: Revision probabilities of standard total knee arthroplasties by bearing mobility *($p < 0.0001$)*

Revision probabilities for specific implant systems and component pairs (I)

10 JAHRE 2012 - 2022 EPRD Endoprothesenregister Deutschland

- The EPRD annual report again presents outcomes of specific implant systems (brands) and combinations in detail

Elective total hip arthroplasties							Revision probabilities after ...						
Femoral stem	Cup	Number	Hosp.	Age	m/f	Period	1 year	2 years	3 years	4 years	5 years	6 years	7 years
Hybrid fixation													
ABG II Stem (Stryker)	Trident Cup (Stryker)	440	9	79 (76 - 82)	22/78	2014-2021	2.5 [1.4; 4.5] (409)	3.0 [1.8; 5.1] (344)	3.0 [1.8; 5.1] (242)	*3.0 [1.8; 5.1]* (100)			
Avenir (Zimmer Biomet)	Allofit (Zimmer Biomet)	2,398	102	80 (76 - 83)	23/77	2014-2021	2.2 [1.6; 2.9] (1,556)	2.4 [1.8; 3.2] (959)	2.6 [1.9; 3.4] (594)	2.6 [1.9; 3.4] (384)	2.9 [2.1; 4.0] (195)	*2.9 [2.1; 4.0]* (82)	
Avenir (Zimmer Biomet)	Allofit IT (Zimmer Biomet)	312	14	78 (75 - 81)	19/81	2014-2021	4.1 [2.3; 7.3] (187)	*4.1 [2.3; 7.3]* (105)					
BHR (Smith & Nephew)	BHR (Smith & Nephew)	319	21	55 (51 - 59)	99/1	2014-2021	1.3 [0.5; 3.4] (259)	2.2 [1.0; 4.8] (213)	2.2 [1.0; 4.8] (160)	*2.2 [1.0; 4.8]* (105)	*2.2 [1.0; 4.8]* (61)		
BICONTACT (Aesculap)	PLASMACUP (Aesculap)	315	20	78 (75 - 82)	30/70	2013-2021	2.3 [1.1; 4.7] (284)	2.6 [1.3; 5.1] (267)	2.6 [1.3; 5.1] (231)	3.0 [1.6; 5.8] (187)	*3.0 [1.6; 5.8]* (128)	*3.0 [1.6; 5.8]* (65)	

Total knee arthroplasties							Revision probabilities after ...						
Femoral component	Tibial component	Number	Hosp.	Age	m/f	Period	1 year	2 years	3 years	4 years	5 years	6 years	7 years
Standard total knee systems, cruciate-retaining, fixed bearing, hybrid													
balanSys BICONDYLAR uncem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	309	5	71 (64 - 77)	44/56	2016-2021	0.7 [0.2; 2.7] (234)	1.2 [0.4; 3.8] (168)	*1.8 [0.7; 5.0]* (112)	*1.8 [0.7; 5.0]* (52)			
COLUMBUS (Aesculap)	COLUMBUS (Aesculap)	708	5	69 (62 - 76)	37/63	2014-2021	3.4 [2.3; 5.1] (662)	4.0 [2.8; 5.8] (569)	4.4 [3.1; 6.2] (434)	4.7 [3.3; 6.6] (285)	*5.2 [3.6; 7.5]* (135)		
EFK Femur zementfrei (OHST Medizintechnik)	EFK Tibia zementiert (OHST Medizintechnik)	1,230	15	70 (63 - 76)	42/58	2014-2021	1.2 [0.7; 2.0] (1,122)	1.5 [1.0; 2.4] (1,014)	1.8 [1.2; 2.8] (914)	2.0 [1.3; 3.0] (819)	2.5 [1.7; 3.6] (621)	3.5 [2.4; 5.1] (294)	
GENESIS II CR COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	438	6	68 (62 - 76)	43/57	2012-2021	0.8 [0.2; 2.3] (391)	1.3 [0.5; 3.0] (345)	1.6 [0.7; 3.5] (306)	1.6 [0.7; 3.5] (245)	1.6 [0.7; 3.5] (177)	*1.6 [0.7; 3.5]* (125)	*1.6 [0.7; 3.5]* (61)
LEGION CR COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	406	8	69 (61 - 77)	48/52	2017-2021	2.7 [1.4; 4.9] (267)	4.3 [2.4; 7.5] (153)	*4.3 [2.4; 7.5]* (85)				

Revision probabilities for specific implant systems and component pairs (II)

- Note that hospital-related and patient-related factors may sometimes overlap with implant effects
  - Additional information on the patient population operated (median age and proportions of male and female patients) is therefore provided.
  - We also indicate when primary arthroplasties with the corresponding components became available.
- Important: If the procedure involves revision or explantation, this is considered to be the endpoint of the analysis – regardless of whether implant components were actually left *in situ* during the surgery or replaced.

Re-revision probability (I)

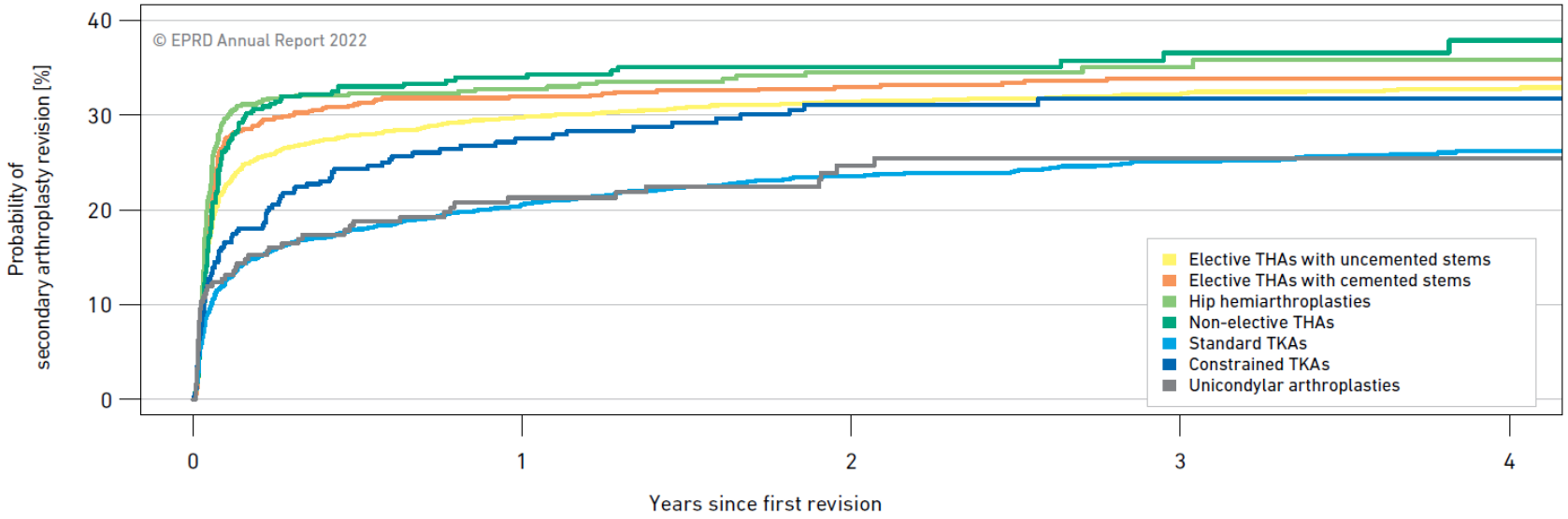
10 JAHRE 2012 - 2022 EPRD
Endoprothesenregister Deutschland

In brief

- Probability of a second arthroplasty revision within two years of the first revision is
  - 23.5 % to 35.1 % after a first revision for periprosthetic infection
  - 11.3 % to 17.5 % after a first aseptic revision

Re-revision probability (II)

- Strongly dependent on type of primary arthroplasty



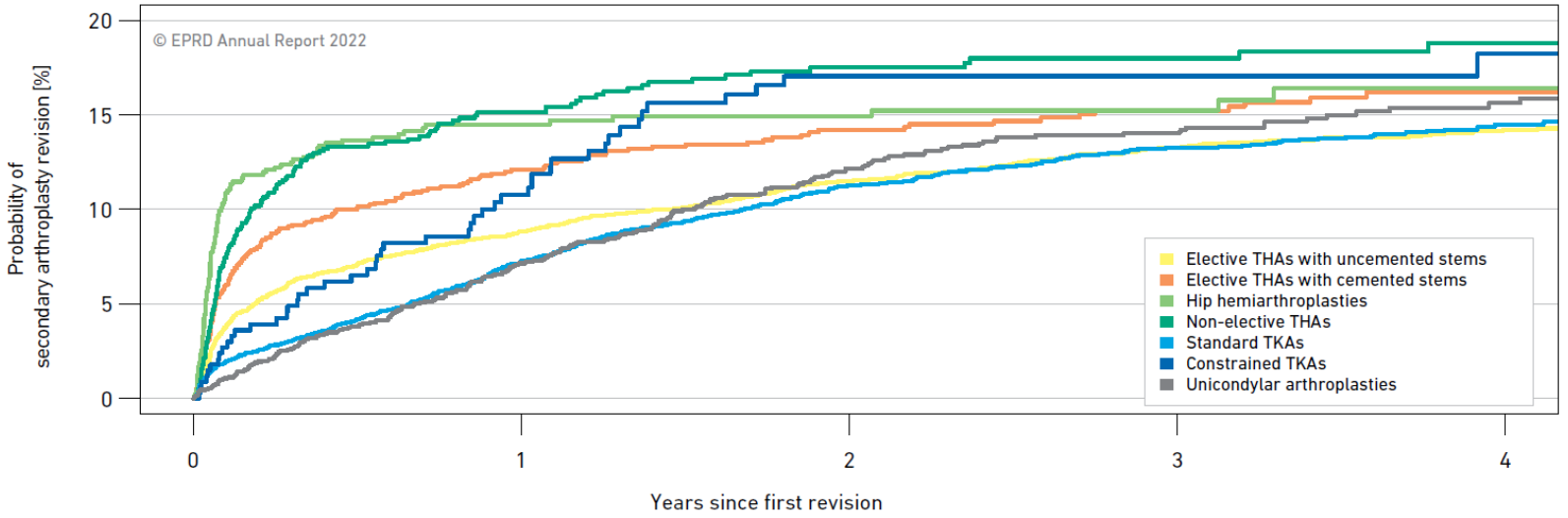
Numbers at risk

3,199	1,758	1,270	850	503
910	456	345	227	133
848	272	181	91	43
473	189	125	78	40
2,636	1,608	1,143	743	436
351	185	135	83	41
253	147	97	59	32

Figure 24: Probability of second revision following primary revision for infection by type of primary arthroplasty

Re-revision probability (III)

- The risk of a second revision largely depends on the underlying cause for the first revision.



Numbers at risk					
	6,220	4,401	3,218	2,209	1,364
	1,281	850	615	407	243
	1,029	440	278	166	77
	1,002	561	390	256	154
	5,470	3,936	2,761	1,816	1,006
	341	236	160	103	67
	1,995	1,420	964	631	342

Figure 23: Probability of second revision following primary revision for reasons other than infection by type of primary arthroplasty

The probability of a second revision within 2 years after an infection-related revision reaches values of between 23.5 % to 35.1 % compared to 11.3 % to 17.5 % for an aseptic revision.

Results in international comparison

Results in international comparison (I)

10 JAHRE 2012 - 2022 EPRD
Endoprothesenregister Deutschland

In brief

- The EPRD is the third largest hip and knee arthroplasty registry in the world
- International arthroplasty registries differ in their data collection methodology and structure
- Across all countries considered, fewer arthroplasties were documented due to the pandemic

Results in international comparison (II)

10 JAHRE 2012 - 2022 EPRD Endoprothesenregister Deutschland

- International comparisons are based on data extracted from the following selected national registries

National equivalent	Name of registry	Acronym	Documentation started in	Number of hip and knee arthroplasties documented[8]	Sources
Australia	The Australian Orthopaedic Association National Joint Replacement Registry	AOANJRR	1999	1.7 million	[4]
England, Wales, Northern Ireland, Isle of Man, and Guernsey	The National Joint Registry	NJR	2003	2.8 million	[5]
The Netherlands	Landelijke Registratie Orthopedische Implantaten	LROI	2007	0.46 million	[6]
Sweden	Swedish Arthroplasty Register	SAR	1975 (knee) 1979 (hip)	1 million	[7]
USA	American Joint Replacement Registry	AJRR	2011	2.5 million	[8]

Table 46: Comparative summary of selected national arthroplasty registries

8 The numbers, in each case until the end of 2020, include both primary arthroplasties and reoperations. Not all registries provide the same level of follow-up and completeness of revision.

Hip arthroplasty – international comparison(I)

10 JAHRE 2012 - 2022 EPRD Endoprothesenregister Deutschland

- THA: Fully cemented arthroplasties continue to decline in the national registries compared, while hybrid fixations are on the rise

	AOANJRR	EPRD	NJR	LROI	SAR[10]	AJRR
Uncemented	61	77	35	69	33	94
Reverse-hybrid	-	1	2	3	9	
Cemented	2	4	22	21	50	6
Hybrid	37	18	38	7	8	

Table 47: Proportion (%) of primary total hip arthroplasty bone fixations reported in selected international registries

10 Since the annual report does not provide proportions as numerical values, these were extrapolated from the graph.

Hip arthroplasty - international comparison (II)

- THA: 32 mm heads remain the most common head size in Europe, but 36 mm heads are becoming more common

	EPRD	LROI	SAR[12]	AJRR[13]
< 28 mm	<0.5	11	<1	4
28 mm	5		6	
32 mm	50	66	83	19
36 mm	44	23	10	59
> 36 mm	<0.1	<1	0	8

Table 48: Proportion (%) of hip arthroplasty head sizes in selected international registries

12 Since the annual report does not provide proportions as numerical values, these were extrapolated from the graph.
13 The share of dual mobility (DM) arthroplasties is presented separately in the AJRR and amounts to about 10 %.

Knee arthroplasty - international comparison (I)

10 JAHRE 2012 - 2022 EPRD Endoprothesenregister Deutschland

- Unicondylar knee arthroplasty is quite common, especially in Europe

	AOANJRR	EPRD	NJR	LROI	SAR[16]	AJRR
Total knee arthroplasty	94	87	85	80	88	95
Unicondylar knee arthroplasty	6	13	13	19	11	4
Patellofemoral knee arthroplasty	<1	<1	1	<1	<1	<1

Table 50: Proportion (%) of knee arthroplasties reported in selected international registries

16 Since the annual report does not provide proportions as numerical values, these were extrapolated from the graph.

Knee arthroplasty - international comparison (II)

- TKA: The international standard is still fully cemented fixations (ranging from 67 % to 97 %); more uncemented arthroplasties internationally

	AOANJRR	EPRD	NJR[20]	LROI	SAR	AJRR
Cemented	67	95	97	93	91	83
Uncemented	16	1	2	4	9	14
Hybrid	17	4	<1	3	<1	2

Table 52: Proportion (%) of primary total knee arthroplasty bone fixations reported in selected international registries

20 The percentages were converted to the percentage of total knee arthroplasties based on the figures given for total knee arthroplasty in the annual report.

Knee arthroplasty - international comparison (III)

- TKA: In Europe, the majority without primary patellar resurfacing (ranging from 79 % to 97 %), in the US and Australia the majority with resurfacing

	AOANJRR	EPRD	LROI	SAR	AJRR
Without patellar resurfacing	25	88	79	97	10
With patellar resurfacing	75	12	21	3	90

Table 53: Proportion (%) of patellar resurfacing at primary total knee arthroplasty in selected international registries

„Specific analysis: …“ (I)

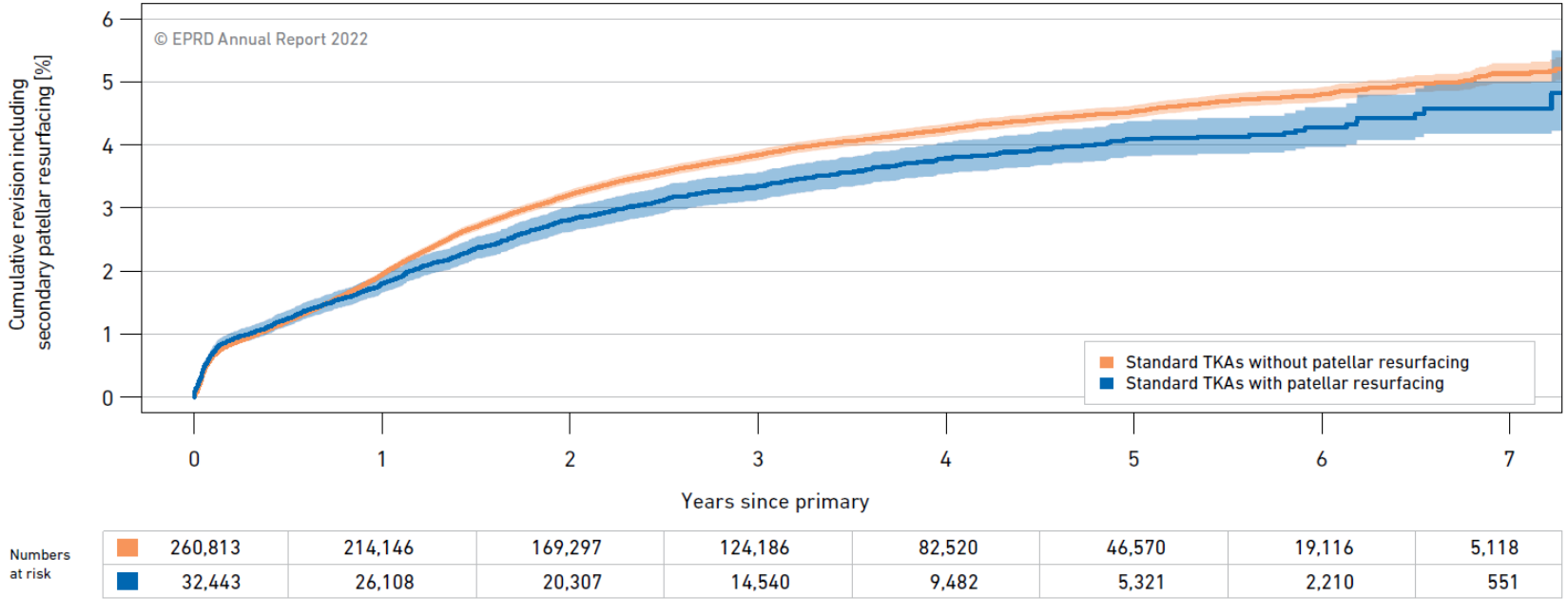
- New section: „Specific analysis: Patellar resurfacing is not required for all primary TKAs“

- The EPRD is examining the extent to which the German data speaks for or against such a general recommendation in terms of primary patellar resurfacing.

- This is because a publication based on data from the British NJR generally recommends patellar resurfacing in primary TKAs.

„Specific analysis: …“ (II)

- Overall differences in reoperation probabilities observed



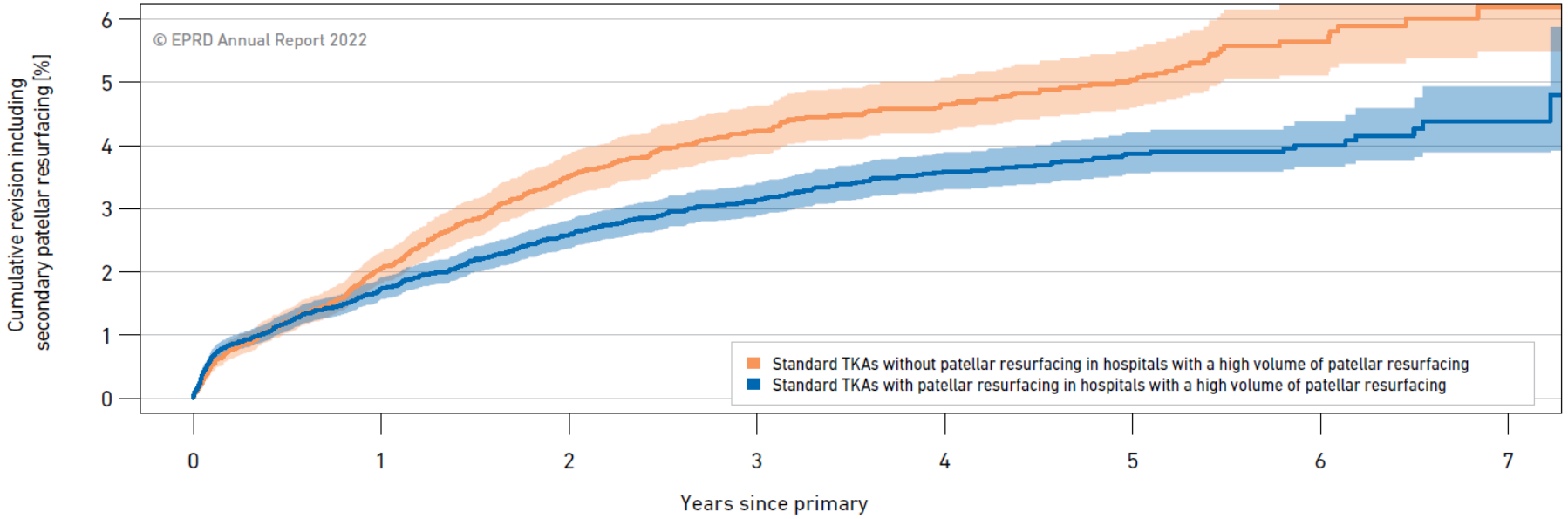
Numbers at risk								
Standard TKAs without patellar resurfacing	260,813	214,146	169,297	124,186	82,520	46,570	19,116	5,118
Standard TKAs with patellar resurfacing	32,443	26,108	20,307	14,540	9,482	5,321	2,210	551

Figure 25: Reoperation probabilities of standard primary total knee arthroplasties with and without patellar resurfacing *(p = 0.0006)*

- For the purposes of this analysis secondary patellar resurfacing is considered to represent the end of the primary arthroplasty survival period

„Specific analysis: …“ (III)

- But, arthroplasties with patellar resurfacing only fare better if hospitals perform these procedures frequently

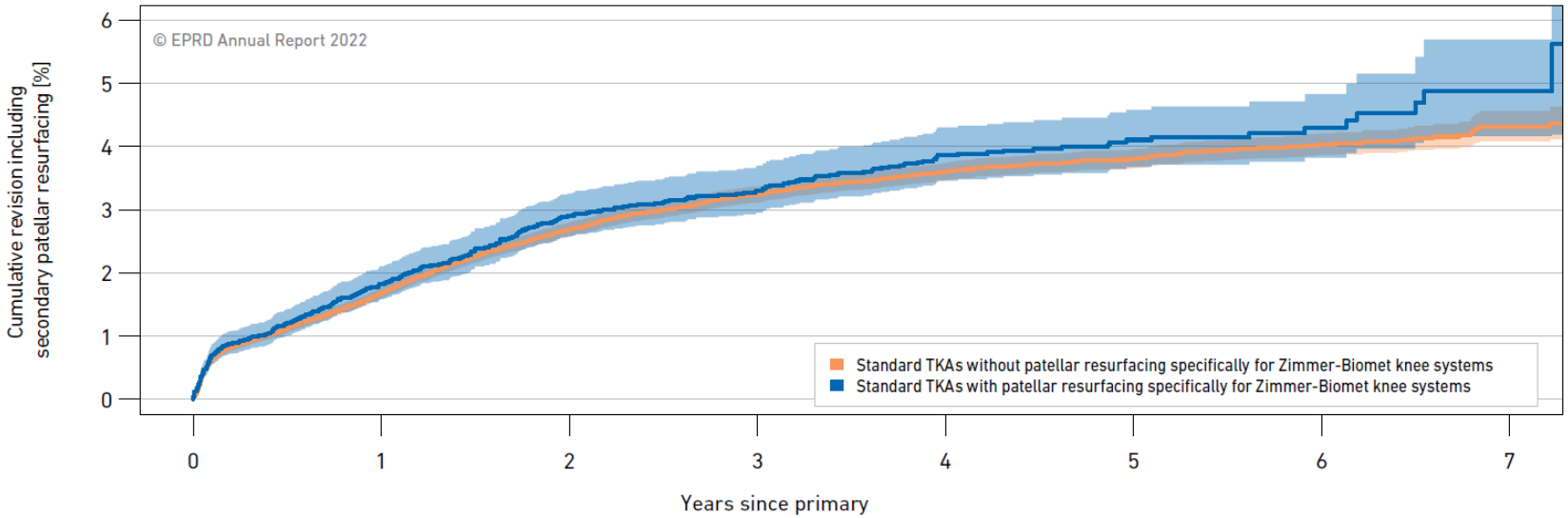


Numbers at risk								
	13,659	11,073	8,748	6,359	4,454	2,783	1,175	376
	23,078	18,367	14,107	9,930	6,430	3,651	1,505	343

Figure 26: Reoperation probabilities of standard primary total knee arthroplasties with and without patellar resurfacing for hospitals performing more than 30% of patellar replacements *($p < 0.0001$)*

„Specific analysis: …“ (VI)

- And, reoperation probabilities do not differ significantly if the analysis is limited to TKAs with components from one manufacturer, shown here by way of example



Numbers at risk								
	93,396	76,938	61,239	45,357	30,430	17,696	7,699	2,335
	10,900	9,061	7,343	5,814	4,134	2,421	999	205

Figure 28: Reoperation probabilities of standard primary total knee arthroplasties with and without patellar resurfacing specifically for Zimmer-Biomet systems *(p = 0.2)*

- Applies regardless of how frequently hospitals perform these procedures

„Specific analysis: …“ (IV)

- Conclusion: blanket recommendation for patellar resurfacing in primary TKAs not justified from the EPRD's point of view
- Current „Implant outcomes for secondary patellar resurfacing“ (see Table 45 in EPRD Annual Report 2022) helpful in decision-making
  - For TKAs with a high probability of requiring complementary patellar resurfacing it may indeed make sense to consider primary patellar resurfacing.

Mismatch detection in the EPRD

Mismatch detection in the EPRD (I)

- In 2021, the EPRD identified 462 potential mismatch cases in otherwise plausibly documented primary arthroplasties.
- These included 38 THAs where the documented sizes of the head component and the insert or acetabular component (Monobloc) differed:

		Inner diameter of insert/acetabular component			
		22.25 mm	28 mm	32 mm	36 mm
Head size	22 mm		3		
	28 mm			7	
	32 mm		4		12
	36 mm	1		10	
	40 mm				1

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Table 54: Number of mismatches due to deviations between head size and inner diameter of the insert or cup in 2021

Mismatch detection in the EPRD (II)

- Aim: Prevent mismatch cases by informing hospitals at an early stage about possible problems with component selection

- Currently, the hospitals are informed in two ways:
  - in the case queries provided with the monthly EPRD summary reports
  - since 2019, directly in the data acquisition software

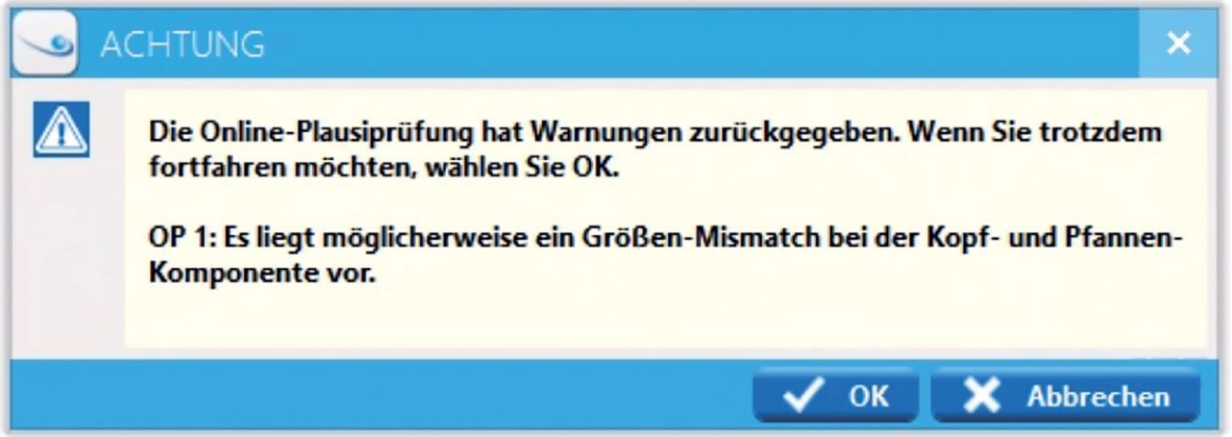
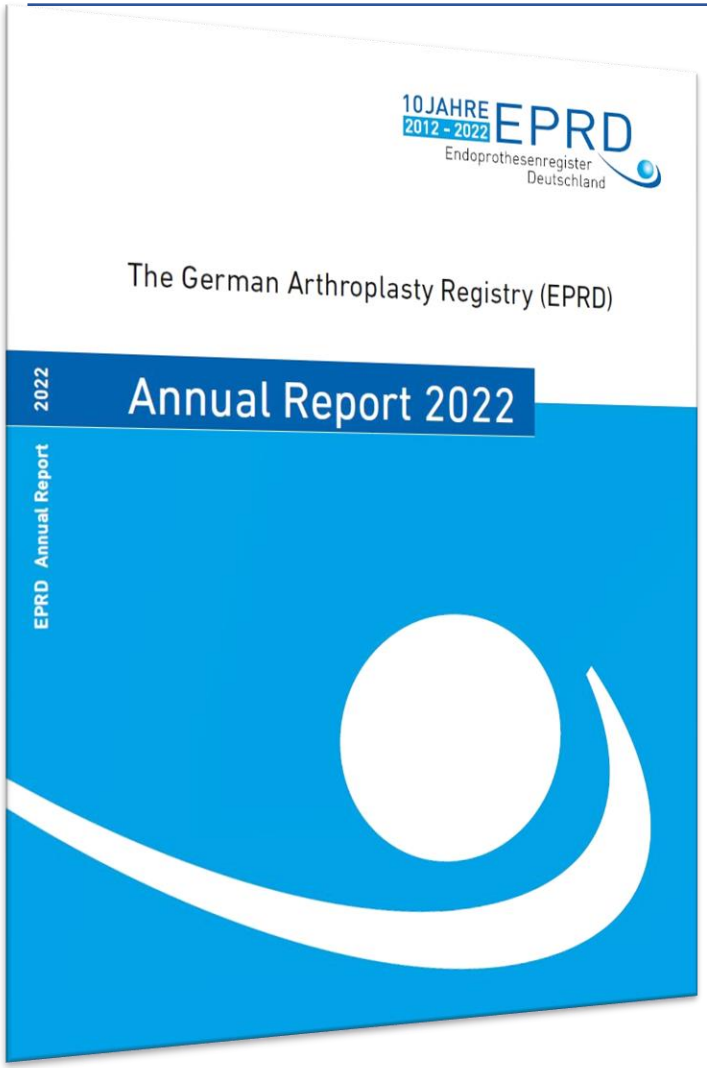


Illustration 4: An EPRD-Edit software mismatch notification during data entry. The text shown is: The online plausibility check has returned warnings. If you still want to continue, select OK. OP 1: There may be a size mismatch in the head and acetabular component.

Contact



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