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The German Arthroplasty Registry

Annual Report 2020

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The German Arthroplasty Registry

An initiative of the
German Society for Orthopaedics
and Orthopaedic Surgery (DGOOC)

DEUTSCHE GESELLSCHAFT
FÜR ORTHOPÄDIE UND
ORTHOPÄDISCHE CHIRURGIE

Annual Report 2020

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We are very grateful to the members of the working groups for their suggestions and feedback regarding this annual report.

Message from the Scientific Director of the EPRD

Professor Volkmar Jansson
Scientific Director of the EPRD

The world of registries is dynamic. The EPRD is therefore also subject to continuous change. Politics has recognised its great significance: The EPRD is the essential building block for the planned German Implant Registry (IRD). We can all be proud of this, as it proves the high quality of our data and evaluation structures.

This is the second annual report for which we were able to draw on our revised product database, which we developed together with the National Joint Registry (NJR) of the UK. This product database is characterised by an even greater granularity and allows a detailed analysis of arthroplasty survival and revision probabilities. For the hospitals participating in the EPRD, the outcomes of the various implant systems are evaluated twice-a-year and made available to the departments. Hopefully, this transparency will allow us to continuously improve implant safety.

The number of procedures reported to the Registry continues to increase. We would like to take this opportunity to once again thank all those involved. Without their commitment, the EPRD would not have come so far!

By now, the EPRD is also attracting increased international attention. The Annual Report 2019 had therefore been published in English, and this report will also be translated into English. It is not simply the number of data sets in the EPRD, but also our product database and the structure of our data flow that have gained us positive international recognition. In particular, the product database developed jointly with the NJR will establish international standards.

Strengthened by further national and international developments, we are therefore on the right track which we can continue to pursue together. Happy reading!

Table of contents

1 Introduction

Launched in 2010 as a joint project by doctors, hospitals, health insurance providers, and industry, the German Arthroplasty Registry (EPRD) began compiling data on hip and knee arthroplasties in November 2012. By the end of 2019, the commitment of the participating institutions and patients has allowed the EPRD, as a purely voluntary registry, to compile documentation on more than 1.3 million such procedures. The declared intent of the EPRD was and is to create a robust framework for the assessment of hip and knee arthroplasties. This annual report highlights the lessons already learned by the EPRD from the data collected.

The days of the EPRD as a voluntary and independent arthroplasty registry are numbered. At the end of 2019, the German Parliament decided to introduce the mandatory German National Implant Registry (IRD). Hospitals, patients, implant manufacturers, and health insurance providers are required to participate in this registry. Together with the know-how gained over the years, the entire database of the EPRD will be transferred to the new IRD and constitute one of its foundations. Until the IRD starts compiling data on hip and knee arthroplasties, the EPRD will continue its work and provide such information in its annual reports.

The present annual report adheres to the established structure of its predecessors: after a brief outline of the EPRD's development to date in Chapter 2, Chapter 3 explains how the data has been analysed. Chapter 4 describes the documentation submitted for the calendar year 2019, the current situation in patient care and looming developments. Chapter 5, the core of the report, discusses the timeline of the arthroplasty survival outcomes. This includes an assessment of the risk of (second) revision after primary arthroplasty or revision surgery or – for the first time in this report – another reoperation. Chapter 6 briefly summarises the contents.

2 Registry development

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Since the registry was launched in November 2012, the number of document sets submitted by hospitals to the EPRD has increased year by year, as has the number of hospitals participating in the EPRD. Even though recent annual growth rates have slowed down, 2019 has seen new record levels with more than 315,000 document sets from 723 different hospitals. Figure 1 and Figure 2 illustrate the trend in documentation figures and overall database.

Based on the figures published by the German Institute of Quality Assurance and Transparency in Health Care (IQTIG) in its annual quality assurance report for the field of arthroplasties [1], by now the EPRD therefore covers 70 % of all hip or knee arthroplasties performed in Germany (see also Table 1).

As a purely voluntary registry, the EPRD has only been able to evolve in such positive ways because of the strong willingness to participate and the great commitment of hospitals and patients. With its Act on the Establishment of the IRD in the autumn of 2019, the German Parliament initiated the creation of a registry mandatory for all parties involved – patients, hospitals, manufacturers, and health insurance providers, both private and statutory. The Act has already become law on 1 January 2020. While starting with hip, knee and breast implants, the registry will be expanded step by step to include other types of implants as well.

The introduction of a mandatory implant registry in Germany does, however, not constitute a completely new endeavour. Rather, the EPRD, which has in the past been repeatedly funded by the Federal Ministry of Health, serves as a blueprint for establishing the IRD. It is also planned to transfer the essential parts of the EPRD database collected

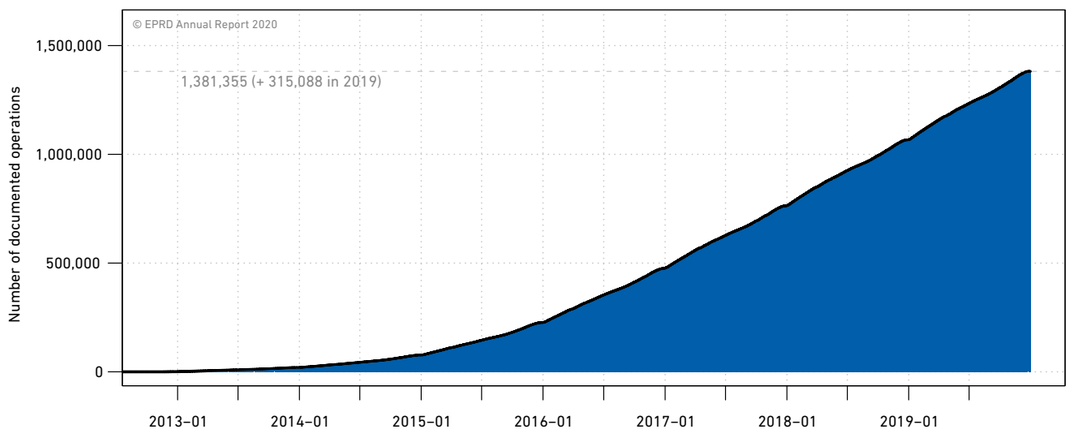

Figure 1: Evolution of the EPRD database inventory over time

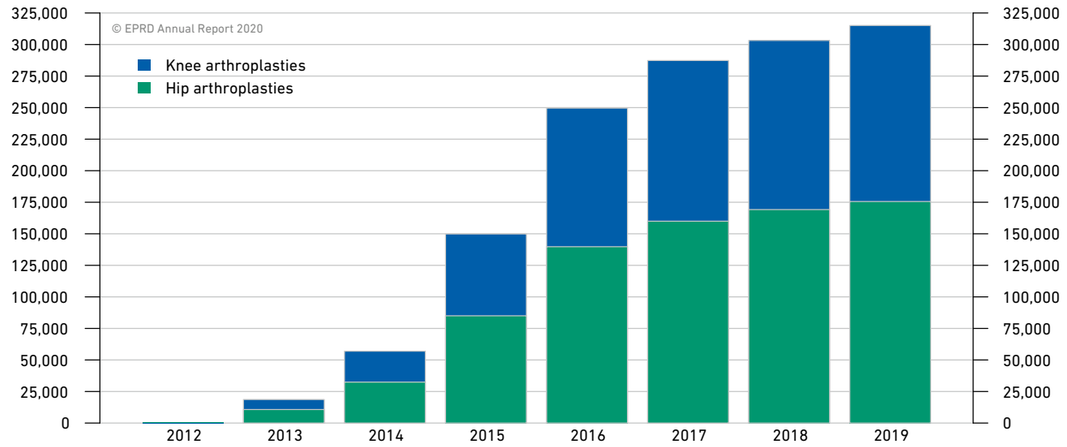

Figure 2: Evolution of surgical documentation submission figures from 2012 to 2019

Year	2012	2013	2014	2015	2016	2017	2018	2019
EPRD data sets	695	18,632	56,961	149,852	249,599	287,342	303,186	315,088
Estimated total volume of hip and knee arthroplasties [1]	400,000	400,000	400,000	420,000	440,000	448,000	450,000	450,000
Estimated coverage	0.2 %	4.7 %	14.2 %	35.7 %	56.7 %	64.1 %	67.4 %	70.0 %

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Table 1: Percentage of hip and knee arthroplasties performed in Germany and included in the registry over time

1 The estimate is based on the respective annual AQUA and IQTIG quality assurance reports and the case numbers presented in the corresponding treatment activities. From 2012 to 2014 unicondylar knee arthroplasties were not included in the treatment activities; their number was therefore estimated according to their share in the EPRD and added. Since the report year 2018, isolated insert revisions no longer have to be documented for external quality assurance purposes. Thus, the total tables listed since 2018 are also extrapolations.

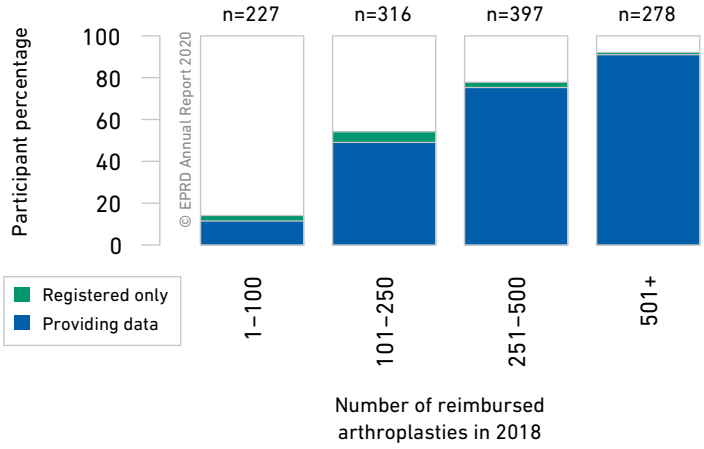


Figure 3: Registry participation by hospital volume[2]. Green bars indicate the percentage of hospitals registered with the EPRD, blue bars the percentage of hospitals providing data. The figures above the bars indicate the number of hospitals in each category.

over the years to the IRD in a data protection-compliant manner such that this data can also be utilised in the future.

The transition to a mandatory registry offers new perspectives. According to the IQTIG quality assurance reports [1] more than 1,200 hospitals perform hip and/or knee arthroplasties and around 750 of them participate in the EPRD. These are predominantly hospitals with high annual case volumes. Hospitals performing only a few arthroplasties each year account for a smaller percentage in the EPRD (see Figure 3). As these institutions must also report their surgical cases in full to a mandatory registry, the IRD will be able to paint a more comprehensive picture of the arthroplasty situation in Germany than the EPRD, as a voluntary institution, is currently able to do.

In brief

- In 2019 more than 315,000 operations documented by 723 hospitals
- 70 % coverage
- Mandatory participation once the IRD registry has been launched

2 Individual hospitals are assigned to an arbitrary size category based on the total number of billed arthroplasties identified by German ICPM (International Classification of Procedures in Medicine) codes 5-820 to 5-823 extracted from the hospitals 2018 quality report.

3 Summary of statistical methodology and data linkage

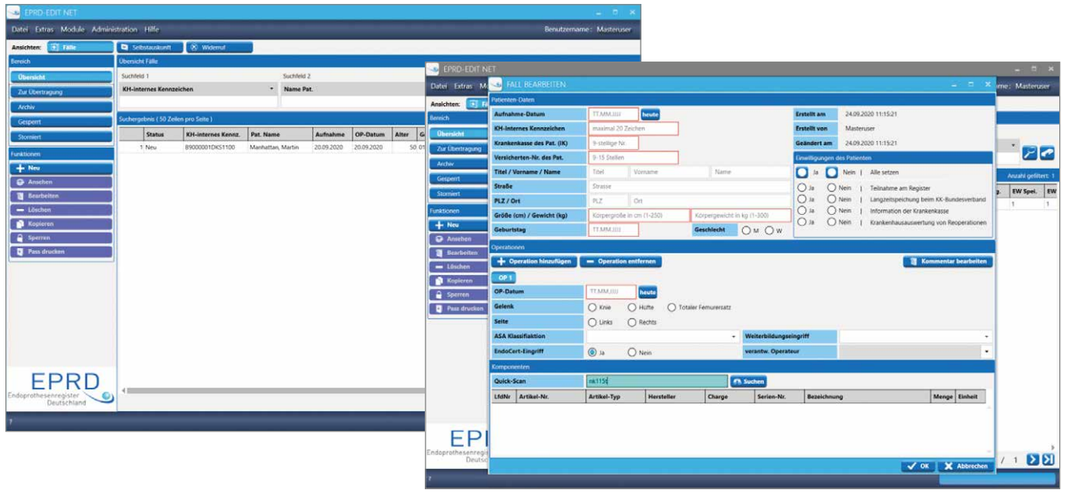
3 Summary of statistical methodology and data linkage

The EPRD receives data from three different sources:

- The main data source are the transmissions of the participating hospitals. After obtaining written informed consent from each patient, the hospitals not only document details of the operation itself, but also details about the patients and the surgically treated joint. In addition, when **documenting the data for the registry** the hospitals also note which implant components were used.

- The participating implant manufacturers enter information on their products into the EPRD **product database**. The database contains not only basic product information, e.g., part number and trade name, but also more detailed classification data, such as material and composition. At present, the product database comprises more than 60,000 products. With the part numbers stored there, it is possible to link the classification information of the database with the registry data sets. This permits the data sets entered into the registry to be categorised and allows arthroplasties with the same characteristics to be summarised for analysis[3].

- In accordance with data protection regulations, the federal associations of health insurance providers cooperating with the EPRD, i. e. the Bundesverband der Allgemeinen Ortskrankenkassen (AOK-Bundesverband GbR) and the Verband der Ersatzkassen e. V. (vdek), supply the EPRD with additional data on the patients insured with them and participating in the EPRD. From the German ICPM and ICD codes contained in this **routine data**, the EPRD can derive details of the procedure and its accompanying circumstances. Relevant censoring events, such as the death of a patient but also subsequent reoperations related to the initial arthroplasty are flagged even if they have not been directly reported in the registry.



Representative example: For registry documentation, hospitals may enter their data via the EPRD-Edit software, among others. Illustrated here are the main window after starting the software (back) and the dialogue window to create a new case (front).

3 The product database is continuously upgraded and improved. As these changes may impact the results of the analyses, older data sets are also re-evaluated for the annual report with the current status of the product database in order to highlight developments over the years. However, this limits any comparison of the outcomes with previous annual reports.

The data of the health insurance providers are not required if – as in the following chapter – the documentation from the previous year is viewed from a purely descriptive perspective and the types of arthroplasties currently preferred are discussed. If, however, as in chapter 5, statements are made about arthroplasty survival, it is absolutely necessary to include the routine data. This is the only way the EPRD, as a voluntary registry that cannot carry out a full census, can ensure a valid analysis. However, since not all health insurance providers participate in the EPRD, and since it takes time, due to the nature of the process, until the participating federal associations of health insurance providers can also provide routine data on an intervention documented in the registry, the number of data sets that can be used for arthroplasty survival analysis is significantly smaller than the total number of data sets compiled in the EPRD.

In order to ensure the highest data quality possible, the EPRD thoroughly reviews incoming data sets and notifies the hospitals of any documentation issues. The routine data of the health insurance providers is also included in the reviews to identify any inconsistencies. In particular for arthroplasty survival analyses, all data sets with contradictory details and other doubts about plausibility are excluded until further notice. This ultimately reduces the number of data sets used in the analyses to 535,000 primary implants and almost 16,000 first revisions.

The hip and knee arthroplasty survival analysis in Chapter 5 looks at three different time frames and end points:

- Time span between primary arthroplasty and first revision for any reason (incl. explantation of components) (sections 5.1 to 5.3): Subsequent (secondary) patellar resurfacing is explicitly not counted as revision, even if during the same procedure the insert was replaced prophylactically. 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. Censoring events include patient death, leg amputation and the termination of the follow-up, e.g., due to the patient changing his/her provider.

- Time span between the primary arthroplasty and subsequent soft tissue surgery (incl. lavage)[4] or secondary patellar resurfacing (section 5.4): In order for a procedure to count as secondary patellar resurfacing, no prosthetic components other than the actual patellar component and an insert must be documented for the procedure. Only data from patients who had not yet undergone patellar resurfacing during primary arthroplasty are included here. In all these analyses, procedures in which prosthetic components are replaced or explanted are regarded as additional censoring events.

- Time span between first and second revision arthroplasty (incl. explantation) (section 5.5): Only revisions of primary arthroplasties already documented in the registry

4 German ICPM codes 5-821.0 and 5-823.0 ("Reoperation (without implant revision)")

are considered. If the first revision was carried out in two stages, i.e. components were explanted and re-implanted at two different dates, the time span is only calculated from the re-implantation date.

Arthroplasty survival trend analysis looks at the probabilities of a primary or secondary revision procedure and of subsequent soft tissue surgery (incl. lavage) or complementary procedure respectively. In the chapters below more detailed information on the illustrations and statistical methods is provided in coloured text boxes at the beginning of the corresponding sections.

In brief

- Arthroplasty survival analyses: Based on 535,000 primary procedures and almost 16,000 first revision arthroplasties followed up
- In addition to the probabilities of first revision arthroplasties, the probabilities of second revision procedures and other reoperations are also studied

4 The 2019 operating year

4 The 2019 operating year

This chapter presents the data reported to the EPRD for the calendar year 2019. For the period from 1 January to 31 December 2019, this amounts to a total of 315,088 procedures.

Table 2 illustrates how this figure breaks down into hip and knee arthroplasties, primary implants and revision surgery/reoperations, supplemented by some basic information on the patients undergoing these procedures.

Over the years the sex ratio has remained constant: the majority of patients, about 60 %, are female. In knee arthroplasties, which all together account for only about 45 % of the procedures documented in the EPRD, the median age of the surgical patients is three years younger than for those who underwent hip surgery. However, the body mass index (BMI) of knee arthroplasty patients is about three points higher than the BMI of patients with hip arthroplasties. For a height of 1.70 m, such a difference in BMI would amount to an additional weight of almost nine kilograms.

The following subchapters detail the data sets of the past year separately for hip and knee arthroplasties as well as primary and repeat surgery, thus presenting the current situation in hip and knee arthroplasty. Developments observed in this respect over the years in the EPRD are highlighted in particular.

	Percentage [%]	Age	m/f [%]	BMI
All registered procedures	100.0 (315,088)	71	40 / 60	28.3
Primary hips	50.0 (157,681)	72	40 / 60	27.1
Hip reoperations	5.7 (17,903)	76	42 / 58	27.2
Primary knees	39.6 (124,677)	69	40 / 60	29.9
Knee reoperations	4.6 (14,462)	70	40 / 60	30.1
Total femur	0.1 (365)	73	35 / 65	28.5

Table 2: Proportion of registered procedures by joint and type of intervention in 2019. Absolute number of data sets in brackets below the percentages.

Presentation of descriptive data

In this chapter, data sets submitted to the EPRD were categorised separately by type of arthroplasty, and the following descriptive parameters were determined for each category:

Parameter	Description
Proportion [%]	Percentage of the procedures in each category
Age	Median age in years of patients in this category. Thus, at least 50 % of patients in this category are not older and at least 50 % are not younger than this age.
m/f [%]	Percentage of male and female patients in this category
BMI	Median BMI of patients in this category. In each case, the figure refers to the subgroup of these patients for whom valid data on weight and height had been provided.

Classification into the various arthroplasty categories is based on the products documented for the procedure and the classification information stored in the product database. As a rule, the categories are designed so that they do not overlap. In total, the percentages given usually add up to 100 % and refer to the total number of data sets to which the corresponding analysis rule could be applied. If analysis rules could not be applied because, for example, not all essential products were classified, these data sets were excluded from the analysis.

	Percentage [%]	Age	m/f [%]	BMI
Category A	95.9	72	40 / 60	27.1
Category B	2.3	66	38 / 62	25.7
Subcategory B1	0.3	57	50 / 50	26.3
Subcategory B2	1.8	69	36 / 64	25.6
Subcategory B3	0.1	52	25 / 75	25.8

As illustrated by the following example, results of the descriptive analyses are presented as a mix of tables (numerical values for the parameters) and graphs (additional visual elements). In addition to numeric percentage values, percentages are also displayed as horizontal bars relative to a left hand side baseline. The greater the percentage, the longer the bar. Median age and median BMI are symbolised by additional horizontal lines in the "Age" and "BMI" columns respectively, covering the range 50 to 90 years and 20 to 35 points. The further left a line is, the younger the patients are or the lower the BMI of the patients in this category. The sex ratio is visualised by two complementary bars: The light blue bar on the left represents the male patients, while the pink bar on the right stands for the female patients. If the light blue bar dominates, the patients in this category are predominantly male; if the pink bar dominates, they are predominantly female.

If the table includes indented category names, the above rule that the percentages shown in a table always add up to 100 % does not apply. Indented category names indicate subcategories of the category previously listed but not indented. Apart from rounding errors, the sum of the shares of the subcategories again equals the share of their parent category.

4.1 Primary hip arthroplasty

In 2019, the EPRD registered 157,681 primary hip arthroplasties. Table 3 breaks down the surgical patients by age and sex. Overall, men accounted for 40 %. The older the patients are, the smaller the percentage of men. However, among patients up to 54 years of age, men are more prevalent than women.

Table 4 indicates whether the patients had undergone any previous surgery, and if so, what kind. However, significant previous operations were the exception. Only 3.5 % of patients had documented previous operations. About half of these cases involved internal fixation or osteotomy of the femur.

The choice of arthroplasty and its characteristics primarily depended on the individual patient treated. Figure 4 is a representative example of how the age of the patient impacts the choice of fixation and the type of stem.

Over the years, there have also been some sustained developments in the EPRD regarding the choice of arthroplasty and implant characteristics:

- In the EPRD there is a continuing trend in total and partial arthroplasty towards fully uncemented fixation. In total hip arthroplasty (THA), the percentage of fully uncemented arthroplasties has risen by 3.6 points over the past five years, and in hemiarthroplasty by as much as roughly five points.

	Percentage [%]	Age	m/f [%]	BMI
All primary hip arthroplasties	100.0	71	40 / 60	27.0
<45 years	1.7		54 / 46	27.2
45–54 years	7.5		53 / 47	28.1
55–64 years	20.6		49 / 51	28.2
65–74 years	28.3		40 / 60	27.7
75–84 years	32.9		34 / 66	26.2
85 years and older	9.0		29 / 71	24.7
Men	40.1	69	100 / 0	27.7
Women	59.9	73	0 / 100	26.5

Table 3: Primary hip arthroplasties in 2019 by patient age and sex

	Percentage [%]	Age	m/f [%]	BMI
No previous surgery	96.5	72	40 / 60	27.0
Osteosynthesis / Osteotomy	2.1	67	39 / 61	25.9
Pelvis	0.3	57	48 / 52	26.7
Femur	1.7	70	38 / 62	25.7
Pelvis and femur	0.1	56	34 / 66	26.2
Femoral head necrosis	0.2	61	53 / 47	26.9
Arthrodesis	<0.1	74	41 / 59	26.6
Other previous surgery	1.1	67	42 / 58	26.9

Table 4: Previous surgeries reported for primary hip arthroplasties in 2019

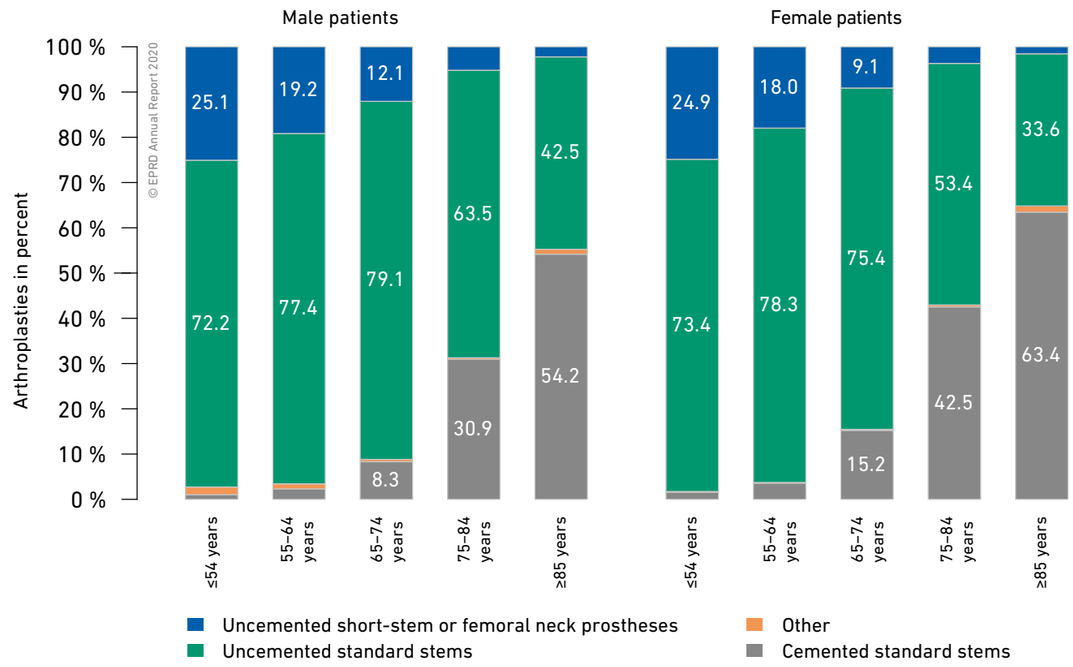


Figure 4: Total hip arthroplasties by patient age, sex, and type of stem and fixation in 2019. The collective term "standard stems" covers standard femoral stems with modular heads as well as modular femoral stems.

Now at 21.1 %, uncemented hemiarthroplasties are still the exception.

- The use of short stems also continues to increase in the EPRD. In 2019, 10.4 % of total hip arthroplasties were documented as short stemmed. In 2015 their share was still only 6.6 %.

- In the EPRD the use of monoblock cups has decreased by 4.3 percentage points over the last five years. The modular and dual-mobility cup systems have gained whatever percentage the monoblock cups have lost. During this period, the former increased their share from 0.4 % to 1.2 %.

- In the EPRD, total arthroplasty still mainly used the three different head sizes: 28 mm, 32 mm and 36 mm. Within this size range, however, there is a clear shift towards the larger heads: within five years, the use of 36-mm heads has increased steadily from 31.4 % to the present 39.3 %.

- The following trends can be observed regarding the materials of those components relevant for tribological bearings: for their heads, total hip arthroplasties increasingly rely on ceramic and less on metallic components. With 88.8 %, ceramic heads reached a new record in 2019. In the case of cup inserts, however, ceramic components are losing

more and more ground, just like their counterparts made of conventional or moderately cross-linked polyethylene. Inserts made of highly cross-linked polyethylene – both with and without additional antioxidants – have seen their share increase considerably in recent years. In 2019, they accounted for a combined share of 74 % (compared to about 52 % five years earlier).

In brief

- 78.4 % of total hip arthroplasties are uncemented
- 10.4 % use short stems
- 88.8 % use standard ceramic heads
- 39.3 % use 36-mm heads
- Slight increase in dual-mobility cup systems

Tables 5 to 15 provide a detailed overview of the different types of arthroplasties performed in 2019 and the corresponding patient characteristics.

	Percentage [%]	Age	m/f [%]	BMI
Total	90.2	70	41 / 59	27.3
Hemi-hip	9.8	84	31 / 69	24.3

Table 5: Types of primary hip replacements in 2019

	Percentage [%]	Age	m/f [%]	BMI
Uncemented	78.4	67	44 / 56	27.6
Hybrid	15.2	78	30 / 70	26.3
Cemented	4.8	81	26 / 74	25.7
Reverse-hybrid	1.2	76	26 / 74	26.6
Unknown	0.3	69	41 / 59	27.4

Table 6: Fixations in primary total hip arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Cemented	78.5	84	30 / 70	24.2
Uncemented	21.1	84	33 / 67	24.5
Unknown	0.4	74	33 / 67	25.3

Table 7: Fixations in primary hip hemiarthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Hip stem with modular head (standard)	87.5	71	40 / 60	27.3
Short stem	10.4	62	49 / 51	27.7
Femoral neck prosthesis	0.9	59	53 / 47	27.8
Revision or tumour stem	0.4	77	36 / 64	26.0
Modular stem	0.4	74	41 / 59	27.1
Resurfacing head	0.2	57	97 / 3	27.8
Unknown	0.2	64	45 / 55	27.8

Table 8: Stem types in primary total hip arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Modular cup	87.7	69	42 / 58	27.4
Monoblock cup	10.1	76	35 / 65	26.8
Dual mobility	1.2	79	35 / 65	26.0
Revision cup	0.9	71	35 / 65	26.4
Resurfacing cup	0.1	56	100 / 0	27.8
Unknown	<0.1	66,5	53 / 47	29.5

Table 9: Acetabular components in primary total hip arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Without reconstruction shell	99.8	70	41 / 59	27.3
With reconstruction shell	0.2	77	37 / 63	25.7

Table 10: Reconstruction shells in primary total hip arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
28 mm	5.3	72	14 / 86	26.6
32 mm	54.7	71	32 / 68	27.1
36 mm	39.3	69	57 / 43	27.7
Other diameters	0.3	74	20 / 80	25.3
Unknown	0.4	61	76 / 24	27.8

Table 11: Head sizes in primary total hip arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
hXLPE	55.1	70	41 / 59	27.3
hXLPE+antioxidant	18.9	69	43 / 57	27.5
PE	9.1	77	33 / 67	26.7
Ceramic	8.6	63	46 / 54	27.6
mXLPE	7.7	73	41 / 59	27.2
Metal	0.2	57	97 / 3	27.8
Unknown	0.2	76	34 / 66	26.8

Table 12: Acetabular bearing materials in primary total hip arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Ceramic	88.8	69	42 / 58	27.4
Metal	8.2	79	36 / 64	26.3
Ceramicised metal	2.8	69	41 / 59	27.7
Unknown	0.1	70	44 / 56	27.5

Table 13: Modular heads in primary total hip arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Ceramic / hXLPE	48.2	69	41 / 59	27.4
Ceramic / hXLPE+antioxidant	18.4	69	43 / 57	27.5
Ceramic / ceramic	8.6	63	46 / 54	27.6
Ceramic / mXLPE	6.8	72	42 / 58	27.3
Ceramic / PE	6.7	75	34 / 66	27.0
Metal / hXLPE	4.3	79	37 / 63	26.4
Ceramicised metal / hXLPE	2.5	68	42 / 58	27.8
Metal / PE	2.1	81	29 / 71	25.7
Metal / mXLPE	0.9	80	33 / 67	26.5
Metal / hXLPE+antioxidant	0.5	78	36 / 64	26.9
Ceramicised metal / PE	0.3	77	29 / 71	27.0
Metal / Metal	0.2	57	97 / 3	27.8
Ceramicised metal / hXLPE+antioxidant	<0.1	62	41 / 59	29.9
Ceramicised metal / mXLPE	<0.1	80	25 / 75	26.0
Ceramicised metal / ceramic	<0.1	50	0 / 100	29.7
Unknown	0.4	73	38 / 62	27.2

Table 14: Bearing materials in primary total hip arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Metal	94.9	84	31 / 69	24.2
Ceramic	4.4	83	32 / 68	24.7
Ceramicised metal	0.5	83	36 / 64	24.9
Unknown	0.2	86	30 / 70	21.5

Table 15: Modular head materials in primary hip hemiarthroplasties in 2019

4.2 Hip arthroplasty reoperations

For 2019, data sets on a total of 17,903 hip arthroplasty reoperations were submitted to the EPRD. 2,842 of these documented procedures concerned explantations and re-implantation in two-stage revision arthroplasties, with significantly more re-implantations (1,791) documented than explantations (1,051). It can only be extrapolated that the registry was sometimes not notified of explantation procedures.

Table 16 presents the age and sex distribution of patients who had undergone reoperations in 2019. Table 17 lists the reasons given by surgeons when documenting their procedures in the registry. The most common reasons for reoperations are loosening (27.0 %), infection (15.5 %), periprosthetic fracture (12.1 %), and dislocation (11.9 %).

Table 18 summarises which components were replaced or newly implanted during the reoperations. In 27.0 % of procedures, the arthroplasty had to be completely replaced. In as many as 74.1 % of procedures, at least one of the components anchored in the bone, i.e. the stem or cup component, had to be replaced or augmented. The head component was left untouched in only a few reoperations, but was replaced in the vast majority of cases (96.4 %). In 31.7 % of reoperations, at least one implant component specially designed for revision procedures was used.

	Percentage [%]	Age	m/f [%]	BMI
All hip reoperations	100.0	76	42 / 58	27.1
<45 years	1.7		55 / 45	26.8
45–54 years	5.1		52 / 48	28.7
55–64 years	15.5		52 / 48	28.6
65–74 years	24.0		45 / 55	28.1
75–84 years	40.9		38 / 62	26.7
85 years and older	12.8		28 / 72	25.0
Men	41.5	73	100 / 0	27.7
Women	58.5	77	0 / 100	26.7

Table 16: Hip reoperations in 2019 by patient age and sex

	Percentage [%]	Age	m/f [%]	BMI
Infection	15.5	74	50 / 50	28.3
Loosening	27.0	76	40 / 60	27.2
Cup	14.6	76	34 / 66	26.9
Stem	9.7	75	49 / 51	27.7
Cup and stem	2.7	77	43 / 57	26.8
Osteolysis with fixed component	0.8	74	47 / 53	26.8
Cup	0.3	74	41 / 59	27.2
Stem	0.3	72	49 / 51	26.0
Cup and stem	0.2	74	54 / 46	26.8
Periprosthetic fracture	12.1	80	34 / 66	25.7
Dislocation	11.9	78	34 / 66	26.5
Wear	8.0	74	42 / 58	27.5
Component failure	2.0	72	44 / 56	27.5
Malalignment	1.8	75	32 / 68	27.4
Progression of arthrosis	0.5	68	47 / 53	26.1
Condition after removal	10.0	72	50 / 50	27.5
Other reasons	10.4	74	41 / 59	26.7

Table 17: Reasons for hip reoperations in 2019

	Percentage [%]
Stem, head, cup, insert	27.0
Head, cup, insert	23.2
Head, insert	16.6
Stem, head	14.9
Head	7.9
Stem, head, insert	6.8
Cup, insert	2.2
Insert	0.8
Accessory parts only (e.g. screws)	0.5

Table 18: Components replaced or complemented[5] in hip reoperations in 2019

In brief

- The most common reasons for reoperations: loosening (27.0 %), infection (15.5 %), periprosthetic fracture (12.1 %), and dislocation (11.9 %)
- In 74.1 % of revisions, at least one component anchored in the bone had to be replaced

5 As a matter of principle, the EPRD only registers the components implanted, but not those explanted. Thus, in order to draw conclusions about the explanted components, data presented in table 18 are based on products documented at the time of the reoperation. If, for example, a new stem is documented, it may be assumed that the existing stem had to be replaced. Only surgical documentation identifying all items in the product database are considered here because only then is this conclusion possible.

4.3 Primary knee arthroplasty

In 2019 a total of 124,677 primary knee arthroplasties were documented in the EPRD. Table 19 and Table 20 summarise the patients treated and any significant previous surgery. The median BMI of EPRD patients with knee arthroplasties is about 30. For younger patients this figure is slightly higher, while for older patients it is somewhat lower. According to the classification of the World Health Organisation (WHO), someone with a BMI of 30 or more is considered obese. Roughly half the patients operated on would therefore be classified as obese, which underlines the fact that premature wear and tear of the knee joint is often due to severe obesity.

As can be seen from the EPRD data, knee arthroplasty primarily involves two types of procedures, total and unicondylar knee arthroplasty. As Figure 5 demonstrates, the decision as to which type of arthroplasty will be used not only seems to depend on the severity of joint wear, but also on the age and sex of the patient.

Akin to hip arthroplasties, knee arthroplasties appear to have undergone certain developments over time as regards type and characteristics:

	Percentage [%]	Age	m/f [%]	BMI
All primary knee arthroplasties	100.0	69	40 / 60	29.8
<45 years	0.6		39 / 61	31.0
45–54 years	7.8		39 / 61	32.3
55–64 years	26.1		45 / 55	31.5
65–74 years	33.1		39 / 61	30.2
75–84 years	29.7		36 / 64	28.1
85 years and older	2.7		34 / 66	26.5
Men	39.8	68	100 / 0	29.4
Women	60.2	70	0 / 100	30.2

Table 19: Primary knee arthroplasties in 2019 by patient age and sex

	Percentage [%]	Age	m/f [%]	BMI
No prior surgery	92.6	70	39 / 61	29.8
Osteosynthesis / Osteotomy	1.8	64	50 / 50	29.2
Femur	0.3	67	48 / 52	29.4
Tibia	1.2	63	50 / 50	29.3
Patella	0.1	64	43 / 57	28.9
Several locations	0.2	61	55 / 45	28.4
Capsule and ligaments	1.8	61	59 / 41	29.2
Arthrodesis	<0.1	72	42 / 58	30.9
Other prior surgery	3.8	65	46 / 54	29.4

Table 20: Prior surgeries reported for knee arthroplasties in 2019

- Over the past few years, the share of unicondylar knee arthroplasties in the EPRD has grown steadily across all age groups. With a total share of 13.5 % in 2019, these arthroplasties where usually only the medial compartment of the knee joint is replaced, less often only the lateral compartment, reached a new peak. In 2015 their share was still only 9.1 %.

- The trend towards fully cemented total knee arthroplasties continues. In only 5.5 % of the total knee arthroplasties documented, both the femoral and tibial components were not cemented.

- In terms of the type of knee system selected, the EPRD shows a slight increase in the use of posterior stabilised and pivot systems. With shares of 19.0 % and 2.1 % respectively, they are now about five and one percentage point respectively higher than three years ago.

- The declining use of mobile platforms in recent years has continued. This is true for both total and unicondylar knee arthroplasties. With a share of 14.2 % for total arthroplasties and 60.2 % for unicondylar types, they have lost more than five and even more than ten percentage points respectively in recent years.

- The trend towards the use of highly cross-linked polyethylenes is also evident in knee arthroplasty, although it is not as marked as in hip arthroplasty. Since 2015, highly cross-linked polyethylenes have increased their share in total knee arthroplasties from 10.9 % to 17.8 %, and from 2.1 % to 9.4 % in unicondylar arthroplasties. The greatest single increase was seen with unicondylar arthroplasties, specifically with the antioxidant-enriched variants. While these have only been documented in the registry since 2017, in 2019 they already accounted for 8.2 %.

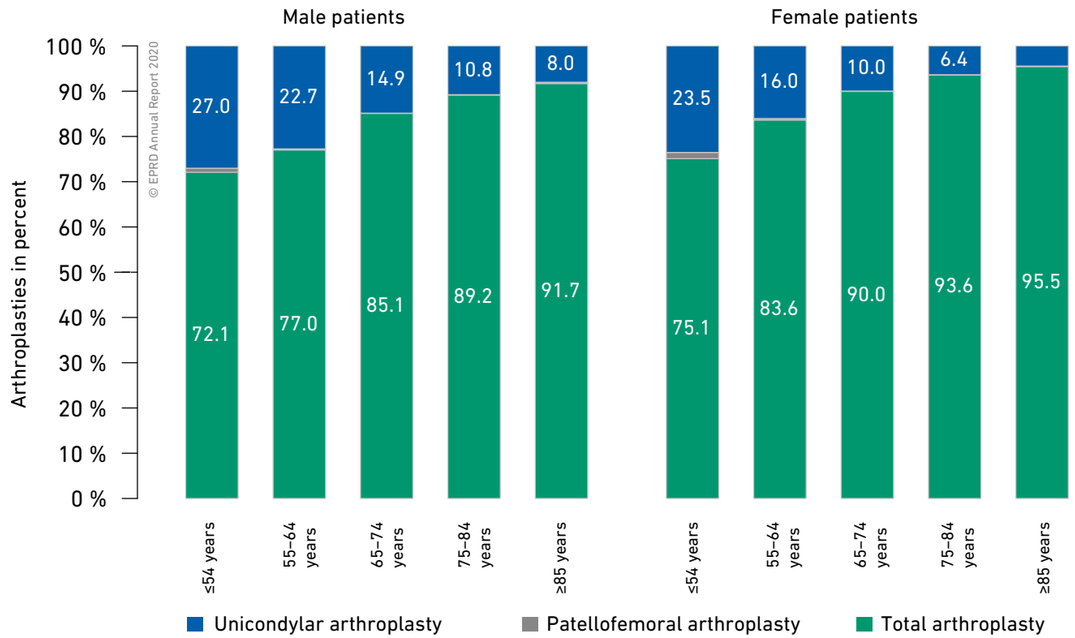


Figure 5: Knee arthroplasties by patient age, sex and type of procedure in 2019

	Percentage [%]	Age	m/f [%]	BMI
Total	86.3	70	38 / 62	29.9
Unicondylar	13.5	64	50 / 50	29.4
Femoro-patellar	0.2	56	33 / 67	27.8
Other	<0.1	65.5	100 / 0	30.9

Table 21: Types of primary knee replacements in 2019

- In 2019, as in the previous year, primary total knee arthroplasty (TKA) included patellar resurfacing in 11.1 % of the cases documented in the EPRD. Compared to previous years, this represents a slight increase of up to one percentage point. However, in the case of primary patellar resurfacing, the hospitals are quite heterogeneous: Approximately three-quarters of the participating hospitals perform it only in no more than every twentieth TKA patient; every twentieth hospital, however, performs it in more than every other patient. Primary total knee arthroplasty with patellar resurfacing is performed significantly more often in high-volume hospitals.

In brief

- 94.5 % of primary total knee arthroplasties are fully cemented
- 13.5 % of knee arthroplasties are unicondylar
- Increasing use of highly cross-linked polyethylene
- 11.1 % of total knee arthroplasties with patellar resurfacing

Tables 21 to 33 detail the knee arthroplasties documented for 2019.

	Percentage [%]	Age	m/f [%]	BMI
Unconstrained systems	94.6	70	39 / 61	30.0
Cruciate retaining	42.9	70	40 / 60	30.1
Posterior stabilised	19.0	70	38 / 62	30.0
Cruciate retaining/sacrificing	17.0	70	39 / 61	29.8
Cruciate sacrificing	13.6	70	37 / 63	30.1
Pivot	2.1	69	40 / 60	29.6
Constrained systems	5.3	74	28 / 72	28.9
Hinged	3.1	76	25 / 75	28.4
Varus–valgus stabilised	2.1	72	32 / 68	29.4
Unknown	0.1	68.5	35 / 65	29.9

Table 22: Grade of constraint in primary total knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Cemented	94.5	70	38 / 62	29.9
Hybrid	4.3	69	45 / 55	30.0
Uncemented	1.0	68	38 / 62	29.4
Reverse-hybrid	<0.1	68	14 / 86	28.7
Unknown	0.1	71	21 / 79	28.2

Table 23: Fixations in primary total knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Cemented	87.8	64	49 / 51	29.4
Uncemented	11.3	64	60 / 40	29.4
Hybrid	0.7	66.5	38 / 62	29.1
Unknown	0.2	63	64 / 36	30.0

Table 24: Fixations in primary unicondylar knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Fixed	85.6	70	38 / 62	29.9
Mobile	14.2	70	38 / 62	29.8
Unknown	0.2	75	26 / 74	28.0

Table 25: Bearing mobility in primary total knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Mobile	60.2	64	50 / 50	29.6
Fixed	39.8	63	50 / 50	29.1

Table 26: Bearing mobility in primary unicondylar knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Without patellar resurfacing	88.9	70	39 / 61	29.9
With patellar resurfacing	11.1	70	36 / 64	30.0

Table 27: Patellar resurfacing in primary total knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Uncoated metal	91.3	70	40 / 60	29.8
Coated metal	5.1	67	18 / 82	30.8
Ceramicised metal	3.5	65	26 / 74	30.5
Ceramic	<0.1	64	13 / 87	31.3
Unknown	0.1	73	14 / 86	30.1

Table 28: Femoral bearing materials in primary total knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
PE	45.7	70	38 / 62	29.8
mXLPE	36.2	70	38 / 62	29.8
hXLPE	10.7	68	38 / 62	30.1
hXLPE+antioxidant	7.1	68	42 / 58	30.0
mXLPE+antioxidant	0.2	70	36 / 64	31.2

Table 29: Tibial bearing materials in primary total knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Uncoated metal / PE	41.6	71	40 / 60	29.8
Uncoated metal / mXLPE	33.1	71	40 / 60	29.7
Uncoated metal / hXLPE	9.5	69	38 / 62	30.1
Uncoated metal / hXLPE+antioxidant	6.9	68	43 / 57	29.9
Coated metal / mXLPE	3.1	66	15 / 85	31.1
Ceramicised metal / PE	2.3	65	20 / 80	30.9
Coated metal / PE	1.8	69	22 / 78	30.1
Ceramicised metal / hXLPE	1.2	65	35 / 65	30.1
Uncoated metal / hXLPE+antioxidant	0.2	64	14 / 86	31.2
Uncoated metal / mXLPE+antioxidant	0.2	70	36 / 64	31.2
Ceramic / PE	<0.1	64	13 / 87	31.3
Unknown	0.1	73	14 / 86	30.1

Table 30: Bearing materials in primary total knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Uncoated metal	88.5	64	52 / 48	29.3
Coated metal	9.4	60	33 / 67	30.1
Ceramicised metal	2.1	61	37 / 63	29.3

Table 31: Femoral bearing materials in primary unicondylar knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
mXLPE	75.2	64	49 / 51	29.4
PE	15.4	62	50 / 50	29.3
hXLPE+antioxidant	8.2	64	52 / 48	29.3
hXLPE	1.2	63	51 / 49	29.0

Table 32: Tibial bearing materials in primary unicondylar knee arthroplasties in 2019

	Percentage [%]	Age	m/f [%]	BMI
Uncoated metal / mXLPE	66.4	65	51 / 49	29.4
Uncoated metal / PE	12.7	63	54 / 46	29.3
Coated metal / mXLPE	8.8	60	34 / 66	30.1
Uncoated metal / hXLPE+antioxidant	8.2	64	52 / 48	29.3
Ceramicised metal / PE	2.1	61	37 / 63	29.3
Uncoated metal / hXLPE	1.2	63	51 / 49	29.0
Coated metal / PE	0.6	61	25 / 75	29.4

Table 33: Bearing materials in primary unicondylar knee arthroplasties in 2019

4.4 Knee arthroplasty reoperations

Of the 14,462 reoperations on the knee joint reported to the EPRD in 2019, 11,767 were performed in a single procedure. The other documented reoperations comprise 952 explantations and 1,741 implantations as part of two-stage revision procedures. Table 34 and Table 35 provide an overview of those patients in 2019 who underwent surgery of their existing knee arthroplasty, including the reasons for the reoperation. As with hip arthroplasty, loosening (23.9 %) and infections (14.5 %) are the most frequently noted reasons for knee arthroplasty reoperations.

Table 36 summarises which components of the reoperations were replaced or newly implanted during the reoperations considered. In almost every other reoperation, all major components were replaced. In 57.8 % of cases, at least one of the components anchored in the femur or tibia had to be replaced. Straight insert replacement accounted for another 20 % of the reoperations. In 14.4 % of reoperations, patellar resurfacing and at most one new insert were implanted, presumably to augment the previous arthroplasty. Hinged or varus-valgus stabilised knee systems account for a significantly higher share of 31.2 % in reoperations than in primary knee arthroplasties (5.3 %; see Table 22).

In brief

- Almost 50 % of knee arthroplasties are replaced completely
- Reasons for knee reoperations primarily included loosening (23.9 %), infection (14.5 %) and instability (8.5 %)

	Percentage [%]	Age	m/f [%]	BMI
All knee reoperations	100.0	70	40 / 60	30.0
<45 years	1.1		39 / 61	28.7
45–54 years	8.5		40 / 60	31.1
55–64 years	23.9		44 / 56	31.4
65–74 years	30.4		42 / 58	30.8
75–84 years	31.2		38 / 62	28.7
85 years and older	4.9		25 / 75	26.8
Men	40.2	69	100 / 0	29.5
Women	59.8	71	0 / 100	30.5

Table 34: Knee reoperations in 2019 by patient age and sex

	Percentage [%]	Age	m/f [%]	BMI
Infection	14.5	72	50 / 50	29.6
Loosening	23.9	70	40 / 60	30.3
Femoral component	4.6	70	45 / 55	29.7
Tibial tray	8.9	68	36 / 64	31.0
Patellar component	0.6	70.5	44 / 56	30.5
Several components	9.8	71	40 / 60	30.0
Osteolysis with fixed component	1.2	71.5	39 / 61	29.7
Femoral component	0.2	70	51 / 49	30.4
Tibial tray	0.4	73	37 / 63	28.9
Patellar component	0.2	67.5	35 / 65	30.4
Several components	0.4	75.5	35 / 65	29.9
Periprosthetic fracture	3.2	78	20 / 80	27.8
Ligament instability	8.5	68	32 / 68	30.2
Wear	5.9	72	38 / 62	30.1
Component failure	2.1	69	38 / 62	31.1
Malalignment	1.7	67	32 / 68	30.1
Restricted mobility	4.5	67	37 / 63	30.3
Progression of arthrosis	5.6	69	35 / 65	30.1
Condition after removal	12.0	70	48 / 52	29.7
Other reasons	16.8	68	39 / 61	30.0

Table 35: Reasons for knee reoperations in 2019

	Percentage [%]
Femoral component, tibial tray, insert	42.3
Insert	20.0
Patellar replacement	7.7
Insert, patellar replacement	6.7
Femoral component, tibial tray, insert, patellar replacement	6.5
Tibial tray, insert	4.7
Accessory parts only (e.g. screws)	2.4
Femoral component, insert	2.3
Femoral component	1.1
Tibial tray, insert, patellar replacement	0.4
Femoral component, insert, patellar replacement	0.4
Femoral component, patellar replacement	0.1

Table 36: Components replaced or complemented[6] during knee reoperations in 2019

6 Since the EPRD in principle only covers those components which have been implanted, but not those explanted, data presented in table 36 are based on explanted components that can be inferred from products documented during the reoperations, for example, if a new tibial component was documented.

5 Hip and knee arthroplasty survival

5 Hip and knee arthroplasty survival

One important quality indicator for hip and knee arthroplasties is survival rate. Arthroplasty survival is defined as that period during which prostheses remain unchanged in the patient body before they fail and revision surgery becomes necessary. As most cases are still being followed up at present, this chapter will present the probabilities of having to replace arthroplasty components after the initial implantation (see sections 5.1 to 5.3) or after a revision procedure (see section 5.5). The subsequent section 5.4 discusses how likely other reoperations – especially the secondary patellar resurfacing – are after primary arthroplasty. Since the EPRD does not consider such other reoperations as revisions and thus not as the end of arthroplasty "survival", they are not included in the usual analyses. However, the patient must undergo an additional surgery procedure. For this reason, they are worth considering separately.

Regarding the outcomes presented in the following sections, it should be noted that the EPRD registry is still young despite almost eight years of data collection. As such, its statements only apply to the first few years after arthroplasty. Arthroplasties with positive short-term outcomes will not necessarily perform equally well in the medium and long run. In addition, the implants and their characteristics are not the only decisive factors for the success in arthroplasties: As explained in section 5.1, the patient and the hospital in which the procedure was performed can also have a significant impact on the success of the surgery, especially during the early phase, and this can override the role of the implant systems. This is particularly important for the correct assessment of the results of the specific implant systems listed in section 5.3.

Calculation of revision and other reoperation probabilities

The EPRD defines a "revision" as any arthroplasty that subsequently requires revision surgery. Kaplan-Meier estimators are used to calculate the probability that no such (re) operation will be required within a certain time frame after the primary arthroplasty or the primary revision surgery, and that the arthroplasty will therefore remain in place.

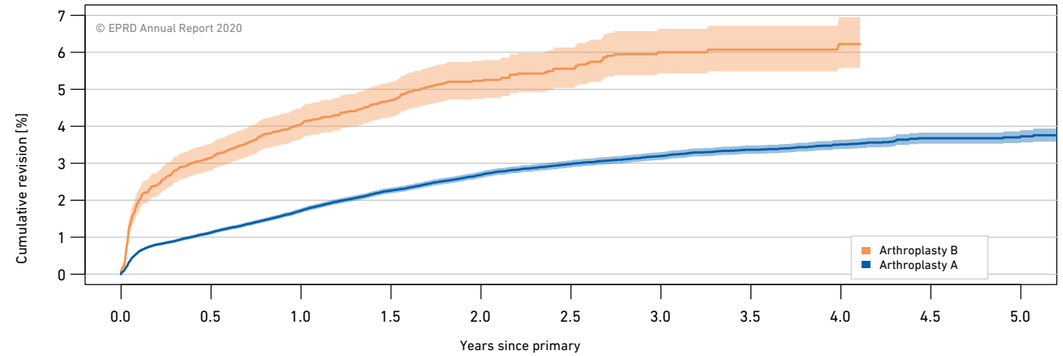
It is taken into account that

- at the time of the analysis the monitoring of the arthroplasty has not yet been completed in most cases and
- that events such as patient death or amputation of the leg may completely prevent any follow-up of the arthroplasty.

The same procedure is used to calculate the probability of other reoperations, with a distinction being made between different types of reoperation. Revision operations are regarded as additional censoring events and taken into account accordingly.
The results of the estimates are presented as figures and tables (see the following sections). The complementary probabilities of the Kaplan-Meier estimators, i.e., the cumulative probabilities of arthroplasty revision or other reoperations, are presented together with their 95 % confidence intervals.
In addition to the confidence intervals referenced to the respective point in time, the p-value of the test for parity of revision and other reoperation probabilities over the entire course of the arthroplasty is determined and specified.

Graphical representation of revision and other reoperation probabilities

The graphical representation of revision and other reoperation probabilities in this report is provided as shown in the following example. The legends below the graphs also show how many arthroplasties were still followed up at the time in question, i.e., how many arthroplasties had already been followed up over a correspondingly long period without revision or the patient terminating the follow-up for other reasons.



Numbers at risk											
Arthroplasty B	9,005	7,529	6,202	4,912	3,689	2,652	1,754	1,089	600		
Arthroplasty A	171,463	148,571	125,344	99,110	78,134	56,072	38,867	23,236	13,687	6,230	3,527

Representative example of the revision probability of two arthroplasty subgroups. Below the graph displaying revision probabilities with their corresponding 95 % confidence intervals, a table lists the actual number of arthroplasties under observation at any of the given time points examined.

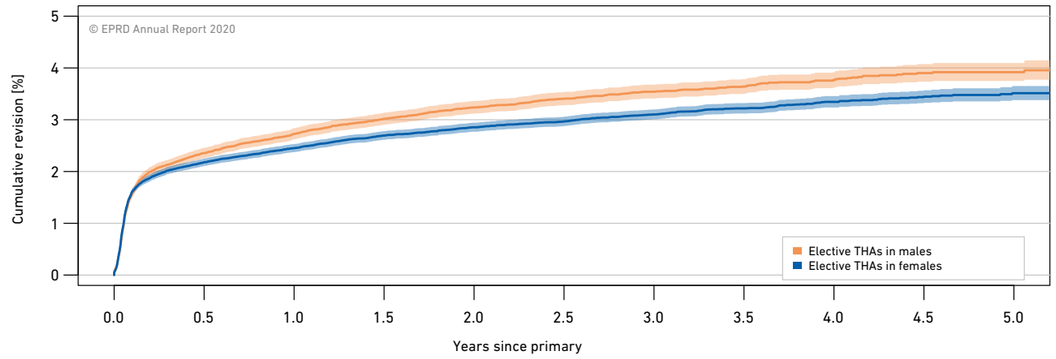
Revision probabilities shown in the figures of section 5.1 are based on at least 500 arthroplasties under observation. If more than three curves are shown in any one figure, the confidence intervals are omitted in order to provide a better overview.

5.1 Impact of non-implant related factors

In addition to the types of arthroplasties and types of implants used, patient factors and hospital-specific parameters play an important role in the revision probability. For example, for most types of arthroplasties, the EPRD demonstrates a higher risk in male patients than in female patients (see figure 6 and figure 7). The only exceptions are partial knee arthroplasties, where no such correlation can be found *(p = 0.15)*.

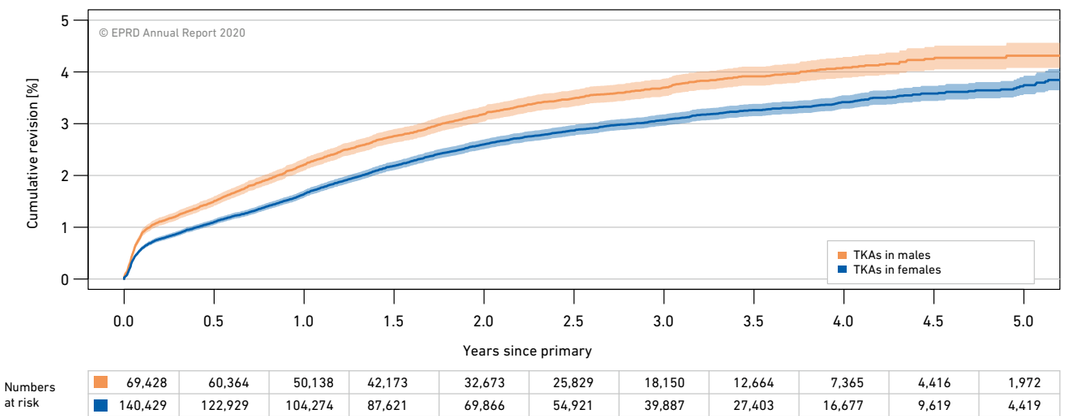
Patient age also plays a significant role in the revision probability. However, there is no uniform correlation in hip and knee arthroplasties. While an increased revision probability is to be expected for older patients with uncemented hip arthroplasties (see figure 20 in section 5.2.1), the opposite is true for total knee arthroplasties, with younger patients exhibiting increased revision probabilities (figure 8).

Patient height and weight have only been documented in the EPRD since 2017. The BMI derived from this data is therefore only



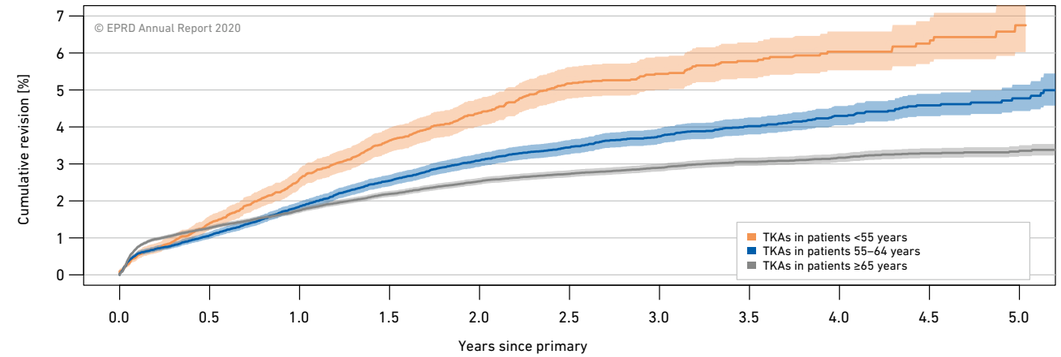
Numbers at risk											
93,704	80,244	67,323	56,495	44,838	35,265	25,227	17,339	10,236	6,080	2,813
158,146	135,311	115,002	96,253	77,631	60,728	44,626	30,230	18,563	10,704	5,142

Figure 6: Revision probabilities of elective total hip arthroplasties by sex *(p < 0.0001)*



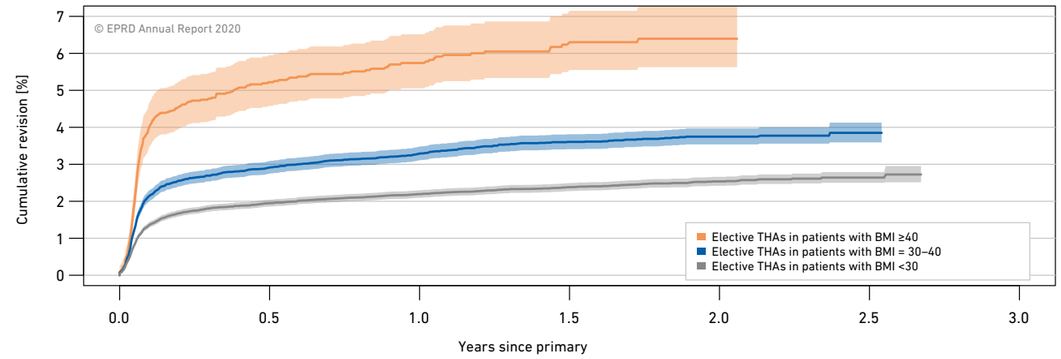
Numbers at risk											
69,428	60,364	50,138	42,173	32,673	25,829	18,150	12,664	7,365	4,416	1,972
140,429	122,929	104,274	87,621	69,866	54,921	39,887	27,403	16,677	9,619	4,419

Figure 7: Revision probabilities of total knee arthroplasties by sex *(p < 0.0001)*



Numbers at risk											
15,320	13,372	11,190	9,359	7,387	5,758	4,099	2,793	1,724	1,085	523
48,711	42,667	35,445	29,787	23,302	18,449	13,123	9,186	5,497	3,265	1,521
145,826	127,254	107,777	90,648	71,850	56,543	40,815	28,088	16,821	9,685	4,347

Figure 8: Revision probabilities of total knee arthroplasties by patient age *(p < 0.0001)*



Numbers at risk							
4,255	3,170	2,276	1,428	605		
39,078	29,840	21,078	13,402	5,658	612	
88,902	68,576	48,598	31,143	13,025	1,555	

Figure 9: Revision probabilities of elective total hip arthroplasties by body mass index *(p < 0.0001)*

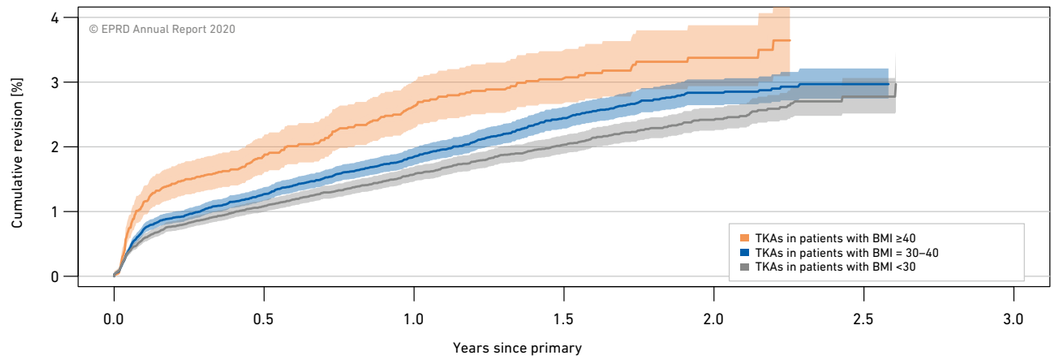
available for slightly more than half of the data sets that can be used for arthroplasty survival analyses and only for a maximum follow-up period of three years. Nevertheless, this already shows that the BMI has a considerable impact on the revision probability, particularly in hip arthroplasties.

As is evident from figures 9 and 10, it is even possible to identify differences between the different classes of obesity.

In addition to the data documented directly in the EPRD by the hospitals, the EPRD also receives additional data from the participating health insurance providers.

This includes a detailed list of all diagnoses documented during the hospital stay. These allow an assessment of the general health status of each patient, for example, by counting how many relevant comorbidities were present from a predefined set of

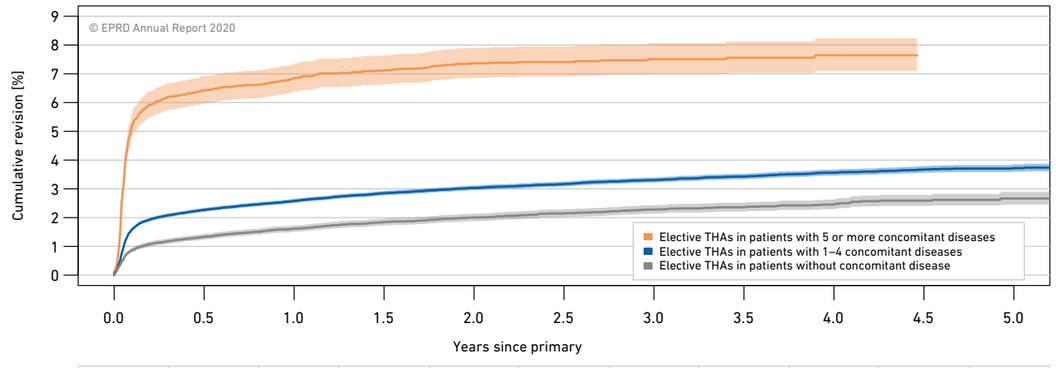
disorders[7]. As demonstrated in figures 11 and 12, even this simplistic approach results in significant differences in the revision probability between patient groups. However, it should be noted that the patients with at least five concomitant diseases were significantly older and heavier than the other patients. Thus, the impact of age and BMI described above also plays a role. For all types of arthroplasties the volume performed by a hospital also affects the risk of revision procedures [2]. The EPRD does not have any data on how many surgeons operate in a hospital and how many procedures each of them performs. However, the hospital quality assurance reports provide data on the experience each hospital has



Numbers at risk

9,051	7,092	4,973	3,169	1,244		
47,639	37,561	26,431	17,090	6,814	786	
54,214	42,898	30,269	19,838	7,900	938	

Figure 10: Revision probabilities of total knee arthroplasties by body mass index *(p < 0.0001)*

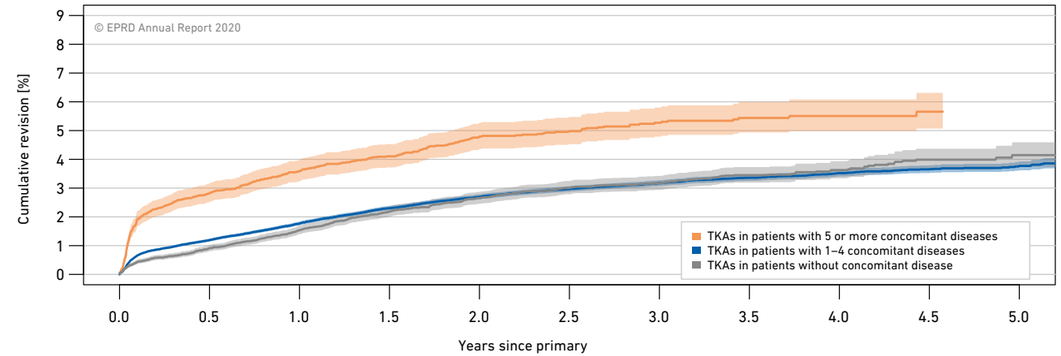


Numbers at risk

10,733	8,396	6,984	5,632	4,473	3,372	2,508	1,617	932		
187,943	160,757	136,137	113,787	91,384	71,552	52,248	35,577	21,671	12,444	5,897
53,174	46,402	39,204	33,329	26,612	21,069	15,097	10,375	6,196	3,864	1,824

Figure 11: Revision probabilities of elective total hip arthroplasties by comorbidities *(p < 0.0001)*

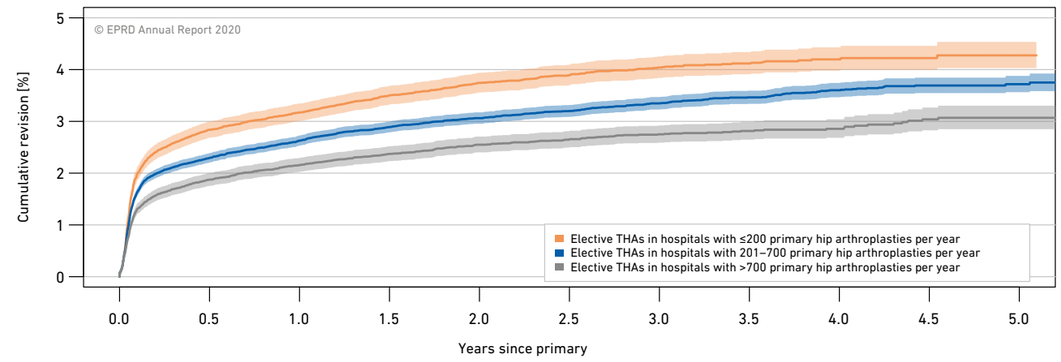
7 It is analysed how many of the 31 clinical entities included in the Elixhauser-Comorbidity Index are present. The Elixhauser Index covers a broad range of rather diverse physical and mental disorders, such as diabetes, cancer, hypertension, depression, and cardiac arrhythmia.



Numbers at risk

10,489	8,833	7,439	6,113	4,823	3,748	2,749	1,791	1,062	564	
169,610	148,233	124,861	104,865	82,879	65,268	47,013	32,421	19,390	11,216	5,048
29,758	26,227	22,112	18,816	14,837	11,734	8,275	5,855	3,590	2,255	1,060

Figure 12: Revision probabilities of total knee arthroplasties by comorbidities *(p < 0.0001)*



Numbers at risk

43,583	37,132	31,168	26,222	20,760	16,173	11,240	7,286	3,955	2,013	653
107,249	92,319	77,983	65,398	52,214	41,224	30,142	21,071	12,875	7,342	3,276
47,000	40,196	33,929	28,361	22,770	17,799	12,868	8,492	5,091	3,484	2,094

Figure 13: Revision probabilities of elective total hip arthroplasties by hospital volume (determined from each hospital's 2018 quality assessment report) *(p < 0.0001)*

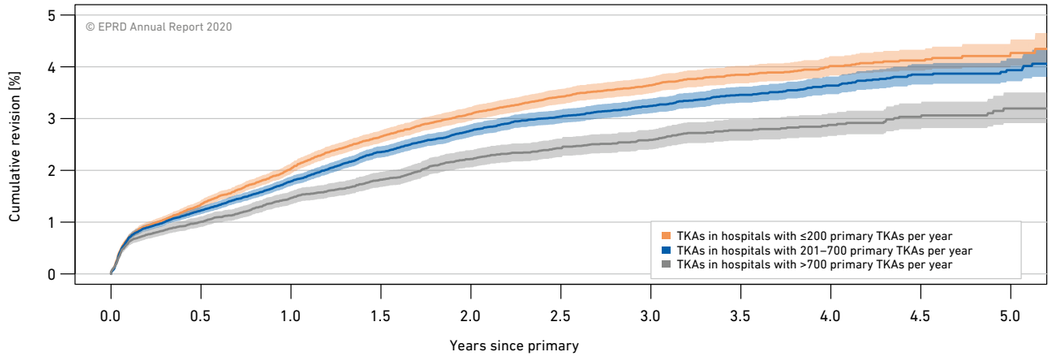
in the various fields of arthroplasty[8]. As can be seen in figures 13 to 15, the probability of revision surgery decreases with increasing institutional experience. This is especially true in unicondylar knee arthroplasties (figure 15).

This does not always imply that hospitals with higher volume achieve better outcomes than hospitals with less cases. Twice a year, the EPRD analyses the arthroplasty survival of the participating hospitals and provides them with the results.

8 The analysis of the quality assurance reports was based on the version currently available, i.e., the calendar year 2018. The number of procedures from the three German ICPM codes 5-820 (corresponds to hip arthroplasties), 5-822 with the exception of 5-822.0 (corresponds to knee arthroplasties without unicondylar knee arthroplasties), and separately 5-822.0 (corresponds to unicondylar knee arthroplasties) was determined individually for each hospital. For reasons of data protection, individual codes were not listed accurately in the reports if the case numbers were less than 5; in these cases the analysis counted them as 1. Hospitals to which no quality assurance report could be assigned were not included in the analyses.

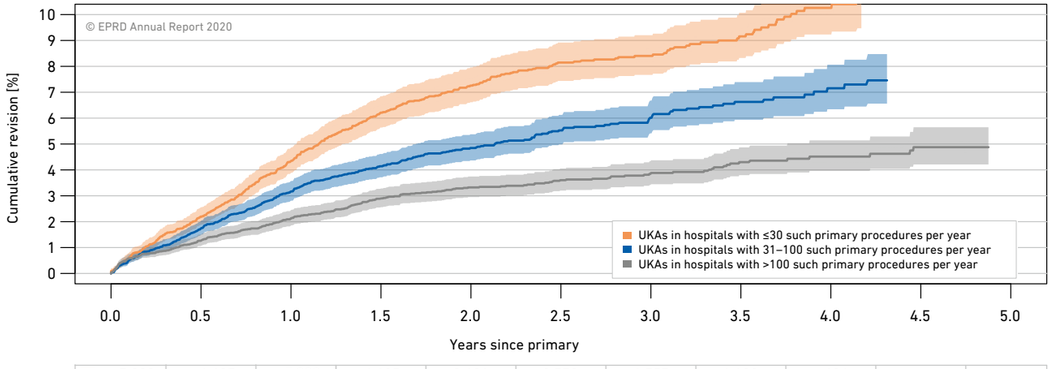
So-called funnel plots compare the hospital in question with other anonymised hospitals performing the same types of arthroplasties (see figures 16 and 17). Each dot on the graph represents a hospital, with the different dot colours reflecting the hospital's arthroplasty case numbers.

The diagram shows the tendency already noted previously that the risk of revision procedures is lower in higher volume hospitals. At the same time the hospital outcomes vary greatly. Most hospitals with at least 700 hip arthroplasties (grey dots) are below the dark grey expectation line, a considerable number even below the lower limit of the confidence interval. Thus, these hospitals performed significantly fewer revision arthroplasties than would actually be expected for the number of procedures performed within the follow-



Numbers at risk											
	81,860	71,418	59,612	50,009	38,932	30,333	21,330	14,263	7,955	4,317	1,605
	87,824	76,777	64,865	54,303	42,762	33,513	24,178	16,757	10,325	5,897	2,681
	38,092	33,239	28,274	24,021	19,617	15,887	11,737	8,416	5,336	3,512	1,928

Figure 14: Revision probabilities of total knee arthroplasties by hospital volume (determined from each hospital's 2018 quality assessment report) *(p < 0.0001)*



Numbers at risk											
	7,823	6,635	5,388	4,435	3,401	2,559	1,755	1,128	624		
	9,513	8,088	6,497	5,256	3,878	2,894	1,959	1,263	706		
	10,238	8,852	7,438	6,121	4,875	3,806	2,767	1,791	1,007	727	

Figure 15: Revision probabilities of unicondylar knee arthroplasties by hospital volume (determined from each hospital's 2018 quality assessment report) *(p < 0.0001)*

Funnel plots for inter-hospital comparisons

Funnel-plots are used to graph the outcomes of primary arthroplasties performed in different hospitals. In these funnel plots, each hospital is represented by a dot.

The location of each dot in the graph depends on how many of the primary arthroplasties performed by the hospital actually required revision surgery later on (observed number of revisions) and how many revisions would have been expected if the risk of revision over time had been the same for all hospitals. The number of revision arthroplasties of an individual hospital is expected to increase as the number of its documented arthroplasties, and their follow-up time increases. The calculation is stratified for the different types of arthroplasties, but does not include any further risk adjustment[9].

In the graph, the x-coordinate of each point corresponds to the number of expected revisions, while the y-coordinate represents the ratio of the number of observed revisions over the expected number of revisions. Thus, if more revisions than expected were observed for a hospital, their dot on the y-axis is above 1; if observation and expectation coincide, their dot is exactly 1; otherwise it is below that.

The horizontal dark grey expectation line at the level of the 1 in the graph serves as a guide. In addition, light grey dotted lines indicate the upper and lower limits of the 95 % confidence intervals. In hospitals with dots are above the upper light grey line, significantly more revisions were performed and for dots below the lower line that number was significantly less. The light grey lines converge into a funnel from left to right and give the funnel plot its name.

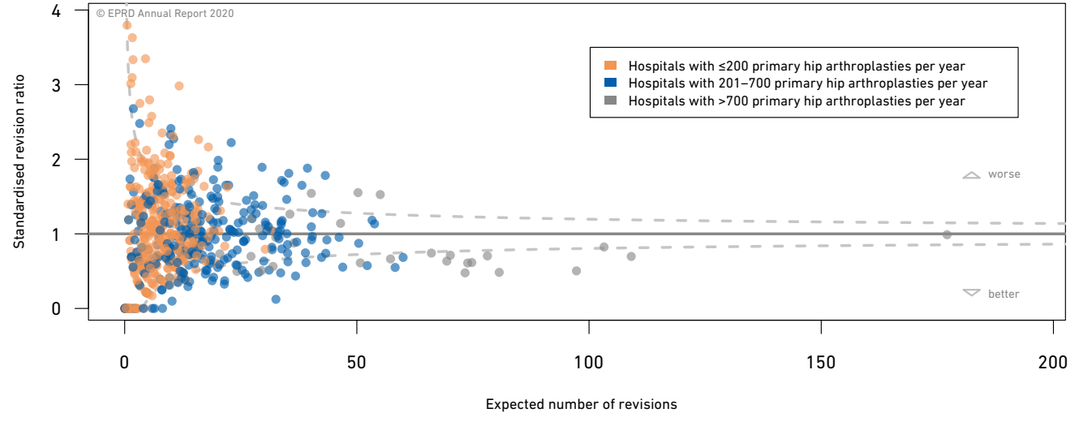


Figure 16: Funnel plot comparing primary hip arthroplasty outcomes between hospitals.

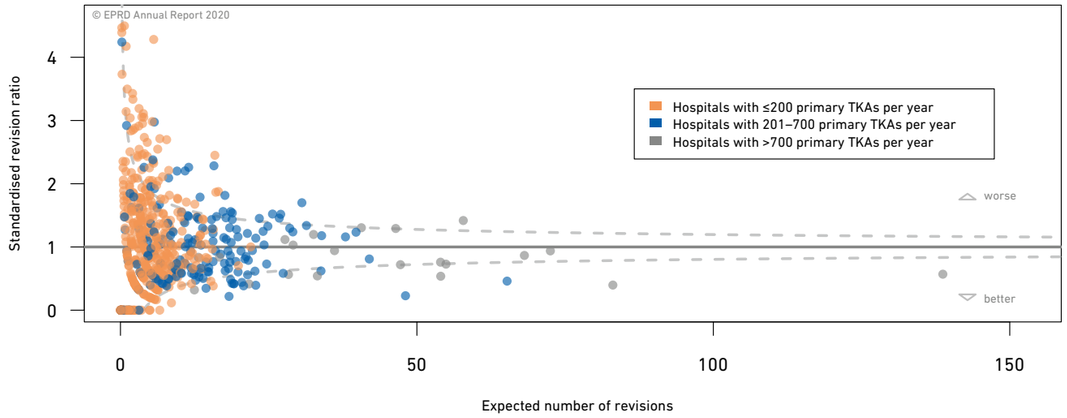


Figure 17: Funnel plot comparing primary total knee arthroplasty outcomes between hospitals.

up period. However, some orange (hospitals with up to 200 hip arthroplasties per year) and blue dots (hospitals with more than 200 and less than 700 hip arthroplasties per year) are also well below the expectation line. On the other hand, other grey dots can be found well above this line. Evidently there are exceptions to the general rule in both directions.

In brief

- 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 generally reduce the risk of revision arthroplasty

9 At present, the EPRD could essentially rely on the age and sex of the patients for risk adjustment. Body height and weight and the resulting BMI of patients have only been documented since 2017, and so far have only been available in about half the data sets available for arthroplasty survival analyses. The ASA status of the patients has only been documented since this year and therefore cannot yet be used. In principle, the presence of specific concomitant disease can be inferred from the routine data of the health insurance providers. Since the coding behaviour of the hospitals evidently varies markedly, this data is not suitable for risk adjustment in inter-hospital comparisons. Incidentally, adjustment for age and gender changes the picture only marginally.

5.2 Revision probabilities by type of arthroplasty

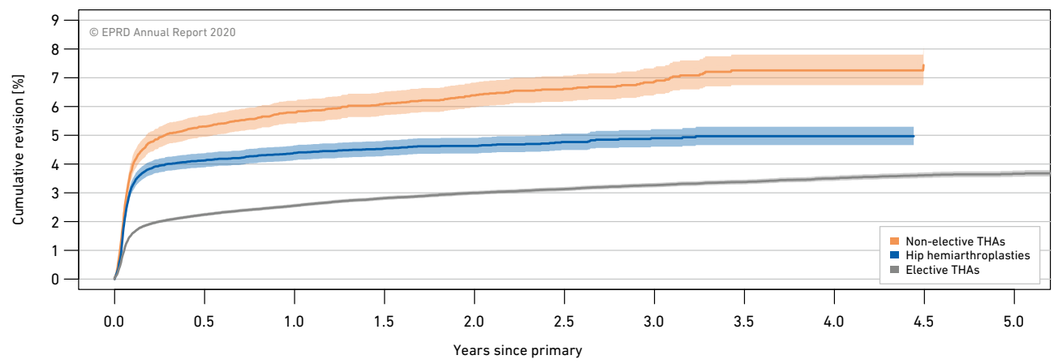
The following subchapters explain the revision probabilities observed for different types of hip (Section 5.2.1) and knee (Section 5.2.2) arthroplasties. In addition, the percentage of revision caused by certain arthroplasty and implant characteristics is also examined.

Finally, the results for the various types of arthroplasties and their characteristics are summarised in tables (see table 37 and table 38). The results for less common arthroplasties, which could not be addressed in the text, are also presented, provided they reached the required minimum number of cases.

5.2.1 Comparison of different hip arthroplasty types

The significant differences observed in previous years between elective, i.e. planned, and non-elective arthroplasties have been confirmed this year as well (figure 18). Elective procedures account for 85.2 % of hip arthroplasties in the database usable for arthroplasty survival analyses, hip hemiarthroplasties for 9.8 % and non-elective total hip arthroplasties for 5.0 %. Across all types of arthroplasties a sharp increase in the number of revision procedures was observed within the first two months post implantation. In more than every other of these changes documented in the registry within 60 days, infection (in 29.6 % of the revisions) or periprosthetic fracture (in 22.6 %) is given as the indication for surgery.

In patients up to 74 years of age, stem fixation with (less common) and without (more common) cement achieved comparable results in elective arthroplasties (figure 19). In patients aged 75 years and older, the percentage of cemented arthroplasties was higher, but uncemented stem fixation dominated here as well, although this type of fixation is associated with a significant increase in the revision probability (figure 20). In hemiarthroplasties of the hip, cemented fixation is the preferred option, which achieves a significantly better outcome than uncemented arthroplasties (figure 21). Groups did not differ in patient mortality (p = 0.22), which implies that a cemented fixation should generally be the modality of choice, at least in this type of arthroplasty.

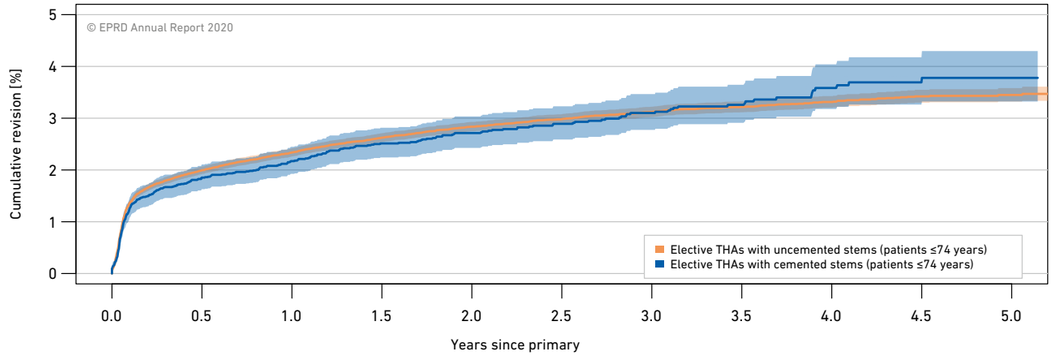


Numbers at risk											
Non-elective THAs	14,854	11,073	9,029	7,238	5,612	4,087	2,826	1,766	1,003		
Hip hemiarthroplasties	28,865	18,420	14,056	10,568	7,565	5,276	3,367	1,963	1,008		
Elective THAs	251,850	215,555	182,325	152,748	122,469	95,993	69,853	47,569	28,799	16,784	7,955

Figure 18: Revision probabilities of elective and non-elective hip arthroplasties *(p < 0.0001)*

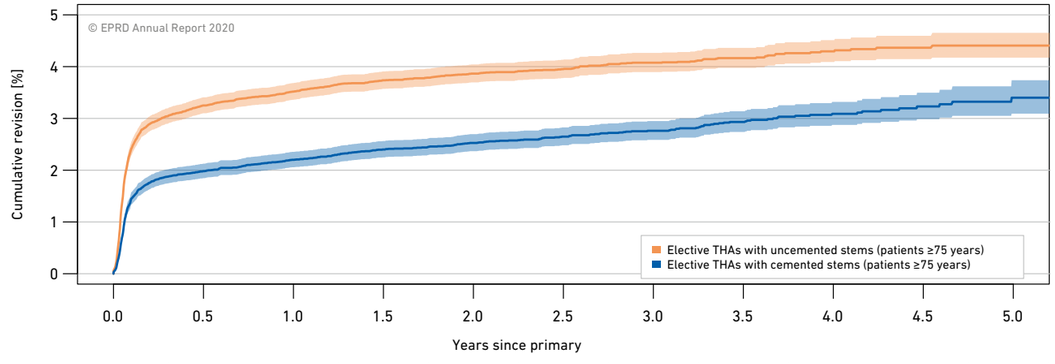
Apart from the usual standard stems, short-stemmed and femoral neck prostheses have been increasingly implanted in recent years, especially in younger patients. As illustrated in table 37, the groups differ markedly in their revision probabilities. Both immediately post primary intervention and over the current follow-up period of five years, short-stemmed prostheses in particular display lower revision probabilities in the EPRD than uncemented standard stems. However, the median age of patients with standard stems is six and nine years older respectively. Figure 22 illustrates that a difference between the revision probabilities remains apparent even if the analysis is restricted to patients under 70 years of age.

The most commonly used head sizes in total hip arthroplasty are 32 mm and 36 mm. In male patients in particular, the larger head diameter is associated with a lower revision probability during the early phase (figure 23). One of the reasons for this may be that larger



Numbers at risk											
Elective THAs with uncemented stems (patients ≤74 years)	147,278	127,396	107,411	90,803	72,637	57,749	41,840	28,968	17,431	10,566	5,006
Elective THAs with cemented stems (patients ≤74 years)	12,737	11,032	9,489	8,084	6,656	5,305	4,062	2,882	1,896	1,115	604

Figure 19: Revision probabilities of elective total hip arthroplasties by stem fixation in patients younger than 75 years *(p = 0.85)*



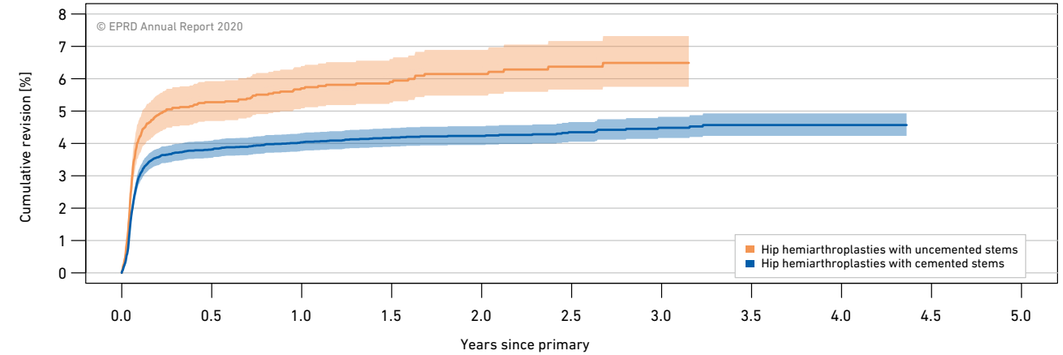
Numbers at risk											
Elective THAs with uncemented stems (patients ≥75 years)	52,341	43,790	37,018	30,334	24,097	18,248	13,025	8,342	4,790	2,491	1,117
Elective THAs with cemented stems (patients ≥75 years)	39,494	33,337	28,407	23,527	19,079	14,691	10,926	7,377	4,682	2,612	1,228

Figure 20: Revision probabilities of elective total hip arthroplasties by stem fixation in patients aged 75 years and older *(p < 0.0001)*

heads dislocate less often. Only 5.6 % of the registered cases (instead of 9.9 % for smaller head sizes) reported dislocation as a reason for the revision. It remains to be seen whether there is a long-term difference in the survival of hip arthroplasties with 32 mm and 36 mm heads.

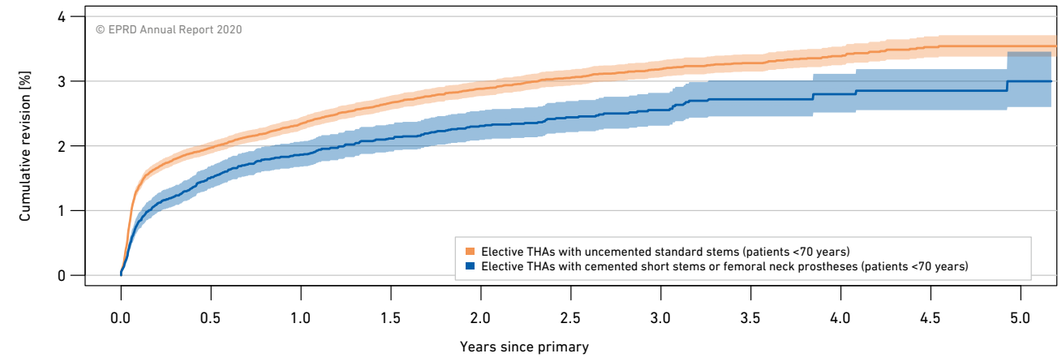
92.6 % of the arthroplasties analysed in the EPRD use ceramic head components with a uncemented stem, most often in combination with cross-linked polyethylene (74.2 % of the arthroplasties). Figure 24 demonstrates how they perform in combination with various insert materials.

The initially lower revision probability of ceramic inserts as well as the higher revision probability of conventional polyethylene compared to cross-linked polyethylene cannot be explained by the different wear of these materials, especially not within the first three months after primary arthroplasty. They could at least partly be due to diffe-



Numbers at risk											
Hip hemiarthroplasties with uncemented stems	5,832	3,615	2,746	2,069	1,434	939	581				
Hip hemiarthroplasties with cemented stems	22,906	14,722	11,245	8,449	6,100	4,318	2,772	1,634	851		

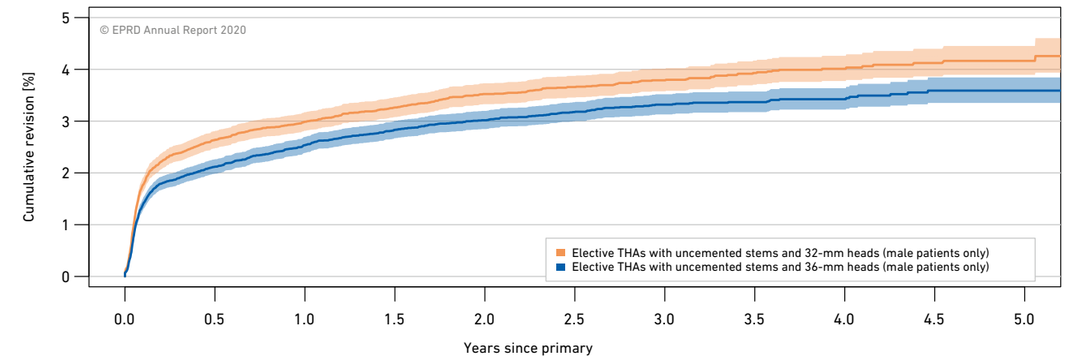
Figure 21: Revision probabilities of hip hemiarthroplasties by stem fixation *(p < 0.0001)*



Numbers at risk											
Elective THAs with uncemented standard stems (patients <70 years)	93,592	81,052	68,044	57,502	45,863	36,457	26,266	18,124	10,891	6,697	3,166
Elective THAs with cemented short stems or femoral neck prostheses (patients <70 years)	20,073	17,300	14,387	11,935	9,264	7,234	5,078	3,492	2,015	1,228	594

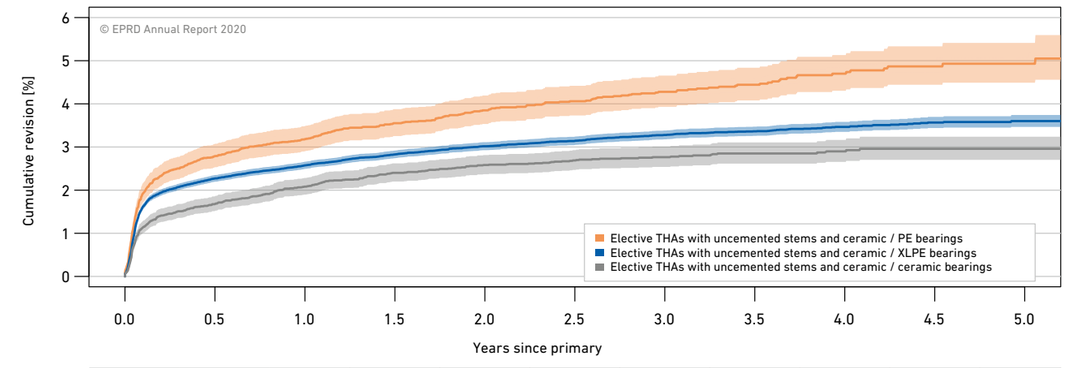
Figure 22: Revision probabilities of elective uncemented total hip arthroplasties by stem fixation for patients younger than 70 years *(p < 0.0001)*

rences in the patient groups (see also section 5.1): The patients analysed with ceramic/ceramic bearing combinations are markedly younger with a median age of 62 years, while the patients with ceramic/polyethylene bearing combinations are considerably older with 72 years.



Numbers at risk											
Elective THAs with uncemented stems and 32-mm heads (male patients only)	36,357	31,383	26,505	22,381	17,736	13,949	9,839	6,803	4,046	2,471	1,119
Elective THAs with uncemented stems and 36-mm heads (male patients only)	42,264	36,113	30,003	25,133	19,767	15,579	11,112	7,555	4,341	2,575	1,207

Figure 23: Revision probabilities of elective total hip arthroplasties with uncemented stems by head size in men *(p < 0.0001)*



Numbers at risk											
Elective THAs with uncemented stems and ceramic / PE bearings	14,459	12,811	11,319	9,898	8,419	6,919	5,327	3,884	2,534	1,604	842
Elective THAs with uncemented stems and ceramic / XLPE bearings	148,114	126,070	105,404	87,693	69,258	53,723	38,199	25,370	14,684	8,376	3,831
Elective THAs with uncemented stems and ceramic / ceramic bearings	22,299	19,872	17,243	14,957	12,339	10,109	7,552	5,483	3,417	2,165	1,056

Figure 24: Revision probabilities of elective total hip arthroplasties with uncemented stems and ceramic heads by acetabular insert material *(p <0.0001)*. The collective term XLPE covers insert components made of mXLPE, hXLPE and hXLPE stabilised with antioxidants.

Table of revision probabilities

When presenting the outcomes by type of arthroplasty in sections 5.2.1 and 5.2.2, the implant-related outcomes in section 5.3, and the probabilities of subsequent patellar resurfacing in section 5.4.2, the following parameters are presented in tables:

Number refers to the total number of arthroplasties in follow-up with this implant or implant combination.

Age refers to the median age and the age quartiles of the patients who received these arthroplasties.

M/F refers to the percentage of male and female patients with these arthroplasties.

BMI refers to the median BMI of patients with corresponding arthroplasty (only in tables 37 and 38).

Hosp. refers to the number of hospitals documenting these arthroplasties.

For the arthroplasty in question, **%L**, **%M** and **%H** each indicate the percentage of arthroplasties performed by hospitals with low, medium or high case volumes. The following limits were used for classification:

In the fields for the revision probability, the corresponding 95 % confidence interval (in brackets) and the number of arthroplasties still followed up at the respective point in time (in parentheses) are listed after the actual revision probability in percent – unless the latter is zero.

	Number cases[10]		
	Low	Medium	High
Primary hip arthroplasties	0 to 200	201 to 700	more than 700
Primary total knee arthroplasties	0 to 200	201 to 700	more than 700
Primary unicondylar knee arthroplasties	0 to 30	31 to 100	more than 100

Results are only presented if at least 300 primary arthroplasties from at least three different hospitals are available for the analysis of this type of arthroplasty, implant system or implant combination. If the number of arthroplasties being followed up is less than 150 at any one time, both the revision probability and confidence interval are shown in italics. If the number is less than 50, the results are not reported.

Table 37 below summarises the revision probabilities for various types and characteristics of hip arthroplasties, supplemented by data on the patient groups operated on and hospitals performing the arthroplasties.

In brief

- Lower revision probabilities with cemented stems in older patients
- Low revision rates currently also seen with short stems, larger heads and ceramic/ceramic bearings

10 In some cases, no quality report could be assigned to a hospital. As a result, these hospitals lack data on their arthroplasty numbers, and the percentages %L, %M and %H listed in the table do not add up to 100 %, but to a lower percentage.

Revision probabilities by ...																
Type of arthroplasty	Category	Type	Number	Age	m/f	BMI	Hosp.	%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Elective THAs with uncemented stems			199,619	67 (59 - 75)	40/60	27.8	656	22	54	24	2.6 [2.6; 2.7] (144,429)	3.1 [3.0; 3.2] (96,734)	3.4 [3.3; 3.5] (54,865)	3.6 [3.5; 3.7] (22,221)	3.7 [3.6; 3.8] (6,123)
	Bearing	Ceramic / hXLPE	96,687	67 (59 - 74)	40/60	27.9	554	18	53	29	2.6 [2.5; 2.7] (69,587)	3.0 [2.9; 3.1] (46,555)	3.3 [3.2; 3.4] (26,432)	3.5 [3.3; 3.6] (10,514)	3.7 [3.5; 3.8] (2,804)
		Ceramic / hXLPE+antiox.	32,832	68 (60 - 75)	41/59	28.0	291	19	55	26	2.6 [2.5; 2.8] (21,879)	2.9 [2.7; 3.1] (12,908)	3.1 [2.9; 3.3] (6,087)	3.2 [3.0; 3.5] (1,815)	3.2 [3.0; 3.5] (335)
		Ceramic / ceramic	22,299	62 (55 - 69)	44/56	27.7	323	21	57	22	2.1 [1.9; 2.3] (17,243)	2.6 [2.4; 2.8] (12,339)	2.8 [2.5; 3.0] (7,552)	2.9 [2.7; 3.2] (3,417)	3.0 [2.7; 3.2] (1,056)
		Ceramic / mXLPE	18,595	71 (63 - 77)	38/62	27.6	227	28	54	19	2.6 [2.4; 2.8] (13,938)	3.1 [2.8; 3.4] (9,795)	3.3 [3.1; 3.6] (5,680)	3.7 [3.4; 4.0] (2,355)	3.7 [3.4; 4.1] (692)
		Ceramic / PE	14,459	72 (63 - 77)	36/64	27.9	409	29	57	14	3.2 [2.9; 3.5] (11,319)	3.8 [3.5; 4.2] (8,419)	4.3 [3.9; 4.7] (5,327)	4.7 [4.3; 5.1] (2,534)	4.9 [4.5; 5.4] (842)
		Ceramicised metal / hXLPE	4,964	67 (59 - 75)	42/58	28.0	86	38	56	6	2.9 [2.4; 3.4] (3,205)	3.1 [2.6; 3.6] (1,701)	3.1 [2.7; 3.7] (679)	*3.1 [2.7; 3.7]* (128)	
		Metal / hXLPE	4,580	73 (64 - 79)	42/58	27.8	275	40	56	4	3.7 [3.2; 4.3] (3,388)	3.9 [3.4; 4.5] (2,338)	4.1 [3.5; 4.7] (1,394)	4.1 [3.6; 4.8] (595)	*4.1 [3.6; 4.8]* (135)
		Metal / mXLPE	2,328	76 (70 - 81)	32/68	27.4	131	52	45	3	4.4 [3.6; 5.3] (1,817)	5.0 [4.2; 6.0] (1,345)	5.3 [4.5; 6.4] (885)	5.5 [4.6; 6.6] (481)	*5.5 [4.6; 6.6]* (129)
		Metal / PE	1,141	77 (70 - 81)	31/69	27.1	237	47	45	8	5.2 [4.0; 6.7] (882)	5.4 [4.2; 7.0] (629)	5.6 [4.4; 7.2] (400)	5.9 [4.6; 7.6] (190)	*5.9 [4.6; 7.6]* (54)
		Metal / hXLPE+antiox.	697	77 (71 - 81)	36/64	27.3	92	56	42	2	5.8 [4.3; 7.8] (488)	6.3 [4.6; 8.4] (295)	6.6 [4.9; 8.9] (183)	*6.6 [4.9; 8.9]* (79)	
		Ceramicised metal / PE	630	74 (66 - 79)	34/66	27.6	40	62	36	2	3.1 [2.0; 4.9] (442)	3.4 [2.2; 5.2] (245)	*4.8 [2.9; 7.8]* (108)		
	Acetabular articulating surface	hXLPE	106,350	67 (59 - 74)	40/60	27.9	563	20	54	27	2.6 [2.5; 2.7] (76,237)	3.1 [3.0; 3.2] (50,609)	3.3 [3.2; 3.5] (28,518)	3.5 [3.4; 3.6] (11,245)	3.7 [3.5; 3.9] (2,955)
		hXLPE+antiox.	33,571	68 (60 - 75)	41/59	28.0	299	20	55	26	2.7 [2.5; 2.9] (22,389)	3.0 [2.8; 3.2] (13,218)	3.2 [3.0; 3.4] (6,274)	3.3 [3.0; 3.5] (1,895)	3.3 [3.0; 3.5] (352)
		Ceramic	22,313	62 (55 - 69)	44/56	27.7	324	21	57	22	2.1 [1.9; 2.3] (17,249)	2.6 [2.4; 2.8] (12,340)	2.8 [2.5; 3.0] (7,553)	2.9 [2.7; 3.2] (3,417)	3.0 [2.7; 3.2] (1,056)
		mXLPE	20,935	72 (64 - 77)	38/62	27.6	241	30	53	17	2.8 [2.6; 3.0] (15,757)	3.3 [3.1; 3.6] (11,140)	3.6 [3.3; 3.9] (6,565)	3.9 [3.6; 4.2] (2,836)	3.9 [3.6; 4.3] (821)
		PE	16,237	72 (64 - 78)	36/64	27.8	456	31	55	14	3.3 [3.1; 3.6] (12,645)	3.9 [3.6; 4.3] (9,294)	4.4 [4.0; 4.7] (5,836)	4.8 [4.4; 5.2] (2,739)	5.0 [4.6; 5.5] (896)
	Head component	Ceramic	185,075	67 (59 - 74)	40/60	27.8	654	20	54	25	2.6 [2.5; 2.6] (134,111)	3.0 [3.0; 3.1] (90,144)	3.3 [3.2; 3.4] (51,194)	3.5 [3.4; 3.6] (20,724)	3.6 [3.5; 3.8] (5,772)
		Metal	8,758	75 (67 - 80)	37/63	27.6	455	45	51	4	4.3 [3.9; 4.7] (6,583)	4.6 [4.2; 5.1] (4,612)	4.8 [4.4; 5.3] (2,865)	4.9 [4.5; 5.5] (1,345)	4.9 [4.5; 5.5] (335)
		Ceramicised metal	5,640	67 (59 - 75)	41/59	27.9	90	40	54	6	2.9 [2.5; 3.4] (3,672)	3.1 [2.7; 3.6] (1,962)	3.4 [2.8; 4.0] (792)	*3.5 [2.9; 4.2]* (144)	
	Head size	32 mm	112,481	68 (60 - 75)	32/68	27.7	649	21	54	25	2.7 [2.6; 2.8] (82,152)	3.2 [3.1; 3.3] (55,339)	3.4 [3.3; 3.5] (31,348)	3.7 [3.5; 3.8] (12,914)	3.8 [3.6; 4.0] (3,630)
		36 mm	75,046	67 (59 - 74)	56/44	28.1	559	23	53	24	2.5 [2.4; 2.6] (53,140)	3.0 [2.8; 3.1] (34,867)	3.2 [3.1; 3.4] (19,557)	3.4 [3.2; 3.5] (7,585)	3.5 [3.3; 3.7] (2,043)
		28 mm	11,606	67 (59 - 75)	10/90	27.2	510	21	62	17	3.1 [2.8; 3.5] (8,835)	3.4 [3.1; 3.8] (6,347)	3.8 [3.4; 4.2] (3,862)	3.9 [3.5; 4.3] (1,684)	3.9 [3.5; 4.3] (445)
	Cup type	Modular cup	184,911	67 (59 - 75)	40/60	27.8	651	22	54	23	2.6 [2.6; 2.7] (134,049)	3.1 [3.0; 3.2] (89,933)	3.3 [3.3; 3.4] (51,126)	3.5 [3.4; 3.7] (20,742)	3.7 [3.6; 3.8] (5,694)
		Monoblock cup	12,434	69 (61 - 77)	36/64	27.7	405	16	53	31	2.3 [2.0; 2.6] (8,841)	2.7 [2.4; 3.0] (5,811)	3.0 [2.7; 3.4] (3,196)	3.1 [2.8; 3.5] (1,263)	3.3 [2.9; 3.7] (362)
		Revision cup	1,617	64 (54 - 73)	31/69	27.5	254	17	54	29	6.4 [5.3; 7.7] (1,135)	7.5 [6.3; 9.0] (755)	8.0 [6.6; 9.5] (415)	8.6 [7.1; 10.5] (169)	
		Dual mobility	657	74 (63 - 79)	35/65	27.8	139	21	64	15	5.4 [3.9; 7.6] (404)	6.4 [4.6; 8.9] (235)	*6.9 [4.9; 9.6]* (128)		
	Stem type	Femoral stem with modular head	172,115	68 (60 - 75)	39/61	27.8	655	23	54	23	2.7 [2.6; 2.8] (124,739)	3.2 [3.1; 3.3] (83,976)	3.4 [3.4; 3.5] (47,909)	3.6 [3.5; 3.7] (19,695)	3.8 [3.6; 3.9] (5,441)
		Short stem	22,275	62 (55 - 69)	44/56	27.7	308	13	53	34	1.9 [1.7; 2.1] (15,540)	2.3 [2.1; 2.6] (9,683)	2.5 [2.3; 2.8] (4,986)	2.8 [2.5; 3.1] (1,953)	3.0 [2.6; 3.4] (614)

Table 37: Table of revision probabilities for different types and characteristics of hip arthroplasties – table continued on the next pages

Revision probabilities by ...																
Type of arthroplasty	Category	Type	Number	Age	m/f	BMI	Hosp.	%L	%M	%H	1 year	2 years	3 years	4 years	5 years
	Stem type	Femoral neck prosthesis	3,427	59 (53 - 66)	48/52	27.5	99	19	58	23	2.3 [1.8; 2.8] (2,759)	2.7 [2.1; 3.3] (1,991)	3.0 [2.4; 3.6] (1,321)	3.3 [2.7; 4.1] (401)	
		Modular stem	1,311	69 (60 - 75)	40/60	28.3	78	18	81	1	4.6 [3.6; 5.9] (1,066)	5.3 [4.2; 6.7] (883)	5.6 [4.4; 7.0] (537)	*5.9 [4.6; 7.6]* (126)	
		Revision or tumour stem	457	74 (61 - 80)	40/60	26.8	174	29	54	17	9.5 [7.1; 12.7] (304)	11.1 [8.3; 14.6] (189)	*11.7 [8.8; 15.5]* (111)		
	Reconstruction shell	Without reconstruction shell	199,352	67 (59 - 75)	40/60	27.8	656	22	54	24	2.6 [2.6; 2.7] (144,244)	3.1 [3.0; 3.2] (96,609)	3.4 [3.3; 3.5] (54,798)	3.6 [3.5; 3.7] (22,199)	3.7 [3.6; 3.8] (6,117)
	Fixation	Uncemented	196,281	67 (59 - 75)	40/60	27.8	655	22	54	24	2.6 [2.5; 2.7] (142,024)	3.1 [3.0; 3.2] (95,076)	3.3 [3.2; 3.4] (53,930)	3.5 [3.4; 3.6] (21,890)	3.7 [3.5; 3.8] (6,051)
		Reverse-hybrid	3,338	76 (67 - 80)	22/78	27.0	428	37	49	15	4.5 [3.8; 5.3] (2,405)	5.0 [4.3; 5.9] (1,658)	5.7 [4.9; 6.6] (935)	5.9 [5.0; 6.9] (331)	*6.2 [5.2; 7.4]* (72)
Elective THAs with cemented stems			52,231	78 (75 - 82)	26/74	26.8	613	22	58	20	2.2 [2.1; 2.3] (37,896)	2.6 [2.4; 2.7] (25,735)	2.9 [2.7; 3.0] (14,988)	3.2 [3.0; 3.4] (6,578)	3.5 [3.2; 3.8] (1,832)
	Bearing	Ceramic / hXLPE	22,522	78 (74 - 81)	25/75	26.8	427	17	56	27	2.0 [1.8; 2.2] (15,868)	2.4 [2.2; 2.6] (10,476)	2.6 [2.4; 2.9] (5,858)	2.9 [2.6; 3.2] (2,590)	3.2 [2.8; 3.6] (833)
		Ceramic / PE	9,374	78 (75 - 82)	25/75	26.8	389	24	62	14	2.2 [1.9; 2.5] (7,387)	2.7 [2.3; 3.0] (5,506)	2.9 [2.6; 3.3] (3,537)	3.1 [2.7; 3.6] (1,641)	3.1 [2.7; 3.6] (473)
		Metal / hXLPE	5,954	80 (76 - 83)	29/71	26.8	268	21	62	17	2.7 [2.3; 3.2] (4,294)	3.0 [2.6; 3.5] (2,766)	3.2 [2.8; 3.8] (1,508)	3.6 [3.0; 4.3] (613)	*4.0 [3.3; 5.0]* (128)
		Metal / PE	5,087	81 (77 - 84)	26/74	26.5	349	36	57	7	2.8 [2.3; 3.3] (3,777)	3.1 [2.7; 3.7] (2,702)	3.5 [2.9; 4.1] (1,685)	4.2 [3.5; 5.0] (779)	4.7 [3.8; 5.8] (169)
		Ceramic / hXLPE+antiox.	4,063	78 (74 - 82)	22/78	26.9	181	19	52	29	1.8 [1.4; 2.3] (2,587)	2.2 [1.8; 2.8] (1,521)	2.7 [2.1; 3.5] (736)	3.2 [2.5; 4.1] (271)	*3.9 [2.6; 5.8]* (55)
		Ceramic / mXLPE	1,403	78 (74 - 81)	28/72	26.8	119	17	67	16	2.3 [1.7; 3.3] (1,121)	3.1 [2.2; 4.2] (822)	3.2 [2.3; 4.3] (583)	3.6 [2.6; 5.0] (272)	*4.8 [2.8; 8.1]* (79)
		Ceramic / ceramic	1,047	76 (71 - 79)	24/76	27.2	90	31	41	28	1.1 [0.6; 2.0] (854)	1.2 [0.7; 2.1] (674)	1.2 [0.7; 2.1] (427)	1.5 [0.8; 2.6] (165)	
		Metal / mXLPE	919	80 (76 - 84)	28/72	25.8	90	41	43	16	3.4 [2.4; 4.8] (696)	3.7 [2.6; 5.2] (486)	4.7 [3.3; 6.5] (297)	*5.9 [4.1; 8.5]* (142)	
		Metal / hXLPE+antiox.	558	80 (77 - 83)	29/71	27.1	80	36	55	9	1.9 [1.0; 3.6] (397)	2.3 [1.3; 4.2] (247)	*2.3 [1.3; 4.2]* (128)		
		Metal / Metal	542	56 (51 - 61)	93/7	27.8	28	11	89	0	0.6 [0.2; 1.8] (403)	1.2 [0.5; 2.9] (252)	*1.7 [0.7; 4.0]* (132)		
		Ceramicised metal / hXLPE	318	79 (75 - 82)	26/74	27.2	32	42	56	3	2.6 [1.3; 5.0] (222)	*2.6 [1.3; 5.0]* (104)			
	Acetabular articulating surface	hXLPE	28,805	78 (75 - 82)	26/74	26.8	461	18	57	25	2.2 [2.0; 2.4] (20,386)	2.5 [2.3; 2.7] (13,346)	2.8 [2.5; 3.0] (7,392)	3.1 [2.8; 3.3] (3,212)	3.3 [3.0; 3.7] (964)
		PE	14,706	79 (76 - 83)	25/75	26.7	469	28	60	12	2.4 [2.1; 2.7] (11,355)	2.8 [2.6; 3.1] (8,330)	3.1 [2.8; 3.4] (5,266)	3.5 [3.2; 3.9] (2,433)	3.6 [3.2; 4.1] (642)
		hXLPE+antiox.	4,637	79 (75 - 82)	23/77	26.9	203	21	52	27	1.8 [1.5; 2.3] (2,987)	2.2 [1.8; 2.8] (1,769)	2.7 [2.2; 3.3] (864)	3.1 [2.4; 3.9] (310)	*3.7 [2.5; 5.3]* (70)
		mXLPE	2,322	78 (74 - 82)	28/72	26.5	152	27	57	16	2.8 [2.2; 3.5] (1,817)	3.3 [2.6; 4.2] (1,308)	3.8 [3.0; 4.7] (880)	4.5 [3.5; 5.7] (414)	*5.2 [3.7; 7.4]* (125)
		Ceramic	1,051	76 (71 - 79)	25/75	27.3	91	31	41	28	1.1 [0.6; 1.9] (854)	1.2 [0.7; 2.1] (674)	1.2 [0.7; 2.1] (427)	1.5 [0.8; 2.6] (165)	
		Metal	542	56 (51 - 61)	93/7	27.8	28	11	89	0	0.6 [0.2; 1.8] (403)	1.2 [0.5; 2.9] (252)	*1.7 [0.7; 4.0]* (132)		
	Head component	Ceramic	38,451	78 (74 - 81)	25/75	26.8	574	19	57	24	2.0 [1.9; 2.2] (27,836)	2.4 [2.3; 2.6] (19,008)	2.7 [2.5; 2.9] (11,145)	3.0 [2.7; 3.2] (4,939)	3.2 [2.9; 3.5] (1,466)
		Metal	13,186	80 (76 - 83)	30/70	26.7	478	28	60	12	2.7 [2.4; 2.9] (9,642)	3.0 [2.7; 3.3] (6,500)	3.3 [3.0; 3.7] (3,773)	4.0 [3.5; 4.5] (1,617)	4.3 [3.8; 5.0] (363)
		Ceramicised metal	568	79 (76 - 82)	22/78	27.0	43	36	63	2	2.7 [1.6; 4.4] (415)	3.4 [2.1; 5.5] (226)	*3.4 [2.1; 5.5]* (69)		
	Head size	32 mm	34,474	79 (75 - 82)	22/78	26.7	569	21	58	20	2.2 [2.1; 2.4] (25,258)	2.6 [2.4; 2.8] (17,442)	2.8 [2.6; 3.0] (10,392)	3.2 [3.0; 3.5] (4,649)	3.5 [3.2; 3.8] (1,306)
		36 mm	13,614	78 (75 - 82)	37/63	27.1	414	23	54	23	2.0 [1.7; 2.2] (9,592)	2.4 [2.1; 2.7] (6,177)	2.9 [2.5; 3.2] (3,355)	3.1 [2.7; 3.5] (1,384)	3.4 [2.9; 4.0] (414)

Table 37 (continued)

Revision probabilities by ...																
Type of arthroplasty	Category	Type	Number	Age	m/f	BMI	Hosp.	%L	%M	%H	1 year	2 years	3 years	4 years	5 years
	Head size	28 mm	3,422	79 (75 - 82)	13/87	26.1	361	22	64	14	3.0 [2.5; 3.7] (2,550)	3.3 [2.7; 4.0] (1,814)	3.7 [3.0; 4.4] (1,091)	4.2 [3.4; 5.2] (494)	*4.2 [3.4; 5.2]* (106)
	Cup type	Modular cup	35,506	78 (74 - 81)	26/74	26.8	577	20	57	23	2.1 [2.0; 2.3] (25,492)	2.5 [2.3; 2.7] (17,063)	2.7 [2.5; 2.9] (9,653)	3.0 [2.8; 3.3] (4,116)	3.3 [3.0; 3.7] (1,102)
		Monoblock cup	14,924	80 (76 - 83)	25/75	26.7	468	26	59	14	2.1 [1.8; 2.3] (11,299)	2.5 [2.2; 2.8] (8,029)	2.8 [2.5; 3.1] (4,994)	3.2 [2.9; 3.6] (2,322)	3.4 [3.0; 3.9] (699)
		Revision cup	796	78 (73 - 82)	33/67	26.0	217	32	55	13	7.9 [6.2; 10.1] (483)	8.6 [6.7; 10.9] (284)	10.5 [8.1; 13.4] (166)	*11.9 [9.0; 15.7]* (76)	
		Dual mobility	776	80 (75 - 84)	26/74	25.7	156	26	55	18	2.5 [1.6; 3.9] (459)	2.8 [1.7; 4.3] (250)	*3.5 [2.0; 6.1]* (112)		
	Stem type	Femoral stem with modular head	51,238	78 (75 - 82)	26/74	26.8	605	22	57	21	2.2 [2.1; 2.3] (37,217)	2.6 [2.4; 2.7] (25,332)	2.8 [2.7; 3.0] (14,788)	3.2 [3.0; 3.4] (6,523)	3.5 [3.2; 3.8] (1,825)
		Resurfacing prosthesis	542	56 (51 - 61)	93/7	27.8	28	11	89	0	0.6 [0.2; 1.8] (403)	1.2 [0.5; 2.9] (252)	*1.7 [0.7; 4.0]* (132)		
	Reconstruction shell	Without reconstruction shell	51,866	78 (75 - 82)	26/74	26.8	612	22	58	21	2.1 [2.0; 2.3] (37,689)	2.5 [2.4; 2.7] (25,607)	2.8 [2.6; 2.9] (14,917)	3.1 [3.0; 3.4] (6,545)	3.4 [3.2; 3.7] (1,824)
		With reconstruction shell	365	79 (74 - 84)	33/67	24.5	150	30	60	10	9.6 [6.9; 13.5] (207)	*11.1 [8.0; 15.3]* (128)	*13.7 [9.8; 19.0]* (71)		
	Fixation	Hybrid	38,269	78 (74 - 81)	27/73	26.9	591	19	57	24	2.1 [2.0; 2.3] (27,489)	2.5 [2.3; 2.7] (18,388)	2.7 [2.5; 2.9] (10,427)	3.1 [2.9; 3.3] (4,440)	3.4 [3.1; 3.8] (1,167)
		Cemented	13,962	80 (76 - 83)	24/76	26.6	495	29	61	11	2.4 [2.1; 2.6] (10,407)	2.8 [2.5; 3.1] (7,347)	3.2 [2.9; 3.5] (4,561)	3.6 [3.2; 4.0] (2,138)	3.7 [3.3; 4.2] (665)
Non-elective THAs			14,854	76 (69 - 82)	29/71	24.8	580	48	48	5	5.8 [5.4; 6.2] (9,029)	6.4 [6.0; 6.8] (5,612)	6.9 [6.4; 7.4] (2,826)	7.3 [6.7; 7.8] (1,003)	7.4 [6.8; 8.1] (192)
	Bearing	Ceramic / hXLPE	4,765	74 (66 - 79)	30/70	24.8	384	41	54	5	5.8 [5.1; 6.5] (2,833)	6.3 [5.6; 7.1] (1,724)	6.7 [6.0; 7.6] (872)	7.2 [6.3; 8.2] (289)	*7.2 [6.3; 8.2]* (50)
		Metal / PE	2,123	81 (76 - 86)	25/75	24.4	253	45	51	4	6.1 [5.1; 7.2] (1,207)	6.8 [5.7; 8.1] (758)	7.8 [6.5; 9.3] (385)	8.3 [6.9; 10.1] (153)	
		Ceramic / PE	1,991	77 (70 - 82)	27/73	24.7	289	49	43	8	5.1 [4.2; 6.2] (1,322)	5.9 [4.9; 7.1] (890)	6.1 [5.0; 7.4] (480)	6.5 [5.3; 8.0] (186)	
		Ceramic / hXLPE+antiox.	1,752	75 (67 - 80)	32/68	24.9	160	40	51	8	6.4 [5.3; 7.8] (1,016)	7.2 [5.9; 8.6] (545)	7.5 [6.1; 9.2] (257)	*7.5 [6.1; 9.2]* (95)	
		Metal / hXLPE	1,612	79 (74 - 84)	27/73	24.7	200	58	40	3	5.1 [4.1; 6.3] (957)	5.9 [4.8; 7.4] (584)	6.4 [5.1; 8.1] (259)	*6.4 [5.1; 8.1]* (82)	
		Ceramic / mXLPE	1,061	74 (67 - 79)	32/68	24.9	138	59	39	2	5.2 [4.0; 6.8] (728)	5.6 [4.3; 7.3] (456)	6.1 [4.7; 7.9] (229)	*6.5 [4.9; 8.6]* (83)	
		Ceramic / ceramic	616	69 (61 - 76)	32/68	25.0	116	55	43	2	5.5 [3.9; 7.7] (416)	5.8 [4.1; 8.0] (309)	6.3 [4.4; 8.8] (179)	*6.3 [4.4; 8.8]* (64)	
		Metal / mXLPE	565	79 (75 - 85)	28/72	25.0	87	66	34	0	7.8 [5.8; 10.4] (353)	7.8 [5.8; 10.4] (245)	*8.3 [6.1; 11.2]* (130)		
	Acetabular articulating surface	hXLPE	6,511	75 (68 - 80)	29/71	24.8	416	46	50	4	5.6 [5.1; 6.3] (3,863)	6.2 [5.6; 6.9] (2,341)	6.7 [6.0; 7.4] (1,140)	7.1 [6.3; 7.9] (372)	*7.1 [6.3; 7.9]* (67)
		PE	4,148	79 (73 - 85)	26/74	24.5	365	47	47	6	5.5 [4.9; 6.3] (2,555)	6.3 [5.6; 7.2] (1,660)	6.9 [6.0; 7.8] (869)	7.4 [6.4; 8.4] (340)	*7.4 [6.4; 8.4]* (64)
		hXLPE+antiox.	1,919	75 (67 - 81)	33/67	24.9	175	42	50	8	6.7 [5.6; 8.0] (1,100)	7.3 [6.2; 8.8] (595)	7.7 [6.4; 9.3] (277)	*7.7 [6.4; 9.3]* (101)	
		mXLPE	1,626	76 (69 - 81)	30/70	25.0	158	61	37	1	6.1 [5.0; 7.4] (1,081)	6.4 [5.2; 7.7] (701)	6.9 [5.6; 8.4] (359)	*7.5 [6.0; 9.3]* (125)	
		Ceramic	619	69 (61 - 76)	32/68	25.0	116	55	43	2	5.5 [3.9; 7.7] (416)	5.7 [4.1; 8.0] (309)	6.2 [4.4; 8.8] (179)	*6.2 [4.4; 8.8]* (64)	
	Head component	Ceramic	10,199	75 (67 - 80)	30/70	24.8	558	45	49	6	5.7 [5.2; 6.2] (6,318)	6.2 [5.7; 6.8] (3,926)	6.6 [6.1; 7.2] (2,018)	7.0 [6.4; 7.6] (718)	*7.3 [6.5; 8.1]* (140)
		Metal	4,479	80 (75 - 85)	26/74	24.6	382	53	44	3	6.1 [5.4; 6.8] (2,610)	6.7 [6.0; 7.6] (1,640)	7.4 [6.6; 8.4] (795)	7.9 [6.9; 9.0] (283)	*7.9 [6.9; 9.0]* (52)
	Head size	32 mm	8,947	76 (69 - 82)	25/75	24.7	532	48	48	4	5.7 [5.2; 6.2] (5,605)	6.3 [5.8; 6.9] (3,578)	6.7 [6.2; 7.4] (1,855)	6.9 [6.3; 7.5] (645)	*6.9 [6.3; 7.5]* (128)
		36 mm	4,076	76 (68 - 81)	45/55	25.0	375	49	47	4	5.5 [4.9; 6.3] (2,380)	6.0 [5.2; 6.8] (1,374)	6.7 [5.8; 7.7] (627)	7.5 [6.4; 8.8] (208)	

Table 37 (continued)

Revision probabilities by ...															
Type of arthroplasty	Category	Type	Number	Age	m/f	BMI	Hosp.	%L	%M	%H	1 year	2 years	3 years	4 years	5 years
	Head size	28 mm	1,712	78 (70 - 83)	15/85	24.0	331	45	47	8	7.0 [5.9; 8.4] (996)	7.8 [6.5; 9.3] (642)	8.1 [6.8; 9.7] (338)	*9.0 [7.4; 10.9]* (149)	
	Cup type	Modular cup	10,270	75 (67 - 80)	30/70	24.8	557	50	47	3	6.0 [5.6; 6.5] (6,360)	6.6 [6.1; 7.1] (3,965)	7.1 [6.5; 7.7] (2,019)	7.5 [6.9; 8.1] (739)	*7.7 [7.0; 8.6]* (145)
		Monoblock cup	3,701	80 (75 - 85)	25/75	24.7	340	44	48	7	5.0 [4.3; 5.8] (2,239)	5.6 [4.8; 6.5] (1,430)	6.0 [5.2; 7.0] (722)	6.3 [5.4; 7.4] (239)	
		Dual mobility	655	80 (73 - 85)	32/68	24.4	131	36	53	11	6.3 [4.6; 8.7] (303)	*7.4 [5.4; 10.2]* (146)	*7.4 [5.4; 10.2]* (54)		
	Stem type	Femoral stem with modular head	14,299	76 (69 - 82)	29/71	24.8	577	48	47	4	5.7 [5.3; 6.1] (8,714)	6.2 [5.8; 6.7] (5,423)	6.7 [6.3; 7.2] (2,728)	7.1 [6.6; 7.7] (969)	7.3 [6.7; 8.0] (185)
	Reconstruction shell	Without reconstruction shell	14,804	76 (69 - 82)	29/71	24.8	580	48	47	5	5.8 [5.4; 6.2] (9,000)	6.4 [5.9; 6.8] (5,596)	6.8 [6.4; 7.3] (2,817)	7.2 [6.7; 7.8] (1,000)	7.4 [6.8; 8.1] (191)
	Fixation	Uncemented	7,034	73 (65 - 78)	33/67	24.8	543	51	46	3	6.7 [6.1; 7.3] (4,455)	7.3 [6.7; 8.0] (2,788)	7.8 [7.1; 8.5] (1,418)	8.2 [7.5; 9.1] (510)	*8.6 [7.6; 9.7]* (92)
		Hybrid	4,034	77 (72 - 82)	27/73	24.8	428	42	49	9	4.5 [3.9; 5.2] (2,431)	5.0 [4.3; 5.7] (1,506)	5.6 [4.8; 6.6] (749)	6.0 [5.1; 7.0] (270)	*6.0 [5.1; 7.0]* (60)
		Cemented	3,235	81 (76 - 86)	25/75	24.5	324	47	48	5	4.7 [4.0; 5.6] (1,832)	5.4 [4.6; 6.3] (1,122)	5.6 [4.7; 6.6] (556)	6.0 [5.0; 7.3] (185)	
		Reverse-hybrid	467	77 (69 - 83)	27/73	25.3	170	48	51	2	8.4 [6.1; 11.5] (268)	9.4 [6.8; 12.7] (172)	*9.4 [6.8; 12.7]* (86)		
Hemiarthroplasties			28,865	84 (79 - 89)	28/72	24.3	502	57	42	1	4.4 [4.1; 4.7] (14,056)	4.6 [4.4; 4.9] (7,565)	4.9 [4.6; 5.2] (3,367)	5.0 [4.7; 5.3] (1,008)	*5.0 [4.7; 5.3]* (149)
	Head component	Metal	27,649	84 (79 - 89)	28/72	24.3	484	58	41	1	4.3 [4.1; 4.6] (13,478)	4.6 [4.3; 4.9] (7,256)	4.8 [4.5; 5.2] (3,241)	4.9 [4.6; 5.2] (987)	*4.9 [4.6; 5.2]* (147)
		Ceramic	1,121	83 (79 - 89)	28/72	24.6	166	48	50	2	5.1 [3.8; 6.7] (542)	5.5 [4.1; 7.2] (292)	*6.0 [4.4; 8.1]* (119)		
	Head size	28 mm	26,559	84 (79 - 89)	27/73	24.2	489	58	41	1	4.3 [4.1; 4.6] (12,991)	4.6 [4.3; 4.9] (6,962)	4.8 [4.5; 5.1] (3,101)	4.8 [4.5; 5.2] (917)	*4.8 [4.5; 5.2]* (135)
		32 mm	1,655	84 (79 - 88)	47/53	24.8	84	49	50	1	5.4 [4.3; 6.7] (782)	5.6 [4.5; 6.9] (451)	5.8 [4.6; 7.2] (202)	*6.3 [4.8; 8.2]* (74)	
	Stem type	Femoral stem with modular head	28,366	84 (80 - 89)	28/72	24.3	496	57	42	1	4.3 [4.1; 4.6] (13,842)	4.5 [4.3; 4.8] (7,461)	4.8 [4.5; 5.1] (3,321)	4.9 [4.6; 5.2] (1,000)	*4.9 [4.6; 5.2]* (148)
		Revision or tumour stem	320	84 (79 - 89)	28/72	24.8	124	62	38	0	*7.8 [5.2; 11.8]* (135)	*9.8 [6.4; 14.9]* (66)			
	Reconstruction shell	Without reconstruction shell	28,867	84 (79 - 89)	28/72	24.3	502	57	42	1	4.4 [4.1; 4.6] (14,057)	4.6 [4.4; 4.9] (7,565)	4.9 [4.6; 5.2] (3,367)	5.0 [4.7; 5.3] (1,008)	*5.0 [4.7; 5.3]* (149)
	Fixation	Cemented	22,906	84 (80 - 89)	27/73	24.2	460	55	44	1	4.0 [3.8; 4.3] (11,245)	4.2 [4.0; 4.5] (6,100)	4.5 [4.2; 4.8] (2,772)	4.6 [4.2; 4.9] (851)	*4.6 [4.2; 4.9]* (127)
		Uncemented	5,832	84 (79 - 88)	31/69	24.6	284	67	33	0	5.7 [5.1; 6.4] (2,746)	6.1 [5.5; 6.9] (1,434)	6.5 [5.8; 7.3] (581)	6.5 [5.8; 7.3] (156)	

Table 37 (continued)

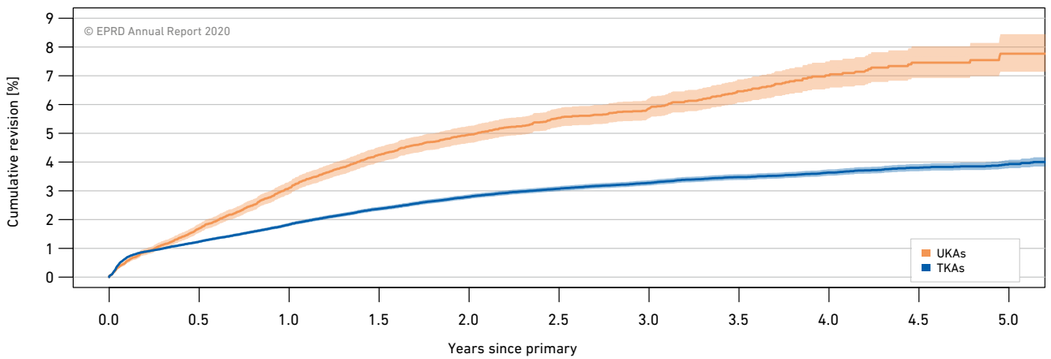
5.2.2 Comparison of different knee arthroplasty types

Total, unicondylar and femoro-patellar represent the three basic types of knee arthroplasties. Figure 25 compares the revision probabilities of the first two types of arthroplasties. Significant differences are already apparent after a few months. After four years, unicondylar arthroplasties have a revision probability of 7.0 %, which is almost twice as much as that of total knee arthroplasties (3.6 %). However, the basic types of arthroplasties differ significantly in terms of their indications and thus the underlying conditions of the patients. In the first few years after unicondylar arthroplasties, progression of osteoarthritis in the untreated compartment is a common reason for revision surgery, after revisions due to loosening or infections [3]. In about 70 % of the cases documented in the EPRD, revision of a unicondylar arthroplasty ended in a conversion to a total knee replacement. Even though unicondylar arthroplasties generally have a higher revision probability than total arthroplasties, the absolute difference is significantly lower in specialised hospitals, with the success of such a procedure depending to a large extent on the experience of the hospital (see figure 15).

After three years the revision probability of patellofemoral arthroplasty is already more than 10 % and thus significantly higher than that in total and unicondylar knee arthroplasties (see table 38). However, the number of cases in the EPRD is low.

The following figures in this chapter refer exclusively to total knee arthroplasties. The majority of patients receive standard knee systems without additional lateral stabilisation. However, a small number of patients undergo varus-valgus stabilised or hinged arthroplasty. The latter offers the maximum stabilisation possible. It can be assumed that this additional stabilisation, a so-called constrained arthroplasty, is necessary due to ligament instabilities and joint deformities. The results shown in figure 26 reflect the different initial conditions: the more the joint must be stabilised, the higher is the probability of arthroplasty revision.

Primary standard arthroplasties in particular are mostly performed without patellar resurfacing (see table 38). As illustrated in figure 27, the overall revision probability is slightly higher in patients with patellar resurfacing as part of the primary arthroplasty

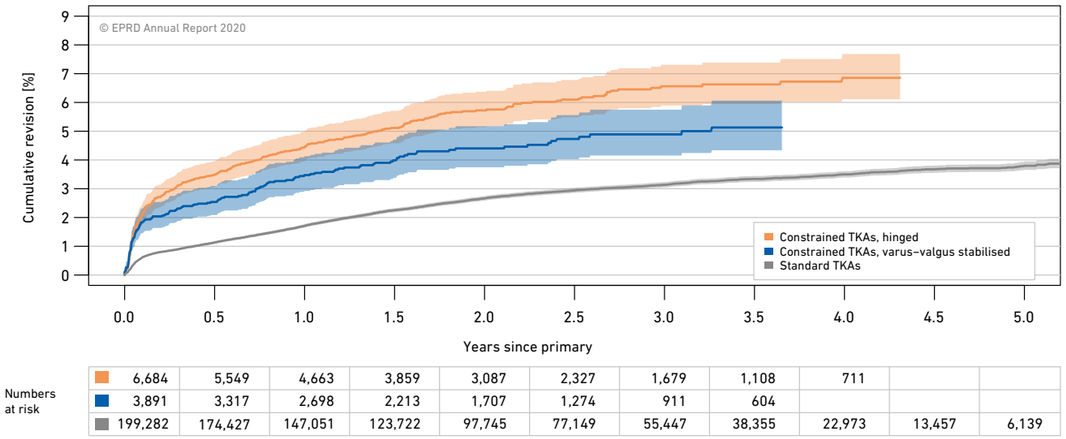


Numbers at risk											
UKAs	27,845	23,820	19,552	16,010	12,325	9,394	6,577	4,237	2,362	1,505	775
TKAs	209,857	183,293	154,412	129,794	102,539	80,750	58,037	40,067	24,042	14,035	6,391

Figure 25: Revision probabilities of total and unicondylar knee arthroplasties *(p < 0.0001)*

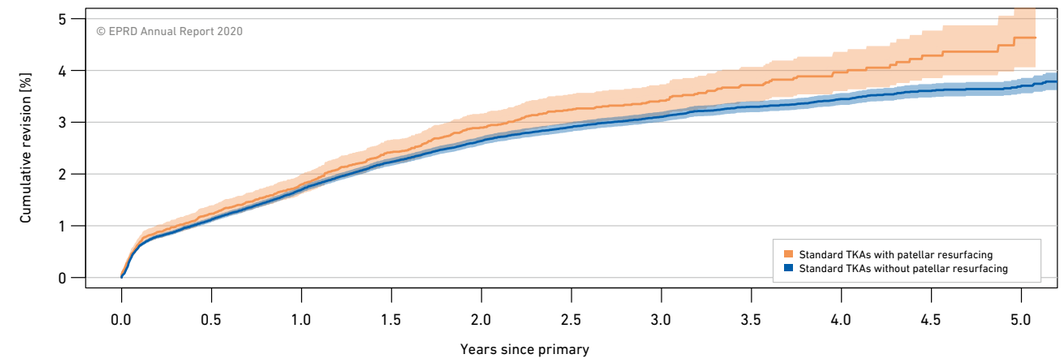
than in those without patellar resurfacing. When assessing this outcome, the EPRD definition of revision must be taken into account: Subsequent patellar resurfacing does not count as revision of the primary arthroplasty (see chapter 3). As a result, in arthroplasties with subsequent patellar resurfacing, additional corrections such as revision arthroplasty with a higher insert are not reflected in the arthroplasty survival outcomes. If, on the other hand, only the insert is replaced, this is deemed the end of arthroplasty survival of all components. Whether the absence of patellar resurfacing lowers the threshold for reoperation and wether patellar resurfacing was indicated during the primary procedure cannot be deduced from the results presented. Additional findings on the probability of patellar resurfacing are discussed in the following section 5.4.

In knee arthroplasties, both most femoral and tibial components are cemented in the bone (see table 38). Hybrid fixation with



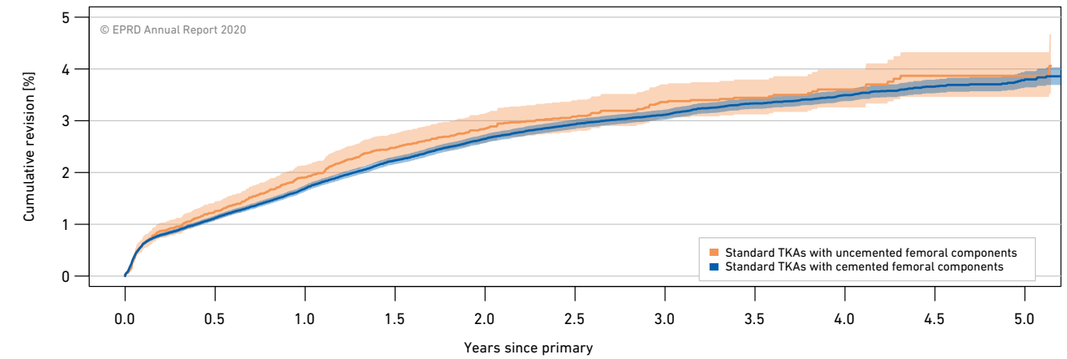
Numbers at risk											
Constrained TKAs, hinged	6,684	5,549	4,663	3,859	3,087	2,327	1,679	1,108	711		
Constrained TKAs, varus–valgus stabilised	3,891	3,317	2,698	2,213	1,707	1,274	911	604			
Standard TKAs	199,282	174,427	147,051	123,722	97,745	77,149	55,447	38,355	22,973	13,457	6,139

Figure 26: Revision probabilities of total knee arthroplasties by degree of constraint *(p < 0.0001)*



Numbers at risk											
Standard TKAs with patellar resurfacing	20,537	17,892	15,100	12,598	10,005	7,865	5,629	3,908	2,344	1,387	587
Standard TKAs without patellar resurfacing	178,745	156,535	131,951	111,124	87,740	69,284	49,818	34,447	20,629	12,070	5,552

Figure 27: Revision probabilities of standard primary total knee arthroplasties with and without patellar resurfacing *(p = 0.01)*



Numbers at risk											
Standard TKAs with uncemented femoral components	15,688	14,275	12,565	10,947	8,968	7,304	5,367	3,780	2,244	1,330	653
Standard TKAs with cemented femoral components	183,478	160,053	134,400	112,708	88,717	69,795	50,052	34,557	20,717	12,118	5,486

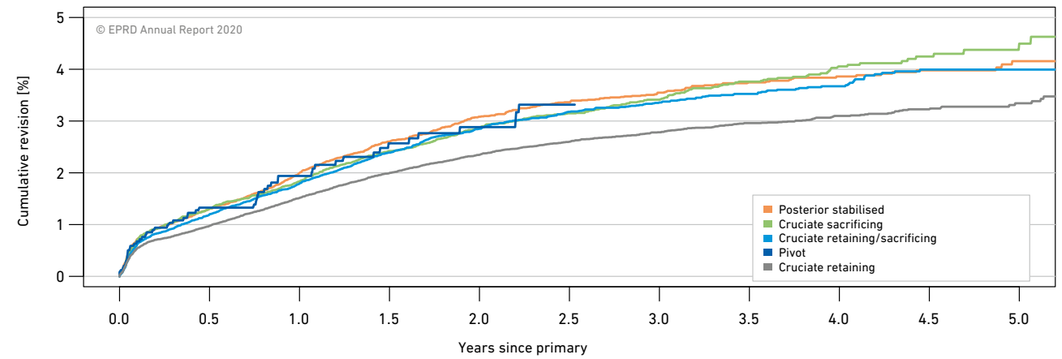
Figure 28: Revision probabilities of standard total knee arthroplasties by femoral component fixation *(p = 0.19)*

uncemented femoral component is markedly less common. Figure 28 reveals no significant differences in the revision probability of unconstrained total knee arthroplasties with cemented versus uncemented femoral components. Completely uncemented or reverse-hybrid fixation is quite rare. Table 38 lists the individual outcomes for these types of fixation. When considering the various unconstrained knee systems, only the group of cruciate retaining systems with their slightly lower revision probability stands out from the other systems (see figure 29). The other knee systems exhibit almost identical revision probabilities. One possible explanation for the lower revision probabilities of cruciate ligament-retaining prosthesis systems may be system-related patient selection, since CR systems are almost always implanted when joint stability is adequate. The groups compared may therefore differ in terms of their initial conditions and the severity of wear. In recent years, the implantation of mobile bearings has trended downwards (see chapter 4.3). Unlike mobile bearing systems, those systems with fixed bearings exhibit a lower revision probability in the EPRD (figure 30). This trend is consistent with the findings in other registries. The British NJR and the Australian AOANJRRR (Australian Orthopaedic Association National Joint Replacement Registry) also report higher revision rates for mobile bearings [4, 5].

Table 38 summarises the outcomes for all types of knee arthroplasties analysed.

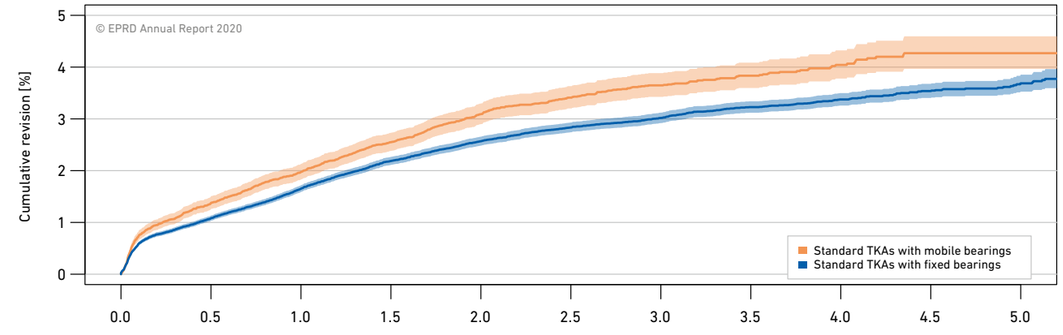
In brief

- At four years from the primary surgery revision probabilities of unicondylar arthroplasties are almost twice as high as those of total knee arthroplasties
- To date, no significant difference in the revision probabilities between cemented and uncemented femoral components has been observed
- Higher probability of revision for TKAs with mobile bearings than for TKAs with fixed bearings



Numbers at risk											
Posterior stabilised	36,322	30,994	25,362	20,834	15,980	12,317	8,887	6,286	4,052	2,641	1,458
Cruciate sacrificing	30,517	26,987	23,244	19,803	15,920	12,559	8,911	5,965	3,387	1,881	793
Cruciate retaining/sacrificing	38,506	34,067	29,080	24,870	20,008	15,935	11,306	7,805	4,614	2,690	1,175
Pivot	2,422	1,924	1,426	1,086	761	524					
Cruciate retaining	91,515	80,455	67,939	57,129	45,076	35,814	26,057	18,128	10,841	6,206	2,709

Figure 29: Revision probabilities of standard total knee arthroplasties by knee system *(p < 0.0001)*



Numbers at risk											
Standard TKAs with mobile bearings	35,657	31,743	27,412	23,486	19,063	15,296	10,971	7,384	4,103	2,263	911
Standard TKAs with fixed bearings	163,625	142,684	119,639	100,236	78,682	61,853	44,476	30,971	18,870	11,194	5,228

Figure 30: Revision probabilities of standard total knee arthroplasties by bearing mobility *(p < 0.0001)*

Revision probabilities by ...																	
Type of arthroplasty	Category	Type	Number	Age	m/f	BMI	Hosp.			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Standard TKAs			199,282	70 (62 - 77)	34/66	30.1	648			39	42	19	1.7 [1.6; 1.8] (147,051)	2.7 [2.6; 2.7] (97,745)	3.1 [3.0; 3.2] (55,447)	3.5 [3.4; 3.6] (22,973)	3.8 [3.7; 3.9] (6,139)
	Bearing mobility	Fixed	163,625	70 (62 - 77)	34/66	30.1	619			38	44	18	1.7 [1.6; 1.7] (119,639)	2.6 [2.5; 2.7] (78,682)	3.0 [2.9; 3.1] (44,476)	3.4 [3.3; 3.5] (18,870)	3.7 [3.5; 3.9] (5,228)
		Mobile	35,657	71 (63 - 77)	34/66	30.0	301			45	32	22	2.0 [1.8; 2.1] (27,412)	3.1 [2.9; 3.3] (19,063)	3.6 [3.4; 3.9] (10,971)	4.0 [3.8; 4.3] (4,103)	4.3 [4.0; 4.6] (911)
	Bearing materials	Uncoated metal / PE	85,792	71 (63 - 77)	35/65	30.1	452			36	40	24	1.5 [1.5; 1.6] (64,137)	2.3 [2.2; 2.4] (43,206)	2.7 [2.6; 2.9] (25,314)	3.1 [3.0; 3.3] (10,829)	3.4 [3.2; 3.7] (3,055)
		Uncoated metal / mXLPE	73,168	71 (63 - 77)	35/65	30.0	405			44	42	14	1.8 [1.7; 1.9] (54,500)	2.8 [2.7; 3.0] (36,505)	3.4 [3.2; 3.6] (20,613)	3.7 [3.5; 3.9] (8,382)	3.9 [3.7; 4.1] (2,129)
		Uncoated metal / hXLPE	15,092	69 (61 - 76)	30/70	30.5	304			40	42	18	1.7 [1.5; 1.9] (10,822)	2.6 [2.3; 2.9] (6,883)	2.9 [2.6; 3.3] (3,734)	3.2 [2.9; 3.6] (1,597)	3.5 [3.0; 4.1] (355)
		Uncoated metal / hXLPE+antiox.	8,703	68 (61 - 76)	37/63	30.4	140			25	49	26	1.8 [1.5; 2.1] (5,641)	2.7 [2.4; 3.2] (3,572)	3.1 [2.7; 3.6] (1,907)	3.6 [3.0; 4.2] (748)	3.9 [3.2; 4.8] (199)
		Coated metal / mXLPE	5,984	66 (58 - 74)	14/86	31.1	299			43	49	8	2.4 [2.0; 2.8] (4,219)	4.2 [3.7; 4.9] (2,589)	5.0 [4.4; 5.8] (1,296)	5.8 [4.9; 6.8] (493)	*6.0 [5.1; 7.1]* (103)
		Ceramicised metal / PE	4,010	66 (58 - 73)	18/82	31.4	182			28	65	7	1.3 [1.0; 1.8] (2,894)	2.7 [2.2; 3.4] (1,879)	3.2 [2.6; 4.0] (1,084)	3.5 [2.8; 4.4] (536)	3.7 [2.9; 4.8] (264)
		Coated metal / PE	2,526	68 (60 - 75)	18/82	31.1	160			55	39	6	2.7 [2.1; 3.4] (1,867)	4.6 [3.8; 5.6] (1,310)	5.2 [4.3; 6.3] (765)	5.8 [4.7; 7.2] (242)	
		Ceramicised metal / hXLPE	2,483	67 (59 - 75)	31/69	30.1	73			24	68	8	2.5 [2.0; 3.3] (1,767)	3.7 [2.9; 4.6] (990)	4.6 [3.6; 5.8] (344)		
		Uncoated metal / XLPE+antiox.	1,127	71 (64 - 77)	34/66	31.0	16			52	47	1	2.0 [1.3; 3.0] (971)	2.8 [1.9; 4.0] (670)	3.2 [2.2; 4.7] (321)	*3.6 [2.4; 5.2]* (85)	
	Femoral component	Uncoated metal	183,882	71 (63 - 77)	35/65	30.1	643			39	41	20	1.7 [1.6; 1.7] (136,071)	2.6 [2.5; 2.7] (90,836)	3.0 [2.9; 3.1] (51,889)	3.4 [3.3; 3.5] (21,641)	3.7 [3.5; 3.8] (5,738)
		Coated metal	8,713	66 (59 - 74)	15/85	31.1	404			45	46	8	2.4 [2.1; 2.8] (6,174)	4.3 [3.8; 4.8] (3,944)	5.0 [4.5; 5.6] (2,086)	5.7 [5.0; 6.5] (739)	*6.5 [5.2; 8.0]* (136)
		Ceramicised metal	6,493	66 (58 - 74)	23/77	30.9	196			27	66	7	1.8 [1.5; 2.2] (4,661)	3.1 [2.6; 3.6] (2,869)	3.7 [3.1; 4.3] (1,428)	4.1 [3.4; 4.9] (577)	4.3 [3.5; 5.2] (265)
	Tibial articulating surface	PE	92,522	71 (63 - 77)	34/66	30.1	507			36	41	23	1.6 [1.5; 1.6] (69,043)	2.4 [2.3; 2.5] (46,491)	2.8 [2.7; 3.0] (27,207)	3.2 [3.0; 3.4] (11,623)	3.5 [3.3; 3.8] (3,352)
		mXLPE	79,152	71 (63 - 77)	34/66	30.1	416			44	43	14	1.9 [1.8; 2.0] (58,719)	2.9 [2.8; 3.1] (39,094)	3.5 [3.4; 3.7] (21,909)	3.9 [3.7; 4.0] (8,875)	4.1 [3.9; 4.3] (2,232)
		hXLPE	17,575	68 (61 - 76)	30/70	30.4	320			38	46	16	1.8 [1.6; 2.0] (12,589)	2.8 [2.5; 3.1] (7,873)	3.1 [2.8; 3.5] (4,078)	3.4 [3.1; 3.8] (1,638)	3.7 [3.3; 4.3] (356)
		hXLPE+antiox.	8,906	68 (61 - 76)	37/63	30.4	142			25	49	27	1.7 [1.5; 2.0] (5,729)	2.7 [2.3; 3.2] (3,617)	3.1 [2.7; 3.6] (1,932)	3.5 [3.0; 4.2] (752)	3.9 [3.2; 4.8] (199)
		mXLPE+antiox.	1,127	71 (64 - 77)	34/66	31.0	16			52	47	1	2.0 [1.3; 3.0] (971)	2.8 [1.9; 4.0] (670)	3.2 [2.2; 4.7] (321)	*3.6 [2.4; 5.2]* (85)	
	Knee system	CR	91,515	70 (62 - 77)	35/65	30.2	562			44	45	11	1.5 [1.4; 1.6] (67,939)	2.3 [2.2; 2.5] (45,076)	2.8 [2.7; 2.9] (26,057)	3.1 [2.9; 3.3] (10,841)	3.3 [3.1; 3.6] (2,709)
		CR/CS	38,506	70 (63 - 77)	34/66	30.0	290			41	36	23	1.8 [1.7; 1.9] (29,080)	2.8 [2.7; 3.0] (20,008)	3.4 [3.2; 3.6] (11,306)	3.7 [3.4; 3.9] (4,614)	4.0 [3.7; 4.3] (1,175)
		PS	36,322	70 (62 - 77)	32/68	30.1	441			28	41	32	2.0 [1.8; 2.2] (25,362)	3.1 [2.9; 3.3] (15,980)	3.5 [3.3; 3.8] (8,887)	3.9 [3.6; 4.1] (4,052)	4.2 [3.8; 4.5] (1,458)
		CS	30,517	71 (63 - 77)	30/70	30.1	392			35	45	19	1.8 [1.7; 2.0] (23,244)	2.9 [2.7; 3.1] (15,920)	3.4 [3.2; 3.7] (8,911)	4.1 [3.7; 4.4] (3,387)	4.5 [4.1; 5.0] (793)
		Pivot	2,422	69 (61 - 76)	39/61	30.1	55			40	31	28	1.9 [1.4; 2.6] (1,426)	2.9 [2.2; 3.8] (761)	3.3 [2.5; 4.4] (286)	*3.3 [2.5; 4.4]* (79)	
	Patella	Without patellar resurfacing	178,745	70 (62 - 77)	34/66	30.1	645			41	43	16	1.7 [1.6; 1.8] (131,951)	2.6 [2.6; 2.7] (87,740)	3.1 [3.0; 3.2] (49,818)	3.4 [3.3; 3.6] (20,629)	3.7 [3.6; 3.9] (5,552)
		With patellar resurfacing	20,537	70 (62 - 77)	30/70	30.4	400			19	35	46	1.8 [1.6; 2.0] (15,100)	2.9 [2.6; 3.2] (10,005)	3.4 [3.1; 3.7] (5,629)	4.0 [3.6; 4.4] (2,344)	4.6 [4.1; 5.3] (587)

Table 38: Table of revision probabilities for different types and characteristics of knee arthroplasties – table continued on the next pages

Revision probabilities by ...																	
Type of arthroplasty	Category	Type	Number	Age	m/f	BMI	Hosp.			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
	Fixation	Cemented	183,413	71 (62 - 77)	33/67	30.1	644			39	42	19	1.7 [1.6; 1.8] (134,364)	2.6 [2.6; 2.7] (88,698)	3.1 [3.0; 3.2] (50,043)	3.5 [3.4; 3.6] (20,715)	3.8 [3.6; 4.0] (5,485)
	Fixation	Hybrid	12,979	69 (62 - 76)	39/61	30.3	161			41	49	10	1.9 [1.7; 2.2] (10,473)	2.8 [2.5; 3.1] (7,541)	3.3 [3.0; 3.7] (4,553)	3.6 [3.2; 4.0] (1,948)	3.9 [3.4; 4.4] (567)
		Uncemented	2,709	68 (60 - 76)	32/68	30.6	158			48	44	7	1.8 [1.3; 2.4] (2,092)	3.1 [2.5; 3.9] (1,427)	3.7 [2.9; 4.7] (814)	3.8 [3.0; 4.8] (296)	*3.8 [3.0; 4.8]* (86)
Constrained TKAs			10,575	74 (66 - 80)	24/76	29.1	572			46	42	11	4.1 [3.7; 4.5] (7,361)	5.2 [4.8; 5.7] (4,794)	6.0 [5.4; 6.5] (2,590)	6.2 [5.7; 6.9] (1,069)	6.5 [5.8; 7.3] (252)
	Bearing mobility	Fixed	10,185	74 (66 - 80)	24/76	29.1	566			47	42	11	4.0 [3.6; 4.4] (7,096)	5.1 [4.7; 5.6] (4,615)	5.8 [5.3; 6.4] (2,500)	6.1 [5.5; 6.7] (1,031)	6.4 [5.6; 7.2] (242)
	Bearing	Uncoated metal / PE	6,741	75 (67 - 80)	24/76	29.0	452			45	42	13	3.9 [3.4; 4.4] (4,729)	5.1 [4.5; 5.7] (3,118)	5.7 [5.0; 6.3] (1,680)	5.9 [5.2; 6.6] (699)	6.3 [5.3; 7.4] (167)
		Uncoated metal / mXLPE	2,247	74 (66 - 79)	27/73	29.1	232			52	37	10	3.5 [2.8; 4.4] (1,624)	4.5 [3.7; 5.5] (1,077)	4.9 [4.0; 6.0] (654)	5.5 [4.4; 6.9] (268)	*5.5 [4.4; 6.9]* (64)
		Coated metal / PE	792	74 (66 - 80)	21/79	28.8	130			46	47	7	7.0 [5.3; 9.2] (522)	8.3 [6.4; 10.8] (320)	*10.1 [7.7; 13.1]* (134)	*10.1 [7.7; 13.1]* (53)	
		Uncoated metal / hXLPE	368	72 (62 - 78)	27/73	30.8	48			47	51	3	4.8 [2.9; 7.7] (222)	*6.8 [4.4; 10.6]* (119)			
	Femoral component	Uncoated metal	9,443	75 (66 - 80)	25/75	29.1	560			47	41	12	3.8 [3.4; 4.2] (6,613)	5.0 [4.5; 5.5] (4,329)	5.6 [5.1; 6.1] (2,385)	5.9 [5.3; 6.5] (986)	6.1 [5.4; 7.0] (239)
		Coated metal	977	73 (65 - 79)	19/81	29.0	184			46	49	6	6.6 [5.1; 8.5] (647)	8.0 [6.3; 10.2] (403)	9.9 [7.8; 12.6] (171)	*9.9 [7.8; 12.6]* (67)	
	Tibial articulating surface	PE	7,688	75 (66 - 80)	24/76	29.0	471			45	43	12	4.2 [3.7; 4.7] (5,352)	5.4 [4.8; 5.9] (3,500)	6.1 [5.5; 6.8] (1,848)	6.3 [5.6; 7.0] (768)	6.6 [5.7; 7.7] (179)
		mXLPE	2,432	73 (65 - 79)	25/75	29.1	248			52	39	10	3.6 [2.9; 4.5] (1,749)	4.7 [3.8; 5.7] (1,160)	5.2 [4.3; 6.4] (691)	5.8 [4.7; 7.1] (282)	*5.8 [4.7; 7.1]* (65)
		hXLPE	368	72 (62 - 78)	27/73	30.8	48			47	51	3	4.8 [2.9; 7.7] (222)	*6.8 [4.4; 10.6]* (119)			
	Knee system	Hinged	6,684	76 (68 - 81)	22/78	28.4	511			50	39	10	4.4 [3.9; 5.0] (4,663)	5.7 [5.1; 6.4] (3,087)	6.6 [5.9; 7.3] (1,679)	6.9 [6.1; 7.7] (711)	*7.3 [6.2; 8.5]* (139)
		Varus-valgus stabilised	3,891	72 (63 - 78)	28/72	29.8	334			40	47	14	3.5 [2.9; 4.1] (2,698)	4.4 [3.7; 5.2] (1,707)	4.9 [4.2; 5.7] (911)	5.1 [4.3; 6.1] (358)	*5.1 [4.3; 6.1]* (113)
	Patella	Without patellar resurfacing	9,090	75 (66 - 80)	24/76	29.0	562			50	41	10	3.9 [3.5; 4.3] (6,315)	5.1 [4.6; 5.6] (4,121)	5.8 [5.3; 6.5] (2,222)	6.2 [5.6; 6.9] (922)	6.5 [5.7; 7.4] (216)
		With patellar resurfacing	1,485	74 (65 - 79)	26/74	29.7	183			27	50	22	5.1 [4.1; 6.4] (1,046)	6.2 [5.0; 7.7] (673)	6.6 [5.3; 8.2] (368)	*6.6 [5.3; 8.2]* (147)	
	Fixation	Cemented	10,425	75 (66 - 80)	24/76	29.2	571			46	42	12	4.0 [3.6; 4.4] (7,279)	5.1 [4.7; 5.6] (4,753)	5.8 [5.3; 6.4] (2,570)	6.1 [5.5; 6.7] (1,064)	6.4 [5.6; 7.2] (252)
Unicondylar knee arthroplasties			27,845	64 (57 - 73)	43/57	29.7	549			28	34	37	3.1 [2.9; 3.3] (19,552)	5.0 [4.7; 5.3] (12,325)	5.9 [5.5; 6.2] (6,577)	7.0 [6.6; 7.5] (2,362)	7.8 [7.1; 8.4] (775)
	Bearing mobility	Mobile	17,792	64 (57 - 73)	44/56	29.7	364			25	35	40	3.3 [3.0; 3.5] (12,717)	4.9 [4.6; 5.3] (8,199)	5.8 [5.4; 6.2] (4,540)	7.0 [6.4; 7.6] (1,811)	7.7 [7.0; 8.5] (629)
		Fixed	10,053	63 (57 - 72)	42/58	29.4	340			34	34	32	2.8 [2.5; 3.2] (6,835)	5.0 [4.5; 5.5] (4,126)	6.0 [5.4; 6.7] (2,037)	7.1 [6.3; 8.0] (551)	*7.8 [6.8; 9.0]* (146)
	Bearing	Uncoated metal / mXLPE	19,277	65 (58 - 73)	45/55	29.6	387			24	35	41	2.9 [2.6; 3.1] (13,823)	4.4 [4.1; 4.8] (8,841)	5.3 [4.9; 5.7] (4,833)	6.5 [6.0; 7.1] (1,843)	7.1 [6.5; 7.9] (605)
		Uncoated metal / PE	4,349	64 (58 - 73)	45/55	29.7	193			36	29	36	2.7 [2.2; 3.2] (3,203)	4.9 [4.2; 5.7] (2,082)	5.9 [5.1; 6.9] (1,040)	6.7 [5.7; 7.9] (229)	*8.7 [6.4; 11.8]* (77)
		Coated metal / mXLPE	2,273	61 (55 - 68)	26/74	30.1	246			34	43	23	4.3 [3.5; 5.3] (1,497)	7.2 [6.1; 8.6] (871)	8.6 [7.2; 10.3] (446)	10.0 [8.1; 12.2] (186)	*10.7 [8.5; 13.5]* (70)
		Uncoated metal / hXLPE+antiox.	786	63 (56 - 72)	45/55	29.3	55			30	38	32	1.9 [1.1; 3.4] (221)				
		Ceramicised metal / PE	543	60 (54 - 66)	34/66	30.1	93			57	28	15	5.5 [3.7; 8.1] (345)	7.7 [5.5; 10.9] (201)	*7.7 [5.5; 10.9]* (93)		
		Uncoated metal / hXLPE	362	62.5 (56 - 70)	44/56	29.3	28			69	31	0	4.5 [2.8; 7.4] (286)	7.1 [4.7; 10.6] (201)	*8.2 [5.5; 12.0]* (110)	*9.1 [6.1; 13.5]* (56)	
	Femoral component	Uncoated metal	24,774	64 (57 - 73)	45/55	29.6	519			27	34	39	2.8 [2.6; 3.1] (17,533)	4.5 [4.3; 4.9] (11,131)	5.4 [5.1; 5.8] (5,983)	6.6 [6.1; 7.1] (2,128)	7.3 [6.7; 8.1] (694)

Table 38 (continued)

Revision probabilities by ...																
Type of arthroplasty	Category	Type	Number	Age	m/f	BMI	Hosp.			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
	Femoral component	Coated metal	2,528	61 (55 - 68)	26/74	30.1	284			39	41	20	5.2 [4.4; 6.3] (1,674)	8.5 [7.3; 9.9] (993)	9.8 [8.4; 11.4] (501)	11.3 [9.5; 13.4] (205)	*12.0 [9.8; 14.6]* (75)
		Ceramicised metal	543	60 (54 - 66)	34/66	30.1	93			57	28	15	5.5 [3.7; 8.1] (345)	7.7 [5.5; 10.9] (201)	*7.7 [5.5; 10.9]* (93)		
	Tibial articulating surface	mXLPE	21,550	64 (57 - 73)	43/57	29.7	411			25	36	39	3.0 [2.8; 3.3] (15,320)	4.7 [4.4; 5.1] (9,712)	5.6 [5.2; 6.0] (5,279)	6.8 [6.3; 7.4] (2,029)	7.5 [6.8; 8.2] (675)
		PE	5,147	63 (57 - 72)	42/58	29.7	241			40	28	32	3.5 [3.0; 4.1] (3,725)	5.9 [5.2; 6.7] (2,405)	6.8 [6.0; 7.7] (1,188)	7.7 [6.6; 8.8] (277)	*9.4 [7.2; 12.1]* (88)
		hXLPE+antiox.	786	63 (56 - 72)	45/55	29.3	55			30	38	32	1.9 [1.1; 3.4] (221)				
		hXLPE	362	62.5 (56 - 70)	44/56	29.3	28			69	31	0	4.5 [2.8; 7.4] (286)	7.1 [4.7; 10.6] (201)	*8.2 [5.5; 12.0]* (110)	*9.1 [6.1; 13.5]* (56)	
	Patella	Without patellar resurfacing	27,845	64 (57 - 73)	43/57	29.7	549			28	34	37	3.1 [2.9; 3.3] (19,552)	5.0 [4.7; 5.3] (12,325)	5.9 [5.5; 6.2] (6,577)	7.0 [6.6; 7.5] (2,362)	7.8 [7.1; 8.4] (775)
	Fixation	Cemented	23,998	64 (57 - 73)	42/58	29.7	547			31	37	31	3.0 [2.8; 3.2] (16,789)	4.9 [4.6; 5.3] (10,525)	5.8 [5.5; 6.2] (5,549)	7.2 [6.7; 7.7] (1,890)	8.0 [7.3; 8.8] (579)
		Uncemented	3,449	63 (57 - 71)	55/45	29.9	73			7	18	74	3.7 [3.1; 4.4] (2,451)	5.0 [4.3; 5.9] (1,576)	5.8 [5.0; 6.8] (912)	6.0 [5.1; 7.1] (421)	6.6 [5.4; 8.0] (166)
		Hybrid	365	66 (60 - 75)	36/64	28.4	33			29	6	64	4.1 [2.4; 6.8] (293)	5.7 [3.6; 8.9] (211)	*6.8 [4.4; 10.6]* (106)		
Patellofemoral arthroplasties			429	54 (48 - 61)	25/75	27.8	133			29	33	38	4.9 [3.1; 7.7] (303)	8.8 [6.2; 12.6] (189)	*11.0 [7.8; 15.4]* (91)		
	Patella	With patellar resurfacing	353	54 (48 - 61)	24/76	28.0	111			26	35	39	4.3 [2.5; 7.5] (239)	*8.1 [5.2; 12.3]* (147)	*10.9 [7.3; 16.1]* (61)		

Table 38 (continued)

5.3 Revision probabilities of specific implant systems (brands) and combinations

The following tables show, without any rating, the revision probabilities determined for arthroplasties with specific implant systems and components. Hip arthroplasties are presented as individual femoral stem and cup pairs (table 39) and knee arthroplasties as femoral and tibial component pairs (table 40). The outcomes for stem and cup, obtained by considering each component in isolation across all combinations, are also listed separately in tables 41 and 42.

For the following presentations, groups of comparable systems are created, since the initial conditions for various implant systems can differ and certain implant systems, for example, are only used for very specific indications. For hip arthroplasties, only elective procedures are analysed. The calculation does not include hemiarthroplasties and total hip arthroplasties implanted because of femoral neck fracture. In the case of hip arthroplasties, classification into groups of comparable systems is based on the specified type of fixation, and in knee arthroplasties on the type of arthroplasty present, on the type of fixation, knee system, and the degree of constraint. Within each group, the implants are listed alphabetically.

To ensure that the final results obtained were robust, only outcomes for implant combinations or implants based on a minimum of 300 primary arthroplasties sourced from at least 3 different hospitals were considered. If the follow-up figures fall below the limit of 150 arthroplasties over time, this is highlighted in italics in the tables to indicate the resulting higher uncertainty of the numbers. If the number of arthroplasties followed up decreases to less than 50, no further numbers are given.

At this point it should be emphasised once again that the outcomes obtained cannot be attributed solely to the components implanted, but also to the circumstances of the arthroplasty and special aspects of the patient group treated with these implants (see also chapter 5.1). In order to, at least partially, reflect these external contributing circumstances, the following tables also list arthroplasty patients' characteristics (median age and percentage of male to female patients), as well as the percentage of arthroplasties that were performed by hospitals reporting low, medium and high arthroplasty volumes per year.

Elective total hip arthroplasties											Revision probabilities after ...				
Femoral stem	Cup	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Uncemented fixation															
A2 Kurzschaft (ARTIQO)	ANA.NOVA® Alpha Pfanne (ARTIQO)	1,359	23	64 (58 - 71)	42/58			1	92	3	1.3 [0.8; 2.1] (817)	1.4 [0.9; 2.3] (352)	*1.9 [1.0; 3.3]* (82)		
A2 Kurzschaft (ARTIQO)	ANA.NOVA® Hybrid Pfanne (ARTIQO)	2,234	26	63 (57 - 69)	37/63			6	36	57	1.0 [0.7; 1.6] (1,397)	1.5 [1.0; 2.2] (653)	*1.9 [1.2; 3.0]* (133)		
Accolade II Stem (Stryker)	Trident Cup (Stryker)	3,199	35	68 (60 - 75)	42/58			17	53	31	2.8 [2.3; 3.5] (1,816)	3.1 [2.5; 3.9] (885)	3.4 [2.7; 4.2] (437)	*3.8 [2.8; 5.0]* (147)	
Accolade II Stem (Stryker)	Trident TC Cup (Stryker)	415	9	69 (62 - 75)	38/62			16	84	0	2.0 [1.0; 3.9] (389)	2.5 [1.3; 4.6] (355)	2.8 [1.5; 5.0] (274)	*2.8 [1.5; 5.0]* (50)	
Accolade II Stem (Stryker)	Tritanium Cup (Stryker)	1,199	20	69 (62 - 75)	43/57			21	78	0	2.3 [1.6; 3.4] (786)	2.8 [1.9; 4.0] (545)	3.4 [2.3; 4.8] (289)	*3.8 [2.6; 5.7]* (112)	
Actinia cementless (Implantcast)	EcoFit cpTi (Implantcast)	521	9	69 (61 - 75)	40/60			25	75	0	3.0 [1.8; 5.0] (330)	*4.0 [2.5; 6.4]* (146)			
Alloclassic (Zimmer)	Alloclassic (Zimmer)	382	7	67 (59 - 75)	32/68			57	43	0	4.0 [2.4; 6.6] (326)	4.3 [2.7; 7.0] (258)	4.7 [2.9; 7.5] (189)	*5.3 [3.3; 8.4]* (87)	
Alloclassic (Zimmer)	Allofit (Zimmer)	6,204	53	70 (62 - 76)	35/65			12	74	14	2.5 [2.1; 2.9] (4,946)	3.1 [2.7; 3.6] (3,671)	3.3 [2.8; 3.8] (2,494)	3.6 [3.1; 4.2] (1,165)	3.7 [3.2; 4.3] (283)
Alloclassic (Zimmer)	Trilogy (Zimmer)	368	3	67 (63 - 70)	35/65			1	98	1	3.4 [1.9; 5.9] (284)	4.1 [2.5; 6.9] (215)	*4.1 [2.5; 6.9]* (120)		
Alpha-Fit (Corin)	Trinity no Hole (Corin)	435	3	75 (69 - 78)	32/68			25	0	75	1.6 [0.8; 3.4] (364)	2.0 [1.0; 4.0] (256)	2.0 [1.0; 4.0] (191)	*2.0 [1.0; 4.0]* (116)	
AMISTEM (Medacta)	VERSAFITCUP CC TRIO (Medacta)	810	24	67 (58 - 75)	43/57			22	71	5	3.4 [2.3; 4.9] (564)	4.0 [2.8; 5.7] (343)	*4.0 [2.8; 5.7]* (147)		
ANA.NOVA® Alpha Schaft (ARTIQO)	ANA.NOVA® Alpha Pfanne (ARTIQO)	699	7	70 (62 - 76)	44/56			0	94	0	3.3 [2.2; 5.0] (539)	3.7 [2.5; 5.5] (367)	3.7 [2.5; 5.5] (235)	*4.5 [2.8; 7.3]* (52)	
ANA.NOVA® Alpha Schaft (ARTIQO)	ANA.NOVA® Hybrid Pfanne (ARTIQO)	622	9	69 (62 - 75)	38/62			24	75	0	2.1 [1.2; 3.7] (428)	2.7 [1.6; 4.6] (260)	*2.7 [1.6; 4.6]* (141)		
ANA.NOVA® Solitär Schaft (ARTIQO)	ANA.NOVA® Hybrid Pfanne (ARTIQO)	325	6	74 (65 - 79)	36/64			20	80	0	4.3 [2.5; 7.3] (188)	*4.3 [2.5; 7.3]* (101)	*5.2 [3.0; 9.1]* (56)		
Avenir (Zimmer)	Allofit (Zimmer)	10,436	120	70 (63 - 76)	39/61			36	35	28	2.7 [2.4; 3.1] (6,407)	2.9 [2.6; 3.3] (3,945)	3.0 [2.6; 3.4] (1,943)	3.0 [2.6; 3.4] (558)	*3.0 [2.6; 3.4]* (65)
Avenir (Zimmer)	Allofit IT (Zimmer)	1,376	36	67.5 (59 - 75)	41/59			50	40	10	2.8 [2.1; 3.9] (890)	3.1 [2.2; 4.2] (490)	3.1 [2.2; 4.2] (186)		
BICONTACT H (Aesculap)	PLASMACUP SC (Aesculap)	1,454	19	70 (63 - 76)	49/51			11	77	12	2.2 [1.5; 3.1] (1,171)	2.4 [1.7; 3.4] (885)	2.4 [1.7; 3.4] (606)	2.4 [1.7; 3.4] (295)	*2.4 [1.7; 3.4]* (58)
BICONTACT H (Aesculap)	PLASMAFIT PLUS (Aesculap)	2,299	55	71 (63 - 76)	54/46			12	71	17	3.7 [3.0; 4.6] (1,699)	3.9 [3.2; 4.8] (1,191)	4.0 [3.2; 4.9] (721)	4.0 [3.2; 4.9] (381)	*4.0 [3.2; 4.9]* (124)
BICONTACT H (Aesculap)	PLASMAFIT POLY (Aesculap)	650	37	70 (63 - 76)	49/51			27	69	4	3.7 [2.5; 5.5] (466)	4.4 [3.0; 6.5] (318)	4.8 [3.3; 7.1] (201)	*4.8 [3.3; 7.1]* (77)	
BICONTACT S (Aesculap)	PLASMACUP SC (Aesculap)	1,615	22	72 (67 - 76)	32/68			21	41	37	2.1 [1.5; 3.0] (1,420)	2.8 [2.1; 3.7] (1,129)	3.0 [2.2; 4.0] (784)	3.2 [2.4; 4.3] (405)	3.2 [2.4; 4.3] (151)
BICONTACT S (Aesculap)	PLASMAFIT PLUS (Aesculap)	3,739	77	71 (64 - 77)	35/65			30	60	5	3.0 [2.5; 3.6] (2,812)	3.3 [2.7; 3.9] (1,997)	3.5 [2.9; 4.2] (1,228)	3.5 [2.9; 4.2] (617)	3.5 [2.9; 4.2] (186)
BICONTACT S (Aesculap)	PLASMAFIT POLY (Aesculap)	1,451	40	71 (65 - 76)	38/62			28	68	4	5.8 [4.7; 7.2] (1,006)	6.1 [4.9; 7.5] (625)	6.1 [4.9; 7.5] (309)	*6.1 [4.9; 7.5]* (74)	
CLS Spotorno (Zimmer)	Allofit (Zimmer)	14,960	150	65 (58 - 72)	43/57			20	39	38	2.7 [2.4; 3.0] (11,738)	3.1 [2.9; 3.4] (8,586)	3.5 [3.2; 3.8] (5,425)	3.6 [3.3; 4.0] (2,596)	3.7 [3.4; 4.1] (794)
CLS Spotorno (Zimmer)	Allofit IT (Zimmer)	1,278	28	66 (58 - 74)	43/57			15	83	2	1.4 [0.8; 2.2] (1,016)	2.0 [1.3; 3.0] (795)	2.0 [1.3; 3.0] (618)	2.0 [1.3; 3.0] (383)	2.3 [1.5; 3.6] (212)
CLS Spotorno (Zimmer)	Trilogy IT (Zimmer)	745	3	68 (61 - 74)	41/59			1	99	0	2.5 [1.6; 4.0] (582)	2.9 [1.9; 4.4] (424)	3.2 [2.1; 5.0] (280)	*3.2 [2.1; 5.0]* (118)	
CORAIL™ AMT-Hüftschaft (DePuy)	Allofit (Zimmer)	1,339	15	70 (61 - 77)	32/68			1	4	95	2.4 [1.7; 3.4] (1,057)	2.5 [1.8; 3.6] (610)	3.0 [2.1; 4.3] (279)		
CORAIL™ AMT-Hüftschaft (DePuy)	Allofit IT (Zimmer)	388	5	72 (66 - 77)	38/62			0	1	99	3.1 [1.8; 5.4] (363)	4.2 [2.6; 6.8] (337)	4.5 [2.8; 7.2] (259)		

Table 39: Implant outcomes for stem/cup combinations in elective total hip arthroplasties. For each type of fixation, the combinations are listed alphabetically by the stem component. The table is continued on the following pages.

Elective total hip arthroplasties											Revision probabilities after ...				
Femoral stem	Cup	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Uncemented fixation															
CORAIL™ AMT-Hüftschaft (DePuy)	DURALOC™ OPTION™ Press Fit-Hüftpfanne (DePuy)	471	8	70 (60 - 76)	36/64			39	40	21	4.4 [2.8; 6.7] (344)	4.7 [3.1; 7.1] (261)	4.7 [3.1; 7.1] (174)	*4.7 [3.1; 7.1]* (66)	
CORAIL™ AMT-Hüftschaft (DePuy)	PINNACLE™ Press Fit-Hüftpfanne (DePuy)	24,329	142	70 (62 - 77)	37/63			26	51	22	2.5 [2.3; 2.7] (17,267)	2.9 [2.7; 3.2] (11,269)	3.2 [3.0; 3.5] (6,019)	3.4 [3.1; 3.7] (2,235)	3.5 [3.2; 3.8] (627)
CORAIL™ AMT-Hüftschaft (DePuy)	PINNACLE™ SPIROFIT™-Schraubpfanne (DePuy)	328	16	75.5 (69 - 80)	26/74			62	38	0	3.7 [2.1; 6.4] (291)	4.0 [2.4; 6.9] (243)	4.5 [2.7; 7.6] (158)	*4.5 [2.7; 7.6]* (85)	
EXCEPTION (Biomet)	Allofit (Zimmer)	973	12	68 (59 - 75)	49/51			10	90	0	4.1 [3.0; 5.5] (601)	4.1 [3.0; 5.5] (299)	*4.7 [3.2; 6.9]* (53)		
EXCIA T (Aesculap)	PLASMAFIT PLUS (Aesculap)	1,536	46	70 (62 - 76)	32/68			28	69	0	2.8 [2.1; 3.8] (969)	3.4 [2.5; 4.5] (516)	*3.6 [2.7; 4.8]* (142)		
EXCIA T (Aesculap)	PLASMAFIT POLY (Aesculap)	2,058	41	69 (61 - 76)	37/63			35	40	24	3.4 [2.6; 4.3] (1,340)	3.5 [2.8; 4.4] (762)	3.5 [2.8; 4.4] (276)		
EXCIA TL (Aesculap)	PLASMAFIT PLUS (Aesculap)	591	41	69 (62 - 75)	54/46			19	77	2	3.4 [2.1; 5.3] (389)	3.9 [2.5; 6.0] (280)	*3.9 [2.5; 6.0]* (113)		
EXCIA TL (Aesculap)	PLASMAFIT POLY (Aesculap)	1,339	36	70 (62 - 76)	50/50			16	40	44	2.2 [1.5; 3.2] (887)	3.1 [2.2; 4.4] (495)	3.5 [2.4; 5.1] (191)		
Fitmore (Zimmer)	Allofit (Zimmer)	12,223	153	62 (55 - 69)	46/54			15	60	24	2.0 [1.8; 2.3] (8,854)	2.4 [2.1; 2.7] (5,910)	2.6 [2.3; 2.9] (3,484)	2.7 [2.4; 3.0] (1,483)	2.8 [2.4; 3.2] (318)
Fitmore (Zimmer)	Allofit IT (Zimmer)	1,524	50	57 (51 - 63)	47/53			15	28	56	2.8 [2.0; 3.8] (1,117)	3.5 [2.6; 4.6] (787)	3.9 [2.9; 5.2] (447)	3.9 [2.9; 5.2] (201)	*4.4 [3.2; 6.1]* (66)
Fitmore (Zimmer)	Trilogy (Zimmer)	1,642	13	61 (56 - 67)	42/58			6	62	32	1.8 [1.3; 2.6] (1,259)	2.3 [1.7; 3.2] (919)	2.7 [1.9; 3.7] (577)	3.1 [2.2; 4.3] (305)	3.4 [2.4; 4.9] (160)
GTS (Biomet)	Allofit (Zimmer)	565	14	65 (57 - 71)	44/56			18	18	65	2.6 [1.5; 4.3] (394)	3.2 [1.9; 5.3] (201)	*3.2 [1.9; 5.3]* (113)		
GTS (Biomet)	G7 (Biomet)	302	10	65 (58 - 74)	34/66			28	53	19	4.1 [2.4; 7.2] (221)	*5.3 [3.1; 8.9]* (137)	*5.3 [3.1; 8.9]* (96)		
Konusprothese (Zimmer)	Allofit (Zimmer)	367	62	53 (44 - 61)	18/82			9	72	17	2.9 [1.6; 5.3] (277)	3.2 [1.8; 5.8] (204)	*3.9 [2.2; 6.9]* (142)	*3.9 [2.2; 6.9]* (69)	
Konusprothese (Zimmer)	Allofit IT (Zimmer)	320	12	69 (59 - 76)	11/89			1	98	1	2.0 [0.9; 4.3] (277)	2.4 [1.1; 4.9] (235)	3.3 [1.7; 6.4] (176)	*4.0 [2.1; 7.5]* (130)	*4.0 [2.1; 7.5]* (72)
LCU (Waldemar Link)	Allofit (Zimmer)	393	5	68 (62 - 76)	50/50			9	91	1	1.1 [0.4; 2.9] (275)	*1.1 [0.4; 2.9]* (147)			
LCU (Waldemar Link)	CombiCup PF (Waldemar Link)	858	18	69 (62 - 75)	44/56			40	60	0	2.5 [1.6; 3.8] (538)	2.9 [1.9; 4.4] (299)	*3.5 [2.2; 5.7]* (65)		
LCU (Waldemar Link)	CombiCup SC (Waldemar Link)	368	7	62 (54 - 68)	50/50			3	97	0	2.6 [1.4; 5.0] (279)	3.1 [1.7; 5.7] (178)	*4.2 [2.1; 8.3]* (81)		
M/L Taper (Zimmer)	Allofit (Zimmer)	3,377	20	69 (62 - 75)	41/59			14	47	40	3.1 [2.5; 3.7] (2,646)	3.6 [3.0; 4.3] (1,766)	3.9 [3.2; 4.7] (916)	4.4 [3.6; 5.4] (395)	*4.8 [3.7; 6.1]* (98)
M/L Taper (Zimmer)	Trilogy (Zimmer)	460	3	69 (63 - 72)	32/68			18	14	67	0.9 [0.3; 2.3] (431)	1.4 [0.6; 3.0] (394)	1.4 [0.6; 3.0] (306)	1.4 [0.6; 3.0] (202)	*2.0 [0.9; 4.4]* (116)
METABLOC (Zimmer)	Allofit (Zimmer)	475	12	73 (66 - 78)	38/62			70	30	0	2.0 [1.0; 3.8] (413)	2.2 [1.2; 4.1] (346)	2.5 [1.4; 4.6] (241)	*2.5 [1.4; 4.6]* (138)	*2.5 [1.4; 4.6]* (67)
Metafix (Corin)	Trinity Hole (Corin)	411	8	74 (66 - 79)	36/64			32	68	0	1.6 [0.7; 3.5] (293)	1.6 [0.7; 3.5] (214)	*1.6 [0.7; 3.5]* (121)		
Metafix (Corin)	Trinity no Hole (Corin)	746	7	71 (65 - 76)	45/55			18	82	0	1.5 [0.8; 2.7] (566)	2.1 [1.2; 3.5] (454)	2.3 [1.4; 3.9] (299)	*2.3 [1.4; 3.9]* (140)	
METHA (Aesculap)	PLASMACUP SC (Aesculap)	706	22	59 (53 - 64)	44/56			8	23	68	1.6 [0.9; 2.9] (589)	2.5 [1.5; 4.1] (435)	2.5 [1.5; 4.1] (319)	2.5 [1.5; 4.1] (199)	*2.5 [1.5; 4.1]* (105)
METHA (Aesculap)	PLASMAFIT PLUS (Aesculap)	2,849	87	57 (52 - 63)	48/52			16	57	18	2.8 [2.3; 3.5] (2,165)	3.5 [2.9; 4.3] (1,494)	3.7 [3.0; 4.5] (894)	4.0 [3.2; 4.9] (466)	*4.0 [3.2; 4.9]* (123)
METHA (Aesculap)	PLASMAFIT POLY (Aesculap)	873	53	56 (51 - 61)	50/50			20	74	5	2.7 [1.8; 4.2] (549)	3.2 [2.1; 4.8] (307)	3.2 [2.1; 4.8] (159)	*3.2 [2.1; 4.8]* (57)	
MiniHip (Corin)	Trinity Hole (Corin)	814	28	61 (54 - 67)	49/51			69	27	3	2.3 [1.4; 3.6] (656)	2.4 [1.6; 3.8] (472)	2.8 [1.7; 4.3] (282)	*3.4 [2.0; 5.8]* (115)	

Table 39 (continued)

Elective total hip arthroplasties											Revision probabilities after ...				
Femoral stem	Cup	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Uncemented fixation															
MiniHip (Corin)	Trinity no Hole (Corin)	632	18	60 (54 - 66)	43/57			19	45	35	3.8 [2.5; 5.6] (473)	4.7 [3.2; 6.8] (280)	5.2 [3.5; 7.6] (151)		
Nanos Schenkelhalsprothese (OHST / Smith & Nephew)	Allofit (Zimmer)	694	15	62 (56 - 69)	49/51			1	95	2	2.2 [1.3; 3.7] (583)	2.4 [1.5; 3.9] (462)	2.4 [1.5; 3.9] (303)	*2.4 [1.5; 3.9]* (116)	
Nanos Schenkelhalsprothese (OHST / Smith & Nephew)	EP-FIT PLUS (Smith & Nephew)	306	24	57 (52 - 61)	56/44			42	50	6	3.1 [1.6; 5.9] (262)	3.1 [1.6; 5.9] (226)	3.1 [1.6; 5.9] (156)	*3.1 [1.6; 5.9]* (69)	
Nanos Schenkelhalsprothese (OHST / Smith & Nephew)	HI Lubricer Schale (Smith & Nephew)	428	10	61 (55 - 68)	50/50			13	82	5	1.4 [0.6; 3.1] (379)	2.3 [1.2; 4.4] (279)	4.5 [2.6; 7.7] (182)		
Nanos Schenkelhalsprothese (OHST / Smith & Nephew)	R3 (Smith & Nephew)	778	48	58 (51 - 64)	48/52			39	40	21	3.6 [2.4; 5.2] (540)	3.7 [2.6; 5.4] (324)	3.7 [2.6; 5.4] (163)		
optimys (Mathys)	Allofit (Zimmer)	1,875	19	64 (56 - 70)	46/54			5	62	33	1.7 [1.2; 2.4] (1,391)	1.7 [1.2; 2.4] (908)	2.0 [1.4; 2.9] (484)	2.0 [1.4; 2.9] (170)	
optimys (Mathys)	aneXys Flex (Mathys)	933	32	60 (54 - 65)	48/52			22	49	29	1.9 [1.1; 3.1] (509)	2.2 [1.3; 3.7] (267)	*2.2 [1.3; 3.7]* (50)		
optimys (Mathys)	RM Pressfit (Mathys)	464	7	72 (63 - 77)	42/58			0	97	3	2.7 [1.5; 4.7] (322)	3.0 [1.7; 5.1] (197)	*3.0 [1.7; 5.1]* (87)		
optimys (Mathys)	RM Pressfit vitamys (Mathys)	5,817	56	65 (58 - 73)	44/56			5	49	46	1.5 [1.2; 1.9] (3,925)	1.7 [1.4; 2.1] (2,314)	1.8 [1.4; 2.2] (1,061)	1.8 [1.4; 2.2] (286)	*1.8 [1.4; 2.2]* (66)
Polarschaft (Smith & Nephew)	EP-FIT PLUS (Smith & Nephew)	994	30	68 (60 - 75)	47/53			47	52	1	2.2 [1.5; 3.4] (842)	2.5 [1.7; 3.7] (600)	2.5 [1.7; 3.7] (286)		
Polarschaft (Smith & Nephew)	HI Lubricer Schale (Smith & Nephew)	1,864	12	71 (63 - 77)	33/67			27	73	0	2.1 [1.5; 2.9] (1,407)	2.5 [1.9; 3.4] (936)	2.5 [1.9; 3.4] (517)	2.5 [1.9; 3.4] (209)	*2.5 [1.9; 3.4]* (75)
Polarschaft (Smith & Nephew)	R3 (Smith & Nephew)	4,512	62	69 (61 - 76)	43/57			45	55	0	2.7 [2.3; 3.3] (2,983)	3.0 [2.5; 3.5] (1,750)	3.2 [2.7; 3.9] (755)	3.6 [2.9; 4.6] (221)	
Proxy PLUS Schaft (Smith & Nephew)	EP-FIT PLUS (Smith & Nephew)	341	13	70 (62 - 75)	46/54			59	31	10	3.8 [2.2; 6.5] (305)	4.9 [3.0; 7.9] (251)	5.3 [3.3; 8.4] (173)	*5.3 [3.3; 8.4]* (86)	
Pyramid (Atesos)	Pyramid (Atesos)	1,965	22	71 (64 - 77)	37/63			9	81	3	2.7 [2.1; 3.6] (1,572)	3.2 [2.5; 4.1] (1,140)	3.7 [2.9; 4.8] (633)	4.0 [3.0; 5.3] (189)	
QUADRA (Medacta)	VERSAFITCUP CC TRIO (Medacta)	4,499	42	68 (61 - 75)	39/61			8	66	25	2.4 [2.0; 2.9] (3,207)	2.9 [2.4; 3.5] (1,700)	3.1 [2.5; 3.7] (618)	*3.1 [2.5; 3.7]* (77)	
SL-PLUS Schaft (Smith & Nephew)	Allofit (Zimmer)	557	9	64 (57 - 71)	36/64			2	36	62	3.8 [2.5; 5.8] (511)	4.8 [3.3; 6.9] (480)	5.2 [3.6; 7.5] (417)	5.4 [3.8; 7.7] (361)	6.3 [4.4; 8.8] (264)
SL-PLUS Schaft (Smith & Nephew)	BICON-PLUS (Smith & Nephew)	1,053	24	72 (65 - 77)	37/63			19	81	0	2.5 [1.7; 3.7] (883)	3.8 [2.7; 5.2] (718)	4.7 [3.5; 6.4] (526)	5.7 [4.2; 7.6] (311)	*6.0 [4.4; 8.1]* (73)
SL-PLUS Schaft (Smith & Nephew)	EP-FIT PLUS (Smith & Nephew)	328	11	66 (62 - 72)	44/56			24	76	0	3.1 [1.7; 5.8] (280)	3.5 [2.0; 6.2] (242)	3.5 [2.0; 6.2] (182)	*4.1 [2.3; 7.1]* (84)	
SL-PLUS Schaft (Smith & Nephew)	R3 (Smith & Nephew)	1,328	19	69 (63 - 76)	34/66			10	68	23	3.8 [2.9; 5.0] (969)	4.8 [3.7; 6.2] (633)	5.0 [3.8; 6.5] (329)	*5.0 [3.8; 6.5]* (115)	
SL MIA Schaft (Smith & Nephew)	Allofit (Zimmer)	887	14	71 (61 - 77)	33/67			0	27	73	2.1 [1.4; 3.4] (476)	3.0 [1.9; 4.7] (287)	*3.0 [1.9; 4.7]* (105)		
SL MIA Schaft (Smith & Nephew)	BICON-PLUS (Smith & Nephew)	662	16	71 (64 - 76)	35/65			26	74	0	1.8 [1.1; 3.2] (598)	2.0 [1.2; 3.5] (539)	2.4 [1.5; 4.0] (445)	2.7 [1.6; 4.4] (323)	3.0 [1.8; 4.8] (163)
SL MIA Schaft (Smith & Nephew)	EP-FIT PLUS (Smith & Nephew)	549	10	73 (64 - 78)	40/60			69	31	0	2.8 [1.7; 4.5] (494)	3.8 [2.4; 5.8] (413)	4.0 [2.6; 6.1] (260)	*4.0 [2.6; 6.1]* (106)	
SL MIA Schaft (Smith & Nephew)	R3 (Smith & Nephew)	1,071	23	69 (61 - 76)	38/62			20	75	5	2.8 [2.0; 4.0] (720)	3.1 [2.2; 4.5] (350)	*3.1 [2.2; 4.5]* (95)		
SP-CL (Waldemar Link)	Allofit (Zimmer)	1,132	11	64 (57 - 70)	37/63			8	29	63	3.9 [2.9; 5.3] (817)	4.6 [3.4; 6.1] (515)	5.0 [3.8; 6.7] (193)		
SP-CL (Waldemar Link)	CombiCup PF (Waldemar Link)	578	22	66 (58 - 72)	38/62			33	41	24	3.7 [2.5; 5.7] (431)	4.0 [2.6; 6.0] (301)	*4.3 [2.9; 6.5]* (140)		
Taperloc (Biomet)	Allofit (Zimmer)	625	18	66 (60 - 74)	42/58			28	62	0	2.2 [1.2; 3.8] (336)	2.9 [1.7; 4.9] (163)			

Table 39 (continued)

Elective total hip arthroplasties											Revision probabilities after ...				
Femoral stem	Cup	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Uncemented fixation															
Taperloc (Biomet)	G7 (Biomet)	1,495	8	70 (62 - 76)	35/65			31	69	0	2.4 [1.7; 3.3] (1,218)	3.1 [2.3; 4.1] (788)	3.5 [2.6; 4.8] (315)		
TAPERLOC COMPLETE (Biomet)	G7 (Biomet)	342	6	67 (60 - 76)	42/58			0	89	11	*2.2 [1.0; 4.5]* (62)				
TRENDHIP L (Aesculap)	PLASMAFIT POLY (Aesculap)	818	21	68 (61 - 76)	59/41			3	75	22	2.2 [1.3; 3.5] (560)	2.2 [1.3; 3.5] (290)	2.2 [1.3; 3.5] (174)	*2.2 [1.3; 3.5]* (77)	
TRENDHIP S (Aesculap)	PLASMAFIT PLUS (Aesculap)	615	28	69 (61 - 77)	33/67			74	26	0	2.2 [1.3; 3.8] (423)	2.8 [1.7; 4.6] (262)	*2.8 [1.7; 4.6]* (136)		
TRENDHIP S (Aesculap)	PLASMAFIT POLY (Aesculap)	1,601	22	70 (62 - 76)	31/69			18	73	9	2.1 [1.4; 2.9] (1,001)	2.2 [1.5; 3.0] (465)	2.2 [1.5; 3.0] (256)	*2.7 [1.7; 4.5]* (117)	
TRILOCK®-Hüftschaft (DePuy)	PINNACLE™ Press Fit-Hüftpfanne (DePuy)	2,094	41	60 (54 - 66)	48/52			8	59	33	1.9 [1.4; 2.7] (1,494)	2.6 [2.0; 3.5] (1,057)	2.9 [2.1; 3.8] (655)	3.4 [2.5; 4.6] (305)	*3.4 [2.5; 4.6]* (80)
twinSys uncem. (Mathys)	aneXys Flex (Mathys)	476	18	69 (64 - 76)	43/57			51	46	3	3.2 [2.0; 5.3] (245)	*3.7 [2.2; 6.0]* (105)			
twinSys uncem. (Mathys)	RM Classic (Mathys)	496	7	75 (69 - 80)	32/68			33	67	0	1.0 [0.4; 2.5] (374)	1.6 [0.8; 3.3] (295)	2.3 [1.2; 4.6] (246)	2.3 [1.2; 4.6] (200)	2.9 [1.5; 5.4] (173)
twinSys uncem. (Mathys)	RM Pressfit (Mathys)	419	9	74 (68 - 79)	41/59			4	90	5	2.4 [1.3; 4.4] (356)	3.3 [1.9; 5.5] (302)	3.3 [1.9; 5.5] (213)	*3.8 [2.2; 6.4]* (116)	
twinSys uncem. (Mathys)	RM Pressfit vitamys (Mathys)	1,403	25	72 (64 - 77)	38/62			22	54	25	2.1 [1.4; 3.0] (981)	2.3 [1.6; 3.3] (583)	2.8 [1.9; 4.0] (277)	*2.8 [1.9; 4.0]* (142)	
Hybrid fixation															
Avenir (Zimmer)	Allofit (Zimmer)	1,012	65	79 (75 - 83)	23/77			25	66	8	2.4 [1.6; 3.6] (616)	2.8 [1.9; 4.2] (401)	2.8 [1.9; 4.2] (211)	*2.8 [1.9; 4.2]* (92)	
BICONTACT S (Aesculap)	PLASMAFIT PLUS (Aesculap)	474	43	78 (74 - 82)	21/79			48	51	1	1.3 [0.6; 2.8] (362)	1.3 [0.6; 2.8] (266)	2.1 [1.0; 4.3] (152)	*2.8 [1.4; 5.8]* (77)	
BICONTACT S (Aesculap)	PLASMAFIT POLY (Aesculap)	366	24	79 (75 - 82)	18/82			21	79	0	1.2 [0.5; 3.2] (293)	1.6 [0.7; 3.9] (213)	*2.2 [1.0; 4.9]* (123)	*2.2 [1.0; 4.9]* (54)	
CCA (Mathys)	Allofit (Zimmer)	422	4	76 (73 - 80)	32/68			3	97	0	2.4 [1.3; 4.4] (394)	3.4 [2.0; 5.7] (367)	3.9 [2.4; 6.4] (321)	4.3 [2.7; 6.8] (221)	4.3 [2.7; 6.8] (151)
CORAIL™ AMT-Hüftschaft (DePuy)	PINNACLE™ Press Fit-Hüftpfanne (DePuy)	498	62	79 (74 - 82)	40/60			31	50	19	3.3 [2.0; 5.5] (283)	*3.7 [2.3; 6.1]* (148)	*3.7 [2.3; 6.1]* (72)		
EXCEPTION (Biomet)	Allofit (Zimmer)	392	9	78 (74 - 82)	19/81			6	94	0	2.1 [1.1; 4.2] (207)	*2.1 [1.1; 4.2]* (78)			
EXCIA T (Aesculap)	PLASMAFIT PLUS (Aesculap)	440	28	77 (73 - 81)	22/78			16	73	0	2.3 [1.3; 4.3] (308)	3.3 [1.9; 5.7] (170)	*4.0 [2.3; 6.9]* (95)		
EXCIA T (Aesculap)	PLASMAFIT POLY (Aesculap)	379	33	78 (74 - 82)	19/81			50	21	29	1.1 [0.4; 3.0] (192)	*1.1 [0.4; 3.0]* (78)			
M.E.M. Geradschaft (Zimmer)	Allofit (Zimmer)	9,895	132	78 (74 - 81)	27/73			20	54	22	2.0 [1.7; 2.3] (6,787)	2.2 [1.9; 2.5] (4,300)	2.4 [2.1; 2.8] (2,280)	2.5 [2.1; 2.9] (926)	3.0 [2.4; 3.8] (195)
M.E.M. Geradschaft (Zimmer)	Trilogy (Zimmer)	1,081	11	77 (74 - 80)	30/70			13	60	27	1.1 [0.6; 1.9] (891)	1.2 [0.7; 2.1] (706)	1.3 [0.8; 2.3] (466)	1.3 [0.8; 2.3] (249)	*1.8 [0.9; 3.4]* (112)
METABLOC (Zimmer)	Allofit (Zimmer)	1,282	24	78 (75 - 82)	27/73			19	68	13	2.4 [1.7; 3.4] (986)	2.7 [1.9; 3.8] (685)	3.0 [2.1; 4.3] (432)	3.0 [2.1; 4.3] (196)	*3.0 [2.1; 4.3]* (52)
MS-30 (Zimmer)	Allofit (Zimmer)	2,435	25	77 (73 - 81)	27/73			10	66	24	1.6 [1.2; 2.3] (1,929)	1.8 [1.3; 2.4] (1,445)	2.1 [1.5; 2.8] (875)	2.5 [1.8; 3.5] (340)	
Müller Geradschaft (Smith & Nephew)	R3 (Smith & Nephew)	451	11	78 (75 - 81)	34/66			14	14	72	4.6 [3.0; 7.0] (314)	4.6 [3.0; 7.0] (153)			
Polarschaft (Smith & Nephew)	R3 (Smith & Nephew)	719	39	78 (75 - 82)	22/78			24	76	0	3.2 [2.1; 4.9] (470)	3.5 [2.3; 5.2] (248)	*3.5 [2.3; 5.2]* (79)		
QUADRA (Medacta)	VERSAFITCUP CC TRIO (Medacta)	781	28	79 (77 - 82)	22/78			8	45	47	2.0 [1.2; 3.3] (453)	2.7 [1.6; 4.5] (199)	*2.7 [1.6; 4.5]* (68)		
SPII® Modell Lubinus (Waldemar Link)	Allofit (Zimmer)	2,946	35	77 (73 - 80)	29/71			5	30	65	2.4 [1.9; 3.1] (2,116)	2.8 [2.2; 3.5] (1,443)	3.0 [2.4; 3.8] (799)	3.4 [2.6; 4.4] (392)	*3.8 [2.8; 5.1]* (146)

Table 39 (continued)

Elective total hip arthroplasties											Revision probabilities after ...				
Femoral stem	Cup	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Hybrid fixation															
SPII® Modell Lubinus (Waldemar Link)	CombiCup PF (Waldemar Link)	878	30	77 (73 - 81)	27/73			57	26	6	1.0 [0.5; 2.0] (661)	2.3 [1.4; 3.7] (450)	2.6 [1.6; 4.2] (270)	*4.2 [2.4; 7.1]* (96)	
twinSys (Mathys)	RM Pressfit vitamys (Mathys)	400	12	77 (71 - 81)	19/81			1	25	74	1.7 [0.7; 3.7] (253)	*2.3 [1.0; 4.9]* (78)			
Cemented fixation															
Avenir (Zimmer)	Flachprofil (Zimmer)	358	42	80.5 (76 - 84)	22/78			19	69	9	3.1 [1.7; 5.7] (211)	*3.1 [1.7; 5.7]* (113)	*3.1 [1.7; 5.7]* (51)		
BICONTACT S (Aesculap)	ALL POLY CUP STANDARD (Aesculap)	899	49	80 (77 - 84)	21/79			30	53	17	2.5 [1.6; 3.8] (727)	2.5 [1.6; 3.8] (566)	2.9 [1.9; 4.2] (383)	2.9 [1.9; 4.2] (216)	*2.9 [1.9; 4.2]* (87)
CS PLUS Schaft (Smith & Nephew)	Müller II Pfanne (Smith & Nephew)	479	20	79 (77 - 82)	26/74			22	78	0	1.1 [0.4; 2.5] (435)	1.9 [1.0; 3.8] (340)	2.7 [1.4; 5.0] (216)	*2.7 [1.4; 5.0]* (72)	
M.E.M. Geradschaft (Zimmer)	Flachprofil (Zimmer)	3,184	112	80 (77 - 83)	24/76			26	62	9	2.1 [1.6; 2.7] (2,403)	2.5 [2.0; 3.2] (1,675)	2.9 [2.3; 3.6] (1,040)	3.1 [2.5; 3.9] (504)	3.1 [2.5; 3.9] (152)
METABLOC (Zimmer)	Flachprofil (Zimmer)	357	16	79 (76 - 83)	28/72			10	85	6	2.6 [1.4; 5.0] (270)	2.6 [1.4; 5.0] (184)	*2.6 [1.4; 5.0]* (96)		
MS-30 (Zimmer)	Flachprofil (Zimmer)	434	22	79 (75 - 82)	23/77			17	82	1	1.3 [0.5; 3.1] (323)	1.6 [0.7; 3.5] (224)	2.2 [1.0; 4.7] (154)	*2.2 [1.0; 4.7]* (73)	
Polarschaft (Smith & Nephew)	Müller II Pfanne (Smith & Nephew)	459	28	80 (77 - 84)	23/77			47	53	0	3.3 [2.0; 5.5] (334)	4.1 [2.5; 6.6] (205)	*4.1 [2.5; 6.6]* (86)		
SPII® Modell Lubinus (Waldemar Link)	Endo-Modell Mark III (Waldemar Link)	433	6	76 (73 - 80)	19/81			2	30	68	1.9 [0.9; 3.7] (397)	2.7 [1.5; 4.8] (351)	2.7 [1.5; 4.8] (302)	3.0 [1.7; 5.3] (248)	3.0 [1.7; 5.3] (169)
SPII® Modell Lubinus (Waldemar Link)	IP-Hüftpfannen, UHMWPE (Waldemar Link)	336	15	80 (77 - 83)	24/76			42	49	0	1.8 [0.8; 4.0] (258)	2.3 [1.1; 4.8] (198)	2.8 [1.4; 5.7] (154)	*2.8 [1.4; 5.7]* (62)	
SPII® Modell Lubinus (Waldemar Link)	IP-Hüftpfannen, X-Linked (Waldemar Link)	668	19	80 (78 - 84)	26/74			8	92	0	2.5 [1.5; 4.1] (509)	2.9 [1.8; 4.6] (361)	3.3 [2.1; 5.2] (225)	*5.3 [2.9; 9.5]* (82)	
SPII® Modell Lubinus (Waldemar Link)	Kunststoffpfanne Modell Lubinus (Waldemar Link)	600	17	79 (74 - 82)	25/75			9	60	22	0.7 [0.3; 1.9] (466)	1.2 [0.5; 2.6] (345)	1.2 [0.5; 2.6] (196)	*1.2 [0.5; 2.6]* (99)	
Reverse-hybrid fixation															
CORAIL™ AMT-Hüftschaft (DePuy)	TRILOC® II-PE-Hüftpfanne (DePuy)	697	67	79 (74 - 82)	16/84			35	56	8	3.3 [2.2; 5.0] (519)	3.3 [2.2; 5.0] (380)	3.6 [2.4; 5.3] (224)	*4.1 [2.6; 6.3]* (67)	

Table 39 (continued)

Knee arthroplasties											Revision probabilities after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Standard knee systems, cruciate retaining, fixed bearing, cemented															
ACS cemented (Implantcast)	ACS FB cemented (Implantcast)	549	38	67 (59 - 75)	23/77			71	23	6	3.0 [1.8; 5.0] (363)	5.0 [3.2; 7.6] (208)	*6.2 [4.0; 9.6]* (86)		
ATTUNE™ Femur (DePuy)	ATTUNE™ Tibia (DePuy)	4,478	89	67 (60 - 75)	38/62			27	51	22	1.7 [1.3; 2.1] (3,145)	2.7 [2.2; 3.3] (2,019)	3.2 [2.6; 3.9] (1,078)	3.2 [2.6; 3.9] (497)	3.7 [2.8; 4.8] (156)
balanSys BICONDYLAR cem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	1,442	17	72 (65 - 78)	34/66			42	33	25	2.2 [1.5; 3.1] (1,019)	2.6 [1.9; 3.7] (662)	3.5 [2.5; 5.0] (299)	*4.0 [2.8; 5.8]* (83)	
COLUMBUS CR (Aesculap)	COLUMBUS CR/PS (Aesculap)	8,648	119	71 (63 - 77)	32/68			67	28	3	1.2 [1.0; 1.5] (6,219)	2.1 [1.8; 2.5] (4,055)	2.5 [2.1; 3.0] (2,298)	2.9 [2.4; 3.4] (980)	3.0 [2.5; 3.6] (296)
COLUMBUS CR (Aesculap)	COLUMBUS CRA/PSA (Aesculap)	1,924	32	69 (62 - 77)	36/64			37	63	0	1.1 [0.7; 1.7] (1,316)	1.7 [1.2; 2.6] (765)	2.1 [1.4; 3.2] (345)	*2.1 [1.4; 3.2]* (110)	
EFK (OHST Medizintechnik)	EFK (OHST Medizintechnik)	2,955	51	72 (64 - 77)	34/66			35	57	8	1.4 [1.0; 1.9] (2,839)	1.9 [1.5; 2.5] (2,603)	2.2 [1.7; 2.8] (1,840)	2.6 [2.0; 3.3] (659)	*4,2 [2,2; 7,7]* (65)
GEMINI SL Fixed Bearing CR / Mobile Bearing (zementiert) (Waldemar Link)	GEMINI SL Fixed Bearing CR / PS (zementiert) (Waldemar Link)	384	23	73 (63 - 77)	30/70			58	29	13	1.8 [0.8; 4.0] (242)	*3.7 [2.0; 6.8]* (136)	*4.6 [2.4; 8.6]* (64)		
GENESIS II CR COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	5,936	79	70 (62 - 76)	33/67			59	37	3	1.8 [1.5; 2.2] (4,354)	2.7 [2.3; 3.3] (3,009)	3.3 [2.8; 3.9] (1,851)	3.7 [3.1; 4.4] (838)	3.7 [3.1; 4.4] (210)
GENESIS II CR OXINIUM (Smith & Nephew)	Genesis II (Smith & Nephew)	1,788	95	65 (58 - 73)	20/80			34	59	6	1.3 [0.9; 2.0] (1,434)	2.8 [2.0; 3.7] (1,012)	3.0 [2.2; 4.0] (652)	3.3 [2.4; 4.5] (335)	3.3 [2.4; 4.5] (166)
GENESIS II LDK COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	1,857	16	71 (63 - 76)	36/64			18	65	18	2.3 [1.7; 3.0] (1,669)	3.2 [2.5; 4.2] (1,236)	3.9 [3.1; 5.0] (886)	4.2 [3.3; 5.4] (390)	*4.6 [3.5; 6.0]* (108)
INNEX (Zimmer)	INNEX (Zimmer)	919	25	73 (66 - 78)	42/58			92	8	0	2.3 [1.5; 3.6] (714)	2.6 [1.7; 4.0] (506)	2.6 [1.7; 4.0] (291)	*3.4 [2.1; 5.3]* (143)	
JOURNEY II CR OXINIUM (Smith & Nephew)	JOURNEY (Smith & Nephew)	714	20	65 (59 - 73)	36/64			37	63	0	2.8 [1.7; 4.4] (513)	3.7 [2.4; 5.6] (235)	*5.7 [3.4; 9.4]* (83)		
LEGION CR COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	5,370	85	71 (63 - 77)	37/63			38	56	5	1.5 [1.2; 1.9] (3,120)	2.4 [1.9; 3.0] (1,370)	2.8 [2.2; 3.5] (475)	*3.0 [2.3; 3.9]* (51)	
LEGION CR OXINIUM (Smith & Nephew)	Genesis II (Smith & Nephew)	1,247	92	65 (58 - 72)	15/85			31	56	13	1.9 [1.2; 2.9] (771)	3.8 [2.6; 5.5] (355)	*4.4 [3.0; 6.5]* (94)		
Natural Knee NK Flex (Zimmer)	Natural Knee NK II (Zimmer)	378	10	73 (63 - 78)	33/67			95	5	0	1.1 [0.4; 2.8] (329)	2.1 [1.0; 4.4] (217)	*2.6 [1.3; 5.2]* (124)	*2.6 [1.3; 5.2]* (77)	
NexGen CR-Flex-Gender (Zimmer)	NexGen (Zimmer)	3,299	86	70 (62 - 76)	9/91			25	53	18	0.8 [0.5; 1.2] (2,548)	1.7 [1.3; 2.3] (1,726)	2.0 [1.5; 2.7] (1,082)	2.0 [1.5; 2.7] (528)	2.2 [1.6; 3.1] (215)
NexGen CR-Flex (Zimmer)	NexGen (Zimmer)	12,160	105	72 (64 - 77)	40/60			29	40	30	1.2 [1.1; 1.5] (9,173)	1.8 [1.5; 2.1] (6,140)	2.0 [1.7; 2.3] (3,682)	2.2 [1.9; 2.5] (1,800)	2.4 [2.0; 2.9] (578)
NexGen CR (Zimmer)	NexGen (Zimmer)	2,906	43	70 (62 - 76)	43/57			39	19	42	1.1 [0.7; 1.5] (2,418)	1.9 [1.4; 2.5] (1,745)	2.3 [1.8; 3.1] (1,204)	3.2 [2.4; 4.1] (660)	3.2 [2.4; 4.1] (182)
Persona (Zimmer)	Persona (Zimmer)	2,154	51	69 (61 - 76)	39/61			49	46	5	1.2 [0.8; 1.9] (1,260)	1.5 [1.0; 2.2] (725)	1.8 [1.2; 2.7] (327)	*1.8 [1.2; 2.7]* (95)	
Scorpio NRG CR (Stryker)	Scorpio (Stryker)	328	7	71 (63 - 77)	30/70			90	10	0	0.9 [0.3; 2.8] (322)	1.9 [0.8; 4.1] (288)	3.2 [1.6; 6.1] (187)	*3.2 [1.6; 6.1]* (88)	
TC-PLUS CR (Smith & Nephew)	TC-PLUS (Smith & Nephew)	2,833	39	72 (64 - 78)	36/64			44	56	0	1.1 [0.8; 1.6] (2,035)	1.6 [1.2; 2.2] (1,022)	1.9 [1.3; 2.6] (434)	*1.9 [1.3; 2.6]* (106)	
Triathlon CR (Stryker)	Triathlon (Stryker)	6,271	69	71 (63 - 77)	37/63			43	45	11	1.5 [1.2; 1.9] (4,339)	2.4 [2.0; 2.9] (2,825)	3.2 [2.6; 3.8] (1,622)	3.5 [2.9; 4.2] (734)	3.5 [2.9; 4.2] (209)
Vanguard (Biomet)	Vanguard (Biomet)	7,409	75	71 (63 - 77)	33/67			46	53	1	2.0 [1.7; 2.3] (5,637)	2.8 [2.4; 3.3] (3,624)	3.2 [2.8; 3.7] (1,965)	3.6 [3.1; 4.2] (670)	*3.8 [3.2; 4.5]* (64)
Standard knee systems, cruciate retaining, fixed bearing, hybrid															
COLUMBUS CR zf (Aesculap)	COLUMBUS CR/PS (Aesculap)	422	5	69 (62 - 77)	38/62			72	28	0	5.2 [3.4; 7.8] (340)	5.5 [3.6; 8.2] (251)	*6.2 [4.2; 9.2]* (142)		
EFK (OHST Medizintechnik)	EFK (OHST Medizintechnik)	1,122	16	70 (62 - 76)	38/62			5	92	0	1.3 [0.8; 2.2] (1,091)	1.9 [1.2; 2.9] (1,037)	2.2 [1.5; 3.3] (796)	2.2 [1.5; 3.3] (384)	*3.2 [2.1; 5.0]* (55)
GENESIS II CR COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	360	4	69 (62 - 76)	42/58			35	65	0	0.6 [0.2; 2.4] (320)	1.3 [0.5; 3.3] (262)	1.7 [0.7; 4.1] (191)	*1.7 [0.7; 4.1]* (131)	*1.7 [0.7; 4.1]* (64)

Table 40: Implant outcomes for femoral-tibial combinations in knee arthroplasties. Within the groups comprising type of arthroplasty, type of fixation, knee system, and degree of constraint, the combinations are listed alphabetically by the femoral component. The table is continued on the following pages.

Knee arthroplasties											Revision probabilities after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Standard knee systems, cruciate retaining, fixed bearing, hybrid															
NexGen CR-Flex (Zimmer)	NexGen (Zimmer)	668	17	69 (61 - 76)	49/51			26	74	0	0.6 [0.2; 1.7] (550)	1.6 [0.8; 3.1] (349)	1.6 [0.8; 3.1] (174)	*1.6 [0.8; 3.1]* (83)	
NexGen CR (Zimmer)	NexGen (Zimmer)	462	6	69 (62 - 75)	47/53			76	24	0	0.4 [0.1; 1.8] (421)	0.7 [0.2; 2.1] (367)	0.7 [0.2; 2.1] (228)	*0.7 [0.2; 2.1]* (93)	
TC-PLUS CR (Smith & Nephew)	TC-PLUS (Smith & Nephew)	311	12	72 (64 - 77)	39/61			19	62	0	3.7 [2.0; 6.5] (249)	*4.8 [2.7; 8.2]* (133)	*4.8 [2.7; 8.2]* (55)		
Vanguard (Biomet)	Vanguard (Biomet)	537	7	67 (59 - 74)	42/58			7	93	0	2.0 [1.1; 3.8] (385)	3.2 [1.9; 5.3] (243)	*3.6 [2.1; 6.0]* (128)		
Standard knee systems, cruciate retaining, mobile bearing, cemented															
ACS cemented (Implantcast)	ACS MB cemented (Implantcast)	445	19	71 (63 - 77)	29/71			63	37	0	2.6 [1.4; 4.6] (341)	4.3 [2.6; 7.0] (242)	*4.7 [2.9; 7.6]* (147)	*5.9 [3.4; 10.2]* (53)	
ATTUNE™ Femur (DePuy)	ATTUNE™ Tibia (DePuy)	1,205	17	70 (62 - 75)	35/65			32	41	27	1.6 [1.0; 2.5] (907)	2.3 [1.5; 3.5] (620)	3.0 [2.0; 4.4] (350)	*4.4 [2.5; 7.8]* (77)	
COLUMBUS CR (Aesculap)	COLUMBUS RP (Aesculap)	1,637	22	72 (64 - 77)	33/67			93	7	0	1.5 [1.0; 2.3] (1,208)	2.4 [1.7; 3.4] (823)	3.1 [2.2; 4.4] (467)	3.1 [2.2; 4.4] (186)	*3.1 [2.2; 4.4]* (51)
INNEX (Zimmer)	INNEX (Zimmer)	979	58	71 (63 - 77)	98/2			41	22	36	2.0 [1.2; 3.1] (786)	2.9 [1.9; 4.3] (561)	3.3 [2.2; 4.9] (314)	*4.1 [2.7; 6.2]* (103)	
NexGen CR-Flex (Zimmer)	NexGen CR (Zimmer)	490	10	71 (64 - 76)	43/57			7	93	0	0.6 [0.2; 2.0] (423)	1.5 [0.7; 3.2] (323)	2.4 [1.3; 4.6] (263)	*3.3 [1.8; 5.9]* (119)	
TC-PLUS CR (Smith & Nephew)	TC-PLUS SB (Smith & Nephew)	319	9	71 (63 - 77)	31/69			99	1	0	2.7 [1.3; 5.2] (266)	3.5 [1.9; 6.4] (219)	*4.8 [2.8; 8.3]* (115)		
Standard knee systems, cruciate retaining, mobile bearing, hybrid															
TC-PLUS CR (Smith & Nephew)	TC-PLUS SB (Smith & Nephew)	345	6	70 (62 - 77)	34/66			10	90	0	2.4 [1.2; 4.8] (305)	4.4 [2.6; 7.3] (259)	*4.4 [2.6; 7.3]* (146)		
Standard knee systems, cruciate retaining/sacrificing, fixed bearing, cemented															
3D (Speetec Implantate Gmbh)	3D (Speetec Implantate Gmbh)	1,368	20	71 (63 - 77)	34/66			50	39	11	2.1 [1.5; 3.1] (1,221)	2.9 [2.1; 4.0] (923)	3.3 [2.4; 4.5] (554)	3.5 [2.6; 4.8] (217)	
SIGMA® Femur (DePuy)	SIGMA® Tibia (DePuy)	17,440	124	71 (63 - 77)	34/66			34	40	25	1.4 [1.3; 1.6] (12,877)	2.3 [2.1; 2.6] (8,890)	2.8 [2.5; 3.1] (4,853)	3.2 [2.8; 3.5] (1,986)	3.4 [3.0; 3.9] (558)
Unity CR cmtd (Corin)	Unity cmtd (Corin)	364	11	75 (69 - 78)	27/73			29	71	0	1.0 [0.3; 2.9] (298)	1.7 [0.7; 4.2] (209)	*2.7 [1.3; 5.7]* (130)	*2.7 [1.3; 5.7]* (64)	
Standard knee systems, cruciate retaining/sacrificing, fixed bearing, hybrid															
SIGMA® Femur (DePuy)	SIGMA® Tibia (DePuy)	656	16	68.5 (61 - 76)	41/59			60	40	0	1.2 [0.5; 2.4] (505)	1.2 [0.5; 2.4] (342)	1.6 [0.7; 3.5] (198)	*1.6 [0.7; 3.5]* (76)	
Standard knee systems, cruciate retaining/sacrificing, mobile bearing, cemented															
E.MOTION FP/UC (Aesculap)	E.MOTION UC/PS (Aesculap)	6,823	77	70 (62 - 77)	32/68			46	37	15	2.3 [1.9; 2.7] (4,841)	3.8 [3.3; 4.3] (3,061)	4.4 [3.8; 5.0] (1,631)	4.8 [4.2; 5.6] (652)	*5.7 [4.7; 6.8]* (145)
LCS® COMPLETE™ Femur (DePuy)	MBT Tibia (DePuy)	4,445	56	71 (64 - 77)	36/64			41	19	40	2.1 [1.7; 2.6] (3,748)	3.1 [2.6; 3.7] (2,897)	3.5 [2.9; 4.1] (1,919)	3.7 [3.2; 4.4] (888)	3.9 [3.2; 4.6] (159)
SIGMA® Femur (DePuy)	MBT Tibia (DePuy)	1,402	26	72 (64 - 78)	35/65			77	15	7	2.5 [1.8; 3.5] (949)	3.4 [2.5; 4.7] (616)	4.6 [3.4; 6.2] (331)	*4.6 [3.4; 6.2]* (74)	
Standard knee systems, cruciate retaining/sacrificing, mobile bearing, hybrid															
LCS® COMPLETE™ Femur (DePuy)	MBT Tibia (DePuy)	2,493	34	70 (62 - 77)	35/65			36	19	44	2.7 [2.1; 3.5] (1,944)	3.6 [2.8; 4.4] (1,275)	4.3 [3.5; 5.4] (685)	4.3 [3.5; 5.4] (252)	*4.3 [3.5; 5.4]* (97)
Standard knee systems, cruciate retaining/sacrificing, mobile bearing, uncemented															
LCS® COMPLETE™ Femur (DePuy)	LCS® COMPLETE™ Tibia (DePuy)	428	65	64 (58 - 72)	6/94			45	33	22	1.8 [0.9; 3.8] (309)	4.5 [2.6; 7.6] (185)	*5.9 [3.5; 9.8]* (78)		
LCS® COMPLETE™ Femur (DePuy)	MBT Tibia (DePuy)	1,055	22	70 (61 - 76)	36/64			29	64	8	1.3 [0.8; 2.2] (855)	2.8 [1.9; 4.2] (602)	3.2 [2.2; 4.7] (367)	3.2 [2.2; 4.7] (154)	*3.2 [2.2; 4.7]* (70)

Table 40 (continued)

Knee arthroplasties											Revision probabilities after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Standard knee systems, cruciate sacrificing, fixed bearing, cemented															
ATTUNE™ Femur (DePuy)	ATTUNE™ Tibia (DePuy)	975	60	68 (60 - 75)	36/64			38	46	15	2.2 [1.4; 3.4] (742)	3.8 [2.7; 5.4] (559)	3.8 [2.7; 5.4] (315)	5.0 [3.4; 7.4] (155)	
balanSys BICONDYLAR cem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	1,097	23	70 (62 - 77)	27/73			36	49	15	2.1 [1.3; 3.2] (746)	3.2 [2.2; 4.7] (411)	4.7 [3.1; 7.0] (207)	*5.6 [3.7; 8.4]* (110)	
COLUMBUS CR (Aesculap)	COLUMBUS CR/PS (Aesculap)	1,536	69	71 (62 - 77)	23/77			59	25	16	2.4 [1.7; 3.4] (1,138)	3.4 [2.6; 4.6] (726)	3.8 [2.8; 5.1] (381)	*4.1 [3.0; 5.5]* (122)	
COLUMBUS CR (Aesculap)	COLUMBUS CRA/PSA (Aesculap)	595	22	69 (61 - 77)	31/69			45	55	0	2.3 [1.3; 3.9] (455)	3.9 [2.5; 6.0] (282)	*3.9 [2.5; 6.0]* (147)		
INNEX (Zimmer)	INNEX (Zimmer)	1,101	40	72 (64 - 78)	40/60			56	20	13	1.0 [0.5; 1.8] (798)	1.5 [0.8; 2.6] (488)	1.7 [1.0; 3.0] (240)	*3.5 [2.0; 6.1]* (72)	
INNEX Gender (Zimmer)	INNEX (Zimmer)	581	31	72 (65 - 78)	21/79			33	28	30	2.4 [1.4; 4.1] (449)	3.2 [2.0; 5.2] (281)	3.6 [2.2; 5.8] (180)	*5.4 [3.3; 8.8]* (62)	
Natural Knee NK Flex (Zimmer)	Natural Knee NK II (Zimmer)	438	10	68 (60 - 75)	32/68			31	69	0	2.1 [1.1; 4.1] (370)	2.4 [1.3; 4.4] (283)	3.2 [1.8; 5.7] (200)	*3.2 [1.8; 5.7]* (114)	*3.2 [1.8; 5.7]* (60)
Natural Knee NK II (Zimmer)	Natural Knee NK II (Zimmer)	342	8	73 (67 - 77)	28/72			20	70	10	2.1 [1.0; 4.3] (328)	3.0 [1.6; 5.4] (319)	3.0 [1.6; 5.4] (239)	3.0 [1.6; 5.4] (170)	*4.4 [2.1; 9.2]* (66)
Persona (Zimmer)	Persona (Zimmer)	2,105	44	69 (60 - 76)	34/66			20	24	56	1.2 [0.8; 1.8] (1,457)	1.8 [1.3; 2.6] (971)	2.2 [1.5; 3.1] (377)	*2.2 [1.5; 3.1]* (69)	
SIGMA® Femur (DePuy)	SIGMA® Tibia (DePuy)	3,299	97	71 (63 - 77)	33/67			29	47	22	2.5 [2.0; 3.1] (2,553)	3.7 [3.0; 4.4] (1,844)	4.2 [3.5; 5.1] (995)	4.9 [4.0; 6.0] (375)	*5.5 [4.3; 7.0]* (122)
Triathlon CR (Stryker)	Triathlon (Stryker)	1,244	20	70 (62 - 77)	34/66			29	70	0	1.8 [1.2; 2.8] (804)	3.3 [2.3; 4.8] (431)	3.8 [2.6; 5.6] (275)	*4.3 [2.9; 6.3]* (146)	
Vanguard (Biomet)	Vanguard (Biomet)	4,515	68	72 (64 - 78)	28/72			28	69	2	1.4 [1.1; 1.8] (3,502)	2.5 [2.1; 3.1] (2,309)	3.0 [2.5; 3.7] (1,285)	3.8 [3.0; 4.9] (429)	
Standard knee systems, cruciate sacrificing, fixed bearing, hybrid															
balanSys BICONDYLAR uncem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	781	7	70 (62 - 76)	44/56			48	52	0	2.3 [1.5; 3.7] (547)	3.5 [2.3; 5.3] (362)	4.6 [3.0; 6.9] (186)	*5.3 [3.4; 8.2]* (96)	
Standard knee systems, cruciate sacrificing, mobile bearing, cemented															
ATTUNE™ Femur (DePuy)	ATTUNE™ Tibia (DePuy)	333	14	77 (69 - 80)	35/65			12	73	14	1.0 [0.3; 3.1] (225)	*1.5 [0.6; 4.0]* (134)	*1.5 [0.6; 4.0]* (71)		
balanSys BICONDYLAR cem. (Mathys)	balanSys BICONDYLAR RP (Mathys)	449	9	75 (65 - 79)	26/74			13	87	0	1.7 [0.8; 3.5] (349)	2.7 [1.4; 5.0] (250)	*3.2 [1.8; 5.9]* (142)		
COLUMBUS CR (Aesculap)	COLUMBUS UCR (Aesculap)	865	5	70 (62 - 76)	41/59			14	86	0	1.1 [0.6; 2.0] (738)	1.8 [1.1; 3.0] (606)	2.0 [1.2; 3.3] (415)	2.3 [1.4; 3.8] (205)	
INNEX (Zimmer)	INNEX (Zimmer)	3,891	59	73 (65 - 78)	30/70			45	22	33	2.1 [1.7; 2.6] (3,071)	3.1 [2.6; 3.8] (2,153)	3.8 [3.2; 4.6] (1,217)	4.2 [3.4; 5.2] (405)	
INNEX Gender (Zimmer)	INNEX (Zimmer)	2,954	57	73 (64 - 77)	17/83			31	21	48	1.6 [1.2; 2.2] (2,213)	2.5 [2.0; 3.3] (1,491)	2.8 [2.2; 3.6] (772)	3.4 [2.4; 4.7] (199)	
SIGMA® Femur (DePuy)	MBT Tibia (DePuy)	464	36	73 (65 - 78)	28/72			70	22	6	1.9 [1.0; 3.9] (328)	3.0 [1.6; 5.4] (210)	*3.6 [2.0; 6.6]* (103)		
Standard knee systems, cruciate sacrificing, mobile bearing, hybrid															
balanSys BICONDYLAR uncem. (Mathys)	balanSys BICONDYLAR RP (Mathys)	694	6	70 (61 - 77)	37/63			27	73	0	1.7 [0.9; 3.0] (582)	3.1 [2.0; 4.9] (457)	3.4 [2.2; 5.3] (309)	3.9 [2.5; 6.0] (185)	*3.9 [2.5; 6.0]* (120)
Standard knee systems, posterior stabilised, cemented															
balanSys BICONDYLAR PS cem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	1,319	20	72 (64 - 78)	37/63			37	24	40	2.1 [1.4; 3.1] (757)	4.3 [3.0; 6.1] (341)	5.4 [3.8; 7.7] (194)	*5.4 [3.8; 7.7]* (101)	
COLUMBUS PS (Aesculap)	COLUMBUS CR/PS (Aesculap)	329	20	70 (62 - 76)	36/64			35	64	0	3.8 [2.2; 6.5] (253)	6.4 [4.0; 10.0] (187)	*7.0 [4.4; 10.8]* (115)	*7.0 [4.4; 10.8]* (66)	
E.MOTION PS (Aesculap)	E.MOTION UC/PS (Aesculap)	385	16	68 (61 - 75)	36/64			29	23	49	3.3 [1.9; 5.7] (341)	5.9 [3.9; 8.9] (292)	6.6 [4.4; 9.7] (203)	*7.9 [5.2; 11.7]* (114)	
E.MOTION PS PRO (Aesculap)	E.MOTION UC/PS (Aesculap)	1,431	28	69 (61 - 76)	30/70			22	54	16	1.7 [1.1; 2.6] (943)	2.7 [1.9; 4.0] (557)	3.1 [2.1; 4.5] (275)	*4.2 [2.6; 6.7]* (109)	

Table 40 (continued)

Knee arthroplasties											Revision probabilities after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Standard knee systems, posterior stabilised, cemented															
GEMINI SL Fixed Bearing PS (zementiert) (Waldemar Link)	GEMINI SL Fixed Bearing CR / PS (zementiert) (Waldemar Link)	569	18	72 (64 - 78)	34/66			50	29	21	2.5 [1.4; 4.5] (300)	*2.9 [1.7; 5.0]* (146)	*2.9 [1.7; 5.0]* (62)		
GENESIS II PS COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	2,371	58	72 (64 - 78)	34/66			42	58	0	2.5 [1.9; 3.3] (1,847)	3.3 [2.6; 4.2] (1,206)	3.6 [2.8; 4.5] (569)	4.4 [3.3; 5.8] (216)	*4.4 [3.3; 5.8]* (55)
GENESIS II PS OXINIUM (Smith & Nephew)	Genesis II (Smith & Nephew)	382	41	63 (57 - 71)	19/81			39	55	6	1.2 [0.4; 3.1] (284)	2.5 [1.2; 5.3] (202)	*3.6 [1.8; 6.9]* (96)		
JOURNEY II BCS COCR (Smith & Nephew)	JOURNEY (Smith & Nephew)	300	19	71 (63 - 77)	42/58			14	75	2	*1.6 [0.6; 4.2]* (120)				
JOURNEY II BCS OXINIUM (Smith & Nephew)	JOURNEY (Smith & Nephew)	1,193	36	69 (62 - 76)	31/69			11	85	4	2.8 [2.0; 4.1] (846)	4.1 [3.0; 5.7] (507)	*4.7 [3.4; 6.5]* (138)		
LEGION PS COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	2,920	62	71 (63 - 77)	36/64			28	47	17	2.4 [1.8; 3.0] (1,669)	3.4 [2.7; 4.3] (731)	3.8 [2.9; 5.0] (276)	*4.7 [3.4; 6.5]* (71)	
LEGION PS OXINIUM (Smith & Nephew)	Genesis II (Smith & Nephew)	867	66	67 (59 - 75)	19/81			14	74	9	0.9 [0.4; 2.0] (571)	1.9 [1.1; 3.4] (358)	2.6 [1.5; 4.5] (224)	*3.3 [1.8; 6.0]* (113)	
NexGen LPS-Flex-Gender (Zimmer)	NexGen (Zimmer)	2,707	65	69 (61 - 76)	7/93			14	29	57	1.3 [0.9; 1.8] (1,945)	2.2 [1.7; 3.0] (1,355)	2.7 [2.0; 3.5] (820)	2.7 [2.0; 3.5] (429)	3.6 [2.4; 5.3] (205)
NexGen LPS-Flex (Zimmer)	NexGen (Zimmer)	9,011	180	69 (61 - 76)	30/70			31	31	37	1.9 [1.6; 2.2] (6,506)	2.9 [2.5; 3.3] (4,288)	3.1 [2.7; 3.6] (2,472)	3.4 [3.0; 3.9] (1,090)	3.8 [3.1; 4.6] (340)
NexGen LPS (Zimmer)	NexGen (Zimmer)	6,195	37	70 (62 - 76)	39/61			14	23	62	1.2 [1.0; 1.5] (4,839)	1.9 [1.5; 2.3] (3,486)	2.2 [1.8; 2.7] (2,306)	2.5 [2.0; 3.0] (1,225)	2.6 [2.1; 3.1] (576)
Persona (Zimmer)	Persona (Zimmer)	679	35	68 (60 - 76)	42/58			20	35	44	3.4 [2.2; 5.2] (423)	5.1 [3.4; 7.5] (232)	*6.5 [4.4; 9.6]* (104)		
Triathlon PS (Stryker)	Triathlon (Stryker)	2,357	55	72 (63 - 77)	34/66			31	64	6	2.6 [2.0; 3.4] (1,560)	3.8 [3.0; 4.8] (758)	3.9 [3.1; 5.0] (316)	*3.9 [3.1; 5.0]* (120)	
Vanguard (Biomet)	Vanguard (Biomet)	1,037	33	72 (64 - 78)	30/70			37	44	19	2.8 [1.9; 4.1] (695)	4.9 [3.5; 6.7] (443)	5.4 [3.9; 7.4] (232)	*5.4 [3.9; 7.4]* (60)	
VEGA PS (Aesculap)	VEGA PS (Aesculap)	893	27	69 (60 - 76)	32/68			51	37	9	2.3 [1.4; 3.6] (600)	3.1 [2.0; 4.8] (375)	5.1 [3.4; 7.7] (233)	*5.1 [3.4; 7.7]* (106)	
Standard knee systems, pivot, fixed bearing, cemented															
GMK SPHERE (Medacta)	GMK (Medacta)	477	19	69 (61 - 75)	47/53			55	45	1	2.1 [1.1; 4.1] (301)	*2.5 [1.3; 4.6]* (141)	*3.3 [1.7; 6.3]* (55)		
MicroPort (MicroPort)	MicroPort (MicroPort)	1,160	17	69 (61 - 76)	38/62			43	8	49	1.6 [1.0; 2.6] (726)	2.8 [1.8; 4.2] (391)	*3.4 [2.2; 5.1]* (128)		
Persona (Zimmer)	Persona (Zimmer)	301	7	69 (62 - 76)	42/58			9	72	19	*1.8 [0.8; 4.3]* (119)				
Constrained knee systems, varus-valgus stabilised, fixed bearing, cemented															
LEGION Revision COCR (Smith & Nephew)	LEGION Revision (Smith & Nephew)	345	49	70 (64 - 78)	26/74			46	52	0	5.3 [3.3; 8.5] (247)	6.2 [4.0; 9.5] (162)	*6.2 [4.0; 9.5]* (65)		
NexGen LCCK (Zimmer)	NexGen (Zimmer)	1,086	86	73 (63 - 79)	30/70			25	53	21	2.9 [2.0; 4.1] (816)	3.0 [2.1; 4.3] (568)	3.2 [2.2; 4.5] (319)	*3.2 [2.2; 4.5]* (124)	
Vanguard (Biomet)	Vanguard (Biomet)	377	17	71 (63 - 77)	33/67			11	88	0	2.2 [1.1; 4.4] (287)	4.2 [2.5; 7.3] (185)	*4.8 [2.8; 8.2]* (111)		
Constrained knee systems, hinged, fixed bearing, cemented															
Endo-Modell® - M, Rotationsversion (Waldemar Link)	Endo-Modell® - M, Rotationsversion (Waldemar Link)	668	90	77 (68 - 82)	24/76			34	41	22	5.6 [4.1; 7.7] (430)	7.4 [5.5; 10.0] (249)	*7.4 [5.5; 10.0]* (113)		
Endo-Modell®, Rotationsversion (Waldemar Link)	Endo-Modell®, Rotationsversion (Waldemar Link)	837	109	77 (69 - 82)	20/80			54	23	21	3.3 [2.2; 4.8] (591)	4.4 [3.1; 6.2] (398)	4.9 [3.5; 6.9] (223)	*4.9 [3.5; 6.9]* (108)	
ENDURO (Aesculap)	ENDURO (Aesculap)	1,176	127	75 (67 - 80)	22/78			64	29	3	4.0 [3.0; 5.4] (821)	5.0 [3.8; 6.5] (551)	6.0 [4.6; 7.8] (334)	*6.4 [4.8; 8.6]* (143)	
NexGen RHK (Zimmer)	NexGen RHK (Zimmer)	777	105	75 (67 - 80)	24/76			32	55	12	3.2 [2.1; 4.8] (544)	4.3 [3.0; 6.2] (341)	5.1 [3.5; 7.4] (184)	*5.1 [3.5; 7.4]* (92)	

Table 40 (continued)

Knee arthroplasties											Revision probabilities after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Constrained knee systems, hinged, fixed bearing, cemented															
RT-Plus (Smith & Nephew)	RT-Plus (Smith & Nephew)	1,441	116	77 (70 - 81)	20/80			49	47	4	4.1 [3.2; 5.4] (1,047)	5.4 [4.3; 6.8] (723)	6.2 [4.8; 7.8] (408)	6.4 [5.0; 8.2] (152)	
RT-Plus Modular (Smith & Nephew)	RT-Plus Modular (Smith & Nephew)	403	87	75 (65 - 80)	29/71			58	42	0	3.9 [2.4; 6.4] (301)	4.9 [3.1; 7.8] (219)	*6.1 [3.9; 9.6]* (112)		
Unicondylar knee arthroplasties, fixed bearing, cemented															
balanSys UNI (Mathys)	balanSys UNI fix (Mathys)	319	26	64 (57 - 72)	47/53			63	36	0	2.7 [1.4; 5.4] (243)	4.5 [2.6; 7.9] (168)	*5.8 [3.4; 9.8]* (90)		
JOURNEY UNI COCR (Smith & Nephew)	JOURNEY UNI (Smith & Nephew)	557	56	63 (58 - 70)	46/54			49	42	9	1.9 [1.0; 3.7] (344)	3.9 [2.3; 6.5] (194)	*4.9 [2.8; 8.7]* (90)		
JOURNEY UNI OXINIUM (Smith & Nephew)	JOURNEY UNI (Smith & Nephew)	532	91	60 (54 - 66)	34/66			56	28	15	5.6 [3.8; 8.2] (338)	7.9 [5.6; 11.1] (195)	*7.9 [5.6; 11.1]* (90)		
Oxford (Biomet)	Oxford (Biomet)	510	24	71 (62 - 77)	16/84			2	3	95	0.9 [0.3; 2.5] (331)	1.6 [0.7; 3.6] (167)	*1.6 [0.7; 3.6]* (69)		
Persona Partial Knee (Zimmer)	Persona Partial Knee (Zimmer)	763	44	63 (57 - 72)	46/54			29	38	33	2.0 [1.1; 3.5] (219)				
Schlittenprothese (Waldemar Link)	Schlittenprothese All-Poly (Waldemar Link)	403	24	64 (56 - 73)	52/48			31	69	0	3.0 [1.7; 5.4] (293)	7.6 [5.1; 11.3] (199)	*10.2 [7.1; 14.7]* (129)	*12.0 [8.3; 17.3]* (60)	
Schlittenprothese (Waldemar Link)	Schlittenprothese Metal backed (Waldemar Link)	435	40	63 (58 - 73)	44/56			56	43	1	2.6 [1.4; 5.0] (294)	7.4 [4.9; 11.0] (208)	*9.5 [6.5; 13.8]* (94)		
SIGMA® HP Partial-Kniesystem (DePuy)	SIGMA® HP Partial-Kniesystem (DePuy)	2,359	70	63 (57 - 71)	45/55			25	40	35	1.7 [1.2; 2.3] (1,805)	3.8 [3.0; 4.8] (1,194)	4.7 [3.7; 5.9] (668)	5.9 [4.6; 7.5] (248)	*6.7 [5.1; 8.8]* (62)
Triathlon PKR (Stryker)	Triathlon PKR (Stryker)	362	28	62.5 (56 - 70)	44/56			69	31	0	4.5 [2.8; 7.4] (286)	7.1 [4.7; 10.6] (201)	*8.2 [5.5; 12.0]* (110)	*9.1 [6.1; 13.5]* (56)	
UNIVATION XF (Aesculap)	UNIVATION XF (Aesculap)	1,177	56	63 (56 - 71)	43/57			42	57	1	5.4 [4.1; 7.0] (692)	9.1 [7.2; 11.4] (313)	*12.5 [9.7; 15.9]* (89)		
ZUK (Lima)	ZUK (Lima)	2,220	69	66 (58 - 74)	43/57			23	12	65	2.1 [1.6; 2.9] (1,754)	3.0 [2.3; 3.9] (1,124)	3.4 [2.6; 4.5] (517)		
Unicondylar knee arthroplasties, mobile bearing, cemented															
Oxford (Biomet)	Oxford (Biomet)	13,645	329	64 (57 - 73)	41/59			28	39	31	2.9 [2.7; 3.3] (9,709)	4.6 [4.2; 5.0] (6,217)	5.4 [4.9; 5.9] (3,405)	6.7 [6.1; 7.4] (1,284)	7.4 [6.5; 8.3] (409)
Unicondylar knee arthroplasties, mobile bearing, uncemented															
Oxford (Biomet)	Oxford (Biomet)	3,415	64	63 (57 - 72)	55/45			7	18	74	3.5 [2.9; 4.2] (2,430)	4.8 [4.0; 5.6] (1,564)	5.6 [4.7; 6.6] (910)	5.8 [4.9; 6.9] (421)	6.3 [5.2; 7.8] (166)

Table 40 (continued)

Elective total hip arthroplasties										Revision probabilities after ...				
Femoral stems	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Uncemented femoral stems														
A2 Kurzschaft (ARTIQO)	3,763	43	63 (57 - 70)	38/62			4	55	39	1.2 [0.9; 1.6] (2,335)	1.5 [1.1; 2.0] (1,086)	1.9 [1.3; 2.6] (274)		
Accolade II Stem (Stryker)	5,212	47	68 (61 - 75)	42/58			17	64	19	2.6 [2.2; 3.1] (3,324)	3.0 [2.5; 3.5] (2,030)	3.3 [2.8; 4.0] (1,160)	3.6 [3.0; 4.4] (368)	
Actinia cementless (Implantcast)	1,244	16	72 (64 - 78)	35/65			42	58	0	4.6 [3.6; 6.0] (778)	5.2 [4.0; 6.7] (391)	*5.6 [4.2; 7.3]* (87)		
Alloclassic (Zimmer)	7,631	66	69 (62 - 76)	34/66			14	71	13	2.7 [2.4; 3.1] (6,017)	3.3 [2.9; 3.7] (4,450)	3.6 [3.2; 4.1] (2,974)	4.0 [3.5; 4.5] (1,357)	4.0 [3.5; 4.6] (321)
Alpha-Fit (Corin)	663	3	75 (69 - 79)	29/71			37	0	63	1.8 [1.0; 3.2] (556)	2.1 [1.2; 3.6] (390)	2.1 [1.2; 3.6] (291)	2.1 [1.2; 3.6] (170)	
AMISTEM (Medacta)	841	25	67 (58 - 75)	44/56			22	72	5	3.3 [2.2; 4.8] (594)	3.8 [2.6; 5.4] (371)	3.8 [2.6; 5.4] (162)		
ANA.NOVA® Alpha Schaft (ARTIQO)	1,341	11	69 (62 - 76)	41/59			11	85	0	2.9 [2.1; 4.0] (981)	3.4 [2.5; 4.5] (637)	3.4 [2.5; 4.5] (385)	*3.9 [2.7; 5.6]* (74)	
ANA.NOVA® SL-complete® Schaft (ARTIQO)	366	7	73 (64 - 78)	38/62			57	39	0	4.1 [2.5; 6.9] (256)	4.6 [2.8; 7.5] (153)	*5.5 [3.2; 9.3]* (73)		
ANA.NOVA® Solitär Schaft (ARTIQO)	360	6	74 (65 - 80)	35/65			21	79	0	4.1 [2.5; 6.9] (204)	*4.1 [2.5; 6.9]* (110)	*5.0 [2.9; 8.6]* (62)		
Avenir (Zimmer)	12,368	135	70 (62 - 76)	39/61			37	36	26	2.9 [2.6; 3.2] (7,642)	3.1 [2.8; 3.5] (4,634)	3.2 [2.8; 3.5] (2,209)	3.2 [2.8; 3.5] (628)	*3.2 [2.8; 3.5]* (79)
BICONTACT H (Aesculap)	5,095	89	70 (63 - 76)	51/49			15	71	13	3.2 [2.7; 3.7] (3,868)	3.5 [3.0; 4.0] (2,741)	3.6 [3.1; 4.1] (1,741)	3.6 [3.1; 4.1] (867)	3.6 [3.1; 4.1] (218)
BICONTACT S (Aesculap)	7,692	109	71 (64 - 77)	35/65			29	56	13	3.3 [2.9; 3.8] (5,980)	3.7 [3.3; 4.2] (4,295)	3.9 [3.5; 4.4] (2,667)	4.0 [3.5; 4.5] (1,264)	4.1 [3.6; 4.6] (392)
BICONTACT SD (Aesculap)	538	43	65 (57 - 73)	11/89			21	55	24	3.0 [1.9; 4.9] (451)	3.5 [2.2; 5.4] (324)	3.8 [2.4; 5.9] (187)	*3.8 [2.4; 5.9]* (85)	
Brexis (Zimmer)	415	20	58 (52 - 64)	49/51			28	72	0	2.0 [1.0; 3.9] (181)	*3.3 [1.7; 6.6]* (63)			
CBC Evolution (Mathys)	592	13	67 (61 - 74)	39/61			11	87	2	2.5 [1.5; 4.1] (473)	3.6 [2.3; 5.6] (385)	3.9 [2.5; 6.0] (254)	*4.3 [2.8; 6.7]* (102)	*4.3 [2.8; 6.7]* (58)
CFP (Waldemar Link)	1,029	27	61 (54 - 67)	55/45			11	41	46	1.9 [1.2; 3.0] (891)	2.5 [1.7; 3.7] (716)	2.8 [1.9; 4.1] (460)	3.1 [2.1; 4.6] (255)	3.7 [2.3; 5.7] (168)
CLS Spotorno (Zimmer)	17,993	174	66 (58 - 73)	43/57			20	46	33	2.7 [2.5; 2.9] (14,143)	3.2 [2.9; 3.4] (10,423)	3.4 [3.2; 3.7] (6,727)	3.6 [3.3; 3.9] (3,302)	3.7 [3.4; 4.0] (1,057)
CORAIL™ AMT-Hüftschaft (DePuy)	28,363	153	71 (62 - 77)	36/64			25	48	27	2.6 [2.4; 2.8] (20,522)	3.1 [2.8; 3.3] (13,669)	3.3 [3.1; 3.6] (7,559)	3.5 [3.3; 3.8] (2,816)	3.6 [3.3; 3.9] (809)
COREHIP STD (Aesculap)	332	11	69 (62 - 75)	33/67			0	35	65					
EcoFit cpTi (Implantcast)	895	11	74 (67 - 79)	28/72			14	3	83	5.0 [3.7; 6.7] (639)	5.7 [4.3; 7.5] (418)	6.0 [4.5; 8.0] (204)		
EcoFit HA (Implantcast)	482	6	72 (64 - 78)	43/57			24	73	3	2.1 [1.2; 3.9] (326)	2.1 [1.2; 3.9] (186)	*2.1 [1.2; 3.9]* (59)		
EXCEPTION (Biomet)	993	13	67 (59 - 75)	49/51			10	90	0	4.0 [2.9; 5.4] (618)	4.0 [2.9; 5.4] (311)	*4.6 [3.1; 6.7]* (60)		
EXCIA (Aesculap)	389	16	72 (64 - 77)	35/65			87	9	0	4.8 [3.0; 7.4] (289)	5.5 [3.6; 8.5] (245)	6.0 [3.9; 9.1] (167)	*6.0 [3.9; 9.1]* (83)	
EXCIA T (Aesculap)	3,764	74	70 (62 - 76)	34/66			33	52	14	3.2 [2.6; 3.8] (2,411)	3.5 [3.0; 4.2] (1,325)	3.6 [3.0; 4.3] (435)		
EXCIA TL (Aesculap)	2,054	66	70 (62 - 76)	50/50			18	52	30	2.5 [1.9; 3.3] (1,367)	3.2 [2.5; 4.2] (830)	3.7 [2.8; 4.8] (328)		
Fitmore (Zimmer)	16,066	193	62 (55 - 68)	46/54			15	56	27	2.1 [1.9; 2.4] (11,770)	2.6 [2.3; 2.8] (8,014)	2.8 [2.5; 3.1] (4,754)	2.9 [2.6; 3.3] (2,083)	3.1 [2.8; 3.5] (571)
GTS (Biomet)	1,428	28	64 (56 - 71)	40/60			24	34	42	3.2 [2.4; 4.3] (1,056)	4.2 [3.2; 5.5] (653)	4.2 [3.2; 5.5] (358)	*4.6 [3.4; 6.2]* (125)	

Table 41: Implant outcomes for femoral stems in elective total hip arthroplasties. For each type of fixation, the femoral stems are listed alphabetically by their designation. The table is continued on the following pages.

Elective total hip arthroplasties										Revision probabilities after ...				
Femoral stems	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Uncemented femoral stems														
Konusprothese (Zimmer)	995	96	58 (48 - 68)	15/85			6	75	18	2.6 [1.8; 3.9] (801)	3.4 [2.4; 4.9] (627)	4.0 [2.9; 5.6] (443)	4.3 [3.1; 6.1] (259)	*4.3 [3.1; 6.1]* (108)
LCU (Waldemar Link)	1,827	28	67 (60 - 75)	46/54			26	72	1	2.0 [1.4; 2.8] (1,207)	2.3 [1.7; 3.2] (682)	3.4 [2.3; 5.0] (211)		
M/L Taper (Zimmer)	4,007	22	69 (61 - 74)	40/60			14	43	43	2.8 [2.3; 3.4] (3,212)	3.3 [2.8; 3.9] (2,263)	3.5 [3.0; 4.2] (1,280)	3.9 [3.2; 4.7] (623)	4.3 [3.5; 5.4] (221)
METABLOC (Zimmer)	676	14	72 (65 - 78)	38/62			50	50	0	2.5 [1.5; 4.0] (573)	2.6 [1.6; 4.2] (448)	2.9 [1.8; 4.5] (290)	*2.9 [1.8; 4.5]* (141)	*2.9 [1.8; 4.5]* (67)
Metafix (Corin)	1,188	11	72 (65 - 77)	42/58			23	77	0	1.5 [0.9; 2.4] (887)	1.8 [1.2; 2.9] (691)	2.0 [1.3; 3.1] (434)	2.0 [1.3; 3.1] (188)	
METHA (Aesculap)	5,213	138	57 (51 - 63)	47/53			16	53	26	2.5 [2.1; 3.0] (3,962)	3.2 [2.7; 3.8] (2,772)	3.3 [2.8; 3.9] (1,798)	3.5 [3.0; 4.1] (945)	3.6 [3.1; 4.3] (314)
MiniHip (Corin)	1,500	36	60 (54 - 67)	46/54			48	35	17	2.9 [2.1; 3.9] (1,174)	3.4 [2.6; 4.6] (782)	3.8 [2.9; 5.1] (450)	4.3 [3.1; 5.9] (171)	
Nanos Schenkelhalsprothese (OHST / Smith & Nephew)	3,271	97	59 (53 - 66)	49/51			18	57	24	2.3 [1.8; 2.9] (2,668)	2.7 [2.2; 3.3] (1,948)	3.0 [2.4; 3.7] (1,299)	3.4 [2.7; 4.2] (389)	
optimys (Mathys)	9,901	83	64 (57 - 72)	44/56			7	54	39	1.7 [1.4; 1.9] (6,683)	1.8 [1.6; 2.1] (4,057)	1.9 [1.7; 2.3] (1,902)	2.1 [1.7; 2.4] (543)	*2.1 [1.7; 2.4]* (99)
Peira Schaft (ARTIQO)	352	6	73 (67 - 77)	36/64			27	64	0	3.5 [2.0; 6.0] (249)	*3.5 [2.0; 6.0]* (148)			
Polarschaft (Smith & Nephew)	8,417	87	69 (62 - 76)	40/60			38	61	1	2.5 [2.1; 2.8] (6,082)	2.8 [2.4; 3.2] (3,872)	3.0 [2.6; 3.4] (1,916)	3.1 [2.7; 3.6] (650)	3.1 [2.7; 3.6] (152)
PROFEMUR® GLADIATOR CLASSIC (MicroPort)	369	10	70 (64 - 76)	38/62			16	84	0	3.2 [1.8; 5.7] (246)	3.6 [2.0; 6.2] (155)	*5.0 [2.8; 8.7]* (91)		
Proxy PLUS Schaft (Smith & Nephew)	785	23	69 (62 - 75)	45/55			48	46	6	3.5 [2.4; 5.0] (666)	4.3 [3.1; 6.0] (510)	4.7 [3.4; 6.5] (328)	*4.7 [3.4; 6.5]* (127)	
Pyramid (Atesos)	2,027	23	71 (64 - 77)	37/63			10	81	2	2.8 [2.2; 3.6] (1,621)	3.3 [2.6; 4.2] (1,177)	3.7 [2.9; 4.8] (652)	4.1 [3.1; 5.3] (197)	
QUADRA (Medacta)	4,742	44	68 (61 - 75)	38/62			8	68	24	2.5 [2.1; 3.0] (3,389)	3.0 [2.5; 3.6] (1,822)	3.2 [2.6; 3.8] (670)	*3.2 [2.6; 3.8]* (85)	
SBG-Schaft (Smith & Nephew)	387	7	72 (65 - 78)	35/65			25	75	0	5.3 [3.5; 8.1] (331)	5.9 [3.9; 8.9] (244)	6.8 [4.6; 10.0] (160)	*6.8 [4.6; 10.0]* (85)	
SL-PLUS Schaft (Smith & Nephew)	4,033	54	69 (62 - 76)	36/64			14	65	21	3.4 [2.9; 4.0] (3,304)	4.3 [3.7; 5.0] (2,597)	4.9 [4.2; 5.7] (1,827)	5.3 [4.5; 6.1] (1,009)	5.9 [5.0; 6.9] (398)
SL MIA Schaft (Smith & Nephew)	3,767	47	71 (62 - 77)	36/64			25	55	20	2.5 [2.1; 3.1] (2,660)	3.0 [2.5; 3.7] (1,802)	3.2 [2.6; 3.9] (1,023)	3.4 [2.7; 4.2] (492)	3.6 [2.9; 4.5] (189)
SP-CL (Waldemar Link)	2,063	39	65 (57 - 71)	37/63			18	38	43	4.2 [3.4; 5.2] (1,457)	4.7 [3.8; 5.8] (903)	5.3 [4.3; 6.5] (369)	*5.3 [4.3; 6.5]* (53)	
SPS Evolution (Symbios)	594	13	64 (57 - 71)	45/55			29	70	1	2.0 [1.2; 3.6] (447)	2.3 [1.3; 3.9] (271)	*2.3 [1.3; 3.9]* (134)		
Taperloc (Biomet)	2,488	28	69 (61 - 76)	36/64			37	60	0	2.4 [1.8; 3.1] (1,878)	3.1 [2.4; 3.9] (1,246)	3.3 [2.6; 4.2] (589)	3.3 [2.6; 4.2] (176)	
TAPERLOC COMPLETE (Biomet)	2,492	18	66 (58 - 74)	44/56			1	18	81	1.8 [1.4; 2.4] (1,581)	2.0 [1.5; 2.6] (987)	2.0 [1.5; 2.6] (488)		
TRENDHIP L (Aesculap)	1,194	38	69 (61 - 76)	56/44			16	69	15	2.2 [1.5; 3.2] (828)	2.4 [1.6; 3.5] (443)	2.4 [1.6; 3.5] (256)	*2.4 [1.6; 3.5]* (110)	
TRENDHIP S (Aesculap)	2,591	41	70 (63 - 77)	31/69			36	59	6	2.2 [1.7; 2.9] (1,690)	2.5 [2.0; 3.3] (898)	2.7 [2.1; 3.5] (475)	3.0 [2.2; 4.2] (167)	
TRILOCK®-Hüftschaft (DePuy)	2,881	42	61 (54 - 67)	47/53			6	59	35	1.9 [1.5; 2.5] (2,205)	2.6 [2.0; 3.3] (1,664)	3.0 [2.3; 3.8] (1,058)	3.5 [2.7; 4.5] (447)	*3.5 [2.7; 4.5]* (96)
TRJ (Aesculap)	667	24	71 (62 - 77)	34/66			53	41	3	2.0 [1.2; 3.5] (477)	2.3 [1.4; 3.9] (336)	2.6 [1.6; 4.4] (230)	*3.4 [1.9; 6.1]* (117)	
twinSys uncem. (Mathys)	3,113	39	73 (65 - 78)	38/62			25	59	16	2.3 [1.8; 2.9] (2,172)	2.7 [2.2; 3.4] (1,449)	3.1 [2.5; 3.9] (868)	3.2 [2.6; 4.1] (512)	3.4 [2.7; 4.4] (231)
VEKTOR-TITAN (Peter Brehm)	315	6	66 (59 - 73)	42/58			0	98	2	2.6 [1.3; 5.1] (286)	3.3 [1.8; 6.0] (246)	3.7 [2.1; 6.6] (212)	*4.2 [2.4; 7.4]* (149)	

Table 41 (continued)

Elective total hip arthroplasties										Revision probabilities after ...				
Femoral stems	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Cemented femoral stems														
ABG II Stem (Stryker)	465	11	79 (76 - 82)	20/80			20	78	3	3.1 [1.8; 5.1] (386)	3.7 [2.3; 6.0] (250)	*4.2 [2.6; 6.7]* (144)	*4.2 [2.6; 6.7]* (51)	
Actinia cemented (Implantcast)	308	9	80 (76 - 83)	22/78			16	84	0	1.7 [0.7; 4.2] (179)	*4.6 [2.0; 10.1]* (60)			
AS PLUS Schaft (Smith & Nephew)	585	21	80 (76 - 83)	22/78			14	86	0	3.3 [2.1; 5.2] (496)	3.5 [2.3; 5.5] (352)	3.9 [2.5; 5.9] (211)	*5.4 [2.9; 10.0]* (60)	
Avenir (Zimmer)	1,610	81	79 (76 - 83)	23/77			28	62	9	2.8 [2.1; 3.8] (922)	3.1 [2.3; 4.2] (560)	3.1 [2.3; 4.2] (287)	*3.6 [2.5; 5.1]* (122)	
Bicana (Implantcast)	362	16	78 (75 - 81)	28/72			19	80	1	3.4 [1.9; 5.9] (320)	4.0 [2.4; 6.7] (279)	4.4 [2.6; 7.1] (238)	4.8 [3.0; 7.8] (175)	
BICONTACT H (Aesculap)	614	43	79 (76 - 83)	35/65			17	73	9	2.7 [1.7; 4.4] (473)	3.0 [1.8; 4.8] (330)	3.0 [1.8; 4.8] (195)	*3.5 [2.1; 5.8]* (96)	
BICONTACT S (Aesculap)	2,151	75	79 (76 - 83)	22/78			32	54	14	2.1 [1.6; 2.9] (1,717)	2.3 [1.7; 3.0] (1,299)	2.7 [2.0; 3.5] (814)	2.9 [2.2; 3.9] (413)	2.9 [2.2; 3.9] (153)
C-STEM™ AMT-Hüftschaft (DePuy)	407	7	79 (76 - 83)	19/81			10	90	0	1.5 [0.7; 3.3] (351)	1.8 [0.9; 3.9] (241)	2.7 [1.4; 5.3] (157)	*3.4 [1.7; 6.4]* (80)	
CCA (Mathys)	1,179	19	78 (74 - 81)	30/70			17	72	12	2.9 [2.1; 4.1] (934)	3.7 [2.7; 5.0] (782)	4.0 [2.9; 5.3] (581)	4.4 [3.2; 6.0] (335)	4.8 [3.5; 6.5] (198)
CORAIL™ AMT-Hüftschaft (DePuy)	736	73	79 (74 - 82)	38/62			28	50	21	3.5 [2.3; 5.2] (469)	3.7 [2.5; 5.5] (276)	*4.4 [3.0; 6.6]* (145)		
CS PLUS Schaft (Smith & Nephew)	936	32	78 (75 - 82)	26/74			16	84	0	1.7 [1.1; 2.8] (812)	2.5 [1.7; 3.9] (536)	3.0 [2.0; 4.6] (336)	*3.0 [2.0; 4.6]* (131)	
EXCEPTION (Biomet)	456	11	78 (74 - 82)	20/80			5	95	0	2.5 [1.4; 4.5] (249)	*3.1 [1.7; 5.7]* (96)			
EXCIA (Aesculap)	542	28	79 (75 - 82)	26/74			49	42	0	1.2 [0.5; 2.6] (437)	1.4 [0.7; 2.9] (358)	2.1 [1.1; 4.0] (266)	*2.1 [1.1; 4.0]* (136)	
EXCIA T (Aesculap)	1,206	56	78 (74 - 82)	22/78			37	39	13	1.8 [1.2; 2.8] (760)	2.2 [1.5; 3.3] (399)	2.5 [1.7; 3.9] (184)		
EXCIA TL (Aesculap)	539	42	79 (75 - 83)	27/73			21	37	36	2.1 [1.2; 3.8] (291)	2.9 [1.7; 5.2] (170)	*2.9 [1.7; 5.2]* (101)		
LCP (Waldemar Link)	426	8	81 (78 - 84)	15/85			27	2	70	2.7 [1.5; 4.8] (315)	2.7 [1.5; 4.8] (200)	*3.2 [1.8; 5.7]* (88)	*3.2 [1.8; 5.7]* (56)	
M.E.M. Geradschaft (Zimmer)	15,364	162	78 (75 - 82)	26/74			21	56	19	2.0 [1.8; 2.3] (10,928)	2.3 [2.0; 2.5] (7,230)	2.5 [2.2; 2.8] (4,037)	2.6 [2.3; 2.9] (1,794)	3.0 [2.6; 3.5] (501)
METABLOC (Zimmer)	1,983	28	79 (75 - 82)	27/73			18	72	9	2.7 [2.1; 3.6] (1,526)	2.9 [2.2; 3.8] (1,064)	3.2 [2.5; 4.2] (662)	3.5 [2.6; 4.6] (284)	*3.5 [2.6; 4.6]* (70)
MS-30 (Zimmer)	2,968	32	78 (73 - 81)	26/74			11	69	20	1.6 [1.2; 2.2] (2,331)	1.9 [1.4; 2.5] (1,732)	2.2 [1.7; 2.8] (1,068)	2.5 [1.9; 3.4] (425)	
Müller Geradschaft (Smith & Nephew)	1,185	31	78 (75 - 81)	27/73			18	34	48	2.9 [2.1; 4.1] (991)	3.0 [2.2; 4.2] (710)	3.0 [2.2; 4.2] (408)	3.0 [2.2; 4.2] (181)	
Polarschaft (Smith & Nephew)	1,740	64	79 (76 - 82)	24/76			32	67	0	3.3 [2.6; 4.3] (1,189)	3.6 [2.8; 4.7] (723)	3.6 [2.8; 4.7] (319)	*3.9 [3.0; 5.2]* (116)	
QUADRA (Medacta)	965	32	79 (76 - 83)	24/76			7	50	42	2.2 [1.4; 3.4] (570)	2.9 [1.9; 4.5] (277)	*2.9 [1.9; 4.5]* (90)		
SPII® Modell Lubinus (Waldemar Link)	7,857	89	77 (74 - 81)	27/73			14	41	42	1.9 [1.6; 2.3] (6,014)	2.5 [2.1; 2.9] (4,328)	2.7 [2.4; 3.2] (2,612)	3.3 [2.8; 3.9] (1,210)	3.7 [3.0; 4.4] (419)
Standard C Cem (Waldemar Link)	426	5	77.5 (74 - 81)	32/68			6	94	0	0.7 [0.2; 2.3] (348)	1.8 [0.8; 4.0] (230)	*1.8 [0.8; 4.0]* (126)		
Taperloc Cemented (Biomet)	734	25	80 (75 - 83)	17/83			26	39	35	2.0 [1.1; 3.4] (479)	2.7 [1.6; 4.4] (270)	*2.7 [1.6; 4.4]* (140)		
twinSys (Mathys)	798	25	78 (74 - 82)	21/79			24	32	44	1.8 [1.0; 3.1] (489)	2.3 [1.3; 3.8] (230)	*2.3 [1.3; 3.8]* (107)		
twinSys cem. (Mathys)	339	25	80 (75 - 83)	32/68			25	56	19	1.5 [0.6; 3.5] (299)	1.5 [0.6; 3.5] (252)	*1.5 [0.6; 3.5]* (142)	*3.0 [1.3; 6.7]* (67)	

Table 41 (continued)

Elective total hip arthroplasties										Revision probabilities after ...				
Acetabular cups	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Uncemented cups														
Alloclassic (Zimmer)	506	10	69 (60 - 77)	29/71			52	48	0	3.4 [2.2; 5.5] (438)	3.9 [2.5; 6.1] (342)	4.2 [2.7; 6.5] (255)	*4.6 [3.0; 7.1]* (123)	
Alloclassic Variall (Zimmer)	454	13	71 (62 - 77)	35/65			22	27	27	0.5 [0.1; 2.0] (347)	0.9 [0.3; 2.8] (226)	*0.9 [0.3; 2.8]* (147)	*0.9 [0.3; 2.8]* (79)	
Allofit (Zimmer)	78,570	307	70 (61 - 77)	38/62			18	50	30	2.5 [2.4; 2.6] (56,968)	2.8 [2.7; 3.0] (38,851)	3.1 [2.9; 3.2] (22,705)	3.3 [3.1; 3.4] (9,933)	3.4 [3.2; 3.6] (2,703)
Allofit IT (Zimmer)	5,982	89	65 (56 - 74)	40/60			24	50	26	2.4 [2.0; 2.8] (4,420)	3.0 [2.5; 3.5] (3,162)	3.2 [2.7; 3.7] (1,928)	3.4 [2.9; 4.0] (866)	3.6 [3.0; 4.4] (389)
ANA.NOVA® Alpha Pfanne (ARTIQO)	2,496	26	67 (59 - 74)	42/58			8	83	2	2.1 [1.6; 2.8] (1,649)	2.4 [1.8; 3.1] (870)	2.5 [1.9; 3.4] (361)	*3.2 [2.0; 5.1]* (65)	
ANA.NOVA® Hybrid Pfanne (ARTIQO)	4,596	43	67 (59 - 75)	36/64			16	46	37	2.2 [1.8; 2.6] (3,137)	2.6 [2.2; 3.2] (1,870)	3.0 [2.4; 3.6] (860)	*3.1 [2.5; 3.8]* (137)	
aneXys Flex (Mathys)	1,687	39	64 (57 - 72)	44/56			32	50	18	2.5 [1.8; 3.4] (931)	2.9 [2.1; 4.0] (507)	*3.1 [2.3; 4.3]* (134)		
BICON-PLUS (Smith & Nephew)	2,388	47	72 (63 - 77)	37/63			23	77	0	2.5 [1.9; 3.2] (2,061)	3.2 [2.5; 4.0] (1,710)	3.8 [3.1; 4.7] (1,286)	4.3 [3.5; 5.3] (791)	4.6 [3.7; 5.7] (250)
CombiCup PF (Waldemar Link)	2,777	52	71 (62 - 77)	38/62			44	44	8	2.2 [1.7; 2.8] (1,993)	2.9 [2.3; 3.6] (1,327)	3.3 [2.6; 4.2] (630)	4.0 [3.0; 5.3] (224)	*4.0 [3.0; 5.3]* (50)
CombiCup SC (Waldemar Link)	861	11	72 (61 - 78)	41/59			7	93	0	2.0 [1.2; 3.2] (651)	2.7 [1.8; 4.3] (404)	3.2 [2.0; 5.1] (210)	*4.0 [2.3; 6.8]* (55)	
DURALOC™ OPTION™ Press Fit-Hüftpfanne (DePuy)	1,084	12	69 (61 - 75)	40/60			19	55	26	3.2 [2.3; 4.5] (896)	3.8 [2.8; 5.2] (752)	4.2 [3.1; 5.7] (559)	4.7 [3.5; 6.4] (249)	
EcoFit cpTi (Implantcast)	1,088	19	73 (64 - 79)	35/65			26	58	15	3.7 [2.7; 5.0] (754)	4.4 [3.3; 5.9] (420)	4.4 [3.3; 5.9] (199)		
EcoFit EPORE (Implantcast)	865	12	75 (67 - 80)	30/70			13	27	60	4.0 [2.9; 5.6] (548)	4.4 [3.2; 6.1] (275)			
EcoFit NH cpTi (Implantcast)	747	11	72 (63 - 78)	38/62			48	52	0	4.0 [2.8; 5.7] (522)	4.2 [3.0; 6.0] (359)	5.0 [3.5; 7.3] (169)	*5.0 [3.5; 7.3]* (56)	
EL PFANNE (Smith & Nephew)	351	4	71 (63 - 77)	32/68			2	35	63	4.9 [3.1; 7.7] (326)	4.9 [3.1; 7.7] (311)	5.2 [3.3; 8.1] (303)	5.8 [3.8; 8.9] (271)	*5.8 [3.8; 8.9]* (148)
EP-FIT PLUS (Smith & Nephew)	2,967	62	70 (61 - 76)	44/56			45	52	2	2.7 [2.2; 3.3] (2,569)	3.1 [2.5; 3.8] (2,060)	3.2 [2.6; 4.0] (1,299)	3.3 [2.7; 4.1] (510)	*3.3 [2.7; 4.1]* (117)
Exceed (Biomet)	338	9	72 (63 - 77)	34/66			72	24	4	3.0 [1.6; 5.4] (313)	3.6 [2.1; 6.3] (300)	3.6 [2.1; 6.3] (290)	3.6 [2.1; 6.3] (175)	
Fitmore (Zimmer)	717	12	68 (59 - 76)	34/66			43	35	22	1.9 [1.1; 3.2] (589)	2.2 [1.3; 3.7] (430)	2.7 [1.7; 4.4] (217)	*2.7 [1.7; 4.4]* (76)	
G7 (Biomet)	2,459	18	70 (62 - 77)	35/65			26	70	4	2.6 [2.1; 3.4] (1,733)	3.5 [2.7; 4.3] (1,099)	3.8 [3.0; 4.8] (504)	*4.1 [3.2; 5.3]* (99)	
HI Lubricer Schale (Smith & Nephew)	4,106	30	71 (62 - 77)	35/65			21	74	5	2.4 [2.0; 3.0] (3,179)	3.0 [2.5; 3.6] (2,140)	3.4 [2.9; 4.1] (1,272)	3.9 [3.2; 4.7] (495)	*4.1 [3.3; 5.1]* (124)
PINNACLE™ Press Fit-Hüftpfanne (DePuy)	28,309	162	70 (61 - 77)	37/63			24	52	23	2.5 [2.3; 2.7] (20,004)	3.0 [2.7; 3.2] (13,118)	3.2 [3.0; 3.5] (7,161)	3.5 [3.2; 3.7] (2,713)	3.5 [3.2; 3.8] (749)
PINNACLE™ SPIROFIT™-Schraubpfanne (DePuy)	435	18	74 (65 - 79)	26/74			50	50	0	3.9 [2.5; 6.3] (387)	4.2 [2.7; 6.6] (323)	4.6 [2.9; 7.1] (209)	*4.6 [2.9; 7.1]* (131)	
PLASMACUP DC (Aesculap)	912	11	67 (57 - 76)	29/71			7	49	45	3.4 [2.4; 4.9] (713)	3.7 [2.7; 5.3] (608)	3.9 [2.8; 5.5] (471)	4.3 [3.1; 6.0] (263)	*4.3 [3.1; 6.0]* (101)
PLASMACUP delta (Aesculap)	407	19	61 (55 - 67)	56/44			12	74	14	0.7 [0.2; 2.3] (324)	0.7 [0.2; 2.3] (221)	*0.7 [0.2; 2.3]* (144)	*0.7 [0.2; 2.3]* (80)	
PLASMACUP SC (Aesculap)	4,701	39	70 (62 - 76)	38/62			19	46	36	2.0 [1.7; 2.5] (3,778)	2.6 [2.1; 3.1] (2,879)	2.6 [2.2; 3.2] (1,985)	2.7 [2.3; 3.3] (1,033)	2.7 [2.3; 3.3] (351)
PLASMAFIT PLUS (Aesculap)	14,987	150	69 (60 - 76)	40/60			26	62	8	2.9 [2.7; 3.2] (10,977)	3.4 [3.1; 3.7] (7,521)	3.6 [3.3; 3.9] (4,297)	3.8 [3.4; 4.1] (2,004)	3.8 [3.4; 4.1] (500)
PLASMAFIT POLY (Aesculap)	12,886	110	70 (61 - 76)	39/61			20	47	33	2.8 [2.5; 3.1] (8,566)	3.0 [2.7; 3.4] (4,950)	3.1 [2.8; 3.5] (2,379)	3.2 [2.9; 3.6] (528)	*3.2 [2.9; 3.6]* (72)
PROCOTYL® L BEADED (MicroPort)	696	18	68 (60 - 75)	39/61			25	75	0	3.1 [2.0; 4.8] (449)	3.8 [2.5; 5.6] (281)	*4.2 [2.8; 6.4]* (146)		

Table 42: Implant outcomes for acetabular cups in elective total hip arthroplasties. For each type of fixation, the cups are listed alphabetically by their designation. The table is continued on the following pages.

Elective total hip arthroplasties										Revision probabilities after ...				
Acetabular cups	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Uncemented cups														
Pyramid (Atesos)	2,070	23	71 (64 - 77)	36/64			10	81	2	2.8 [2.1; 3.6] (1,651)	3.2 [2.5; 4.1] (1,193)	3.7 [2.9; 4.7] (664)	4.0 [3.0; 5.2] (196)	
R3 (Smith & Nephew)	10,652	100	70 (61 - 77)	39/61			32	55	14	3.1 [2.7; 3.4] (7,271)	3.5 [3.1; 3.8] (4,263)	3.7 [3.3; 4.1] (1,926)	4.0 [3.5; 4.6] (581)	*4.3 [3.6; 5.0]* (98)
REFLECTION (Smith & Nephew)	813	8	68 (59 - 76)	38/62			14	37	49	1.7 [1.0; 2.9] (656)	2.0 [1.3; 3.3] (421)	2.3 [1.4; 3.7] (289)	*2.3 [1.4; 3.7]* (54)	
RM Classic (Mathys)	1,537	16	75 (68 - 79)	30/70			26	50	24	2.8 [2.1; 3.8] (1,255)	3.4 [2.6; 4.5] (1,056)	3.7 [2.8; 4.8] (795)	4.0 [3.0; 5.2] (416)	4.2 [3.2; 5.6] (203)
RM Pressfit (Mathys)	1,021	12	74 (67 - 79)	40/60			5	88	7	2.4 [1.6; 3.6] (772)	2.9 [2.0; 4.2] (571)	3.2 [2.2; 4.6] (337)	3.8 [2.6; 5.6] (151)	
RM Pressfit vitamys (Mathys)	8,561	61	68 (60 - 76)	40/60			8	48	44	1.6 [1.4; 1.9] (5,863)	1.9 [1.6; 2.2] (3,505)	2.1 [1.8; 2.5] (1,707)	2.1 [1.8; 2.6] (615)	*2.4 [1.8; 3.2]* (126)
SCREWCUP SC (Aesculap)	1,599	49	72 (64 - 78)	35/65			44	53	1	2.6 [1.9; 3.6] (1,170)	3.4 [2.6; 4.6] (729)	3.9 [2.9; 5.2] (401)	4.4 [3.1; 6.1] (192)	*4.4 [3.1; 6.1]* (62)
seleXys PC (Mathys)	458	6	70.5 (61 - 77)	40/60			3	97	0	1.1 [0.5; 2.6] (355)	1.1 [0.5; 2.6] (251)	*1.1 [0.5; 2.6]* (133)		
T.O.P. Hüftpfannensystem (Waldemar Link)	343	8	62 (56 - 69)	50/50			4	52	41	2.3 [1.2; 4.6] (325)	2.6 [1.4; 5.0] (297)	3.0 [1.6; 5.5] (262)	3.4 [1.9; 6.1] (190)	*4.1 [2.3; 7.3]* (129)
TM Modular (Zimmer)	925	98	63 (53 - 74)	29/71			13	63	23	6.0 [4.6; 7.8] (678)	7.1 [5.6; 9.1] (478)	7.6 [5.9; 9.7] (297)	*8.5 [6.5; 11.0]* (141)	
Trident Cup (Stryker)	4,444	50	69 (61 - 77)	40/60			25	52	23	2.9 [2.4; 3.5] (2,828)	3.5 [2.9; 4.2] (1,557)	3.8 [3.2; 4.5] (818)	4.2 [3.4; 5.2] (280)	
Trident TC Cup (Stryker)	760	15	73 (65 - 78)	32/68			19	81	0	2.7 [1.7; 4.1] (706)	3.2 [2.2; 4.8] (647)	3.7 [2.6; 5.4] (496)	*3.7 [2.6; 5.4]* (129)	
Trilogy (Zimmer)	4,697	23	68 (60 - 75)	37/63			11	65	25	2.0 [1.6; 2.4] (3,807)	2.7 [2.2; 3.2] (2,930)	2.9 [2.4; 3.5] (1,912)	3.0 [2.5; 3.6] (992)	3.4 [2.7; 4.1] (427)
Trilogy IT (Zimmer)	1,052	6	71 (62 - 77)	39/61			7	93	0	2.6 [1.8; 3.8] (827)	2.8 [2.0; 4.1] (611)	3.1 [2.1; 4.4] (412)	3.1 [2.1; 4.4] (175)	
Trinity Hole (Corin)	1,350	34	65 (58 - 75)	43/57			58	38	4	2.1 [1.4; 3.0] (1,039)	2.2 [1.5; 3.1] (754)	2.4 [1.6; 3.5] (445)	2.8 [1.8; 4.4] (174)	
Trinity no Hole (Corin)	2,011	21	69 (61 - 76)	40/60			22	51	28	2.2 [1.7; 3.0] (1,583)	2.8 [2.1; 3.7] (1,156)	3.1 [2.4; 4.1] (744)	3.1 [2.4; 4.1] (337)	
Tritanium Cup (Stryker)	1,385	22	70 (62 - 77)	42/58			22	78	0	2.2 [1.6; 3.2] (901)	2.6 [1.8; 3.7] (613)	3.2 [2.2; 4.5] (317)	*3.6 [2.4; 5.3]* (114)	
VERSAFITCUP CC TRIO (Medacta)	6,256	45	70 (61 - 77)	37/63			10	64	26	2.5 [2.2; 3.0] (4,318)	3.0 [2.6; 3.5] (2,291)	3.2 [2.7; 3.7] (850)	*3.2 [2.7; 3.7]* (99)	
Cemented cups														
ALL POLY CUP STANDARD (Aesculap)	2,793	118	80 (76 - 83)	23/77			39	43	13	2.5 [2.0; 3.2] (2,124)	3.0 [2.4; 3.7] (1,490)	3.2 [2.6; 4.0] (935)	3.2 [2.6; 4.0] (454)	3.4 [2.7; 4.3] (155)
AVANTAGE (Biomet)	390	77	78 (72 - 82)	24/76			19	53	27	4.0 [2.4; 6.7] (221)	*4.6 [2.7; 7.6]* (115)	*5.9 [3.3; 10.5]* (63)		
CCB (Mathys)	621	35	79 (75 - 82)	22/78			58	41	0	2.9 [1.8; 4.7] (383)	3.2 [2.0; 5.1] (267)	3.2 [2.0; 5.1] (153)	*3.2 [2.0; 5.1]* (63)	
Endo-Modell Mark III (Waldemar Link)	531	6	76 (72 - 81)	18/82			2	26	72	1.9 [1.0; 3.5] (481)	2.8 [1.6; 4.6] (424)	3.3 [2.0; 5.3] (357)	3.6 [2.2; 5.7] (289)	3.6 [2.2; 5.7] (199)
Flachprofil (Zimmer)	5,557	237	79 (75 - 83)	23/77			22	63	13	2.7 [2.3; 3.2] (4,096)	3.2 [2.7; 3.7] (2,839)	3.8 [3.2; 4.4] (1,714)	4.0 [3.4; 4.6] (759)	4.1 [3.5; 4.9] (215)
IP-Hüftpfannen, UHMWPE (Waldemar Link)	349	18	80 (76 - 83)	25/75			42	50	0	2.3 [1.2; 4.6] (265)	2.8 [1.5; 5.4] (202)	3.3 [1.8; 6.2] (158)	*3.3 [1.8; 6.2]* (64)	
IP-Hüftpfannen, X-Linked (Waldemar Link)	766	24	80 (77 - 83)	27/73			9	91	0	2.3 [1.4; 3.7] (576)	2.9 [1.8; 4.4] (398)	3.2 [2.1; 5.0] (238)	*5.1 [2.8; 9.1]* (85)	
Kunststoffpfanne Modell Lubinus (Waldemar Link)	751	29	79 (74 - 82)	25/75			17	57	18	1.4 [0.8; 2.6] (565)	1.8 [1.0; 3.1] (418)	2.0 [1.2; 3.5] (231)	*2.0 [1.2; 3.5]* (115)	
Müller II Pfanne (Smith & Nephew)	1,968	83	79 (76 - 83)	24/76			30	69	1	2.5 [1.9; 3.3] (1,636)	3.1 [2.4; 4.1] (1,205)	3.6 [2.8; 4.6] (705)	3.8 [2.9; 5.0] (280)	
TRILOC® II-PE-Hüftpfanne (DePuy)	909	74	79 (75 - 83)	20/80			34	59	7	3.0 [2.0; 4.4] (697)	3.0 [2.0; 4.4] (512)	3.4 [2.4; 5.0] (312)	*3.8 [2.6; 5.6]* (110)	

Table 42 (continued)

5.4 Probability of other reoperations

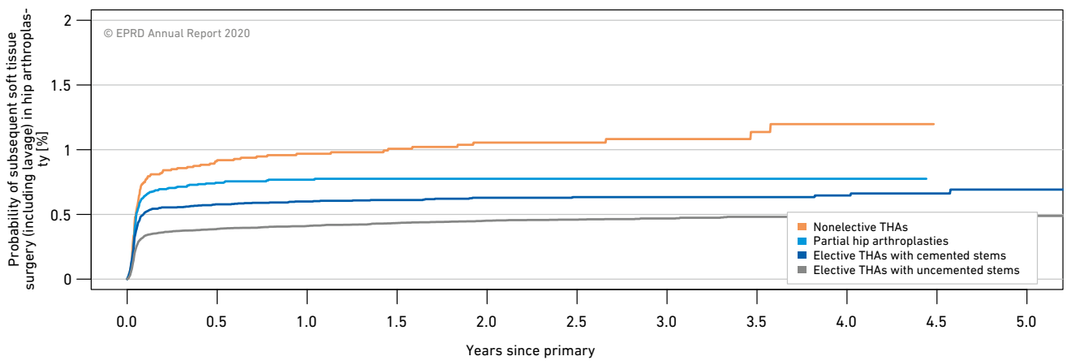
The analysis and presentation of revision probabilities in the previous subchapters generally refer to the "revision arthroplasty" endpoint, where implant components have been replaced or explanted (also see definitions in chapter 3). However, there are additional reoperations which are not classified as revision surgery and therefore do not mark the end of arthroplasty survival in the meaning of the registry. This includes, for example, subsequent procedures limited to soft tissue, in other words soft tissue procedures and/or lavage of the joint without replacing arthroplasty components. These interventions are not explicitly reported to the EPRD itself, but are extracted from the German ICPM codes provided with the routine health insurance data[11].

Subsequent complementation of total knee arthroplasty by secondary patellar resurfacing also counts as one of these reoperations and – according to the definition of the EPRD – is not considered to be the end of arthroplasty survival, regardless of whether or not the procedure does include prophylactic insert replacement. Whether or not a procedure involves subsequent patellar resurfacing is determined by an algorithm based on the product documentation of the hospital and the German ICMP codes[12] supplied by the health insurance companies.

The two subsections below deal in more detail with subsequent soft tissue surgery (incl. lavage) and secondary patellar resurfacing.

5.4.1 Probability of reoperations leaving all implant components *in situ*

The probabilities of soft tissue surgery subsequent to the primary arthroplasty are described below, i.e., these are reoperations in which no implant components are added, explanted or replaced. The registry cannot completely verify that the triggering German ICPM codes have been documented in all of these cases.



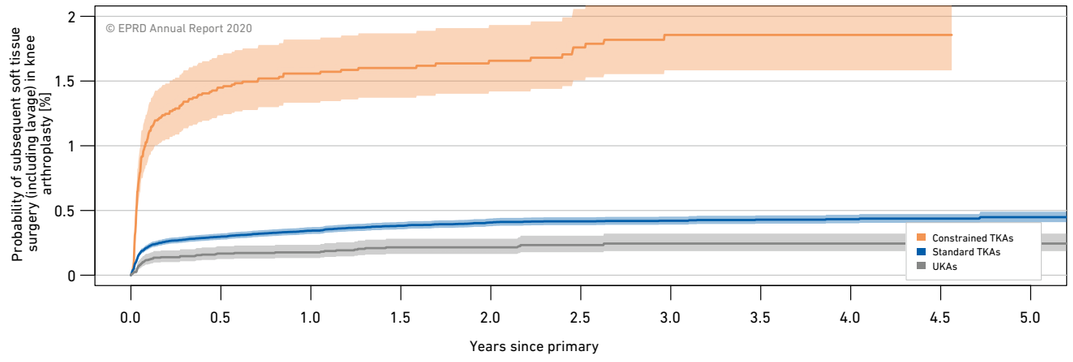
Numbers at risk											
Nonelective THAs	14,854	10,996	8,965	7,182	5,565	4,054	2,804	1,753	993		
Partial hip arthroplasties	28,865	18,348	13,999	10,525	7,531	5,251	3,351	1,955	1,005		
Elective THAs with cemented stems	52,231	44,162	37,717	31,450	25,607	19,896	14,915	10,204	6,540	3,705	1,823
Elective THAs with uncemented stems	199,619	170,659	143,953	120,712	96,375	75,709	54,647	37,159	22,118	13,003	6,095

Figure 31: Probability of subsequent soft tissue surgery (incl. lavage) by type of primary hip arthroplasty *(p < 0.0001)*

11 German ICPM codes 5-821.0 and 5-823.0 ["Reoperation (without revision arthroplasty)"]
12 German ICPM codes 5-822.80 and 5-822.81 ("Implantation of a knee prosthesis: Patellar resurfacing, "uncemented" or "cemented")

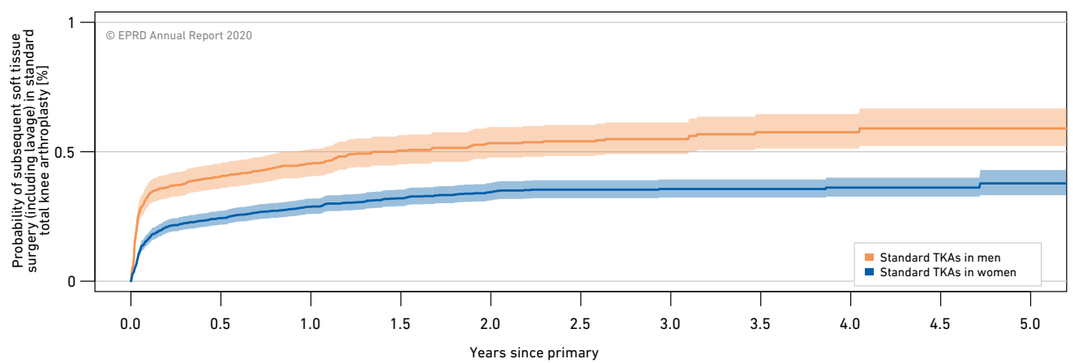
On the whole, subsequent soft tissue surgery is performed less frequently than revisions. For hip arthroplasties, the probability of requiring subsequent soft tissue surgery three years after the primary surgery is 0.5 % to 1.1 %, depending on the type of arthroplasty (figure 31), for knee arthroplasties the corresponding figure ranges from 0.2 % to 1.9 % (figure 32). In addition, the graphs indicate that the types of primary arthroplasties that have previously been shown to have lower revision probabilities (see section 5.2.1 and 5.2.2) are also less likely to require subsequent soft tissue surgery. The one notable exception to this trend are unicondylar knee arthroplasties: Although their revision probabilites are higher than those of TKAs (see figure 25), primary unicondylar knee arthroplasties are less likely to require subsequent soft tissue surgery compared to primary TKAs (see figure 32).

It should be emphasised that soft tissue surgery subsequent to a primary arthroplasty is sometimes required prior to a revision. This means that soft tissue surgery subse-



Numbers at risk											
Constrained TKAs	10,575	8,760	7,264	5,996	4,731	3,553	2,551	1,684	1,051	569	
Standard TKAs	199,282	173,962	146,601	123,300	97,395	76,855	55,223	38,198	22,864	13,391	6,111
UKAs	27,845	23,790	19,523	15,983	12,308	9,378	6,565	4,230	2,357	1,501	773

Figure 32: Probability of subsequent soft tissue surgery (incl. lavage) by type of primary knee arthroplasty *(p < 0.0001)*



Numbers at risk											
Standard TKAs in men	66,869	57,997	48,193	40,536	31,391	24,846	17,465	12,215	7,082	4,251	1,905
Standard TKAs in women	132,413	115,965	98,408	82,764	66,004	52,009	37,758	25,983	15,782	9,140	4,206

Figure 33: Probability of subsequent soft tissue surgery (incl. lavage) of standard total knee arthroplasties by sex *(p < 0.0001)*

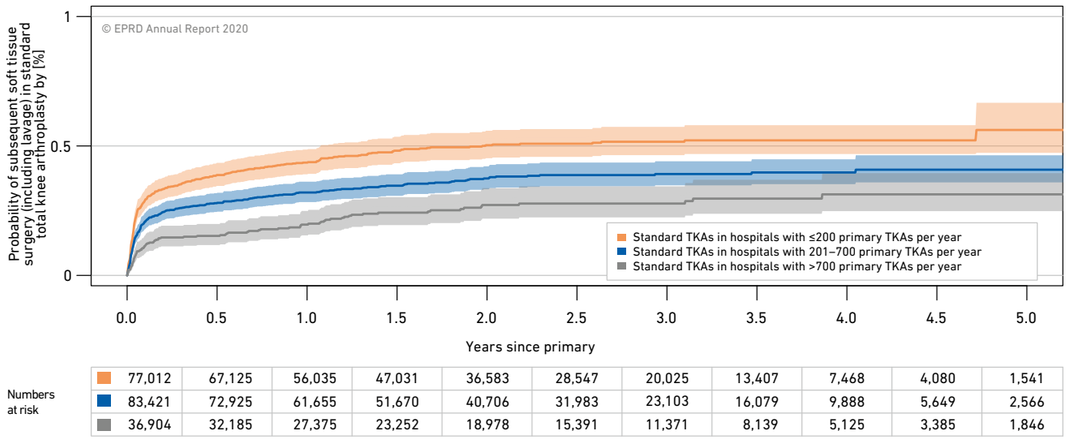


Figure 34: Probability of subsequent soft tissue surgery in standard total knee arthroplasties by total hospital volume (determined from each hospital's 2018 quality assessment report) *(p < 0.0001)*

quent to a primary arthroplasty cannot always be considered as an independent event. The probability of soft tissue surgery subsequent to primary arthroplasty therefore also reflects non-implant-related risk factors, as previously described for revision probabilities in section 5.1. This is illustrated for TKAs below, and is almost identical for hip arthroplasties.

If one considers how a patient's sex impacts the probability of soft tissue surgery subsequent to primary arthroplasty, men face a significantly higher risk (see figure 33).

Probabilities of subsequent soft tissue surgery also reflect the experience of the hospital as measured by its annual volume of corresponding treatments. Hospitals with a larger volume of cases tend to have lower probabilities of soft tissue surgery subsequent to arthroplasties (Figure 34).

In brief

- Probabilities of soft tissue surgery at three years from primary arthroplasty range from 0.2 % to 1.9 %, depending on arthroplasty type.
- Higher probabilities of soft tissue surgery are observed subsequent to primary non-elective hip arthroplasties, primary constrained knee arthroplasties as well as in male patients.

5.4.2 Probability of secondary patellar resurfacing

This subchapter presents the probabilities of patellar resurfacing after primary total knee arthroplasties. Thus, when calculating these probabilities, only those primary arthroplasties were considered which did not initially include patellar resurfacing. Based on the German ICPM codes[13] in the routine data and the surgical documentation in the registry, the EPRD can deduce that about 35 % of secondary patellar resurfacing also included an insert replacement. In 64 % of the operations, the insert was replaced with a thicker model (corresponding to 23 % of all secondary patellar resurfacing considered). These cases probably involved a combination of instability and patellofemoral pain.

In general, the probability of secondary patellar resurfacing within three years of the primary total knee arthroplasty is 0.9 %. Non-implant related factors affect this probability of secondary patellar resurfacing in part differently than the probabilities of revision arthroplasty or reoperation. It is true that both the risk of secondary patellar resurfacing and that of revision arthroplasty of the knee are higher in younger patients (figure 35). A diagnosed depression[14], which proves to be a major risk factor in terms of the probability of secondary patellar resurfacing (see figure 36), also has a similar impact on the probability of revision.

Unlike with the probability of revision (see figure 6), women have a higher risk of requiring secondary patellar resurfacing (see figure 37). Patient weight and BMI *(p = 0.51)* do not have a significant impact on the probability of secondary patellar resurfacing. The same applies to the degree of constraint of the knee system *(p = 0.12)*. As evidenced by figure 38, the institutional experience of the hospital, which in general greatly influences the probability of revision (see section 5.1), is not a factor in the probability of secondary patellar resurfacing.

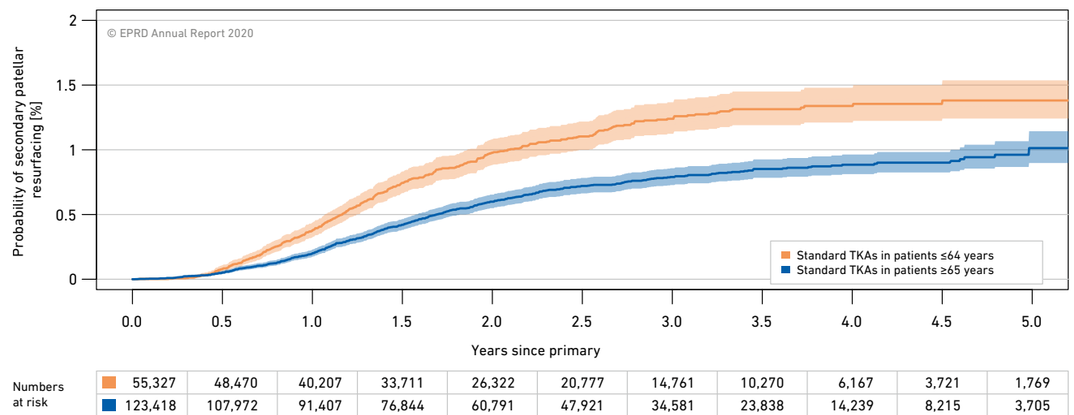
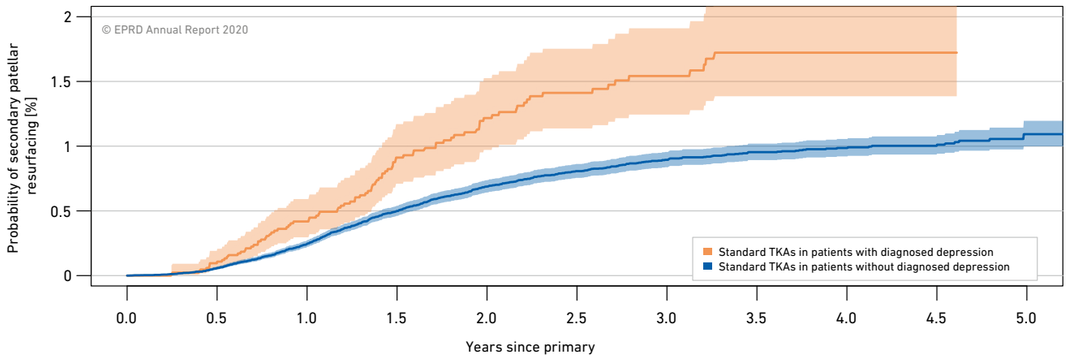


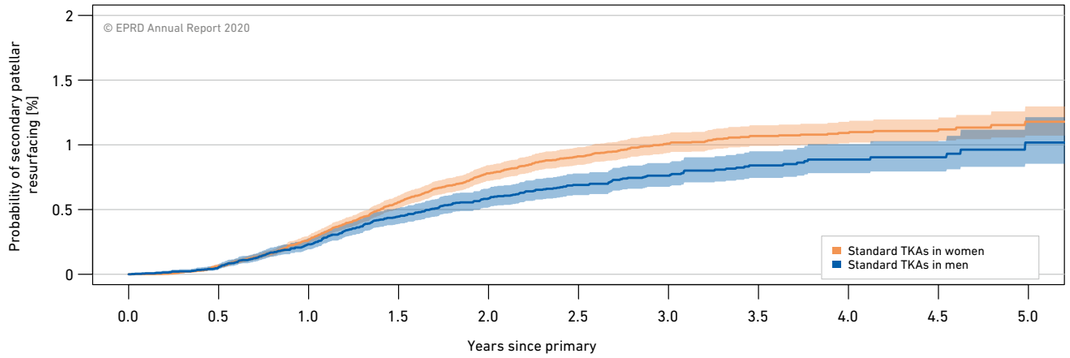
Figure 35: Probability of secondary patellar resurfacing in standard total knee arthroplasties by patient age *(p < 0.0001)*

13 German ICPM codes 5-823.19 and 5-823.27
14 ICD-10 codes F20.4, F31.3 to F31.5, F32.x, F33.x, F34.1, F41.2, F43.2



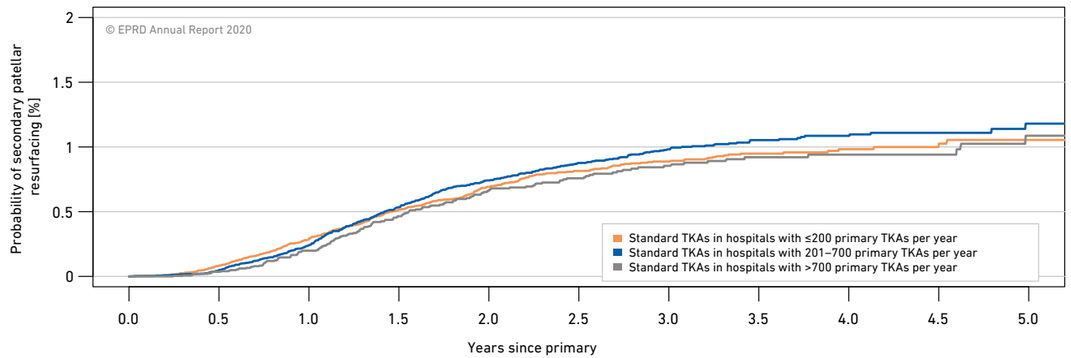
Numbers at risk											
Standard TKAs in patients with diagnosed depression	9,384	8,077	6,731	5,577	4,399	3,458	2,487	1,691	1,041	586	
Standard TKAs in patients without diagnosed depression	169,361	148,365	124,883	104,978	82,714	65,240	46,855	32,417	19,365	11,350	5,176

Figure 36: Probability of secondary patellar resurfacing in standard total knee arthroplasties by diagnosed depression *(p < 0.0001)*



Numbers at risk											
Standard TKAs in women	118,058	103,606	87,755	73,650	58,597	46,084	33,467	23,009	13,982	8,078	3,732
Standard TKAs in men	60,687	52,836	43,859	36,905	28,516	22,614	15,875	11,099	6,424	3,858	1,742

Figure 37: Probability of secondary patellar resurfacing in standard total knee arthroplasties by sex *(p = 0.0006)*



Numbers at risk											
Standard TKAs in hospitals with ≤200 primary TKAs per year	73,113	63,896	53,222	44,552	34,613	26,990	18,944	12,635	7,000	3,784	1,418
Standard TKAs in hospitals with 201–700 primary TKAs per year	76,381	66,840	56,384	47,244	37,135	29,205	21,148	14,750	9,131	5,215	2,360
Standard TKAs in hospitals with >700 primary TKAs per year	27,598	24,187	20,591	17,486	14,302	11,621	8,569	6,184	3,916	2,679	1,550

Figure 38: Probability of secondary patellar resurfacing in standard total knee arthroplasties by total hospital volume (determined from each hospital's 2018 quality assessment report) *(p = 0.29)*. Confidence intervals are not presented here.

the probability of secondary retro-patellar resurfacing. In analogy to data presented in chapter 5.3, table 43 below lists the probability of secondary patellar resurfacing for various specific implant systems. There are sometimes rather large differences between the various systems.

In brief

- 0.9 % risk of secondary patellar resurfacing three years after primary arthroplasty
- Especially at risk are younger female patients and patients with depression
- Probability of secondary patellar resurfacing does not depend on hospital experience

Total knee arthroplasties											Probability of patellar resurfacing after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Standard knee systems, cruciate retaining, fixed bearing, cemented															
ACS cemented (Implantcast)	ACS FB cemented (Implantcast)	522	34	67 (59 - 75)	23/77			71	22	7	0.0 (344)	0.3 [0.0; 2.4] (198)	*0.9 [0.2; 3.6]* (81)		
ATTUNE™ Femur (DePuy)	ATTUNE™ Tibia (DePuy)	3,645	86	67 (59 - 75)	38/62			32	59	9	0.1 [0.0; 0.3] (2,605)	0.6 [0.3; 1.0] (1,703)	0.7 [0.4; 1.2] (893)	1.0 [0.6; 1.7] (414)	*1.0 [0.6; 1.7]* (130)
balanSys BICONDYLAR cem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	1,371	17	72 (65 - 78)	36/64			42	34	24	0.0 (971)	0.0 (642)	0.2 [0.0; 1.3] (295)	*0.2 [0.0; 1.3]* (82)	
COLUMBUS CR (Aesculap)	COLUMBUS CR/PS (Aesculap)	8,243	115	71 (63 - 77)	33/67			69	27	3	0.2 [0.1; 0.4] (5,907)	0.7 [0.5; 1.0] (3,826)	0.9 [0.7; 1.2] (2,169)	1.0 [0.7; 1.3] (949)	1.1 [0.8; 1.5] (292)
COLUMBUS CR (Aesculap)	COLUMBUS CRA/PSA (Aesculap)	1,866	31	69 (62 - 76)	36/64			38	62	0	0.4 [0.2; 0.9] (1,263)	0.5 [0.2; 1.0] (729)	0.5 [0.2; 1.0] (324)	*0.5 [0.2; 1.0]* (103)	
EFK (OHST Medizintechnik)	EFK (OHST Medizintechnik)	2,930	50	72 (64 - 77)	34/66			35	57	8	0.1 [0.0; 0.3] (2,812)	0.3 [0.2; 0.6] (2,572)	0.5 [0.3; 0.8] (1,812)	0.5 [0.3; 0.8] (648)	*0.5 [0.3; 0.8]* (63)
GEMINI SL Fixed Bearing CR / Mobile Bearing (zementiert) (Waldemar Link)	GEMINI SL Fixed Bearing CR/ PS (zementiert) (Waldemar Link)	332	22	73 (63 - 78)	30/70			66	34	0	0.4 [0.1; 2.5] (236)	*0.9 [0.2; 3.9]* (133)	*0.9 [0.2; 3.9]* (64)		
GENESIS II CR COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	5,454	78	70 (62 - 76)	33/67			61	35	3	0.4 [0.3; 0.7] (3,980)	1.2 [0.9; 1.6] (2,728)	1.5 [1.2; 2.0] (1,654)	1.5 [1.2; 2.0] (727)	1.8 [1.2; 2.5] (163)
GENESIS II CR OXINIUM (Smith & Nephew)	Genesis II (Smith & Nephew)	1,685	93	66 (58 - 73)	20/80			35	59	4	0.5 [0.3; 1.1] (1,339)	1.1 [0.7; 1.9] (940)	1.7 [1.1; 2.7] (602)	1.7 [1.1; 2.7] (312)	1.7 [1.1; 2.7] (155)
GENESIS II LDK COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	1,677	16	70 (62 - 76)	38/62			19	68	12	0.3 [0.1; 0.8] (1,492)	1.2 [0.8; 2.0] (1,094)	1.6 [1.0; 2.4] (783)	1.6 [1.0; 2.4] (365)	*1.6 [1.0; 2.4]* (101)
INNEX (Zimmer)	INNEX (Zimmer)	916	25	73 (66 - 78)	42/58			91	8	0	0.3 [0.1; 1.0] (710)	0.4 [0.1; 1.3] (502)	1.0 [0.4; 2.6] (287)	*1.0 [0.4; 2.6]* (141)	
JOURNEY II CR OXINIUM (Smith & Nephew)	JOURNEY (Smith & Nephew)	688	20	65 (59 - 73)	36/64			39	61	0	0.0 (496)	0.6 [0.2; 2.6] (229)	*0.6 [0.2; 2.6]* (83)		
LEGION CR COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	5,168	84	71 (63 - 77)	38/62			38	57	4	0.1 [0.1; 0.3] (2,953)	0.5 [0.3; 0.9] (1,273)	0.5 [0.3; 0.9] (462)		
LEGION CR OXINIUM (Smith & Nephew)	Genesis II (Smith & Nephew)	1,085	88	65 (58 - 72)	15/85			34	62	3	0.1 [0.0; 1.0] (654)	0.6 [0.2; 2.1] (301)	*0.6 [0.2; 2.1]* (92)		
Natural Knee NK Flex (Zimmer)	Natural Knee NK II (Zimmer)	373	10	73 (63 - 78)	33/67			95	5	0	0.0 (324)	0.3 [0.0; 2.3] (214)	*0.8 [0.2; 3.3]* (124)	*0.8 [0.2; 3.3]* (77)	
NexGen CR-Flex-Gender (Zimmer)	NexGen (Zimmer)	3,133	84	70 (62 - 76)	9/91			26	54	16	0.1 [0.0; 0.4] (2,414)	0.4 [0.2; 0.8] (1,622)	0.8 [0.5; 1.3] (1,003)	0.8 [0.5; 1.3] (492)	0.8 [0.5; 1.3] (207)
NexGen CR-Flex (Zimmer)	NexGen (Zimmer)	10,461	103	72 (64 - 77)	41/59			32	45	22	0.1 [0.0; 0.2] (7,832)	0.3 [0.2; 0.4] (5,186)	0.3 [0.2; 0.5] (3,090)	0.5 [0.3; 0.7] (1,490)	0.5 [0.3; 0.7] (544)
NexGen CR (Zimmer)	NexGen (Zimmer)	2,688	41	70 (62 - 76)	42/58			42	16	42	0.2 [0.1; 0.5] (2,205)	0.5 [0.3; 0.9] (1,555)	0.7 [0.4; 1.2] (1,049)	0.8 [0.5; 1.4] (593)	0.8 [0.5; 1.4] (172)
Persona (Zimmer)	Persona (Zimmer)	2,081	50	69 (62 - 76)	39/61			49	46	4	0.1 [0.0; 0.4] (1,216)	0.2 [0.1; 0.7] (701)	0.2 [0.1; 0.7] (322)	*0.2 [0.1; 0.7]* (95)	
TC-PLUS CR (Smith & Nephew)	TC-PLUS (Smith & Nephew)	2,793	39	72 (64 - 78)	36/64			43	56	0	0.2 [0.1; 0.5] (2,006)	0.2 [0.1; 0.5] (1,006)	0.3 [0.1; 0.8] (426)	*0.3 [0.1; 0.8]* (106)	
Triathlon CR (Stryker)	Triathlon (Stryker)	4,704	66	71 (63 - 77)	36/64			53	46	1	0.3 [0.2; 0.5] (3,442)	1.2 [0.9; 1.6] (2,332)	1.6 [1.2; 2.2] (1,342)	1.7 [1.3; 2.3] (602)	1.7 [1.3; 2.3] (170)
Vanguard (Biomet)	Vanguard (Biomet)	7,141	73	71 (63 - 77)	33/67			47	53	0	0.2 [0.1; 0.3] (5,420)	0.4 [0.3; 0.7] (3,489)	0.9 [0.6; 1.2] (1,892)	0.9 [0.6; 1.3] (651)	*0.9 [0.6; 1.3]* (61)
Unconstrained knee systems, cruciate retaining, fixed bearing, hybrid															
COLUMBUS CR zf (Aesculap)	COLUMBUS CR/PS (Aesculap)	422	5	69 (62 - 77)	38/62			72	28	0	0.0 (340)	0.0 (251)	*0.0* (142)		
EFK (OHST Medizintechnik)	EFK (OHST Medizintechnik)	1,096	16	70 (62 - 76)	38/62			5	92	0	0.2 [0.0; 0.7] (1,063)	0.6 [0.3; 1.3] (1,005)	0.6 [0.3; 1.3] (770)	0.7 [0.3; 1.5] (371)	*0.7 [0.3; 1.5]* (53)
GENESIS II CR COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	349	4	69 (62 - 76)	43/57			36	64	0	0.3 [0.0; 2.2] (308)	0.3 [0.0; 2.2] (255)	0.3 [0.0; 2.2] (185)	*0.3 [0.0; 2.2]* (126)	*0.3 [0.0; 2.2]* (60)
NexGen CR-Flex (Zimmer)	NexGen (Zimmer)	498	17	69 (61 - 76)	51/49			33	67	0	0.7 [0.2; 2.1] (404)	1.0 [0.4; 2.8] (255)	*1.0 [0.4; 2.8]* (143)	*1.0 [0.4; 2.8]* (81)	

Table 43: Implant outcomes for probability of secondary patellar resurfacing – table continued on the next pages

Total knee arthroplasties											Probability of patellar resurfacing after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Unconstrained knee systems, cruciate retaining, fixed bearing, hybrid															
NexGen CR (Zimmer)	NexGen (Zimmer)	462	6	69 (62 - 75)	47/53			76	24	0	0.0 (421)	0.0 (367)	0.0 (228)	*0.0* (93)	
TC-PLUS CR (Smith & Nephew)	TC-PLUS (Smith & Nephew)	311	12	72 (64 - 77)	39/61			19	62	0	0.4 [0.1; 2.6] (248)	*0.4 [0.1; 2.6]* (132)	*0.4 [0.1; 2.6]* (54)		
Vanguard (Biomet)	Vanguard (Biomet)	535	7	67 (59 - 74)	42/58			7	93	0	0.0 (383)	0.6 [0.1; 2.4] (241)	*1.2 [0.4; 3.9]* (126)		
Unconstrained knee systems, cruciate retaining, mobile bearing, cemented															
ACS cemented (Implantcast)	ACS MB cemented (Implantcast)	433	19	71 (63 - 77)	29/71			62	38	0	0.0 (331)	0.0 (236)	*1.1 [0.3; 4.4]* (143)	*1.1 [0.3; 4.4]* (52)	
ATTUNE™ Femur (DePuy)	ATTUNE™ Tibia (DePuy)	989	17	69 (62 - 75)	37/63			38	50	12	0.2 [0.1; 0.9] (726)	0.6 [0.2; 1.7] (481)	0.9 [0.3; 2.1] (268)	*0.9 [0.3; 2.1]* (75)	
COLUMBUS CR (Aesculap)	COLUMBUS RP (Aesculap)	1,604	22	72 (64 - 77)	33/67			93	7	0	0.3 [0.1; 0.8] (1,182)	0.4 [0.2; 0.9] (806)	0.4 [0.2; 0.9] (463)	0.8 [0.3; 2.6] (185)	*0.8 [0.3; 2.6]* (51)
INNEX (Zimmer)	INNEX (Zimmer)	862	57	70 (63 - 77)	98/2			46	24	28	0.1 [0.0; 1.0] (678)	0.1 [0.0; 1.0] (476)	0.4 [0.1; 1.9] (264)	*0.4 [0.1; 1.9]* (79)	
NexGen CR-Flex (Zimmer)	NexGen CR (Zimmer)	404	9	70 (64 - 76)	42/58			8	92	0	0.3 [0.0; 1.9] (342)	0.7 [0.2; 2.7] (248)	0.7 [0.2; 2.7] (191)	*0.7 [0.2; 2.7]* (80)	
TC-PLUS CR (Smith & Nephew)	TC-PLUS SB (Smith & Nephew)	319	9	71 (63 - 77)	31/69			99	1	0	0.7 [0.2; 2.8] (264)	1.5 [0.6; 3.9] (215)	*2.0 [0.8; 4.7]* (112)		
Unconstrained knee systems, cruciate retaining, mobile bearing, hybrid															
TC-PLUS CR (Smith & Nephew)	TC-PLUS SB (Smith & Nephew)	345	6	70 (62 - 77)	34/66			10	90	0	0.0 (305)	0.0 (259)	*0.0* (146)		
Unconstrained knee systems, cruciate retaining/sacrificing, fixed bearing, cemented															
3D (Speetec Implantate Gmbh)	3D (Speetec Implantate Gmbh)	1,198	19	71 (63 - 77)	34/66			45	44	10	0.3 [0.1; 0.8] (1,073)	1.1 [0.6; 1.9] (811)	1.2 [0.7; 2.1] (497)	1.2 [0.7; 2.1] (193)	
SIGMA® Femur (DePuy)	SIGMA® Tibia (DePuy)	15,175	120	71 (63 - 77)	35/65			34	42	23	0.2 [0.2; 0.3] (11,099)	0.5 [0.4; 0.7] (7,592)	0.6 [0.5; 0.8] (4,175)	0.7 [0.5; 0.9] (1,705)	0.9 [0.6; 1.4] (519)
Unity CR cmtd (Corin)	Unity cmtd (Corin)	330	10	75 (69 - 79)	26/74			28	72	0	0.6 [0.2; 2.5] (278)	1.1 [0.4; 3.5] (195)	*1.1 [0.4; 3.5]* (125)	*1.1 [0.4; 3.5]* (63)	
Unconstrained knee systems, cruciate retaining/sacrificing, fixed bearing, hybrid															
SIGMA® Femur (DePuy)	SIGMA® Tibia (DePuy)	653	16	69 (61 - 76)	41/59			60	40	0	0.2 [0.0; 1.3] (501)	0.6 [0.2; 1.9] (339)	1.0 [0.4; 2.6] (196)	*1.0 [0.4; 2.6]* (75)	
Unconstrained knee systems, cruciate retaining/sacrificing, mobile bearing, cemented															
E.MOTION FP/UC (Aesculap)	E.MOTION UC/PS (Aesculap)	6,532	75	70 (62 - 77)	33/67			47	37	15	0.7 [0.5; 0.9] (4,619)	1.6 [1.3; 2.0] (2,899)	1.9 [1.6; 2.4] (1,536)	2.2 [1.7; 2.8] (614)	*2.5 [1.8; 3.4]* (135)
LCS® COMPLETE™ Femur (DePuy)	MBT Tibia (DePuy)	4,399	55	71 (64 - 77)	36/64			41	19	40	0.3 [0.2; 0.5] (3,698)	1.0 [0.7; 1.4] (2,835)	1.1 [0.8; 1.6] (1,873)	1.2 [0.9; 1.7] (867)	1.2 [0.9; 1.7] (153)
SIGMA® Femur (DePuy)	MBT Tibia (DePuy)	1,347	25	72 (64 - 78)	35/65			79	16	5	0.4 [0.2; 1.1] (910)	1.4 [0.8; 2.5] (585)	1.8 [1.1; 3.1] (314)	*1.8 [1.1; 3.1]* (68)	
Unconstrained knee systems, cruciate retaining/sacrificing, mobile bearing, hybrid															
LCS® COMPLETE™ Femur (DePuy)	MBT Tibia (DePuy)	2,476	33	70 (62 - 77)	35/65			37	20	44	0.1 [0.0; 0.4] (1,930)	0.5 [0.3; 1.0] (1,260)	0.5 [0.3; 1.0] (676)	0.5 [0.3; 1.0] (249)	*0.5 [0.3; 1.0]* (96)
Unconstrained knee systems, cruciate retaining/sacrificing, mobile bearing, uncemented															
LCS® COMPLETE™ Femur (DePuy)	LCS® COMPLETE™ Tibia (DePuy)	410	64	64 (58 - 72)	6/94			44	33	22	0.0 (294)	0.5 [0.1; 3.6] (176)	*0.5 [0.1; 3.6]* (78)		
LCS® COMPLETE™ Femur (DePuy)	MBT Tibia (DePuy)	1,023	21	70 (61 - 76)	36/64			29	63	8	0.4 [0.2; 1.2] (823)	0.7 [0.3; 1.6] (572)	0.7 [0.3; 1.6] (342)	*0.7 [0.3; 1.6]* (139)	*0.7 [0.3; 1.6]* (64)

Table 43 (continued)

Total knee arthroplasties											Probability of patellar resurfacing after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Unconstrained knee systems, cruciate sacrificing, fixed bearing, cemented															
ATTUNE™ Femur (DePuy)	ATTUNE™ Tibia (DePuy)	824	57	69 (60 - 75)	36/64			40	45	14	0.6 [0.2; 1.6] (617)	1.2 [0.5; 2.4] (463)	1.4 [0.7; 2.8] (260)	*2.0 [0.9; 4.2]* (132)	
balanSys BICONDYLAR cem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	894	23	70 (62 - 77)	26/74			37	47	16	0.0 (623)	1.1 [0.5; 2.5] (345)	2.1 [1.1; 4.3] (174)	*2.1 [1.1; 4.3]* (91)	
COLUMBUS CR (Aesculap)	COLUMBUS CR/PS (Aesculap)	1,441	66	71 (62 - 77)	24/76			61	21	17	0.0 (1,054)	0.2 [0.1; 0.8] (673)	0.4 [0.1; 1.5] (348)	*0.4 [0.1; 1.5]* (119)	
COLUMBUS CR (Aesculap)	COLUMBUS CRA/PSA (Aesculap)	592	22	69 (61 - 77)	32/68			45	55	0	0.0 (453)	0.0 (281)	*0.0* (146)		
INNEX (Zimmer)	INNEX (Zimmer)	922	37	71.5 (64 - 79)	40/60			59	23	14	0.4 [0.1; 1.2] (710)	0.7 [0.3; 1.7] (442)	0.7 [0.3; 1.7] (222)	*1.2 [0.5; 3.2]* (66)	
INNEX Gender (Zimmer)	INNEX (Zimmer)	531	28	72 (65 - 77)	20/80			35	29	27	0.2 [0.0; 1.5] (416)	0.5 [0.1; 1.8] (263)	0.5 [0.1; 1.8] (170)	*0.5 [0.1; 1.8]* (61)	
Natural Knee NK Flex (Zimmer)	Natural Knee NK II (Zimmer)	437	9	68 (60 - 75)	32/68			31	69	0	0.2 [0.0; 1.7] (368)	0.5 [0.1; 2.2] (280)	0.5 [0.1; 2.2] (198)	*0.5 [0.1; 2.2]* (113)	*0.5 [0.1; 2.2]* (60)
Natural Knee NK II (Zimmer)	Natural Knee NK II (Zimmer)	336	8	73 (67 - 77)	28/72			20	70	10	0.3 [0.0; 2.2] (321)	0.3 [0.0; 2.2] (314)	0.3 [0.0; 2.2] (235)	0.3 [0.0; 2.2] (167)	*0.3 [0.0; 2.2]* (65)
Persona (Zimmer)	Persona (Zimmer)	1,319	43	68 (60 - 76)	37/63			30	34	35	0.0 (801)	0.3 [0.1; 1.1] (488)	0.3 [0.1; 1.1] (233)	*0.3 [0.1; 1.1]* (66)	
SIGMA® Femur (DePuy)	SIGMA® Tibia (DePuy)	2,089	88	72 (64 - 78)	33/67			36	52	12	0.7 [0.4; 1.2] (1,573)	1.4 [0.9; 2.1] (1,114)	1.8 [1.2; 2.6] (630)	1.9 [1.3; 2.9] (226)	*1.9 [1.3; 2.9]* (58)
Triathlon CR (Stryker)	Triathlon (Stryker)	990	20	70 (62 - 77)	35/65			20	79	0	0.1 [0.0; 1.0] (604)	0.9 [0.4; 2.2] (299)	0.9 [0.4; 2.2] (189)	*0.9 [0.4; 2.2]* (91)	
Vanguard (Biomet)	Vanguard (Biomet)	4,047	66	72 (64 - 78)	29/71			30	67	2	0.2 [0.1; 0.4] (3,102)	0.5 [0.3; 0.8] (2,010)	0.7 [0.5; 1.2] (1,103)	0.7 [0.5; 1.2] (374)	
Unconstrained knee systems, cruciate sacrificing, fixed bearing, hybrid															
balanSys BICONDYLAR uncem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	756	7	70 (63 - 77)	45/55			47	53	0	0.3 [0.1; 1.4] (533)	0.7 [0.3; 2.0] (350)	0.7 [0.3; 2.0] (177)	*1.4 [0.5; 3.8]* (90)	
Unconstrained knee systems, cruciate sacrificing, mobile bearing, cemented															
ATTUNE™ Femur (DePuy)	ATTUNE™ Tibia (DePuy)	300	12	77 (71 - 81)	35/65			12	80	7	0.0 (204)	*1.0 [0.3; 4.0]* (121)	*1.8 [0.6; 5.8]* (64)		
COLUMBUS CR (Aesculap)	COLUMBUS UCR (Aesculap)	859	5	70 (62 - 76)	40/60			14	86	0	0.3 [0.1; 1.0] (731)	0.8 [0.4; 1.8] (596)	0.8 [0.4; 1.8] (409)	1.0 [0.5; 2.2] (202)	
INNEX (Zimmer)	INNEX (Zimmer)	3,390	57	73 (65 - 78)	31/69			50	25	25	0.2 [0.1; 0.4] (2,629)	0.7 [0.4; 1.1] (1,796)	0.7 [0.5; 1.2] (971)	1.2 [0.7; 2.3] (301)	
INNEX Gender (Zimmer)	INNEX (Zimmer)	2,604	56	73 (64 - 78)	18/82			35	21	43	0.3 [0.2; 0.7] (1,916)	1.2 [0.8; 1.9] (1,271)	1.7 [1.2; 2.6] (636)	1.7 [1.2; 2.6] (166)	
SIGMA® Femur (DePuy)	MBT Tibia (DePuy)	392	33	73 (65 - 78)	29/71			73	24	1	0.0 (270)	0.0 (173)	*0.0* (78)		
Unconstrained knee systems, cruciate sacrificing, mobile bearing, hybrid															
balanSys BICONDYLAR uncem. (Mathys)	balanSys BICONDYLAR RP (Mathys)	546	6	70 (62 - 76)	40/60			26	74	0	0.6 [0.2; 1.8] (470)	1.0 [0.4; 2.4] (367)	1.4 [0.6; 3.1] (250)	*1.4 [0.6; 3.1]* (147)	*2.1 [0.9; 4.8]* (94)
Unconstrained knee systems, posterior stabilised, cemented															
balanSys BICONDYLAR PS cem. (Mathys)	balanSys BICONDYLAR fix (Mathys)	730	20	73 (64 - 78)	39/61			45	41	14	0.2 [0.0; 1.1] (466)	0.6 [0.2; 2.0] (232)	*0.6 [0.2; 2.0]* (114)		
COLUMBUS PS (Aesculap)	COLUMBUS CR/PS (Aesculap)	324	20	70 (62 - 76)	36/64			35	65	0	0.4 [0.1; 2.7] (250)	0.4 [0.1; 2.7] (185)	*0.4 [0.1; 2.7]* (114)	*0.4 [0.1; 2.7]* (66)	
E.MOTION PS (Aesculap)	E.MOTION UC/PS (Aesculap)	366	16	68 (61 - 75)	36/64			30	24	46	1.5 [0.6; 3.6] (319)	2.5 [1.3; 4.9] (268)	4.3 [2.4; 7.5] (178)	*4.3 [2.4; 7.5]* (102)	
E.MOTION PS PRO (Aesculap)	E.MOTION UC/PS (Aesculap)	1,387	27	69 (61 - 76)	31/69			22	55	16	0.4 [0.1; 1.0] (917)	1.6 [0.9; 2.8] (542)	2.2 [1.3; 3.7] (268)	*2.2 [1.3; 3.7]* (106)	

Table 43 (continued)

Total knee arthroplasties											Probability of patellar resurfacing after ...				
Femoral component	Tibial component	Number	Hosp.	Age	m/f			%L	%M	%H	1 year	2 years	3 years	4 years	5 years
Unconstrained knee systems, posterior stabilised, cemented															
GEMINI SL Fixed Bearing PS (zementiert) (Waldemar Link)	GEMINI SL Fixed Bearing CR / PS (zementiert) (Waldemar Link)	553	17	72 (64 - 78)	34/66			50	30	20	0.2 [0.0; 1.3] (287)	*0.2 [0.0; 1.3]* (142)	*0.2 [0.0; 1.3]* (60)		
GENESIS II PS COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	2,126	56	72 (64 - 78)	34/66			44	55	0	0.5 [0.3; 1.0] (1,639)	1.9 [1.3; 2.7] (1,059)	2.2 [1.5; 3.1] (513)	2.2 [1.5; 3.1] (181)	
GENESIS II PS OXINIUM (Smith & Nephew)	Genesis II (Smith & Nephew)	339	37	63 (57 - 71)	20/80			43	50	7	0.3 [0.0; 2.4] (253)	0.8 [0.2; 3.3] (181)	*1.8 [0.5; 5.9]* (87)		
JOURNEY II BCS OXINIUM (Smith & Nephew)	JOURNEY (Smith & Nephew)	1,082	33	69 (62 - 76)	32/68			12	87	1	1.2 [0.6; 2.2] (762)	2.6 [1.6; 4.0] (447)	*2.8 [1.8; 4.4]* (106)		
LEGION PS COCR (Smith & Nephew)	Genesis II (Smith & Nephew)	2,592	61	71 (63 - 77)	36/64			30	46	19	0.6 [0.3; 1.1] (1,517)	1.8 [1.2; 2.8] (682)	1.8 [1.2; 2.8] (260)	*1.8 [1.2; 2.8]* (66)	
LEGION PS OXINIUM (Smith & Nephew)	Genesis II (Smith & Nephew)	766	63	67 (59 - 75)	20/80			15	74	10	0.9 [0.4; 2.1] (504)	2.0 [1.1; 3.7] (315)	2.8 [1.5; 5.1] (191)	*2.8 [1.5; 5.1]* (90)	
NexGen LPS-Flex-Gender (Zimmer)	NexGen (Zimmer)	2,312	64	70 (61 - 77)	8/92			16	28	56	0.2 [0.1; 0.5] (1,622)	0.4 [0.2; 0.9] (1,131)	1.0 [0.5; 1.8] (675)	1.1 [0.6; 2.1] (361)	1.1 [0.6; 2.1] (170)
NexGen LPS-Flex (Zimmer)	NexGen (Zimmer)	7,421	177	69 (61 - 76)	30/70			37	32	31	0.2 [0.1; 0.4] (5,298)	0.5 [0.4; 0.8] (3,448)	0.6 [0.4; 0.9] (1,929)	0.7 [0.5; 1.0] (829)	0.7 [0.5; 1.0] (261)
NexGen LPS (Zimmer)	NexGen (Zimmer)	5,930	35	70 (62 - 76)	40/60			13	23	63	0.1 [0.0; 0.2] (4,642)	0.4 [0.2; 0.6] (3,337)	0.6 [0.4; 0.9] (2,209)	0.7 [0.5; 1.1] (1,182)	0.7 [0.5; 1.1] (565)
Persona (Zimmer)	Persona (Zimmer)	635	35	68 (60 - 76)	42/58			21	35	44	0.2 [0.0; 1.6] (392)	0.2 [0.0; 1.6] (218)	*0.2 [0.0; 1.6]* (101)		
Triathlon PS (Stryker)	Triathlon (Stryker)	1,843	50	72 (64 - 78)	35/65			34	66	0	0.4 [0.2; 0.9] (1,219)	1.2 [0.7; 2.0] (634)	1.5 [0.9; 2.5] (255)	*1.5 [0.9; 2.5]* (88)	
Vanguard (Biomet)	Vanguard (Biomet)	1,003	30	72 (64 - 78)	31/69			37	44	19	0.3 [0.1; 1.1] (666)	0.8 [0.3; 2.0] (422)	0.8 [0.3; 2.0] (223)	*0.8 [0.3; 2.0]* (55)	
VEGA PS (Aesculap)	VEGA PS (Aesculap)	827	25	69 (60 - 76)	32/68			51	36	9	0.3 [0.1; 1.2] (557)	1.6 [0.8; 3.2] (338)	2.7 [1.4; 4.9] (199)	*3.2 [1.7; 5.8]* (83)	
Unconstrained knee systems, pivot, fixed bearing, cemented															
GMK SPHERE (Medacta)	GMK (Medacta)	447	18	68 (61 - 75)	47/53			53	47	0	0.6 [0.2; 2.4] (271)	*1.5 [0.5; 3.9]* (112)			
MicroPort (MicroPort)	MicroPort (MicroPort)	1,078	17	69 (61 - 76)	38/62			45	8	47	0.4 [0.1; 1.1] (683)	1.0 [0.5; 2.2] (371)	*1.0 [0.5; 2.2]* (122)		
Constrained knee systems, varus-valgus stabilised, fixed bearing, cemented															
NexGen LCCK (Zimmer)	NexGen (Zimmer)	849	83	72 (63 - 78)	31/69			32	47	21	0.3 [0.1; 1.1] (638)	1.0 [0.5; 2.3] (445)	1.0 [0.5; 2.3] (251)	*1.0 [0.5; 2.3]* (94)	
Constrained knee systems, hinged, fixed bearing, cemented															
Endo-Modell® - M, Rotationsversion (Waldemar Link)	Endo-Modell® - M, Rotationsversion (Waldemar Link)	610	87	77 (68 - 82)	23/77			35	42	21	0.2 [0.0; 1.4] (394)	1.5 [0.6; 3.6] (224)	*1.5 [0.6; 3.6]* (101)		
Endo-Modell®, Rotationsversion (Waldemar Link)	Endo-Modell®, Rotationsversion (Waldemar Link)	740	103	77 (69 - 82)	20/80			56	24	19	0.2 [0.0; 1.3] (525)	0.9 [0.3; 2.3] (357)	0.9 [0.3; 2.3] (201)	*0.9 [0.3; 2.3]* (102)	
ENDURO (Aesculap)	ENDURO (Aesculap)	958	121	76 (67 - 80)	22/78			65	29	2	0.6 [0.3; 1.5] (672)	1.1 [0.5; 2.2] (447)	1.5 [0.7; 3.0] (261)	*1.5 [0.7; 3.0]* (115)	
NexGen RHK (Zimmer)	NexGen RHK (Zimmer)	658	101	75 (68 - 81)	24/76			33	60	5	0.4 [0.1; 1.6] (459)	0.7 [0.2; 2.1] (285)	1.8 [0.7; 4.7] (160)	*1.8 [0.7; 4.7]* (78)	
RT-Plus (Smith & Nephew)	RT-Plus (Smith & Nephew)	1,346	113	77 (70 - 81)	20/80			51	47	3	0.5 [0.2; 1.2] (971)	0.9 [0.5; 1.7] (666)	1.2 [0.7; 2.3] (377)	*1.6 [0.8; 2.9]* (140)	
RT-Plus Modular (Smith & Nephew)	RT-Plus Modular (Smith & Nephew)	363	85	75 (65 - 80)	30/70			61	39	0	1.0 [0.3; 2.9] (270)	1.3 [0.5; 3.5] (192)	*1.3 [0.5; 3.5]* (97)		

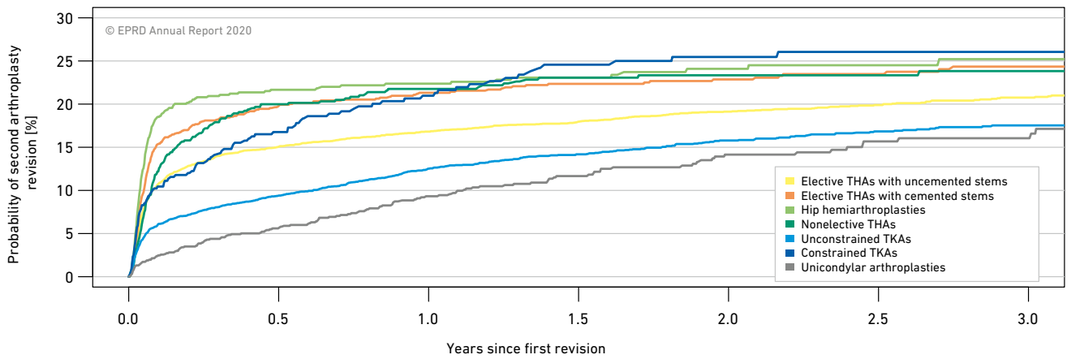
Table 43 (continued)

5.5 Re-revision probability of hip and knee arthroplasty

About 15,700 of the 535,000 primary arthroplasties currently documented in the EPRD, being followed up by the health insurance providers and available for arthroplasty survival analyses, already needed revision arthroplasty. Based on these data, this section discusses the probability that the initial revision of prosthetic components will be followed by at least one more such procedure.

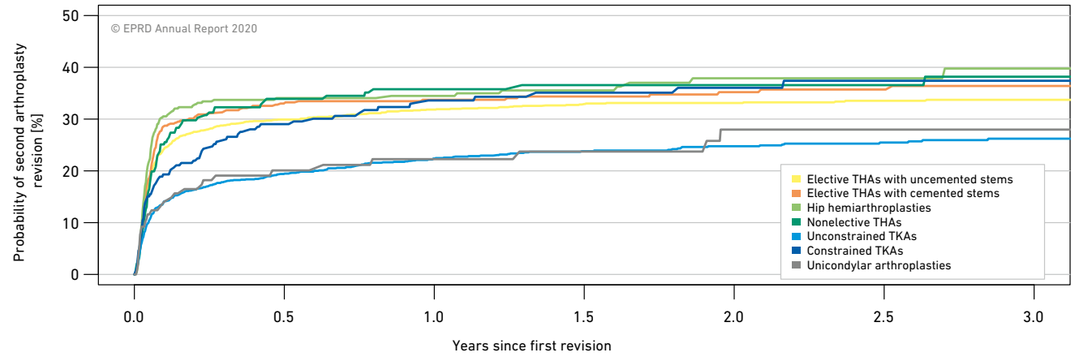
As figure 39 shows, this probability is generally much higher than the probability of first-time revision after primary arthroplasty, which was discussed in the previous sections. However, it largely depends on the type of arthroplasty chosen at the time of the primary procedure and the initial conditions. The lowest probabilities of second revision arthroplasties are seen in uni- and standard total knee arthroplasties. Here, two years after first-time revision arthroplasty, the cumulative probabilities of second revision are 14.1 % and 15.8 % respectively. For hip arthroplasties, this probability at the same point in time is at least 19.1 %. In more complicated initial conditions of primary arthroplasty, such as non-elective arthroplasties in femoral neck fractures, the probability reaches more than 25 % after two years.

It should be noted that for most types of arthroplasty, the probability of second revision increases sharply immediately following the first-time revision arthroplasty. Accordingly, second revision arthroplasties are often performed shortly after the first-time revision, especially if the latter had been due to infection. In figures 40 and 41, the probabilities of second revision arthroplasties are shown separately, depending on whether the first-time revision was due to infection or not[15]. In revision arthroplasty due to infection, the probability of second revision exceeds the 10 % mark within just a few weeks of the first-time revision and ranges from 24.8 % to 37.9 % after two years. After non-infection related first-time revision arthroplasties, six of the seven types of arthroplasties presented have markedly lower probabilities of 11.3 % to 14.5 % at that point in time. Only the probability of revision in non-elective total hip arthroplasties is somewhat higher at 17.8 %.



Numbers at risk							
Elective THAs with uncemented stems	5,868	4,199	3,391	2,676	2,085	1,512	1,032
Elective THAs with cemented stems	1,298	841	670	526	400	298	214
Hip hemiarthroplasties	1,057	504	374	269	192	129	77
Nonelective THAs	843	516	399	313	234	172	110
Unconstrained TKAs	4,840	3,618	2,840	2,164	1,582	1,136	735
Constrained TKAs	479	325	244	188	141	95	63
Unicondylar arthroplasties	1,233	956	744	547	392	246	157

Figure 39: Probability of second revision by type of primary arthroplasty *(p < 0.0001)*



Numbers at risk							
Elective THAs with uncemented stems	1,989	1,156	924	712	550	394	266
Elective THAs with cemented stems	555	296	235	185	137	96	73
Hip hemiarthroplasties	489	190	137	97	72	43	27
Nonelective THAs	252	121	93	71	50	43	30
Unconstrained TKAs	1,614	1,068	836	634	484	354	229
Constrained TKAs	243	138	102	78	55	29	20
Unicondylar arthroplasties	133	78	64	49	33	17	11

Figure 40: Probability of second revision following primary revision for infection by type of primary arthroplasty *(p < 0.0001)*

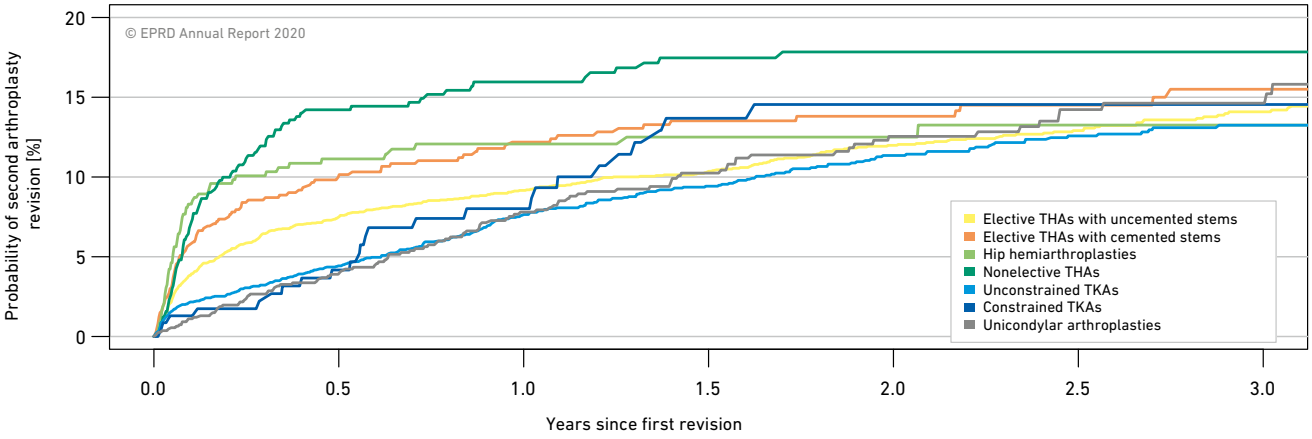
Since the EPRD is still a rather young registry, the majority of the first-time revision arthroplasties analysed in this chapter were performed early: 63.3 % within less than six months and 13.2 % between six and twelve months after primary arthroplasty. Only 23.5 % of first-time revision arthroplasties were performed after more than one year. It can be assumed that the longer a registry exists, the lower the share of early revision arthroplasties. At the same time, the probability of second revision arthroplasty as presented in the annual report should also decrease from year to year, partly because early revision is more often indicated due to infections than late revision (total hip arthroplasties are replaced in 38 % of cases within the first six months, thereafter in 29 % of cases; for knees, the probability of revision arthroplasty is 47 % within the first six months, later 24 %).

In brief

Probability of second revision arthroplasty within two years of the first-time revision is ...

- ... 24.8 % to 37.9 % after periprosthetic infection
- 11.3 % to 17.8 % in non-infection related cases

15 Revision arthroplasty due to infection is considered to be a true revision procedure if "infection" has been specified in the registry documentation as the reason for the revision or the ICD-10 code T84.5 ("infection and inflammatory reaction due to internal joint prosthesis") has been transmitted in the pertinent routine data. It is irrelevant whether the diagnosis was entered as primary or secondary diagnosis.



Numbers at risk

3,879	3,043	2,467	1,964	1,535	1,118	766
743	545	435	341	263	202	141
568	314	237	172	120	86	50
591	395	306	242	184	129	80
3,226	2,550	2,004	1,530	1,098	782	506
236	187	142	110	86	66	43
1,100	878	680	498	359	229	146

Figure 41: Probability of second revision following primary revision for reasons other than infection by type of primary arthroplasty ($p < 0.0001$)

6 Summary

6 Summary

The declared intent of the EPRD was and is to create a robust framework for the assessment of hip and knee arthroplasties in the German healthcare system. By the end of 2019, the commitment of the participating institutions and patients has allowed the EPRD to compile documentation on more than 1.3 million hip and knee arthroplasties. In 2019 alone, 723 hospitals submitted data sets of more than 315,000 arthroplasties to the EPRD. Of these, more than 175,000 were for hip replacements and more than 140,000 for knee replacements. Thus, in 2019 the EPRD covered 70 % of such arthroplasties performed in Germany. This extensive coverage is remarkable in that hospital participation in the registry is still voluntary. However, it is hoped that all arthroplasties in Germany will be documented in full in the near future. This goal will be met with the establishment of the German Implant Registry (IRD), and mandatory participation of all hospitals, patients, manufacturers, and health insurance providers involved in arthroplasty. The know-how gained by the EPRD will be transferred to the new IRD and constitutes one of its foundations.

The 2019 operating year

For the period from 1 January to 31 December 2019, data sets for 315,088 procedures were submitted. 60 % of patients were women. The median age of knee arthroplasty patients was three years younger and these patients had a BMI three points higher than hip arthroplasty patients.

Certain trends can be observed in hip arthroplasty over the years: In total hip arthroplasty, the percentage of fully uncemented arthroplasties has risen by 3.6 points over the past five years (currently 78.4 %), and in hemiarthroplasty by as much as roughly five points (currently 21.1 %). At 10.4 percent the use of short stems also continues to increase in the EPRD. In 2015 their share was still only 6.6 %. In terms of head diameter, the use of 36-mm heads has increased steadily over the last five years from 31.4 % to the present 39.3 %. With 88.8 %, ceramic heads reached a new record in 2019. Inserts made of highly cross-linked polyethylene have seen their share increase considerably in recent years and in 2019 have accounted for 74 % (versus about 52 % five years earlier). Ceramic inserts, on the other hand, are increasingly becoming less common (8.6 %). For 2019, data sets on a total of 17,903 hip arthroplasty reoperations were submitted to the EPRD. The most common reasons for reoperations are loosening (27.0 %), infection (15.5 %), periprosthetic fracture (12.1 %), and dislocation (11.9 %).

In knee arthroplasties, 124,677 primary procedures were documented in the EPRD for 2019. The percentage of unicondylar knee arthroplasties has been increasing steadily in recent years and now stands at 13.5 %. In 2015 their share was still only 9.1 %. The use of mobile bearings has been decreasing consistently for both uni- and bicompartmental knee arthroplasties. With a share of 14.2 % for total arthroplasties and 60.2 % for unicondylar types, mobile bearings have lost more than five and even more than ten percentage points respectively in recent years. Knee arthroplasties rely more and more on highly cross-linked polyethylene. The use of these types of inserts in total knee arthroplasties, since 2015, has increased from 10.9 % to 17.8 %, and from 2.1 % to 9.4 % in unicondylar arthroplasties. The trend towards fully cemented total knee arthroplasties continues and now accounts for 94.5 %. The use of posterior-stabilised (19 %) and pivot systems (2.1 %) continues to grow slightly. Primary patellar resurfacing was performed in 11.1 % of patients, which is a slight increase compared to previous years.

Data sets for 14,462 reoperations of the knee were submitted to the EPRD in 2019. The most common reasons documented were loosening (23.9 %), infection (14.5 %) and instability (8.5 %).

Hip and knee arthroplasty survival

In previous annual reports, it had already been pointed out in detail that a large number of factors are included in the analyses of arthroplasty survival and type. The EPRD cannot and does not intend to give instructions on the types of arthroplasty or prosthetic systems. However, it becomes increasingly evident that, in addition to the type of arthroplasty and types of implants used, patient factors and hospital-specific parameters play an important role in the probability of revision. For example, in most types of arthroplasty men have a higher risk of revision than women according to the EPRD data. Patient age also plays a significant role in the probability of revision. With uncemented hip arthroplasty, the revision rate is higher for older patients, while in all knee arthroplasties it is higher for younger patients. The same applies to body weight: Although the BMI has only been included in the EPRD since 2017, it is already quite apparent that the risk of having to undergo second revision increases with the BMI, particularly in hip arthroplasties. A larger number of concomitant diseases of the patient also has a negative impact on arthroplasty survival. For all types of arthroplasties the volume performed by a hospital also affects the risk of revision procedures. However, detailed analysis of the EPRD data shows that the interhospital variation is large and that high case volume does not always reduce the risk of subsequent revision arthroplasty.

In older patients, the cemented femoral component continues to display a lower risk of revision than the standard uncemented stem. The increasingly used short stems also show low revision rates in the fifth year of follow-up, with patients with short stems being significantly younger than those with standard stems. In the early phase, male patients in particular benefit from large diameter heads (36 mm instead of 32 mm) which is most likely due to a lower dislocation rate. With regard to the choice of material for the head and insert components, the fewest revisions over time are observed in ceramic/ceramic bearings, although in a significantly younger group of patients.

After four years, unicondylar arthroplasties have a probability of revision of 7.0 %, which is almost twice as much as that in total knee arthroplasties (3.6 %). Hospitals with high volumes of such cases do much better in this kind of surgery. After three years the probability of revision in patello-femoral arthroplasty is already above 10 % and thus significantly higher than that in total and unicondylar knee arthroplasties. Although fully cemented total knee arthroplasties are standard, there is no significant difference in the probability of revision between uncemented and cemented femoral components. When considering the various unconstrained knee systems, only the group of cruciate retaining systems with their slightly lower probability of revision stands out from the other systems. Mobile bearings are becoming less and less common in total knee arthroplasty. Unlike mobile bearing systems, those systems with fixed bearings also exhibit a lower probability of revision in the EPRD.

Probability of other reoperations

The probability of subsequent soft tissue surgery (incl. lavage), i.e. without complementing, explanting or replacing implant components, within three years after primary hip arthroplasty is 0.5 % to 1.1 % depending on the type of arthroplasty, and 0.2 % to 1.9 % in knee arthroplasties. Overall, the probability of a secondary patellar resurfacing three years after primary total knee arthroplasty is 0.9 %. Especially at risk are younger female patients and patients with diagnosed depression. Unlike the probabilities for revision arthroplasty or reoperation, the probability that secondary patellar resurfacing becomes necessary does not depend on the hospital volume or the patient BMI, but rather on the knee system implanted.

Re-revision probability of hip and knee arthroplasty

For the second time, the EPRD analyses in its annual report the probabilities of second revision surgery after primary arthroplasty. For uni- and standard total knee arthroplasties two years after first-time revision arthroplasty, the cumulative probabilities of second revision are 14.1 % and 15.8 % respectively. For hip arthroplasties, this probability at the same point in time is at least 19.1 %. Nonelective hip arthroplasties for femoral neck fractures even exceed a probability of revision of 25 %. The probability of second revision arthroplasty is very high, especially after first-time revision due to infection, and after two years ranges from 24.8 % to 37.9 % depending on the type of arthroplasty. For non-infection first-time revision arthroplasties, the figures are significantly less, ranging from 11.3 % to 17.8 %.

7 Appendix

7 Glossary

The following summary briefly explains the terms and designations used in the tables and text.

Term	Description
Acetabular cup	See: *Acetabular component*.
Acetabular component	Part of the hip arthroplasty that replaces the acetabulum. The acetabular component can either consist of one part (monobloc) or of several parts (modular acetabular component). Typically, a modular acetabular component consists of a metal cup and an acetabular insert.
Antioxidant	Describes coupled knee systems with lateral joint stability and with a simple (single degree of mobility = a "rigid hinge") or a rotating hinge joint between the femoral component and the tibial tray.
Bicondylar knee arthroplasty	Replacement of the articular surfaces of both femoral condyles and the tibial plateau of the knee joint, with or without simultaneous replacement of the posterior patella surface. Also refer to *Unicondylar knee arthroplasty* and *Total knee arthroplasty*.
Body Mass Index (acronym: BMI)	Ratio between the height and weight of a person, defined as their weight (in kilograms) divided by their squared height (in metres).
Ceramicised metal	Implant components that consist of a zirconium alloy substrate and a ceramic surface modificatio – xidised zirconium alloy.
Coated metal	Implant components that have been coated with ceramics (e.g. titanium nitride).
Complementary surgery	Patella resurfacing following primary bicondylar knee arthroplasty on the same joint affected by "normal" progression of the disease, is a complementary operation, rather than a revision operation.
Confidence interval	Interval that contains the true value within a specified probability range (confidence level).
Constraint	Knee replacements are characterised by their level of constraint (stabilisation). In this report, we define standard knee systems as cruciate-retaining, cruciate-retaining/sacrificing, pure cruciate sacrificing and also posterior stabilised systems without varus-valgus stabilisation. Varus-valgus stabilised and (rigid/rotational) hinge systems are considered as "constrained".
Cruciate retaining	Design preserving the posterior cruciate ligament without constraining knee motion/kinematic.
Cruciate retaining/sacrificing	The design is suitable for both a cruciate ligament-retaining or a replacement procedure.
Cruciate sacrificing	Design replacing the posterior cruciate ligament with kinematic, which partially permits a limited relative motion in all three planes

Term	Description
Cup	See: *Acetabular component*.
Dual mobility	In case of a dual mobility arthroplasty the acetabular insert is designed (convex surface) to articulate with a dual mobility acetabular component. It is inserted into the concave surface of this bone facing shell. The femoral head is usually inserted into the dual mobility insert which is in turn inserted into the bone facing shell.
Femoral component (hip)	Arthroplasty component inserted into the proximal femur. It is either already inseparably connected to the femoral head (monobloc) or a modular head can be attached to obtain a complete femoral component (modular head stem), it can also include a modular structure with a modular neck or proximal section (modular stem).
Femoral component (knee)	Arthroplasty component inserted onto the distal femur. It can form either one single femoral condyle or both femoral condyles, and the femoral trochlear.
Femoral neck prosthesis	A hip stem component that is primarily fixed in the femoral neck. This also includes large head mid neck resection "resurfacing" prosthesis.
Fixed bearing	Monobloc design of the tibial tray or modular connection between the tibial tray and the tibial insert without permitting any relative movement between these components. As opposed to a *mobile bearing*.
German ICPM code	German hospitals use the German ICPM (International Classification of Procedures in Medicine) codes in their documentation with the health insurance providers to document which procedures have been carried out during the patient's stay. Each procedure has been assigned a numerical code. For example, code 5-820.01 refers to cemented total hip arthroplasty.
Head (component)	See: *Modular head*.
Hemiarthroplasty	In contrast to a total arthroplasty, a hemiarthroplasty (hemi = half) does not replace the entire joint but only part of it. A typical example is a dual-head arthroplasty, in which only the femoral component of the hip joint is replaced with the head, but not the acetabular component.
Hinge	Describes coupled knee systems with lateral joint stability and with a simple (single degree of mobility = a "rigid hinge") or a rotating hinge joint between the femoral component and the tibial tray.
Hip stem/Femoral stem	See: *Femoral component (hip)*.
hXLPE	Highly cross-linked polyethylene (UHMWPE). Also refer to *Polyethylene (PE)*.
Hybrid	Arthroplasty in which one component is cemented while the other is not cemented. In hip replacement, "hybrid" refers to the combination of a cemented stem and an uncemented acetabular component, while "reverse hybrid" refers to the combination of an uncemented stem and a cemented acetabular component. In the case of knee arthroplasty, "hybrid" refers to the combination of cemented tibial support and uncemented femoral component and "reverse hybrid" the reverse combination.
ICD-10 code	The International Statistical Classification of Diseases and Related Health Problems (Version 10) is an internationally accepted system for documenting principal diagnoses and concomitant diseases. German hospitals use the German ICD-10 codes to document to the health insurance providers the diagnoses during the patient's stay in hospital. For example, S72.0 codes for "fracture of neck of femur".

Term	Description
Insert	Tibial inserts are part of a knee replacement and are attached to the superior surface of the tibial tray and provide the articulating surface with the femoral component. Acetabular Inserts are part of a hip replacement and are inserted inside of a modular acetabular component.
Kaplan-Meier estimator	Statistical methodology to determine the probability that a given event of interest will not occur within a specified time interval. Events that make it impossible to observe the occurrence of the given events can be taken into account in the calculation and can be censored.
Mobile bearing	Mobile connection between the tibial tray and the tibial insert. As opposed to a *fixed bearing*.
Modular cup	An acetabular component designed to accommodate a separate bearing surface within its internal diameter. Also refer to *Monobloc cup* and *Acetabular component*.
Modular head	Femoral head with an upper convex surface which articulates with the acetabular articular surface. At its distal aspect, there is a female taper which is designed to engage with the male taper of a modular femoral stem or modular femoral neck. Heads are available in varying sizes to match the internal diameter of the acetabular articulating surface.
Modular stem	A femoral stem component that is composed of several parts and which also requires a modular head. Also refer to *Monobloc stem* and *Femoral component (hip)*.
Monobloc	A component consisting of one part, e.g. for hip replacement a stem component with an integrated head or a polyethylene cup that does not require a separate insert.
Monobloc cup	An acetabular component, which usually consists of one part or parts that have been "inseparably" pre-assembled/connected. In contrast, modular cups consist of at least two parts, which are usually only connected to one another during the implantation. Also refer to *Modular cup* and *Femoral component (hip)*.
Monobloc stem	A femoral stem component that consists of one part and which does not require a separate head component. In contrast, other stems consist of at least two parts. Also refer to *Modular stem* and *Femoral component (hip)*.
mXLPE	Moderately cross-linked polyethylene (UHMWPE)
Partial knee arthroplasty	In a partial knee prosthesis only part of the joint surface is replaced. A typical example is a unicondylar prosthesis in which only the medial/lateral part of the knee joint is replaced, but not the entire knee joint. Also refer to *Total knee arthroplasty*.
Partially cemented	Partially cemented indicates that one component is not cemented and the other is. Also refer to *Hybrid*.
Patellar component	Component of the retropatellar replacement. While this often only consists of a polyethylene cap, which is cemented into the posterior surface of the patella, there are also designs in which a polyethylene cap is fixed to a metal base plate. Also refer to *Patellar resurfacing*.
Patellar resurfacing	Replacing the posterior surface of the kneecap with a prosthesis.
Patellofemoral arthroplasty	Artificial replacement of the patella surface and the trochlea (groove in the thighbone).

Term	Description
Pivot	Describes knee systems designed to support natural rotation/translation kinematics.
Polyethylene (PE)	Polyethylene (abbreviation PE) is a thermoplastic made by chain polymerisation of ethene [CH2=CH2], from which prosthetic components (e.g. inserts) can be produced. In arthroplasty, ultra high molecular weight polyethylene (UHMWPE) is usually used. This can subsequently be modified by irradiating and coupling to antioxidants. Also refer to *hXLPE or mXLPE*.
Posterior stabilised	Design allowing the posterior cruciate ligament to be replaced with a mechanical element such as an articulated polyethylene extension which controls and limits anterior and/or posterior movement.
Primary implantation	See: *Primary surgery*.
Primary surgery/arthroplasty	The primary implantation of one or more arthroplasty components in a particular joint.
Prosthetic joint infection	These infections are generally a bacterial colonisation of an implanted endoprosthesis. This is a particularly dreaded complication, which is difficult and time-consuming to treat surgically. Typically, the infection is caused by pathogens that are part of the normal human skin and mucosal flora.
p-value	Lowest significance level at which a statistical test would still reject the null hypothesis. Values below 0.05 are usually referred to as being statistically significant.
Reconstruction shell	A device to provide structural stability to the pelvis prior to implanting the definitive acetabular articular component. Such a device may be required in bony defect situations. This may be the case in revision surgery, but also in primary surgery where pelvic discontinuity arises secondary to bony loss, e.g. tumour or post-traumatic reconstructions.
Reoperation	Umbrella term including revision arthroplasty, where components are exchanged and complementary surgery where further arthroplasty components are added to compensate for natural disease progression.
Reverse-hybrid	See: *Hybrid*.
Revision cup	Monobloc or modular acetabulum component with added design characteristics for bridging acetabular bone defects or for added bony fixation (e.g. additional screw hole).
Revision stem	A hip stem component that is specifically designed for revision hip arthroplasties.
Revision surgery	Surgery referring to the removal and, if necessary, the replacement of previously implanted hip or knee arthroplasty components. Revision surgery may or may not be followed by re-implantation of new arthroplasty components during the same operation (one-stage revision) or at a later date (multi-stage revision) and is interpreted as failure of the index arthroplasty. In contrast, the reoperation of a knee replacement with patellofemoral-resurfacing as a consequence of progressive patellofemoral arthrosis is not interpreted as failure of the initial arthroplasty. Also refer to *Reoperation* and *Complementary surgery*.

Term	Description
Routine data	Data stored by public health insurance companies, in particular for administrative and billing purposes, in accordance with §301 SGB V (German Social Code, Book V). This data, which includes ICD codes for main and secondary diagnoses as well as OPS codes for treatments, is delivered to the EPRD together with the vital status of the participating patients twice a year. The data is used to supplement the case documentation submitted directly to the registry from participating hospitals.
Short stem	Hip stem components that are specified by the manufacturer as anchoring in the metaphyseal area. These include: Femoral neck-preserving systems, in which only the femoral head is removed and the femoral neck is left intact, femoral neck-preserving systems, in which parts of the femoral neck are also removed, and femoral neck-resecting systems, in which the femoral neck is also completely removed.
Surface replacement (hip)	Surface replacement of the femoral head (resurfacing head) and/or the acetabular cup (surface replacement cup). The "resurfacing head" is used to describe a femoral component that is designed only to cover the patient's own femoral head. There may be an anchoring device which is integral to the component and which extends into the femoral neck. It is used with a corresponding "surface replacement cup" which is made of one piece of material (monobloc).
Tibial tray	The component that replaces/resurfaces the upper tibia can be modular (more than one piece and accepts an insert, monobloc (one piece), preassembled (the insert and tibial tray are assembled by the manufacturer but can be separated) or prefixed (where the tibial tray and insert are assembled by the manufacturer and cannot be separated).
Total hip arthroplasty (acronym: THA)	Orthopaedic implant intended to replace a hip joint within the body. In contrast to a hemiarthroplasty, a total hip arthroplasty replaces the entire joint.
Total knee arthroplasty (acronym: TKA)	A knee arthroplasty replacing all three compartments of the knee joint (medial and lateral compartment of the tibiofemoral joint, and the patellofemoral compartment). Current practice in knee arthroplasty in Germany rarely includes patellar resurfacing. Strictly speaking, these cases should therefore not be classified as total knee arthroplasties, but rather as bicompartmental arthroplasties. However, the term "total knee arthroplasty" for bicompartmental knee arthroplasties is used widely in Germany.
Tribological bearing	Describes the materials of the two surfaces that move against each other in a joint replacement. Examples are: metal/polyethylene, metal/metal, ceramic/polyethylene, ceramic/ceramic. In this report, the first mentioned material always refers to the femoral component of the articulation.
Tumour stem	Primarily modular stem system, which can be implanted as reconstruction option in extensive bony defects after femoral tumour resection or repeated revision surgery.
Uncoated metal	Implant components that have not been ceramic coated.
Unicondylar knee arthroplasty	Replacement of only one femoral condyle and the corresponding portion of the tibial plateau of the knee joint, with or without simultaneous patella resurfacing. Also refer to *Bicondylar knee arthroplasty*.

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9 List of figures

10 List of tables

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