REPORT of R.I.P.O.

Regional Register of Orthopedic Prosthetic Implantology

OVERALL DATA

HIP, KNEE AND SHOULDER ARTHROPLASTY

IN THE EMILIA-ROMAGNA REGION (ITALY)

1st January 2000 – 31st December 2010

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA

Foreword

This is the eleventh report, elaborated by the Register of Orthopedic Prosthetic Implantology (RIPO). It presents the most significant results of the descriptive statistical analyses performed on hip, knee and shoulder arthroplasty surgeries carried out in the Emilia-Romagna region, in Italy, between 1st January 2000 and 31st December 2010.
Starting from today this document accompanies the brief evaluations that authorized persons may make alone via the Register's website (https://ripo.cineca.it). The aim of this report is the presentation of the overall regional data of total hip arthroplasty, hemiarthroplasty, resurfacing and revision operations, as well as uni- and bicompartmental total knee arthroplasty and revision interventions. Starting from July 2008 shoulder prostheses were added.

Altogether data of 98.000 hip, 51.000 knee and 1.100 shoulder prostheses have been reported from 72 Orthopedic Units in 61 Hospitals, either public or private.
Like in the past, data from the orthopedic wards were provided on paper forms. Registry staff transferred the data electronically to the databank run by CINECA (Interuniversity Consortium of North-East Italy), which was responsible for computer management and security aspects of the data. Statistical analysis was performed by Registry statistics staff.
The RIPO representatives of each surgical unit have cooperated actively in fulfilling the aims by providing clarification and integration of the data transferred, when necessary.

Objective of the Register

The Register has some fundamental objectives:

- to determine the demographic characteristics and the diagnostic categories of the patients who have undergone replacement surgery;
- to gather detailed information on the use of the different prostheses used in primary and revision surgery;
- to assess the effectiveness of the different types of prostheses;
- to compare the regional situation with other national and international situations with this aim; the present edition was designed to facilitate a comparison with the data presented by the Swedish register, which was the model that inspired the RIPO analysis;
- to supply a confidential report to the Unit directors so that they can assess their performance in comparison with that reported in the register;
- to supply orthopedic surgeons with a very useful tool to give the patient timely information;
- to inform the Regional Orthopedic Commission about those implants that show an abnormal failure rate;
- to answer to questions coming from the Regional Orthopedic Commission or from surgeons.

Methodological notes

As for last year ***survival analyses are performed only on patients living in the Emilia-Romagna region.*** To avoid the bias resulting from the 'loss' of non-resident patients.
Therefore, following the suggestion of the Regional Orthopedic Commission, all survival analyses presented in this report are based on primary operations in patients resident in Emilia-Romagna and on revisions of same prostheses, wherever performed.

The number of implants for which survival is calculated is obviously lower than the amount present in the database,, but the analysis is more accurate, ***as no lost to follow-up affects the cohort.***

The validity of the data reported in the present report is based on the **complete** adhesion to the register and degree of **reliability** of the information given.
The assessment of the **completeness** is made by comparison with the data from the Hospital Discharge database; in the last year the Register has 'captured' 98% of hip and knee operations.

As far as concerns the **reliability** of the data given, RIPO handles two types of data: incontrovertible data, either that RIPO checks by comparison with other data banks (labels of the components implanted, demographic data of the patients, dates of admission, any date of death), and not verifiable data such as disease that led to replacement or revision or the complications that arose during hospitalization. Reliability is checked by sampling the data, by asking for confirmation of some information. The percentage of responses obtained was unfortunately low and this does not enable definitive conclusions to be drawn.

Explanatory guide for the survival analysis

The survival of the prosthesis is illustrated by tables and graphs.
The ***survival curves*** were calculated and plotted according to the actuarial method of **Kaplan-Meier**; on the x-axis is the time expressed in years, on the y-axis the percentage of survival of the prosthesis. The curve starts, by definition at 100% survival the moment where the period of follow-up begins. The prosthesis is considered to be 'surviving' up to when it was necessary to intervene surgically to replace even a single component. The revision is, thus, the end-point. Each curve is flanked by a pair of curves symmetrical to it that are the 95% Confidence Interval, which delimits the interval of values where at 95% the possibility falls that a patient with prosthesis in place is found. The range of the interval is closely dependent on the number of operations considered in the analysis. If the number of operations is low, the uncertainty of the analysis is high, which is shown by a wide confidence interval.
Each graph is preceded by a table showing the number of prostheses considered, the number of failed prostheses and the failure rate (number of prostheses failed/number of prostheses implanted x 100).
At the bottom of the graph are the data realized for building the graph.

The survival curves are preceded by the **multivariate analysis** performed according to the Cox method.
This analysis enables us to check what, if any, independent variables among them may influence the event, in our case the removal of at least one prosthetic component.
The concept of case-mix comes from this. When a comparison is performed, for example the comparison of different prosthetic models, it is opportune to point out the complexity of the series treated with the prosthesis types under comparison. In the report both complete hip and knee prostheses and single components (acetabulum and stems) were compared, if there was a sufficient number of implants (at least 300 cases). The comparison tables show the number of implants and survival rate at 5 and 9 years. Because it is well-known that some of the patient's characteristics such as age at the time of surgery and the disease that led to the replacement may influence the survival of the prosthesis, each comparison table shows a case-mix rate, that enables a more correct comparison of the effectiveness of the prosthesis to be performed, thus assessing in short the complexity of the series (as obtained from the relative risk calculations performed on all the patients of the Emilia-Romagna region).

Summary of the main results presented

HIP

During 2010 primary THA was performed in nearly 6500 patients to treat pathologies with same percental distribution as last years. Mean age at surgeryis stable, with a slight increase for women (70.2yrs) and a slight decrease for men (66.9yrs). 91 different types of cup and 109 of stem were used. 40% of the stems have a modular neck.

Cemented prostheses were 62% in year 2000 and 94% in year 2010, whilst hybrid fixation was 22% and it is now 5%. Cemented prostheses are now only 1%, and they were 15% in year 2000.

Most common articular coupling is ceramic on ceramic, that in 2010 represents 570% (it was 18% in 2000); second most common is ceramic on poly (21%). Metal on poly, that was 45% in 2000 is now reduced to 11%. Nearly half of poly is cross-linked in met-poly and nearly three forth in cer-poly.

Number of resurfacing is lower and lower, in 010 they represent 1.8% of all primary.

The survival of the hip prostheses is confirmed at very high levels. Nearly 94% of the 45.767 prostheses implanted in Emilia-Romagna region on resident patients are still in place 11 years after the operation.

1404 revision were performed on 45.767 primary operations done on patients living in Emilia-Romagna region. Part (75%) are major revisions, where at least one component interfacing with bone, has been revised. The remaining 25% are minor revisions (liner, head, modular neck)

High incidence of prosthesis breakage was observed among causes of failure; this phenomenon is only partially related to the extensive use of ceramic components.

Survival of resurfacing, at 7 years, is slightly lower than THA (90.8%, statistically significant). This datum is affected by the recall of ASR.

As for previous years, multivariate analysis demonstrated that survival of prosthesis is significantly influenced by hip pathology. Patients with higher risk of revisions are those affected by femoral neck fracture or rare diseases. Beside this, males and young patients are at higher risk of revision.

At ten year follow up, implants seem not to be affected by fixation and articular coupling, but these two variables cannot be introduced in the analysis are they are not independent and they are linked to other variables, such as age at surgery.

In the comparison among different prostheses models the complexity of cases treated has been underlined, so that a sort of 'case-mix' has been proposed.

We found no prosthesis (cup and stem) with sufficient number of cases, having a survival significantly lower than the mean of the region. On the contrary very few single stems or cups have survival slightly lower than the regional mean.

Hemiarthroplasty has an optimal survival (97% at 10 years) even if it is burdened by a high rate of patients deaths.

Total revisions have a survival of 88% at 10 years follow up

KNEE

High percentage of these prostheses are implanted in private structures (63% in 2010, vs 43% in 2000). In 2010 12% of implanted prostheses are unicompartmental, 72% bicompartmental and 16% tricompartmental (with patella resurfacing).

Implanted prostheses are mainly cemented, with very small variations during the years, equally distributed between non-stabilized and posteriorly stabilized ones with a slight increase of the last one (60.7%). Mobile inserts represent 45.5% in 2010.

Prosthetic models are fewer in number compared to hip, and more 'stable' during the years of observation.

The survival of bi-and tri-compartmental prosthesis (total prosthesis with and without patella) is extremely high, exceeding 94.9% at 9 years. Survival of the unicompartmental one is significantly lower (87.4% at 9 years).

In these analyses patella resufacing after primary TKA is not considered as a failure. As requested by the Board, bicompartmental TKA has been calculated also considering patella resurfacing a failure.
The incidence of revisions due to infection in the prosthesis remains high, both in uni and bicompartmental implants. At present it is irrelevant the use of antibiotic-loaded cement than conventional one.
Cox multivariate analysis shows that the survival of knee prostheses, as well as being influenced by type of prostheses (uni vs bi/tricompartmental), is negatively influenced by age of the patient (younger is the patient, lower is the expectancy of prosthesis survival) and by type of insert (mobile liner is worse than fixed liner). Type of insert motion is not decisive.
Some models of have prosthetic survival slightly below average.
The prosthetic femoral-kneecaps and partial resurfacing have been implanted in a limited number of cases, less than 100.

SHOULDER
Data refers to a very short follow-up (30 months). Interesting data are emerging particalarly for types of prosthesis and epidemiology of surgery. Rapid increase of number of prostheses implanted in private hospitals have to be pointed out.

Units supporting RIPO, Head of Orthopedic Surgery Department or Health Manager in the case of Private Nursing homes and RIPO representatives inside the unit are listed in the Table below.
The data are updated to December 2011.

Province of Bologna

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Ospedale privato "Villa Erbosa"	Dir. San. Prof. Piero Fiorentini	Dr. Enzo Zanini Dr. Ettore La Bruna
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Dir.San.= Healthcare Medical Director

The RIPO has been recognized by the Region of Emilia-Romagna formative event in the field, the referents thus acquire their CME credits.

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Bologna, 23rd december 2011

PART ONE: HIP PROSTHESES

January 2000 – December 2010

1. RIPO data collection

1.1 Data collection for RIPO per hospital in 2010

Percentage of R.I.P.O. data collection calculated versus hospital discharge data (S.D.O. – Schede di Dimissione Ospedaliera), is **98.3**% in the year 2010. Data are referred to primary total hip replacements (8151;74;75;76;85;86), hemiarthroplasties (8152), revision (8153) and prosthesis removal (8005).

1.2 Ratio public/private treatment

Percentage of primary total arthroplasties, hemiarthroplasties and revision surgeries of the hip performed in public hospitals.

% of operations performed in public hospitals (AUSL, AOSP, IRCCS)			
Year of surgery	**Total hip arthroplasties**	**Hemiarthroplasties**	**Revisions**
2000	77.0	97.0	78.0
2001	81.0	97.3	77.0
2002	78.0	97.5	79.0
2003	75.1	98.4	76.1
2004	75.3	97.6	76.1
2005	72.9	98.3	77.7
2006	74.8	99.0	74.5
2007	70.8	98.6	73.6
2008	71.6	98.9	76.0
2009	70.9	99.3	76.3
2010	71.8	99.3	76.8

From SDO database

2. Types of surgery

Number of hip surgeries carried out on patients with admission date between 1st January 2000 and 31st December 2010, according to **type of surgery**.

Type of surgery	Number of surgeries	Percentage
Primary THA	61.086	62.5
Hemiarthroplasty	24.262	24.8
Total and partial revision*	9.934	10.2
Resurfacing	1.277	1.3
Prosthesis removal	660	0.7
Hemiarthroplasty with buffer°	116	0.1
Other	463	0.5
Total	**97.798**	**100.0**

° acetabular buffer

***** 2.971 total revision, 4.083 cup revisions, 1.767 stem revisions, 1.113 head/liner/modular neck revisions.

Number of hip operations carried out with ***resurfacing prostheses***.

Year of operation	N.
2000	-
2001	7
2002	34
2003	77
2004	113
2005	178
2006	217
2007	200
2008	163
2009	167
2010	121

Percentage increase of the number of primary and revision operations compared to the previous year.

Year of operation	Primary THA		Revision (total + partial)	
	N.	Increase %	N.	Increase %
2000	4.295	-	721	-
2001	4.578	+6.6	855	+18.6
2002	4.635	+1.2	868	+1.5
2003	5.039	+8.7	860	-0.9
2004	5.355	+6.3	856	-0.5
2005	5.563	+3.9	826	-3.5
2006	5.829	+4.8	942	+14.0
2007	6.247	+7.2	1.019	+8.2
2008	6.324	+1.2	984	-3.4
2009	6.683	+5.7	984	-
2010	6.538	-2.2	1.019	+3.6

3. Descriptive statistics of patients
3.1 Age

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2010, according to **type of operation** and **age group** of patients at the time of surgery.

Type of operation	<40		40-49		50-59		60-69		70-79		≥80		Total
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	
Primary THA	1.905	3.1	3.918	6.4	8.730	14.3	17.773	29.1	22.262	36.4	6.498	10.6	**61.086**
Hemiarthroplasty	17	0.1	49	0.2	147	0.6	820	3.4	5.863	24.2	17.366	71.5	**24.262**
Revision	188	1.9	402	4.0	1.026	10.3	2.552	25.7	4.036	40.6	1.730	17.4	**9.934**
Resurfacing	196	15.3	323	25.3	434	34.0	266	20.8	57	4.5	1	0.1	**1.277**
Prosthesis removal	22	3.3	29	4.4	64	9.7	171	25.9	264	40.0	110	16.7	**660**
Hemiarthroplasty with buffer	0	-	2	1.7	3	2.6	14	12.1	35	30.2	62	53.4	**116**
Other	21	4.5	24	5.2	55	11.9	118	25.5	157	33.9	88	19.0	**463**
Total	**2.349**	**2.4**	**4.747**	**4.9**	**10.459**	**10.7**	**21.714**	**22.2**	**32.674**	**33.4**	**25.855**	**26.4**	**97.798**

Mean age at surgery

Type of operation	Mean age	Range
Primary THA	67.1	14-101
Hemiarthroplasty	83.4	21-109
Resurfacing	52.1	16-82
Revision	70.2	17-99

Mean age of patients, per type of operation, comparison 2000-2010

	Year 2000		Year 2010	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Primary THA	66.5	16-100	66.7	13-97
Hemiarthroplasty	82.9	32-104	83.7	26-101
Revision	69.1	23-98	70.7	19-96

	Year 2003		Year 2010	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Resurfacing	49.8	18-72	53.4	17-78

Mean age at surgery of patients affected by coxarthrosis

	THA			
	Year 2000		Year 2010	
Gender	**Mean age**	**Range**	**Mean age**	**Range**
Males	67.4	33-92	66.9	29-89
Females	68.9	33-93	70.2	27-93

3.2 Gender

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2010, according to **type of operation** and **sex** of patient.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Primary THA	23.786	38.9	37.300	61.1	**61.086**
Hemiarthroplasty	5.983	24.7	18.279	75.3	**24.262**
Revision	3.175	32.0	6.759	68.0	**9.934**
Resurfacing	866	67.8	411	32.2	**1.277**
Removal	249	37.7	411	62.3	**660**
Hemiarthroplasty with buffer	25	21.6	91	78.4	**116**
Other	181	39.1	282	60.9	**463**
Total	**34.265**	**35.0**	**63.533**	**65.0**	**97.798**

3.3 Side of surgery

Coxarthrosis more often affects right hip (58.7%). The percentage has been calculated on patients wearing only one implant due to primary coxarthrosis.

Side	Males	Females
Right	53.1	62.8
Left	46.9	37.2

(Chi – squared $p<0.001$).

3.4 Diseases treated with total hip arthroplasty

Number of primary total hip arthroplasty operations carried out on patients with admission date between 1st January 2000 and 31st December 2010, according to **diagnosis**

Diagnosis	Number	Percentage
Primary arthritis *	40.824	67.1
Sequelae of LCA and DCA	6.759	11.1
Femoral neck fracture	5.398	8.9
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	3.545	5.8
Post traumatic arthritis	1.492	2.5
Post traumatic necrosis	849	1.4
Rheumatic arthritis	736	1.2
Femoral neck fracture sequelae	463	0.8
Epiphysiolysis sequelae	171	0.3
Perthes disease sequelae	144	0.2
Septic coxitis sequelae	110	0.2
Tumor	98	0.2
Paget disease	70	0.1
TBC coxitis sequelae	45	0.1
Other	130	0.2
Total**	**60.834**	**100.0**

** 252 missing data (0.4%)

Prostheses for bone tumor resection are not registered by R.I.P.O.

Percentage distribution of diseases leading to THA according to **year of operation**

Diagnosis in primary arthroplasty	Percentage			
	2000-2002	2003-2005	2006-2008	2009-2010
Primary arthrosis	65.1	67.3	67.4	68.5
Sequelae of LCA and DCA	13.4	11.7	10.6	8.8
Femoral neck fracture	9.2	8.4	8.9	9.1
Femoral head necrosis idiopathic	5.3	5.5	6.1	6.4
Post traumatic arthritis	2.5	2.4	2.5	2.5
Post traumatic necrosis	1.5	1.4	1.4	1.3
Rheumatic arthritis	1.5	1.3	1.0	1.0
Other	1.6	2.0	2.1	2.5

Number of **resurfacing** operations carried out on patients with admission date between 1st January 2000 and 31st December 2010, according to **diagnosis**.

Diagnosis in resurfacing	Number	Percentage
Primary arthrosis	911	71.6
Sequelae of LCA and DCA	143	11.2
Post traumatic arthritis	71	5.6
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	79	6.2
Rheumatic arthritis	25	2.0
Post traumatic necrosis	12	0.9
Femoral neck fracture sequelae	6	0.5
Epiphysiolysis sequelae	9	0.7
Perthes disease sequelae	6	0.5
Septic coxitis sequelae	3	0.2
Anchylosing spondylitis	2	0.2
Paget's disease sequelae	3	0.2
Poliomyelitis sequelae	1	0.1
TBC coxitis sequelae	1	0.1
Femoral neck fracture	1	0.1
Total*	**1.273**	**100.0**

*4 missing data, (0.3%)

3.5 Causes for revision

Number of revision operations carried out on patients admitted between 1st January 2000 and 31st December 2010 according to ***diagnosis***
In italic revisions of hemiarthroplasty, underscored revisions of resurfacings.
In the Table all revisions performed in the Region, without taking care of site and date of primary implant are reported. No indication of follow-up time is in these data.

Diagnosis in revision	Number	Percentage
Cup aseptic loosening	3.006	30.6
Total aseptic loosening	2.180	22.2
Stem aseptic loosening	1.114	11.4
Prosthesis dislocation	803	8.2
Bone fracture	427	4.4
Two steps prosthesis removal	385	3.9
Prosthesis breakage*	369	3.8
Poly wear	286	2.9
Hemiarthroplasty dislocation	246	2.5
Cotiloiditis	233	2.4
Hemiarthroplasty stem loosening	214	2.2
Pain without loosening	135	1.4
Septic loosening	114	1.2
Other diagnosis	100	1.0
Primary instability	63	0.6
Bone fracture in hemiarthroplasty	54	0.6
Loosening of resurfacing	37	0.4
Bone fracture in resurfacing	28	0.3
Primary instability in hemiarthroplasty	6	0.1
Pain in resufacing	5	0.1
Metallosis in resufacing	3	0.0
Total**	**9.808**	**100.0**

***** Failure of 49 cups, 48 stems, 73 heads, 93 liners, 82 modular necks and 6 proximal parts of the stem, 6 proximal stem e 2 cupole, 16 unknown components.

****** 126 missing data, (1.3%)

4. Types of prostheses

The following tables show the types of prostheses (cups, stems) commonly used in the Emilia-Romagna region, according to primary and revision surgery.

4.1 Cups used in primary surgery

Cemented cups	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
ZCA Zimmer	374	12.3	235	15.6	20	16.9
MULLER Citieffe	10	0.3	40	2.6	20	16.9
CONTEMPORARY Stryker Howmedica	455	14.9	311	20.6	17	14.4
CUPULE AVANTAGE Biomet	2	0.1	46	3.0	16	13.6
MULLER Samo	351	11.5	85	5.6	7	5.9
PE Ala-Ortho	-	-	157	10.4	6	5.1
MULLER Sulzer-Centerpulse-Zimmer	358	11.7	82	5.4	4	3.4
MULLER Lima	113	3.7	120	7.9	4	3.4
CCB Mathys	47	1.5	4	0.3	1	0.8
MULLER Smith & Nephew	262	8.6	164	10.9	-	-
MULLER Wright Cremascoli	895	29.3	58	3.8	-	-
LUNA Amplitude	-	-	88	5.8	-	-
MULLER Groupe Lepine	39	1.3	18	1.2	-	-
Other (< 50 cases)	144	4.7	103	6.8	23	19.5
Total*	**3.050**	**100.0**	**1.511**	**100.0**	**118**	**100.0**

Cementless cup	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
FIXA TI-POR Ala-Ortho	-	-	1.945	6.7	1.731	26.9
EP-FIT PLUS Smith & Nephew	24	0.1	2.575	8.8	520	8.1
FIXA Ala-Ortho	16	0.1	6.435	22.1	506	7.9
PINNACLE SECTOR II DePuy	69	0.3	622	2.1	266	4.1
R3 Smith & Nephew	-	-	49	0.2	257	4.0
EXCEED ABT Biomet	-	-	366	1.3	225	3.5
ABGII Stryker Howmedica	1.297	6.2	1.082	3.7	219	3.4
DELTA PF Lima	96	0.5	1.040	3.6	187	2.9
FITMORE Sulzer-Centerpulse-Zimmer	1.368	6.6	1.193	4.1	163	2.5
EXPANSION Mathys	51	0.2	976	3.3	161	2.5
ALLOFIT S Zimmer	-	-	16	0.1	149	2.3
CONTINUUM Zimmer	-	-	10	0.0	143	2.2
TRIDENT Stryker Howmedica	459	2.2	1.345	4.6	139	2.2
SPARKUP Samo	-	-	134	0.5	129	2.0
VERSAFITCUP CC Medacta	-	-	391	1.3	114	1.8
RECAP RESURFACING Biomet	-	-	631	2.2	112	1.7
DELTA TT Lima	-	-	147	0.5	102	1.6
BETA CUP Link	-	-	147	0.5	90	1.4
REFLECTION Smith & Nephew	859	4.1	817	2.8	86	1.3
CUPULE RELOAD AVANTAGE Biomet	-	-	118	0.4	74	1.2
POLARCUP Ortho-Id	-	-	136	0.5	67	1.0
CLS Sulzer-Centerpulse-Zimmer	2.478	11.9	799	2.7	65	1.0
HILOCK LINE Symbios	244	1.2	294	1.0	55	0.9
TRABECULAR METAL Zimmer	17	0.1	437	1.5	49	0.8
SELEXYS TH Mathys	-	-	532	1.8	46	0.7
BS Citieffe	-	-	264	0.9	44	0.7
JUMP Permedica	29	0.1	54	0.2	43	0.7

BICON PLUS Smith & Nephew	315	1.5	898	3.1	34	0.5
BHR Smith & Nephew	33	0.2	94	0.3	34	0.5
MRS RIVESTIMENTO Lima	-	-	160	0.5	20	0.3
TRIBOFIT Active Implants	-	-	96	0.3	20	0.3
DUOFIT PDT Samo	29	0.1	168	0.6	19	0.3
COOPER Permedica	37	0.2	194	0.7	18	0.3
TRILOGY Zimmer	807	3.9	273	0.9	17	0.3
M2A Biomet	72	0.3	114	0.4	17	0.3
TRILOGY AB Zimmer	115	0.6	243	0.8	16	0.2
MALLORY Biomet	74	0.4	141	0.5	16	0.2
ALLOFIT Zimmer	92	0.4	149	0.5	15	0.2
CFP Link	216	1.0	296	1.0	11	0.2
EASY HIT Medica	155	0.7	140	0.5	10	0.2
PROCOTYL-L Wright Cremascoli	-	-	141	0.5	10	0.2
DUROM HIP RESURFACING Zimmer	10	0.0	311	1.1	9	0.1
MOBILIS I Othesio	-	-	107	0.4	7	0.1
MBA Groupe Lepine	101	0.5	111	0.4	6	0.1
DUOFIT PSF Samo	1.056	5.1	310	1.1	5	0.1
PROTESI DA RIVESTIMENTO ASR Depuy	5	0.0	93	0.3	3	0.0
AnCA FIT Wright Cremascoli	6.013	28.9	689	2.4	-	-
TRABECULAR METAL MONOBLOCK Zimmer	150	0.7	267	0.9	-	-
SPH BLIND Lima	81	0.4	119	0.4	-	-
ABG Stryker Howmedica	227	1.1	-	-	-	-
ALBI + Wright Cremascoli	152	0.7	-	-	-	-
CUPULE AVANTAGE Biomet	79	0.4	220	0.8	-	-
ELLIPTICAL CUP HEDROCEL Stratec	154	0.7	-	-	-	-
ELLIPTICAL CUP Stratec	197	0.9	-	-	-	-
EXCEED PC Biomet	87	0.4	98	0.3	-	-
MARBURG Zimmer	171	0.8	3	0.0	-	-
METASUL STAR CUP Sulzer	145	0.7	-	-	-	-
OSTEOLOCK Stryker Howmedica	170	0.8	-	-	-	-
SECUR-FIT Stryker Osteonics	170	0.8	-	-	-	-
SPH CONTACT Lima	224	1.1	10	0.0	-	-
STANDARD CUP Protek Sulzer Zimmer	1.151	5.5	154	0.5	-	-
Other (< 100 cases)	1.503	7.2	1.018	3.5	399	6.2
Total	**20.798**	**100.0**	**29.172**	**100.0**	**6.428**	**100.0**

In the table cups designed for resurfacing but implanted in traditional THA are reported.

4.2 Cups used in total revision surgery

Cemented cup	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
MULLER Protek-Sulzer-Centerpulse-Zimmer	98	25.4	59	29.8	8	33.3
MULLER Samo	40	10.4	21	10.6	5	20.8
CUPULE AVANTAGE CEMENTED Biomet	1	0.3	19	9.6	3	12.5
MULLER Lima	24	6.2	13	6.6	2	8.3
ZCA Zimmer	22	5.7	10	5.1	2	8.3
CONTEMPORARY Stryker Howmedica	85	22.0	31	15.7	1	4.2
CCB Mathys	19	4.9	-	-	-	-
MULLER Smith & Nephew	8	2.1	6	3.0	-	-
MULLER Wright Cremascoli	53	13.7	5	2.5	-	-
Other (< 10 cases)	36	9.3	34	17.2	3	12.5
Total	**386**	**100.0**	**198**	**100.0**	**24**	**100.0**

Cementless cup	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
FIXA Ti-Por Ala-Ortho	-	-	34	3.3	34	16.0
TRABECULAR METAL Zimmer	2	0.2	98	9.6	24	11.3
REGENEREX RINGLOC+ Biomet	-	-	10	1.0	23	10.8
DELTA ONE TT Lima	-	-	5	0.5	21	9.9
Hermes BS Rev Citieffe	-	-	21	2.1	17	8.0
OMNIA Ala-Ortho	-	-	36	3.5	15	7.1
EP-FIT PLUS Smith & Nephew	-	-	22	2.1	6	2.8
TRILOGY Zimmer	79	7.1	49	4.8	3	1.4
BICON PLUS Smith & Nephew	5	0.4	17	1.7	3	1.4
TRIDENT Stryker Howmedica	27	2.4	117	11.4	2	0.9
FITMORE Zimmer	35	3.1	17	1.7	2	0.9
DELTA PF Lima	-	-	35	3.4	2	0.9
REFLECTION Smith & Nephew	9	0.8	20	2.0	1	0.5
FIXA Ala-Ortho	-	-	125	12.2	1	0.5
CLS Zimmer	34	3.0	7	0.7	1	0.5
ABGII Stryker Howmedica	12	1.1	8	0.8	1	0.5
TRIDENT ARC2F Stryker Howmedica	-	-	36	3.5	-	-
STANDARD CUP PROTEK Sulzer	128	11.5	4	0.4	-	-
SECUR-FIT Stryker Osteonics	25	2.2	-	-	-	-
PROCOTYL-Z-PIVOT Wright Cremascoli	4	0.4	18	1.8	-	-
PROCOTYL-E Wright Cremascoli	32	2.9	4	0.4	-	-
PINNACLE MULTIHOLE II DePuy	6	0.5	25	2.4	-	-
OSTEOLOCK Stryker Howmedica	47	4.2	-	-	-	-
MC MINN Link	63	5.6	24	2.3	-	-
LOR ALLOPRO Sulzer	42	3.8	6	0.6	-	-
DUOFIT PSF Samo	30	2.7	19	1.9	-	-
CONICAL SCREW CUP Protek	25	2.2	-	-	-	-
AnCA FIT Wright Cremascoli	280	25.1	19	1.9	-	-
Other (< 20 cases)	231	20.7	248	24.2	56	26.4
Total	**1.116**	**100.0**	**1024**	**100.0**	**212**	**100.0**

4.3 Stems used in primary surgery

Cemented stem	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
APTA Ala-Ortho	-	-	974	25.3	66	19.5
BASIS Smith & Nephew	336	4.7	448	11.6	46	13.6
C-STEM AMT DePuy	-	-	19	0.5	46	13.6
AB Citieffe	23	0.3	78	2.0	22	6.5
LC Samo	315	4.4	51	1.3	22	6.5
EXETER Stryker Howmedica	640	9.0	565	14.7	21	6.2
TAPERLOC CEM Biomet	1	0.0	44	1.1	15	4.4
CCA Mathys	38	0.5	142	3.7	11	3.2
VERSYS ADVOCATE Zimmer	33	0.5	189	4.9	9	2.7
LUBINUS SP2 Link	225	3.2	66	1.7	8	2.4
MERCURIUS Ala-Ortho	-	-	102	2.6	6	1.8
P507 Samo	455	6.4	196	5.1	6	1.8
AD Samo	313	4.4	66	1.7	5	1.5
SL Lima	39	0.5	33	0.9	4	1.2
MS 30 Zimmer	174	2.5	9	0.2	2	0.6
SL STREAKES Hitmedica	40	0.6	8	0.2	2	0.6
ARCAD SO Symbios	-	-	64	1.7	1	0.3
SPECTRON Smith & Nephew	548	7.7	169	4.4	-	-
DUOFIT CKA Samo	15	0.2	35	0.9	-	-
DEFINITION Stryker Howmedica	266	3.7	75	1.9	-	-
MULLER AUTOBLOCCANTE Sulzer	43	0.6	11	0.3	-	-
VERSYS CEMENTED LD Zimmer	122	1.7	10	0.3	-	-
C STEM DePuy	230	3.2	84	2.2	-	-
DUOFIT CFS Samo	59	0.8	13	0.3	-	-
MBA Groupe Lepine	45	0.6	41	1.1	-	-
ABGII Stryker Howmedica	54	0.8	1	0.0	-	-
JVC Wright Cremascoli	669	9.4	58	1.5	-	-
ABG Stryker Howmedica	223	3.1	-	-	-	-
AHS Wright Cremascoli	289	4.1	4	0.1	-	-
ANCA Wright Cremascoli	89	1.3	-	-	-	-
FULLFIX Mathys	66	0.9	-	-	-	-
MRL Wright Cremascoli	468	6.6	1	0.0	-	-
PERFECTA RA Wright	51	0.7	9	0.2	-	-
ULTIMA Johnson & Johnson	197	2.8	-	-	-	-
VERSYS CEMENTED Zimmer	333	4.7	2	0.1	-	-
ANCA-FIT CLU Wright Cremascoli	303	4.3	11	0.3	-	-
Other (< 50 cases)	395	5.6	275	7.1	47	13.9
TOTAL	**7.097**	**100.0**	**3.853**	**100.0**	**339**	**100.0**

Uncemented stem	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
APTA Ala-Ortho	10	0.1	4.087	15.2	1.038	16.7
RECTA Ala-Ortho	6	0.0	2.769	10.3	617	9.9
SL PLUS Smith & Nephew	525	3.1	2.674	10.0	408	6.6
TAPERLOC Biomet	158	0.9	1.239	4.6	339	5.5
CONUS Zimmer	2.172	13.0	1.740	6.5	313	5.0
HYDRA Ala-Ortho	-	-	321	1.2	303	4.9
ABGII Stryker Howmedica	1.229	7.4	1.584	5.9	283	4.6
CBC Mathys	103	0.6	1.223	4.6	282	4.5
CLS Zimmer	2.555	15.3	1.108	4.1	198	3.2
CORAIL DePuy	218	1.3	446	1.7	177	2.9
CFP Link	237	1.4	624	2.3	144	2.3
PROXIPLUS Endoplant Gmbh	-	-	824	3.1	128	2.1
SL PLUS MIA STEM Smith & Nephew	-	-	5	0.0	126	2.0
TAPERLOC MICROPLASTY Biomet	-	-	128	0.5	115	1.9
ADR Smith & Nephew	-	-	200	0.7	113	1.8
PARVA Ala-Ortho	-	-	4	0.0	106	1.7
FITMORE Zimmer	-	-	95	0.4	102	1.6
MODULUS HIP SYSTEM Lima	44	0.3	371	1.4	98	1.6
ALATA ACUTA S Ala-Ortho	-	-	453	1.7	84	1.4
NANOS Endoplant gmbh	-	-	169	0.6	76	1.2
MINIMAX Medacta	-	-	96	0.4	67	1.1
MULTIFIT Samo	-	-	142	0.5	64	1.0
VERSYS FIBER METAL TAPER Zimmer	594	3.6	463	1.7	63	1.0
SPS MODULAR Symbios	-	-	111	0.4	54	0.9
QUADRA-H Medacta	-	-	140	0.5	49	0.8
PBF Permedica	70	0.4	167	0.6	43	0.7
SUMMIT DePuy	1	0.0	192	0.7	43	0.7
SYNERGY Smith & Nephew	214	1.3	245	0.9	40	0.6
PROFEMUR Z Wright Cremascoli	573	3.4	68	0.3	38	0.6
HIPSTAR Stryker Howmedica	124	0.7	385	1.4	37	0.6
Z1 Citieffe	-	-	230	0.9	36	0.6
ACCOLADE Stryker Osteonics	92	0.6	236	0.9	35	0.6
CONELOCK SHORT Biomet	-	-	245	0.9	34	0.5
DUOFIT RTT Samo	23	0.1	91	0.3	31	0.5
C2 Lima	275	1.6	537	2.0	30	0.5
PORO-LOCK II HIT Medica	48	0.3	108	0.4	29	0.5
ALLOCLASSIC SL ALLOPRO Sulzer	169	1.0	129	0.5	26	0.4
SL REVISION Zimmer	67	0.4	71	0.3	18	0.3
ARCAD HA Symbios	5	0.0	203	0.8	16	0.3
QUADRA-S Medacta	3	0.0	171	0.6	12	0.2
ANCA FIT Wright Cremascoli	3.811	22.8	678	2.5	6	0.1
MAYO Zimmer	36	0.2	82	0.3	6	0.1
MBA HAP Groupe Lepine	37	0.2	83	0.3	6	0.1
S. ROM Johnson e Johnson	79	0.5	86	0.3	5	0.1
PPF Biomet	167	1.0	75	0.3	4	0.1
ABG Stryker Howmedica	329	2.0	-	-	-	-
BHS Smith & Nephew	272	1.6	160	0.6	-	-
CITATION Stryker Howmedica	112	0.7	-	-	-	-
DUOFIT RKT Samo	202	1.2	103	0.4	-	-
EASY Hitmedica	150	0.9	77	0.3	-	-
EHS Wright Cremascoli	252	1.5	60	0.2	-	-
FIT STEM Lima	69	0.4	227	0.8	-	-
G3 Citieffe	177	1.1		0.0	-	-
PROXILOCK FT Stratec	287	1.7	17	0.1	-	-
SPS Symbios	156	0.9	65	0.2	-	-
STEM Wright Cremascoli	208	1.2	1	0.0	-	-
Other (< 100 cases)	860	5.1	997	3.7	364	5.9
TOTAL	**16.719**	**100.0**	**26.805**	**100.0**	**6206**	**100.0**

4.4 Stems used in total revision surgery

Cemented stem	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
APTA Ala-Ortho	-	-	30	18.2	3	15.8
EXETER Stryker Howmedica	39	16.3	35	21.2	1	5.3
AD Samo	26	10.8	3	1.8	-	-
ANCA Wright Cremascoli	25	10.4	-	-	-	-
JVC Wright Cremascoli	24	10.0	9	5.5	-	-
ANCA-FIT CLU Wright Cremascoli	10	4.2	-	-	-	-
VERSYS REVISION CALCAR Zimmer	8	3.3	9	5.5	-	-
Other (< 10 cases)	108	45.0	79	47.9	15	78.9
Total	**240**	**100.0**	**165**	**100.0**	**19**	**100.0**

Uncemented stem	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
ALATA AEQUA REVISION Ala-Ortho	-	-	86	8.1	41	18.8
SL REVISION Sulzer Centerpulse Zimmer	281	23.0	154	14.6	36	16.5
CONELOCK REVISION Stratec	21	1.7	64	6.0	29	13.3
REVISION HIP Lima	3	0.2	40	3.8	28	12.8
RESTORATION Stryker Howmedica	11	0.9	192	18.1	16	7.3
MGS Samo	43	3.5	56	5.3	8	3.7
ALATA ACUTA S Ala-Ortho	-	-	25	2.4	7	3.2
APTA Ala-Ortho	-	-	16	1.5	5	2.3
SL PLUS Smith & Nephew	9	0.7	20	1.9	5	2.3
SLR PLUS Smith & Nephew	8	0.7	12	1.1	4	1.8
CONUS Zimmer	54	4.4	28	2.6	3	1.4
MODULUS HIP SYSTEM Lima	-	-	17	1.6	3	1.4
CBC Mathys	1	0.1	14	1.3	2	0.9
CLS Zimmer	26	2.1	8	0.8	2	0.9
EMPERION Smith & Nephew	-	-	21	2.0	2	0.9
PROFEMUR R VERS. 4 Wright Cremascoli	349	28.6	59	5.6	2	0.9
S. ROM Johnson&Johnson	90	7.4	53	5.0	2	0.9
RECTA Ala-Ortho	-	-	8	0.8	2	0.9
ABGII Stryker Howmedica	3	0.2	8	0.8	1	0.5
REEF DePuy	4	0.3	7	0.7	1	0.5
VERSYS FIBER METAL TAPER Zimmer	9	0.7	10	0.9	1	0.5
ZMR REVISION TAPER CONE Zimmer	12	1.0	30	2.8	1	0.5
MRP Bioimpianti	1	0.1	11	1.0	1	0.5
ANCA FIT Wright Cremascoli	55	4.5	4	0.4	-	-
C2 Lima	26	2.1	29	2.7	-	-
CBK REVISION STEM Mathys	18	1.5	2	0.2	-	-
MP RECONSTRUCTION PROSTHESIS Link	33	2.7	17	1.6	-	-
RESTORATION T3 Stryker Howmedica	74	6.1	-	-	-	-
ZMR REVISION TAPER Zimmer	30	2.5	-	-	-	-
Other (< 20 cases)	61	5.0	67	6.3	16	7.3
Total	**1.222**	**100.0**	**1.058**	**100.0**	**218**	**100.0**

4.5 Number of different types of implant

Number of **different types** of cups and stems implanted in primary surgery, according to **year of operation**.

Year of operation	Primary THA	
	Stems	Cups
2000	93	87
2001	98	92
2002	94	90
2003	110	94
2004	99	84
2005	110	90
2006	98	87
2007	113	100
2008	114	105
2009	115	95
2010	109	91

In 2010 16 different types of cup and 18 stems not used in 2009,were implanted

4.6 Resurfacing surgery

Year of surgery	Primary	
	Conventional	Resurfacing
2000	100.0%	-
2001	99.9%	0.1%
2002	99.2%	0.8%
2003	98.6%	1.4%
2004	97.9%	2.1%
2005	96.9%	3.1%
2006	96.4%	3.6%
2007	96.9%	3.1%
2008	97.5%	2.5%
2009	97.6%	2.4%
2010	98.2%	1.8%

Types of resurfacing implanted between **1st January 2000** and **31st December 2010**

Type	N.	%
BHR – Smith & Nephew	726	56.9
ADEPT – Finsbury	162	12.7
MITCH TRH – Finsbury	87	6.8
ASR – DePuy	73	5.7
RECAP – Biomet	61	4.8
MRS – Lima	44	3.4
BMHR – Smith & Nephew	45	3.5
ICON – International Orthopaedics	21	1.6
CONSERVE PLUS – Wright	19	1.5
ROMAX – Medacta	29	2.3
DURON Hip Resurfacing – Zimmer	8	0.6
Cormet – Corin	1	0.1
Tribofit – Active Implants	1	0.1
Total	**1.277**	**100.0**

4.7 Modular neck

32.5% of stems implanted in primary surgery have modular neck.

Year of surgery	Primary surgery	
	Standard neck	Modular neck
2000	78.0	22.0
2001	74.6	25.4
2002	70.8	29.2
2003	72.5	27.5
2004	69.4	30.6
2005	67.1	32.9
2006	63.9	36.1
2007	65.4	34.6
2008	64.2	35.8
2009	64.0	36.0
2010	60.3	39.7

Types of stems with proximal modularity	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
APTA Ala-Ortho	10	0.2	5.061	46.9	1.104	42.5
RECTA Ala-Ortho	6	0.1	2.771	25.7	617	23.7
HYDRA Ala-Ortho	-	-	324	3.0	310	11.9
PARVA Ala-Ortho	-	-	4	0.0	106	4.1
MODULUS HIP SYSTEM Lima	44	0.7	371	3.4	98	3.8
ALATA ACUTA S Ala-Ortho	-	-	454	4.2	84	3.2
MULTIFIT Samo	-	-	142	1.3	64	2.5
SAM-FIT Lima	-	-	36	0.3	59	2.3
SPS MODULAR Symbios	-	-	111	1.0	54	2.1
PROFEMUR Z Wright Cremascoli	573	8.9	68	0.6	38	1.5
ABGII MODULAR Howmedica	-	-	48	0.4	7	0.3
ANCA FIT Wright Cremascoli	3.812	58.9	678	6.3	6	0.2
MERCURIUS Ala-Ortho	-	-	102	0.9	6	0.2
MBA Groupe Lepine	37	0.6	83	0.8	6	0.2
HARMONY Symbios	-	-	64	0.6	5	0.2
S. ROM Johnson e Johnson	79	1.2	85	0.8	5	0.2
PROFEMUR L Wright Cremascoli	-	-	95	0.9	1	0.0
STELO MODULARE NDS1 Citieffe	60	0.9	16	0.1	-	-
MBA HAP Groupe Lepine	45	0.7	41	0.4	-	-
JVC Wright Cremascoli	669	10.3	58	0.5	-	-
EHS Wright Cremascoli	252	3.9	60	0.6	-	-
ANCA-FIT Dual fit Wright Cremascoli	303	4.7	11	0.1	-	-
STEM Wright Cremascoli	208	3.2	1	0.0	-	-
G3 Citieffe	177	2.7	-	-	-	-
PROFEMUR C Wright Cremascoli	86	1.3	-	-	-	-
ALBI PTC Wright Cremascoli	31	0.5	4	0.0	-	-
Other (<30 cases)	82	1.3	100	0.9	30	1.2
Total	**6.474**	**100.0**	**10.789**	**100.0**	**2.600**	**100.0**

4.8 Articular couplings and head diameters

Number of primary total hip arthroplasty operations carried out on patients with admission date between 1st January 2000 and 31st December 2010, according to the **type of operation and articular coupling.**

Articular coupling	Total hip arthroplasty		Total revision	
	N.	%	N.	%
Ceramic-ceramic	22.114	36.3	670	22.6
Met-poly	13.038	21.4	725	24.5
Met-crosslinked poly	4.829	7.9	426	14.4
Met-poly (undefined)*	676	1.1	58	2.0
Cer-poly	10.471	17.2	764	25.8
Cer-crosslinked poly	3.246	5.3	206	7.0
Cer-poly (undefined)*	258	0.4	14	0.5
Met-met	5.842	9.6	95	3.2
Cerid-polietilene	180	0.3	-	-
Biolox delta-met	180	0.3	-	-
Met-policarbonato uretano	116	0.2	-	-
Total^	**60.950**	**100.0**	**2.958**	**100.0**

* missing label did not allow classification of poly
^252 and 13 missing data

Percentage of total hip arthroplasty interventions between 2000 and 2010, according to the **type of polyethylene** used**.**

Year of surgery	Primary surgery		
	Standard poly	Crosslinked poly	Not defined poly*
2000	76.3	10.1	13.6
2001	81.4	16.2	2.4
2002	83.5	14.7	1.8
2003	82.7	16.5	0.9
2004	79.1	20.3	0.5
2005	77.3	22.1	0.6
2006	76.4	23.6	-
2007	72.8	26.9	0.3
2008	65.6	34.3	0.1
2009	52.7	47.3	-
2010	41.8	58.1	-

* missing label

Percentage of total hip arthroplasty according **to articular coupling** during the years 2000 - 2010.

Year of surgery	Primary surgery					
	met-pol	met-xlk	cer-pol	cer-xlk	cer-cer	met-met
2000	38.2	7.4	27.7	1.2	18.4	7.1
2001	30.9	10.3	29.1	1.6	20.5	7.6
2002	30.7	8.9	29.4	1.4	22.3	7.3
2003	29.8	10.0	27.1	1.3	23.7	8.1
2004	25.6	10.0	25.0	2.9	27.9	8.6
2005	24.8	9.5	19.8	3.1	33.6	9.2
2006	22.4	7.7	14.4	3.4	39.8	12.3
2007	21.8	7.4	11.5	4.9	42.6	11.8
2008	16.4	6.2	9.3	7.4	48.0	12.7
2009	12.0	7.1	8.7	11.3	50.0	10.8
2010	8.5	5.6	6.2	14.8	56.7	8.3

Percentage of total revision surgeryarthroplasty according **to articular coupling** during the years 2000 - 2010.

Year of surgery	Total revision surgery					
	met-pol	met-xlk	cer-pol	cer-xlk	cer-cer	met-met
2000	36.7	10.5	31.9	2.7	17.2	1.0
2001	36.4	13.0	35.4	3.2	10.5	1.5
2002	31.6	9.9	40.6	4.4	11.8	1.7
2003	29.4	11.6	39.7	5.4	13.6	0.3
2004	29.1	14.2	29.4	2.0	19.6	5.7
2005	25.9	16.1	21.3	6.1	23.7	6.9
2006	24.8	19.9	18.2	4.5	26.9	5.7
2007	18.5	22.6	13.7	8.5	34.1	2.6
2008	17.9	18.8	12.4	14.3	33.8	2.8
2009	14.5	17.3	14.1	15.0	35.0	4.1
2010	12.3	10.2	18.6	18.2	38.6	2.1

Percentage of elective THA according **to articular coupling and class age**

Age class	Elective THA			
	met-pol	cer-pol	cer-cer	met-met
<40	6.3	12.8	62.7	18.2
40-49	8.9	14.2	58.1	18.8
50-59	12.7	17.1	52.4	17.7
60-69	24.5	22.9	42.3	10.3
70-79	38.2	28.5	28.1	5.1
Oltre 80	57.0	24.3	15.3	3.4

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2010, according **to material** and **diameter of the head**

Head material	Diameter of the head (mm)											
	22		26		28		32		36		>=38	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
Alumina	-	-			16.879	44.2	4.911	53.2	3.260	32.7	-	-
Cr-Co	199	81	16	76	16.495	43.2	1.139	12.3	1.003	10.1	2.239	71.1
Biolox Delta	-	-	-	-	1.099	2.9	2.997	32.5	5.673	56.9	881	28.0
Stainless steel	46	19	5	24	3.086	8.1	152	1.6	4	0.0	-	-
Zirconia	-	-	-	-	289	0.8	2	0.0	-	-	-	-
Oxinium	-	-	-	-	187	0.5	33	0.4	35	0.4	-	-
Cerid	-	-	-	-	180	0.5	-	-	-	-	-	-
Titaniun nitruro	-	-	-	-	-	-	-	-	-	-	27	0.9
Revision ceramic	-	-	-	-	-	-	1	0.0	1	0.0	1	0.0
Bionium-Diamant	-	-	-	-	2	0.0	-	-	-	-	-	-
Total*	**245**	**100.0**	**21**	**100**	**38.217**	**100.0**	**9.235**	**100.0**	**9.976**	**100.0**	**3.148**	**100.0**

*244 missing data, (0.4%)

Year of surgery	Diameter of the head (mm)					
	<=28 cer	<=28 met	32 cer	32 met	>=36 cer	>=36 met
2000	46.6	49.7	1.1	1.3	0.0	1.2
2001	50.5	47.0	0.7	0.4	0.0	1.4
2002	52.2	46.0	0.9	0.1	0.0	0.8
2003	50.9	46.6	0.9	0.1	0.3	1.2
2004	51.1	41.6	3.2	0.6	1.3	2.2
2005	34.1	38.1	16.7	1.6	5.5	4.0
2006	23.3	33.6	19.0	2.0	14.9	7.3
2007	15.9	28.4	20.7	3.9	21.9	9.2
2008	14.3	21.7	20.4	3.7	29.6	10.3
2009	11.5	17.5	21.6	3.1	36.5	9.9
2010	8.7	10.1	24.0	4.6	44.7	7.9

Heads made of alumina, zirconia and biolox delta are marked with the initials "**cer**"; heads made of cobalt-based alloy and stainless steel are marked with the initials "**met**"

4.9 Prosthesis fixation

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2009, according **to type of operation** and **fixation**.

Fixation	Primary THA	%	Total revision	%
Cementless	49.635	81.3	2.112	71.2
Hybrid (cemented stem and cementless cup)	6.741	11.0	244	8.2
Cemented	4.252	7.0	174	5.9
Reverse hybrid (cementless stem and cemented cup)	432	0.7	437	14.7
Total*	**61.060**	**100.0**	**2.967**	**100.0**

*142 and 4 missing data

Fixation of the acetabular component of the resurfacing prosthesis was press fit in 100% of the cases and in 10.6% of the cases screws were used.

Percentage of total hip arthroplasties **according to fixation**, during the years 2000 – 2010.

Year	Primary surgery			
	Cemented	Cementless	Hybrid	Reverse hybrid
2000	15.2	61.8	22.1	0.9
2001	14.2	66.3	18.8	0.7
2002	12.1	71.2	15.9	0.8
2003	11.0	73.2	15.1	0.7
2004	8.6	78.1	12.6	0.7
2005	7.0	80.4	11.8	0.8
2006	6.1	83.0	10.3	0.6
2007	4.3	87.0	8.1	0.6
2008	2.5	90.4	6.5	0.6
2009	2.0	91.6	5.7	0.8
2010	1.2	94.2	4.0	0.6

Percentage of elective total hip arthroplasties **according to fixation, by age of patient**

Age class	Elective primary THA 2000-2010			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0.8	97.7	0.9	0.6
40-49	0.3	98.7	0.8	0.3
50-59	0.6	96.9	2.2	0.3
60-69	1.6	89.4	8.6	0.4
70-79	8.1	74.3	16.7	0.8
≥80	24.4	55.9	17.9	1.7

Percentage of total hip arthroplasties **according to fixation and class age** - year 2000

Age class	Elective primary surgery year 2000			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0.9	93.0	5.2	0.9
40-49	0.8	95.5	3.3	0.4
50-59	1.5	89.7	8.4	0.4
60-69	5.6	70.2	23.7	0.5
70-79	21.5	46.6	30.7	1.2
≥80	53.5	27.8	17.1	1.6

Percentage of total hip arthroplasties **according to fixation and class age** - year 2010

Age class	Elective primary surgery year 2010			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	1.5	98.0	0.5	0.0
40-49	0.2	99.4	0.4	0.0
50-59	0.1	99.6	0.2	0.1
60-69	0.3	97.6	1.7	0.4
70-79	0.5	94.0	5.1	0.4
≥80	5.4	78.4	14.3	1.9

Percentage of total revision surgery **according to fixation**, during the years 2000 – 2010.

Year	Total revision			
	Cemented	**Cementless**	**Hybrid**	**Reverse hybrid**
2000	9.6	63.7	9.6	17.0
2001	7.9	63.7	8.2	20.2
2002	6.1	65.5	7.4	20.9
2003	7.2	69.6	6.9	16.3
2004	7.1	68.7	8.3	15.9
2005	7.0	69.3	7.9	15.8
2006	6.3	71.7	11.4	10.7
2007	3.7	74.0	9.5	12.8
2008	4.4	77.4	8.4	9.7
2009	1.8	82.9	6.3	9.0
2010	1.7	83.8	6.0	8.5

Percentage of total revision surgery **according to fixation and age class**

Age class	Total revision			
	Cemented	**Cementless**	**Hybrid**	**Reverse hybrid**
<40	1.9	90.4	1.9	5.8
40-49	4.8	88.6	2.9	3.8
50-59	2.1	84.6	3.5	9.8
60-69	3.4	75.2	6.7	14.7
70-79	5.1	69.1	9.1	16.7
≥80	14.8	56.4	12.9	15.9

4.10 Bone cement

Type of cement used in primary surgery with at least one cemented component, in resurfacing and in hemiarthroplasty (information recorded in RIPO from 30st September 2001).

In **bold** cements with antibiotics

Cement	% in THA	% in Hemi	% in Resurf
Surgical Simplex P – Howmedica	34.3	32.9	7.0
Cemex System – Tecres	13.4	31.9	2.3
Palacos R – Biomet	6.8	1.8	2.0
Smartset HV – DePuy	4.9	3.5	5.3
Antibiotic Simplex – Howmedica	***4.9***	***2.6***	***73.6***
Amplicem 3 – Amplimedical	4.2	4.8	-
Cemex RX – Tecres	2.6	7.4	0.2
Cemex + Cemex System - Tecres	2.4	-	-
Exolent High – Elmdown	1.9	0.9	-
Cemex RX + Cemex System - Tecres	1.8	-	-
Amplicem 1 + Amplicem 3 – Amplimedical	1.6	-	-
CMW 3 – DePuy	1.6	1.4	-
Cemex System – Tecres + Surgical Simplex P – Howmedica	1.6	-	-
Amplicem 1 – Amplimedical + Smartset HV – DePuy	1.5	-	-
Cemex – Tecres	1.4	2.2	0.4
Versabond – Smith & Nephew	1.3	-	0.3
Cemfix 1 – Teknimed	1.3	0.2	-
Sulcem 3 – Centerpulse	1.2	1.5	0.1
Cemex Genta - Cemex Genta System – Tecres	***1.0***	-	-
Cemfix 3 – Teknimed	0.9	0.1	-
Aminofix 1 – Groupe Lepine	***0.9***	-	-
Palacos R – Heraeus Medical	0.8	1.1	-
Palacos R 40 – SP Europe	0.7	0.1	-
Cemex Genta – Tecres	***0.7***	***0.5***	***0.1***
Cemex Genta System – Tecres	***0.5***	***1.7***	***2.4***
Bone Cement R – Biomet	0.5	0.1	1.7
Smartset MV – DePuy	0.5	0.6	0.1
Amplicem 1 - Amplimedical	0.4	-	0.3
Vacu Mix Plus CMW 3 - DePuy	0.4	0.8	0.3
Amplicem 3G – Amplimedical	***0.3***	***-***	***-***
Refobacin Bone Cement R – Biomet	***0.2***	***-***	***-***
Cemex XL – Tecres	0.2	0.8	-
Osteobond - Zimmer	0.2	-	1.9
Palacos R – Heraeus Medical + Surgical Simplex P – Howmedica	0.2	-	-
Other with antibiotic	***1.4***	***0.4***	***0.3***
Other without antibiotic	1.4	2.6	1.6
Total	**100.0%**	**100.0%**	**100.0%**

4.11 Surgical techniques (surgical approach, bone graft, reinforcement rings)

The most commonly used surgical approaches are lateral and postero-lateral.

60.8% of THA is implanted through lateral approach, 29.5% through postero-lateral.

53.2% of hemiarthroplasties is implanted through lateral approach, 43.0% through postero-lateral

87.5% of resurfacing prostheses is implanted through postero-lateral approach and 10.8 % through lateral.

5 Types of hemiarthroplasty

5.1 Heads and stem

Monoblock	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
THOMPSON - Corin	39	52.7	37	97.4	-	-
AUSTIN MOORE - Amplimedical	16	21.6	-	-	-	-
THOMPSON - Amplimedical	14	18.9	-	-	-	-
THOMPSON -Stryker Howmedica	4	5.4	-	-	-	-
THOMPSON - Bioimpianti	1	1.4	-	-	-	-
THOMPSON - Surgival	-	-	1	2.6	-	-
Total	**74**	**100.0**	**38**	**100.0**	**-**	**-**

Monoarticular head	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
TESTA ELLITTICA - Samo	212	99.5	210	99.0	-	-
Head	1	0.5	2	1.0	-	-
Total	**213**	**100.0**	**212**	**100.0**	**-**	**-**

Biarticular head	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
C1 - Citieffe	865	8.9	1.754	15.4	694	28.3
SPHERI-LOCK - Hit Medica	2.039	21.0	2.213	19.4	379	15.5
BI-POLAR - DePuy	2	0.0	208	1.8	329	13.4
UHR Osteonics Stryker Howmedica	444	4.6	1.630	14.3	272	11.1
JANUS - Bioimpianti	291	3.0	554	4.9	263	10.7
CUPOLA NEMAUSUS - Transysteme	-	-	235	2.1	184	7.5
TESTA BIARTICOLARE LOCK - Lima	241	2.5	1.101	9.7	176	7.2
CUPOLA MOBILE - Zimmer	229	2.4	356	3.1	23	0.9
CUPOLA BIPOLARE - Mathys	404	4.2	232	2.0	20	0.8
CUPOLA BIPOLARE - Zimmer	94	1.0	325	2.8	18	0.7
TESTA BIPOLARE - Samo	100	1.0	2	0.0	17	0.7
CORON - Tantum	1	0.0	173	1.5	11	0.4
BI-POLAR - Biomet	142	1.5	232	2.0	7	0.3
CUPOLA MOBILE MODULARE - Cremascoli	885	9.1	306	2.7	4	0.2
CUPOLA MOBILE - Medacta		0.0	185	1.6	3	0.1
TESTA BIPOLARE -Amplimedical	193	2.0	-	-	-	-
BICENTRIC - Stryker Howmedica	233	2.4	3	0.0	-	-
CUPOLA MOBILE - Centerpulse	129	1.3	144	1.3	-	-
RETENTIVE MOBILE CUP - Cedior	292	3.0	-	-	-	-
SPHERIC - Amplitude		0.0	351	3.1	-	-
CENTRAX - Stryker Howmedica	525	5.4	12	0.1	-	-
MODULAR BIPOLAR - Protek	405	4.2	206	1.8	-	-
TESTA BIARTICOLARE - Lima	608	6.3	4	0.0	-	-
CUPOLA MOBILE BIARTICOLARE - Permedica	460	4.7	260	2.3	-	-
CUPOLA SEM - D.M.O.	429	4.4	301	2.6	-	-
ULTIMA MONK - Johnson+Johnson	528	5.4	475	4.2	-	-
Other (less than 100 cases)	171	1.8	146	1.3	49	2.0
Total	**9.710**	**100.0**	**11.408**	**100.0**	**2.449**	**100.0**

***88** missing (0.4%)

CEMENTED STEM	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
AB - Citieffe	664	7.2	1.644	17.2	669	37.5
G2 - Citieffe	53	0.6	691	7.2	249	13.9
SL STREAKES - Hit Medica	276	3.0	888	9.3	212	11.9
APTA - Ala-Ortho	-	-	534	5.6	170	9.5
SL - Lima	439	4.8	287	3.0	99	5.5
SPERI-SYSTEM II - Hit Medica	887	9.6	1.104	11.5	92	5.1
EXETER - Stryker Howmedica	204	2.2	346	3.6	79	4.4
STANDARD STRAIGHT - Zimmer	525	5.7	230	2.4	24	1.3
DUOFIT CKA - Samo	116	1.3	36	0.4	15	0.8
LOGICA MIRROR - Lima	129	1.4	378	4.0	11	0.6
VERSYS LD/FX - Zimmer	237	2.6	300	3.1	7	0.4
VERSYS HERITAGE - Zimmer	83	0.9	68	0.7	2	0.1
LC - Samo	210	2.3	209	2.2	2	0.1
QUADRA-C - Medacta	-	-	173	1.8	1	0.1
CCA - Mathys	400	4.3	214	2.2	1	0.1
ALBI PTC - Cremascoli	133	1.4	16	0.2	-	-
ULTIMA STRAIGHT- J&J	156	1.7	-	-	-	-
SL - Amplimedical	158	1.7	-	-	-	-
HIP FRACTURE - Stryker Howmedica	162	1.8	-	-	-	-
DEFINITION - Stryker Howmedica	68	0.7	168	1.8	-	-
LOGICA - Lima	141	1.5	106	1.1	-	-
MRL - Cremascoli	270	2.9	-	-	-	-
AHS - Cremascoli	303	3.3	9	0.1	-	-
ULTIMA LX - Johnson&Johnson	315	3.4	-	-	-	-
JVC - Cremascoli	271	2.9	210	2.2	-	-
FIN - Bioimpianti	229	2.5	295	3.1	-	-
RELIANCE - Stryker Howmedica	305	3.3	318	3.3	-	-
SEM II - DMO	359	3.9	278	2.9	-	-
SL - Permedica	425	4.6	253	2.6	-	-
SL -Hit Medica	731	7.9	8	0.1	-	-
ORTHO-FIT - Allopro	385	4.2	444	4.6	-	-
Other (less than 100 cases)	587	6.4	361	3.8	156	8.7
Total	**9.221**	**100.0**	**9.568**	**100.0**	**1.789**	**100**

UNCEMENTED STEM	2000-2004		2005-2009		2010	
	N.	%	N.	%	N.	%
ACCOLADE – Osteonics Stryker Howmedica	282	40.5	831	40.5	179	27.0
S-TAPER - Bioimpianti	-	-	214	10.4	167	25.1
APTA - Ala-Ortho	-	-	47	2.3	42	6.3
LOGICA CS - Lima	-	-	52	2.5	37	5.6
SL - Lima	3	0.4	206	10.0	30	4.5
RECTA - Ala-Ortho	-	-	48	2.3	27	4.1
SPS MODULAR - Symbios	-	-	-	-	26	3.9
TWINSYS - Mathys	-	-	8	0.4	20	3.0
HYDRA - Ala-Ortho	-	-	4	0.2	19	2.9
PORO-LOCK II - Hit Medica	-	-	52	2.5	19	2.9
ENDON - Tantum	1	0.1	171	8.3	11	1.7
VERSYS FIBER METAL TAPER - Zimmer	3	0.4	34	1.7	7	1.1
SL PLUS - Endoplus	1	0.1	14	0.7	6	0.9
CONUS - Centerpulse	5	0.7	12	0.6	6	0.9
SL REVISION - Sulzer	7	1.0	18	0.9	2	0.3
EURO HIP SYSTEM - Cremascoli	17	2.4	23	1.1	-	-
H-AC STEM FURLONG JRI	67	9.6	7	0.3	-	-
HIP FRACTURE - Stryker Howmedica	133	19.0	-	-	-	-
PPF - Biomet	111	15.9	155	7.5	-	-
Other (less than 20 cases)	69	9.9	161	7.8	65	9.8
Total	**699**	**100.00**	**2057**	**100.00**	**663**	**100.00**

82 missing cases

5.2 Other characteristics of hemiarthroplasties

Number of surgeries according to **head type**

Head type	N.	%
Bipolar head to be assembled in the operating theatre	22.554	93.2
Preassembled bipolar head	1.101	4.6
Monoarticular head	424	1.7
Monoblock prosthesis	112	0.5
Total	**24.191**	**100.0**

*****71 missing data, (0.3%)

6. *Blood transfusion*

Percentages of operations performed on patients admitted between 1st January 2003 and 31st December 2010 **according to type of operation and transfusion**

Type of surgery	None	Autologous (recovery)	Autologous (predeposit)	Homologous	Autologous and homologous
Emergency primary	22.7	11.1	-	58.6	7.6
Elective primary	12.2	20.5	40.0	16.2	11.0
Revision	8.9	13.8	18.7	42.3	16.3

In the following tables the analysis is repeated according **to type of surgery** and **type of hospital**

Emergency primary THA and hemiarthroplasty				
Type of hospital	**None**	**Autologous (recovery)**	**Homologous**	**Autologous and homologous**
AOSP	30.3	3.7	65.6	0.5
Private	8.0	34.9	25.6	31.6
AUSL	36.5	5.0	54.9	3.6
IOR	2.6	0.7	96.7	0.0

Elective THA				
Type of hospital	**None**	**Autologous**	**Homologous**	**Autologous and homologous**
AOSP	18.1	60.8	17.6	3.6
Private	5.9	71.3	5.7	17.0
AUSL	20.0	50.6	18.0	11.3
IOR	2.9	62.9	27.7	6.5

7. Complications occurred during hospitalization

The rate of complications appears to be very widely spread out over the various Units. Probably reporting complications is not accurate partially because of interpretative doubts. Therefore, definitive conclusions are not drawn until the ways of checking these data are redefined.

The rate of complications in **primary surgery** carried out on patients hospitalised between January 1st 2000 and December 31st 2010.

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	234	*0.4*	Hematoma	683	*1.1*	Anemia	3.172	*5.2*
Diaphyseal fracture	201	*0.3*	Prosthesis disloc	270	*0.4*	Hyperpyrexia	490	*0.8*
Greater troch fracture	119	*0.2*	SPE paralysis	120	*0.2*	Genito-urinary	264	*0.4*
			Deep vein thromb	82	*0.1*	Gastro-intestinal	254	*0.4*
Anaesthesiolog complications	98	*0.2*	Bleeding	80	*0.1*	Cardiovascular	145	*0.2*
			Bed sores	72	*0.1*	Embolism	113	*0.2*
Cotyle fracture	87	*0.1*	Crural paralysis	65	*0.1*	Collapse	94	*0.2*
Hemorragia	27	*0.04*	Infection	60	*0.1*	Respiratory	92	*0.2*
			Secretion	45	*0.1*	Infarction	82	*0.1*
Instability	16	*0.03*				Disorientation	72	*0.1*
						Dyspnoea	52	*0.1*
Calcar fracture	69	*0.1*	Hematoma	223	*0.4*	Others	351	*0.6*
Total	**851**	***1.4***	**Total**	**1.700**	***2.8***	**Total**	**5.181**	***8.5***

The rate of complications in **revision surgery** carried out on patients hospitalised between January 1st 2000 and December 31st 2010

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Diaphyseal fracture	150	*1.5*	Hematoma	147	*1.5*	Anemia	659	*6.6*
Calcar fracture	51	*0.5*	Prosthesis disloc	88	*0.9*	Hyperpyrexia	64	*0.6*
			SPE paralysis	50	*0.5*	Cardiovascular	39	*0.4*
Anaesthesiologic complications	39	*0.4*	Bleeding	44	*0.4*	Gastro-intestinal	38	*0.4*
			Infection	30	*0.3*	Genito-urinary	34	*0.3*
Greater troch fracture	28	*0.3*	Bed sores	21	*0.2*	Collapse	33	*0.3*
			Deep vein thromb	15	*0.1*	Infarction	24	*0.2*
Cotyle fracture	17	*0.2*	Crural paralysis	7	*0.1*	Embolism	20	*0.2*
Hemorragia	14	*0.1*				Respiratory	17	*0.2*
Other	19	*0.2*	Other	43	*0.4*	Other	105	*1.0*
Total	**318**	***3.2***	**Total**	**445**	***4.4***	**Total**	**1.033**	***10.3***

The rate of complications in **hemiarthroplasty** carried out on patients hospitalised between January 1st 2000 and December 31st 2010.

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Anaesthesiol. complications	96	*0.4*	Hematoma	185	*0.8*	Anemia	2.057	*8.5*
			Prosthesis disloc	114	*0.5*	Hyperpyrexia	225	*0.9*
Calcar fracture	82	*0.3*	Bed sores	102	*0.4*	Genito-urinary	225	*0.9*
			Deep vein thromb	64	*0.3*	Collaspse	188	*0.8*
Greater toch fracture	53	*0.2*	SPE paralysis	60	*0.2*	Respiratory	173	*0.7*
						Gastro-intestinal	143	*0.6*
Diaphyseal fracture	38	*0.2*	Infection	37	*0.2*	Cardiovascular	130	*0.5*
Hemorragia	16	*0.1*	Bleeding	12	*0.05*	Embolism	126	*0.5*
						Infarction	84	*0.3*
Acetabula fracture	3	*0.01*	Crural paralysis	2	*0.01*	Disorient.	48	*0.2*
						Dyspnea	39	*0.2*
Other	44	*0.2*	Other	34	*0.1*Other	Other	232	*1.0*
Total	**332**	***1.4***	**Total**	**610**	***2.5***	**Total**	**3.670**	***15.1***

7.1 Deaths during hospitalization

Number of deaths in prosthetic surgery on patients hospitalized between January 1st 2000 and December 31st 2010.
The deaths recorded are those that occurred during hospitalization.

Years 2000-2010			
Type of surgery	**Deaths**	**n. of operations**	**Percentage**
Primary THA	161	61.202	0.3
Hemiarthroplasty	1.075	24.262	4.4
Revision	66	9.934	0.7
Resurfacing prostheses	0	1.277	-
Prosthesis removal	18	660	2.7

Deaths in first 90 days after surgery, exceeding the previous one, are reported in the following table

Death in first 90 days after surgery – Hemiarthroplasty on resident patients			
Year of surgery	**Deaths**	**n. of operations**	**Percentage**
2000	176	1.681	10.5
2001	199	2.062	9.7
2002	165	1.866	8.8
2003	166	1.970	8.4
2004	188	2.146	8.8
2005	195	2.221	8.8
2006	179	2.296	7.8
2007	168	2.067	8.1
2008	220	2.360	9.3
2009	176	2.401	7.3
2010	167	2.355	7.1
Total	**1.999**	**23.425**	**8.5**

8. Duration of pre-operative hospitalization

Days of pre-operative hospitalization (mean, minimal, maximal) according to type of operations and year of operation.

Year 2000			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	4.292	2.4	0-49
Hemiarthropl	1.756	3.5	0-44
Revision	720	4.0	0-52
Prosthesis removal	38	5.2	0-20
Year 2010			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	6.538	1.6	0-84
Hemiarthropl	2.431	3.7	0-41
Revision	1.019	3.7	0-86
Resurfacing	122	1.3	0-7
Prosthesis removal	88	6.5	0-39

9. Analysis of survival of primary surgery

9.1 Cox multivariate analysis

The Cox multivariate analysis identifies any variables that are independent from each other that can influence the event, in our case the removal of at least one prosthesis component. Analysis was performed on three independent variables, sex, age at surgery and pathology.
Other variables that might influence the outcome of surgery, such as the method of fixing the prosthesis, or joint coupling, were not introduced into the analysis because they were not independent (for example, prosthesis fixation depends on the patient's age).
All primary hip arthroplasties performed in the region between 2000 and 2010 were analyzed.
Unlike previous years, this analysis was limited to patients resident in Emilia Romagna region. In such a way the bias due to lost to follow up of non-resident patients is avoided.

COX PROPORTIONAL RISK MODEL

Variables

Dependent: Follow-up
Independent: Age, gender, diagnosis

Number of valid observations: 45.767
Non revised: 44.363
Revised: 1.404

Chi-square: 79.4 *p*= 0.0001

VARIABLE	SIGNIFICANCE (P)
Gender	**S** (0.009)
Age	**S** (0.001)
Diagnosis	**S** (0.001)

The chi-square test, used to test globally the model applied, was significant, which suggested that, on the whole, the variables inserted in the model influenced the outcome of prosthetic surgery. The effect of each variable was compared to the others when equal.
Variables inserted in the model significantly influenced the outcome. At this point we tested how it acts, either by reducing or increasing the risk.
Diagnosis
The rate of relative risk was expressed with respect to the risk rate presented by the patients affected by coxarthrosis. A relative risk rate below 1 indicated a reduced risk of prosthesis revision.
To analyze the influence of the disease, the patients were divided into 6 groups:
- arthritis
- rheumatic arthritis (rheumatoid arthritis, psoriasis, rhizomelic spondylitis)
- femoral fractures and their consequences (necrosis and post-traumatic arthrosis)
- idiopathic necrosis of the femoral head
- sequelae of congenital and infantile diseases (LCA, DCA, Perthes, epiphysiolysis)
- "others" that include sequelae of septic coxitis, coxitis from TBC, ankylosis, and metastasis

In the case shown in the following table a significantly increased risk is observed in the case of arthroplasty following "femoral fracture and their sequelae" or following "rheumatic arthritis" or to treat rare pathologies, such as septic coxitis.
Patients who had undergone arthroplasty because of femoral fracture or sequelae of fracture had a 1.5-fold greater risk in comparison to subjects of matching sex and age treated for coxarthrosis.
Patients of the grup 'Other pathologies' had a 2.7-fold greater risk of failure. In this heterogeneous group septic coxitis represent the higher risk pathology.
Conversely, in patients treated by arthroplasty due to cephalic necrosis, or to correct sequelae of congenital and infantile diseases the risk of loosening was not significantly higher than in patients treated for coxarthrosis

Preop diagnosis	**Relative risk rate**	**Confidence interval 95%**		**Significance (p)**
Others (sequelae of coxitis, Paget's disease, metastasis, etc..)	2.7	1.6	4.4	S (0.001)
Sequelae congenital diseases	-	-	-	NS (0.18)
Idiopathic necrosis of femoral head	-	-	-	NS (0.55)
Fracture and Sequelae (both femoral and acetabular)	1.5	1.3	1.7	S (0.0001)
Rheumatic arthritis	-	-	-	NS (0.05)

The class 'fractures and their outcomes' includes both fractures of the neck of the femur and those of cup, the post-traumatic arthritis/necrosis. Apparently this is an heterogeneous class, with the coexistence of acute and chronic pathologies.

Concerning gender and age, males have a higher risk of 1.2 compared to women, and with increasing age of the patient decreases the risk of revision surgery.

9.2 Rate of failure

Prosthesis failure is defined as the revision of even one prosthetic component. As already mentioned in the introduction of this report the recovery of data of operations not reported to RIPO is in progress. The uncertainty due to the failure to report about 10% of operations performed in the Region, may lead to an underestimation of the revision rate that is not quantifiable at the moment.
The following table shows in the first column the number of primary joint arthroplasty operations performed in the period from 1st January 2000 to 31st December 2010 on resident in Emilia-Romagna region, the second and third columns show the number of revision operations performed on the same patients.
Some revision operations were performed in the same hospital as the primary operation while others were performed at other hospitals in the Emilia-Romagna region.

Maximum follow-up is 11 years.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital
Primary THA	45.767	1.019	385
Hemiarthroplasty	23.425	299	93
Total revision	1.843	107	49
Total	**71.035**	**1.425**	**527**

* hemiartroplasties with acetabular buffer are not considered. 11 failures were observed in 109 implants

The following table shows the number of resurfacing prostheses performed in Emilia-Romagna. Resurfacing prosthesis has been used significantly only since 2002.

Maximum follow-up is 6 years.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital
Resurfacing	534	32	3

Revision surgery has been divided in two classes: major if one of both bone-fixed components has been revised, and minor if liner, and/or head, and/or modular neck have been exchanged).

The following table shows the **rate of revision** according to type of surgery:

Type of operation	Major revisions	Minor revisions	Revision rate	Percentage
Primary THA	1.068	336	1.404/45.767	3.1
Hemiarthroplasty	380	12	392/23.425	1.7
Resurfacing	35	-	35/534	6.5
Total revision	124	32	156/1843	8.5

9.3 Survival curves according to Kaplan Meier

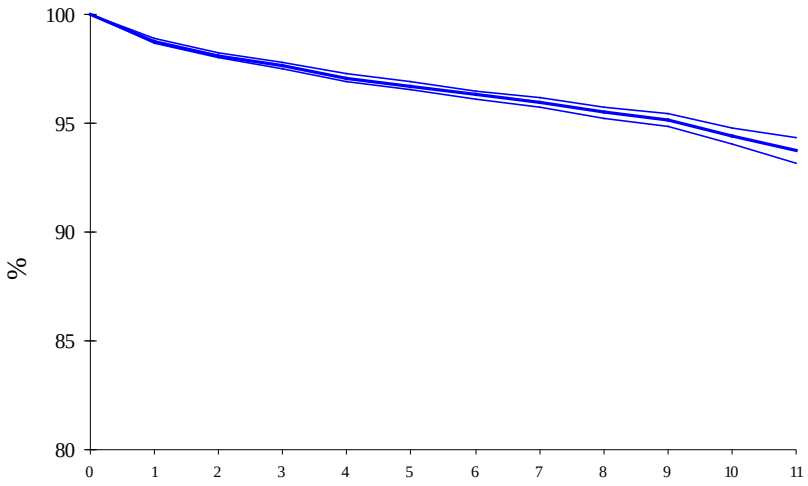
The survival curve calculated by the Kaplan Meier method enables an estimation of the probability that each individual has of maintaining its initial condition (prosthesis in place) over time.
The following paragraphs show the survival curves calculated separately for primary prosthesis, endoprosthesis, and total joint revision.
The influence of fixation and articular coupling was assessed only for primary prosthesis.
Furthermore, survival of single components, stem and cup, was also assessed.

9.4 Analysis of survival in primary total hip arthroplasty

45.767 primary arthroprostheses are under observation. Of these, 1404 revisions were carried out.

Number of arthroprostheses	n. revisions	% revision
45.767	**1.404**	**3.1**

Survival curve



Results in detail

(c.i. = confidence interval)

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	98.8	98.7	98.9
2	98.1	98.0	98.3
3	97.6	97.5	97.8
4	97.1	96.9	97.3
5	96.7	96.6	96.9
6	96.3	96.1	96.5
7	96.0	95.7	96.2
8	95.5	95.3	95.8
9	95.2	94.9	95.5
10	94.4	94.1	94.8
11	93.8	93.2	94.4

The following table shows the rate of revision in total joint arthroplasty according to **cause of revision: the % distribution of the causes of failure is shown**.

Cause of revision	Rate	%	% Distribution failure causes
RECURRENT PROSTHESIS DISLOCATION	**331**/45.767	0.72	**23.6**
within 60 days	*172/45.767*		
over 60 days	*159/45.767*		
Aseptic loosening of the stem	**255**/45.767	0.56	**18.2**
within 60 days	*9/45.767*		
over 60 days	*246/45.767*		
Aseptic loosening of the cup	**221**/45.767	0.48	**15.7**
within 60 days	*19/45.767*		
over 60 days	*202/45.767*		
Periprosthetic bone fracture	**160**/45.767	0.35	**11.4**
within 60 days	*52/45.767*		
over 60 days	*108/45.767*		
Breakage of prosthesis	**141**/45.767	0.31	**10.0**
Global aseptic loosening	**88**/45.767	0.19	**6.3**
within 60 days	*2/45.767*		
over 60 days	*86/45.767*		
Septic loosening	**81**/45.767	0.18	**5.8**
within 60 days	*10/45.767*		
over 60 days	*71/45.767*		
Primary instability	**35**/45.767	0.08	**2.5**
Pain without loosening	**33**/45.767	0.07	**2.4**
Poly wear	**12**/45.767	0.03	**0.9**
Others	**35**/45.767	0.08	**2.5**
Unknown	**12**/45.767	0.03	**0.9**
Total	**1.404/45.767**	**3.1**	**100.0**

Percentage of causes of revision according to follow-up

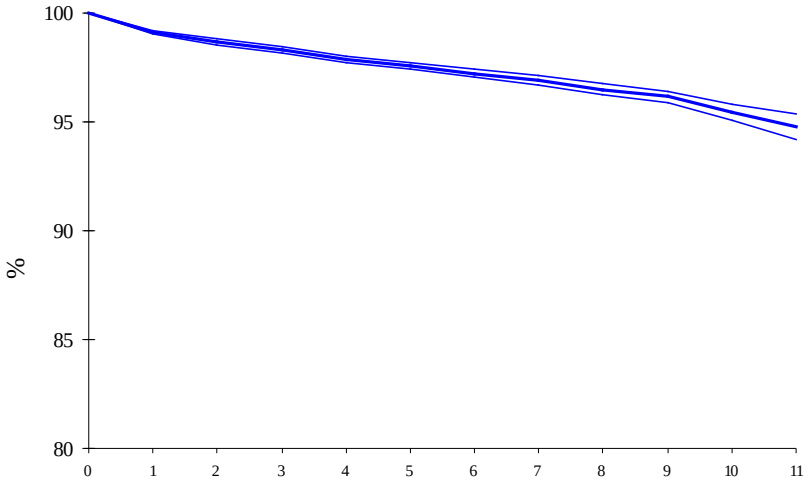
Cause of revision	0-2 Years	3-4 Years	>5 Years
Recurrent prosthesis dislocation	31.6	11.8	11.1
Stem loosening	15.7	22.1	21.6
Periprosthetic bone fracture	12.5	9.6	9.8
Cuo loosening	11.1	19.2	26.1
Breakage of prosthesis	7.6	16.2	11.5
Septic loosening	6.1	6.3	4.2
IPrimary instability	3.9	0.7	0.0
Global loosening	3.8	8.5	11.5
Other	3.3	1.8	0.7
Pain w/o loosening	2.5	3.3	1.0
Poly wear	0.6	0.4	2.1
Missing	1.3	0.0	0.3

9.5 Analysis of survival in primary total hip arthroplasty – major revisions

45.767 primary arthroprostheses are under observation. Of these, 1067 revisions were carried out to remove cup and/or stem

Number of arthroprostheses	n. of revisions	% revision
45.767	**1.068**	**2.3**

Survival curve



Results in detail
(c.i = confidence interval)

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.1	99.1	99.2
2	98.7	98.6	98.8
3	98.3	98.2	98.4
4	97.9	97.7	98.0
5	97.6	97.4	97.7
6	97.2	97.0	97.4
7	96.9	96.7	97.1
8	96.5	96.3	96.7
9	96.2	95.9	96.4
10	95.5	95.1	95.8
11	94.8	94.2	95.4

9.6 Analysis of the survivors hip of the prosthesis according to commercial type

Case-mix
To perform a comparison among the survival of several prosthesis types correctly (Tables 9.6, 9.10 and 9.12), it is necessary to introduce a parameter that takes into account the complexity of the series treated. As in the Swedish register, the calculation of a case-mix was chosen.
According to the Cox multivariate analysis, the hip prosthesis in RIPO was at greater risk of failure in patients treated for femur fracture and their sequelae or for rare diseases. The percentage of patients with these characteristics treated by primary hip arthroplasty in Emilia Romagna is 15.1%.
Series with a higher percentage should be considered as complex series.

Cemented cups and stems are in bold

Cup (stem) Manufacturer	From years	N.	% fracture and rare diseases	N. OF REVISION	% survival 5 yrs	c.i. at 95%	% survival 9 yrs	c.i. at 95%
AnCA Fit (AnCa Fit) Wright Cremascoli	2000	2871	12.4	134	96.2	95.5-96.9	94.9	94.0-95.8
FIXA (RECTA) Ala-Ortho	2004	2366	8.8	64	95.5	94.2-96.8	-	-
ABGII (ABGII) Stryker Howmedica	2000	1847	13.1	29	98.2	97.5-98.9	96.8	95.3-98.3
FIXA (APTA) Ala-Ortho	2004	1700	12.5	44	96.8	95.8-97.8	-	-
CLS (CLS) SulzerCenterpulse Zimmer	2000	1507	15.5	49	97.9	97.2-98.7	96.1	94.8-97.3
EP-FIT PLUS (SL PLUS) ENDOPLUS	2003	1480	17.4	22	97.5	96.4-98.6	-	-
Fixa TI-por (Apta) Ala-Ortho	2007	1416	13.7	12	-	-	-	-
FITMORE (CONUS) SulzerCenterpulse Zimmer	2000	943	14.2	24	96.8	95.5-98.1	96.8	95.5-98.1
BICON PLUS (SL PLUS) Smith & Nephew	2000	891	9.4	30	96.7	95.5-98.0	95.3	93.5-97.2
EXPANSION (CBC) Mathys	2000	848	30.3	25	95.5	93.6-97.5	-	-
FITMORE (CLS) SulzerCenterpulse Zimmer	2000	782	7.3	24	97.2	96.0-98.4	95.9	94.2-97.7
EP-FIT PLUS (PROXIPLUS) Smith & Nephew	2004	645	12.4	5	99.2	98.4-99.9	-	-
CLS (CONUS) SulzerCenterpulse Zimmer	2000	586	14.7	26	97.3	95.9-98.6	94.9	92.8-96.9
REFLECTION (**BASIS**) Smith & Nephew	2001	564	3.7	17	97.0	95.4-98.6	94.6	91.7-97.4
FIXA (**APTA**) Ala-Ortho	2004	559	15.7	14	97.1	95.5-98.6	-	-
TRILOGY (VERSYS FIBER) Zimmer	2000	496	2.6	16	97.1	95.6-98.6	96.2	94.1-98.2
DUOFIT PSF (**P507**) Samo	2000	492	30.9	12	98.3	97.1-99.5	97.4	95.9-98.9
CONTEMPORARY (**EXETER**) Stryker Howmedica	2000	465	19.6	11	97.6	96.1-99.1	97.1	95.4-98.9
SELEXYS TH (CBC) MATHYS	2006	430	12.8	15	72.0	45.0-99.1	-	-

RECAP RESURFACING (TAPERLOC) Biomet	2005	429	12.6	9	96.5	94.0-99.1	-	-
AnCA Fit (PROFEMUR Z) Wright Cremascoli	2002	420	10.5	24	94.7	92.6-96.9	94.2	92.0-96.5
TRIDENT (ABGII) Stryker Howmedica	2002	401	13.7	18	94.3	91.6-97.1	92.9	89.5-96.3
CFP (CFP) Link	2001	394	1.0	8	97.8	96.3-99.3	97.8	96.3-99.3
Fixa TI-por (Hydra) Ala-Ortho	2007	394	6.6	4	-	-	-	-
PINNACLE SECTOR II (CORAIL) DePuy	2002	371	7.3	6	97.4	95.0-99.8	97.4	95.0-99.8
Fixa TI-por (RECTA) Ala-Ortho	2007	353	18.7	12	-	-	-	-
MULLER (**JVC**) Wright Cremascoli	2000	326	12.6	8	98.7	97.5-100	96.4	93.0-99.7
Exceed ABT (TAPERLOC) Biomet	2006	322	10.2	4	98.1	96.3-100	-	-
STANDARD CUP (CLS) SulzerCenterpulse Zimmer	2000	322	13.0	7	98.7	97.5-100	97.6	95.8-99.6
CLS Zimmer (SL PLUS) Smith & Nephew	2001	311	11.3	4	98.0	96.0-100	98.0	96.0-100.0
MULLER (**MRL**) Wright Cremascoli	2000	305	23.0	12	96.8	94.8-98.9	95.5	93.0-98.0
MULLER (**SPECTRON**) Smith and Nephew	2000	303	38.9	12	95.9	93.6-98.3	94.7	91.3-98.0
Other *(models< 300 cases)*	2000	20.228	17.0	703	96.5	96.2-96.8	94.8	94.3-95.2
All models	**2000**	**45.767**	**15.1**	**1404**	**96.7**	**96.6-96.9**	**95.2**	**94.9-95.5**

The marked dispersion of prosthesis types and the wide variability of the combinations between acetabulum and stems enable the comparison of only some types of prosthesis.

To provide, anyway, an indication of the survival of the prosthesis types less represented in data banks, they were grouped together to make a class of prostheses of which less than 300 were implanted over 11 years.

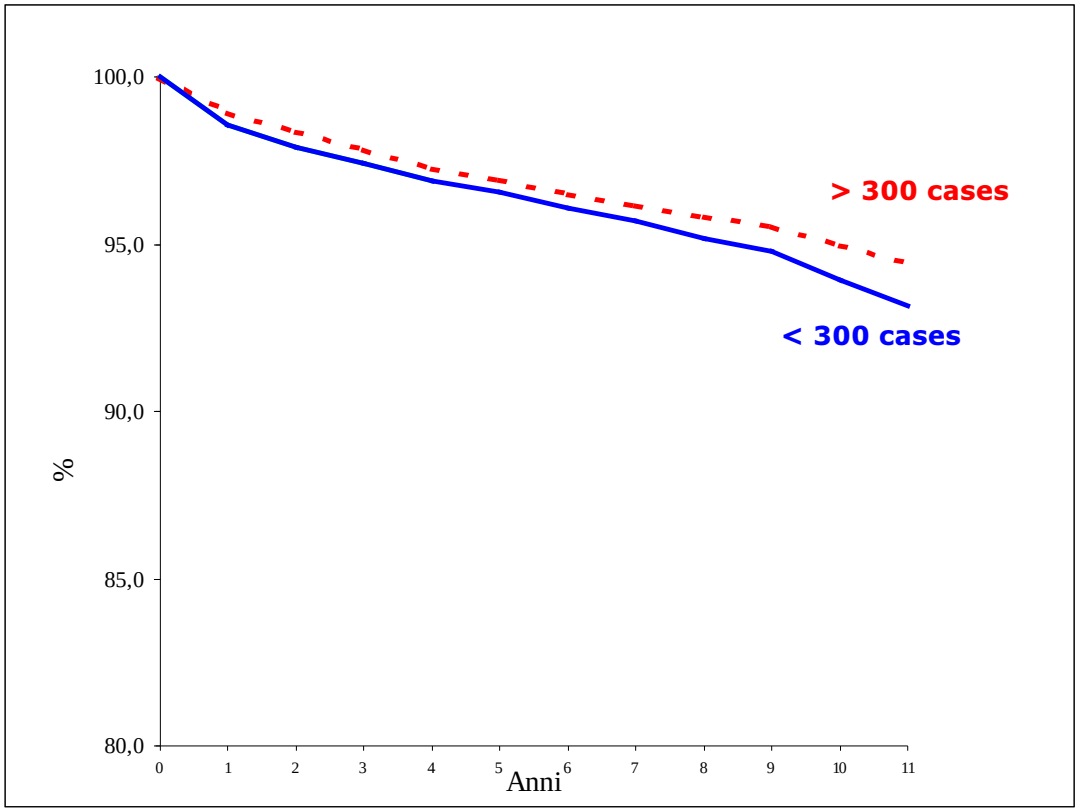
They were compared with the prosthesis types of which more than 300 were implanted (those of the previous table), also grouped into a single class.

Analysis of the survivorship of the prosthesis according to commercial type (cup + stem)

	N.	n. revisions	% revisions
Models > 300 cases	25.543	701	2.7
Models < 300 cases	20.224	703	3.5

Survival curve

Curves are significantly different (p=0.001, Wilcoxon test)

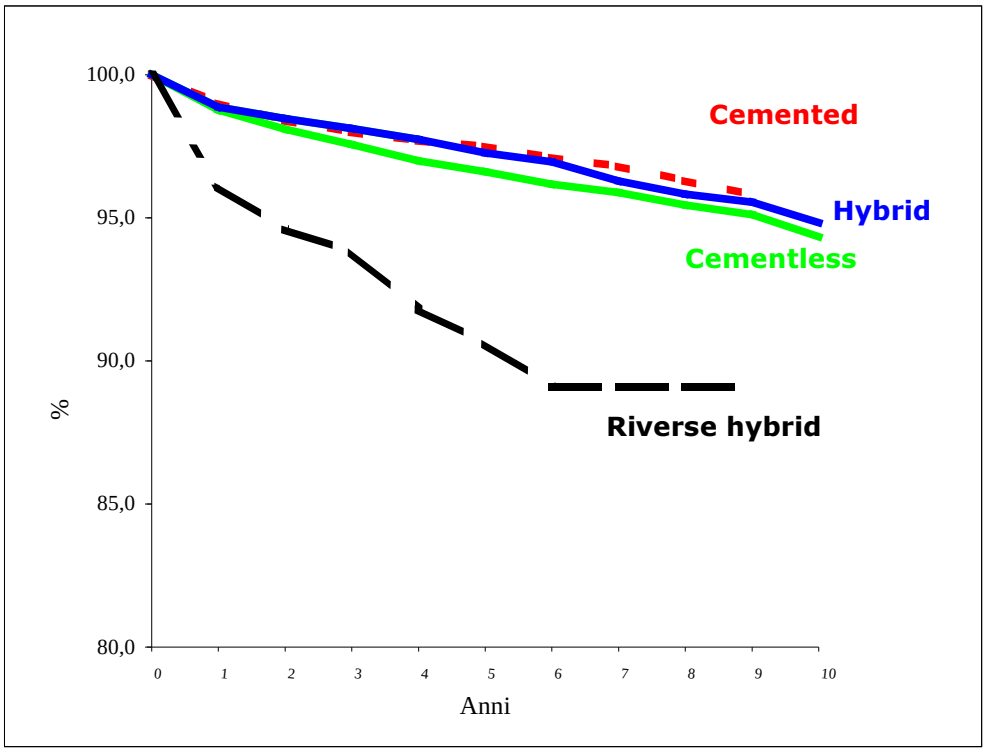


Results in detail

Models >300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.0	98.8	99.1
2	98.4	98.2	98.5
3	97.8	97.6	98.0
4	97.3	97.1	97.5
5	96.9	96.7	97.2
6	96.5	96.2	96.8
7	96.2	95.9	96.5
8	95.8	95.5	96.2
9	95.5	95.1	95.9
10	95.0	94.4	95.5
11	94.4	93.6	95.2
Models < 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	98.6	98.4	98.7
2	97.9	97.7	98.1
3	97.4	97.2	97.6
4	96.9	96.6	97.2
5	96.5	96.2	96.8
6	96.1	95.8	96.4
7	95.7	95.4	96.0
8	95.2	94.8	95.5
9	94.8	94.3	95.2
10	93.9	93.4	94.5
11	93.2	92.3	94.0

9.7 Analysis of survival in primary total hip arthroplasty according to fixation

Fixation	N.	Removals	% revision
Cementless	35.973	1.076	3.0
Hybrid (cemented stem, cementless cup)	5.471	177	3.2
Cemented	3.845	116	3.0
Reverse hybrid (cementless stem, cemented cup)	355	28	7.9



Results in detail

Cemented			
Years	**% in site**	**c.i. 95%**	
0	100.0	100.0	100.0
1	99.0	98.7	99.3
2	98.4	98.0	98.8
3	98.0	97.6	98.5
4	97.7	97.2	98.2
5	97.5	97.0	98.1
6	97.1	96.5	97.6
7	96.8	96.1	97.4
8	96.3	95.5	97.0
9	95.8	95.0	96.7
Cementless			
Years	**% in site**	**c.i. 95%**	
0	100.0	100.0	100.0
1	98.8	98.6	98.9
2	98.1	97.9	98.3
3	97.6	97.4	97.7
4	97.0	96.8	97.2
5	96.6	96.4	96.8
6	96.2	95.9	96.4
7	95.9	95.6	96.2
8	95.4	95.1	95.8
9	95.1	94.8	95.5
10	94.3	93.9	94.8
Hybrid			
Years	**% in site**	**c.i. 95%**	
0	100.0	100.0	100.0
1	98.9	98.6	99.2
2	98.5	98.1	98.8
3	98.1	97.8	98.5
4	97.7	97.3	98.2
5	97.3	96.8	97.7
6	97.0	96.4	97.5
7	96.3	95.7	96.9
8	95.8	95.2	96.5
9	95.5	94.8	96.3
10	94.8	93.9	95.7
Reverse hybrid			
Years	**% in site**	**c.i. 95%**	
0	100.0	100.0	100.0
1	96.1	94.0	98.2
2	94.6	92.1	97.1
3	93.8	91.0	96.5
4	91.8	88.5	95.1
5	90.6	87.0	94.3
6	89.1	85.0	93.3
7	89.1	85.0	93.3
8	89.1	85.0	93.3
9	89.1	85.0	93.3

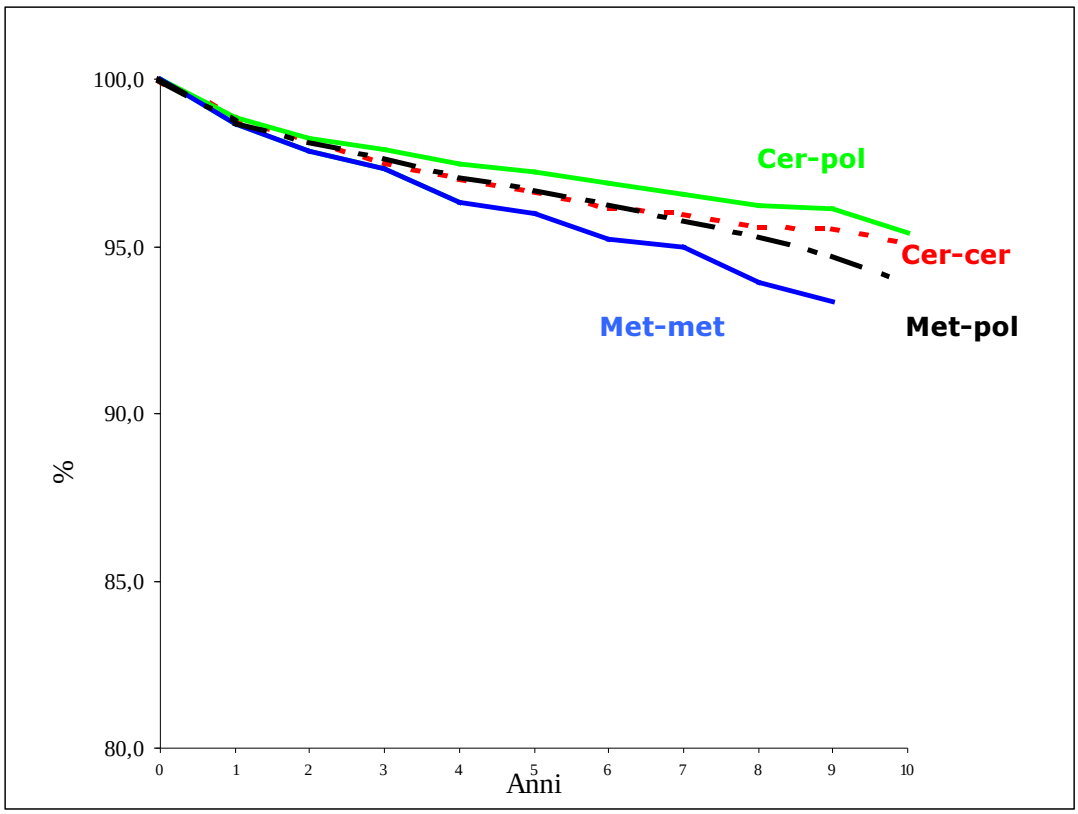
Difference is statistically significant (p=0.001, Wilcoxon test).

	Cemented		
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**31**/3.845	0.81	26.7
Recurrent prosthesis dislocation	**25**/3.845	0.65	21.6
Global aseptic loosening	**19**/3.845	0.49	16.4
Aseptic loosening of the stem	**16**/3.845	0.42	13.8
Septic loosening	**12**/3.845	0.31	10.3
Periprosthetic bone fracture	**8**/3.845	0.21	6.9
Primary instability	**4**/3.845	0.10	3.4
Breakage of prosthesis	**1**/3.845	0.03	0.9
Other	**0**/3.845	0.00	0.0
Total	**116/3.845**	**3.0**	**100.0**
	Cementless		
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**244**/35.973	0.68	22.7
Aseptic loosening of the stem	**173**/35.973	0.48	16.1
Aseptic loosening of the cup	**161**/35.973	0.45	15.0
Periprosthetic bone fracture	**138**/35.973	0.38	12.8
Breakage of prosthesis	**137**/35.973	0.38	12.7
Global aseptic loosening	**57**/35.973	0.16	5.3
Septic loosening	**55**/35.973	0.15	5.1
Pain without loosening	**32**/35.973	0.09	3.0
Primary instability	**29**/35.973	0.08	2.7
Poly wear	**9**/35.973	0.03	0.8
Other	**29**/35.973	0.08	2.7
Missing	**12**/35.973	0.03	1.1
Total	**1.076/35.973**	**3.0**	**100.0**
	Hybrid		
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the stem	**57**/5.471	1.04	32.2
Recurrent prosthesis dislocation	**55**/5.471	1.01	31.1
Aseptic loosening of the cup	**18**/5.471	0.33	10.2
Septic loosening	**14**/5.471	0.26	7.9
Global aseptic loosening	**10**/5.471	0.18	5.6
Periprosthetic bone fracture	**10**/5.471	0.18	5.6
Breakage of prosthesis	**3**/5.471	0.05	1.7
Primary instability	**2**/5.471	0.04	1.1
Poly wear	**2**/5.471	0.04	1.1
Pain without loosening	**1**/5.471	0.02	0.6
Other	**5**/5.471	0.09	2.8
Total	**177/5.471**	**3.2**	**100.0**
	Reverse hybrid		
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**11**/355	3.1	39.3
Aseptic loosening of the stem	**6**/355	1.7	21.4
Recurrent prosthesis dislocation	**5**/355	1.4	17.9
Periprosthetic bone fracture	**4**/355	1.1	14.3
Global aseptic loosening	**2**/355	0.6	7.1
Total	**28/355**	**7.9**	**100.0**

9.8 Analysis of survival in primary total hip arthroplasty according to coupling

Coupling	N.	Revisions	% revision
Metal-poly	15.180	542	3.6
Ceramic-ceramic	15.078	383	2.5
Ceramic-poly	10.747	304	2.8
Metal-metal	4.308	162	3.8

Survival curve



Difference is statistically significant (p=0.001, Wilcoxon test).
Cer-poly vs met-met and met-poly is statistically significant (p=0.002 and p=0.02, Wilcoxon test)

Detailed results

Met-poly			
Yrs	**% in site**	**c.i. al 95%**	
0	100.0	100.0	100.0
1	98.7	98.5	98.9
2	98.1	97.9	98.4
3	97.6	97.4	97.9
4	97.1	96.8	97.4
5	96.7	96.4	97.0
6	96.2	95.9	96.6
7	95.8	95.4	96.2
8	95.3	94.9	95.8
9	94.7	94.2	95.3
10	93.9	93.3	94.6

Cer-cer			
Yrs	**% in site**	**c.i. al 95%**	
0	100.0	100.0	100.0
1	98.8	98.6	99.0
2	98.2	97.9	98.4
3	97.5	97.3	97.8
4	97.0	96.7	97.4
5	96.6	96.3	97.0
6	96.2	95.8	96.6
7	96.0	95.5	96.4
8	95.6	95.1	96.1
9	95.5	95.0	96.1
10	95.1	94.4	95.8

Cer-poly			
Yrs	**% in site**	**c.i. al 95%**	
0	100.0	100.0	100.0
1	98.8	98.6	99.1
2	98.3	98.0	98.5
3	97.9	97.6	98.2
4	97.5	97.2	97.8
5	97.2	96.9	97.6
6	96.9	96.5	97.3
7	96.6	96.2	97.0
8	96.2	95.7	96.7
9	96.1	95.6	96.6
10	95.4	94.7	96.1

Met-met			
Yrs	**% in site**	**c.i. al 95%**	
0	100.0	100.0	100.0
1	98.7	98.3	99.0
2	97.8	97.4	98.3
3	97.3	96.8	97.9
4	96.3	95.7	97.0
5	96.0	95.3	96.7
6	95.2	94.4	96.0
7	95.0	94.1	95.8
8	93.9	92.8	95.0
9	93.4	92.1	94.6

Met-poly			
Cause of revision	**Rate**	**%**	**% distribution of failure causes**
Recurrent prosthesis dislocation	**144**/15.180	0.95	26.6
Aseptic loosening of the cup	**111**/15.180	0.73	20.5
Aseptic loosening of the stem	**110**/15.180	0.72	20.3
Periprosthetic bone fracture	**63**/15.180	0.42	11.6
Global aseptic loosening	**43**/15.180	0.28	7.9
Septic loosening	**25**/15.180	0.16	4.6
Pain without loosening	**14**/15.180	0.09	2.6
Primary instability	**11**/15.180	0.07	2.0
Poly wear	**8**/15.180	0.05	1.5
Breakage of prosthesis	**6**/15.180	0.04	1.1
Missing	**3**/15.180	0.02	0.6
Other	**4**/15.180	0.03	0.7
Total	**542/15.180**	**3.6**	**100.0**
Cer-cer			
Cause of revision	**Rate**	**%**	**% distribution of failure causes**
Recurrent prosthesis dislocation	**86**/15.078	0.57	22.5
Periprosthetic bone fracture	**56**/15.078	0.37	14.6
Aseptic loosening of the stem	**44**/15.078	0.29	11.5
Breakage of stem	**44**/15.078	0.29	11.5
Breakage of liner	**35**/15.078	0.23	9.1
Breakage of head	**31**/15.078	0.21	8.1
Aseptic loosening of the cup	**17**/15.078	0.11	4.4
Septic loosening	**17**/15.078	0.11	4.4
Primary instability	**11**/15.078	0.07	2.9
Pain without loosening	**11**/15.078	0.07	2.9
Global aseptic loosening	**8**/15.078	0.05	2.1
Others	**20**/15.078	0.13	5.2
Unknown	**3**/15.078	0.02	0.8
Total	**383/15.078**	**2.5**	**100.0**
Cer-pol			
Cause of revision	**Rate**	**%**	**% distribution of failure causes**
Recurrent prosthesis dislocation	**79**/10.747	0.74	26.0
Aseptic loosening of the stem	**70**/10.747	0.65	23.0
Aseptic loosening of the cup	**40**/10.747	0.37	13.2
Periprosthetic bone fracture	**26**/10.747	0.24	8.6
Septic loosening	**23**/10.747	0.21	7.6
Global aseptic loosening	**21**/10.747	0.20	6.9
Primary instability	**8**/10.747	0.07	2.6
Breakage of stem	**7**/10.747	0.07	2.3
Pain without loosening	**7**/10.747	0.07	2.3
Breakage of head	**4**/10.747	0.04	1.3
Poly wear	**4**/10.747	0.04	1.3
Breakage of cup	**3**/10.747	0.03	1.0
Unknown	**6**/10.747	0.06	2.0
Other	**6**/10.747	0.06	2.0
Total	**304/10.747**	**2.8**	**100.0**

Met-met			
Cause of revision	**Rate**	**%**	**% distribution of failure causes**
Aseptic loosening of the cup	**51**/4.308	1.18	31.5
Aseptic loosening of the stem	**24**/4.308	0.56	14.8
Recurrent prosthesis dislocation	**19**/4.308	0.44	11.7
Septic loosening	**16**/4.308	0.37	9.9
Global aseptic loosening	**16**/4.308	0.37	9.9
Periprosthetic bone fracture	**14**/4.308	0.32	8.6
Breakage of cup	**6**/4.308	0.14	3.7
Primary instability	**5**/4.308	0.12	3.1
Breakage of stem	**5**/4.308	0.12	3.1
Pain without loosening	**1**/4.308	0.02	0.6
Other	**5**/4.308	0.12	3.1
Total	**162/4.308**	**3.8**	**100.0**

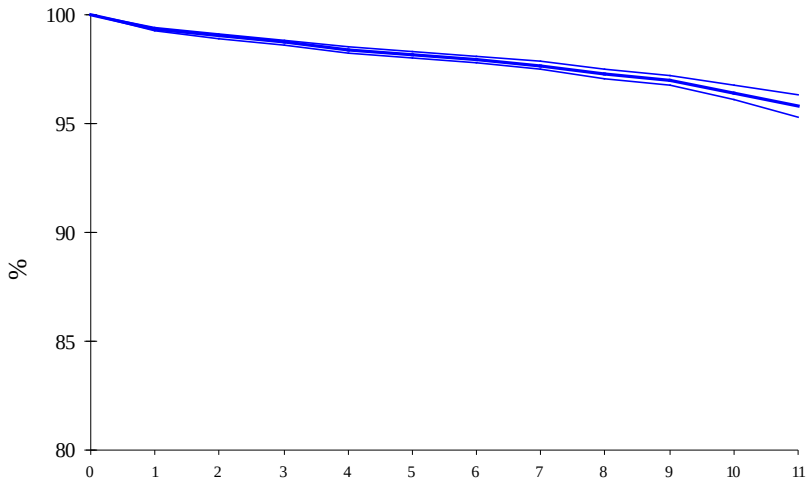
9.9 Survival analysis of acetabular component

Analysis was performed on primary cups. Cup 'survives' until it is completely revised or is revised the liner.

Number of arthroprostheses	Removals of the cup and/or liner	% revision
45.767	**818**	**1.8**

*214 of them liner only

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.4	99.3	99.4
2	99.0	98.9	99.1
3	98.7	98.6	98.8
4	98.4	98.2	98.5
5	98.2	98.0	98.3
6	97.9	97.8	98.1
7	97.7	97.5	97.8
8	97.3	97.1	97.5
9	97.0	96.7	97.2
10	96.4	96.1	96.7
11	95.8	95.3	96.3

9.10 Analysis of the survivorship of the acetabular cup according to commercial type

Cemented cups in bold

Cup	From year	N.	% fracture and rare path	n. revisions	% survival 5 yrs	c.i at 95%	% survival 9 yrs	c.i at 95%
FIXA Ala-Ortho	2004	5.143	11.7	45	98.7	98.3-99.1	-	-
AnCA FIT Wright Cremascoli	2000	4.937	12.5	100	98.5	98.2-98.9	97.7	97.2-98.2
CLS Sulzer, Centerpulse,Zimmer	2000	2.999	16.9	73	98.6	98.1-99.0	96.8	96.0-97.6
FIXATi por – Ala-Ortho	2007	2.464	13.8	17	-	-	-	-
EP-FIT Plus – Smith & Nephew	2003	2.416	16.2	14	99.2	98.8-99.7	-	-
ABGII Stryker Howmedica	2000	2.158	12.2	25	98.8	98.2-99.3	97.9	97.0-98.9
FITMORE Sulzer	2000	2.015	12.2	33	98.2	97.6-98.9	97.7	96.8-98.6
REFLECTION Smith & Nephew	2000	1.323	5.2	23	98.8	98.1-99.4	96.7	95.2-98.2
BICON PLUS Smith & Nephew	2000	1.143	9.4	28	97.8	96.9-98.7	95.7	93.4-98.1
TRIDENT Stryker Howmedica	2002	1.123	11.0	16	98.2	97.3-99.1	98.2	97.3-99.1
EXPANSION Mathys	2003	1.055	29.7	23	96.8	95.3-98.3	86.4	73.3-99.4
DUOFIT PSF Samo	2000	985	28.1	27	97.6	96.6-98.6	96.9	95.7-98.2
DELTA PF – Lima	2003	931	10.2	10	98.4	97.4-99.4	-	-
MULLER Wright Cremascoli	2000	884	16.6	18	98.9	98.2-99.6	97.7	96.4-98.9
STANDARD CUP PROTEK Sulzer	2000	867	14.5	21	98.5	97.6-99.3	97.3	96.2-98.5
TRILOGY Zimmer	2000	841	6.2	16	98.6	97.8-99.4	97.2	95.7-98.8
CONTEMPORARY Stryker Howmedica	2000	692	16.5	16	97.6	96.4-98.9	97.1	95.4-98.8
Pinnacle Sector II – DePuy	2002	678	6.3	7	98.2	96.7-99.7	98.2	96.7-99.7
ZCA Zimmer	2000	602	31.6	6	99.3	98.5-100	98.2	96.6-99.9
RECAP RESURFACING - Biomet	2005	565	13.6	9	97.3	95.3-99.2	-	-
SELEXYS TH - Mathys	2006	522	12.5	11	86.3	73.1-99.5	-	-
EXCEED ABT Biomet	2006	506	11.1	2	99.5	98.8-100	-	-
HILOCK LINE Symbios	2000	485	13.2	24	94.6	92.3-96.9	92.5	89.1-95.9
CFP Link	2000	441	3.4	9	98.0	96.6-99.4	96.9	94.5-99.4
MULLER Smith & Nephew	2000	398	30.7	12	97.3	95.6-99.0	95.9	93.4-98.5
PE (Muller Protek) Sulzer	2000	395	43.5	14	97.5	95.9-99.1	95.5	93.2-97.9
VERSAFITCUP CC Medacta	2005	381	10.8	15	94.1	91.1-97.1	-	-
MULLER Samo	2000	356	39.9	15	95.7	93.4-98.0	94.4	91.6-97.3
Other (with less than 300 cases each)	2000	8.462	17.8	189	97.8	97.4-98.1	96.4	95.8-97.0
All Models	2000	45.767	15.1	818	98.2	98.0-98.3	97.0	96.7-97.2

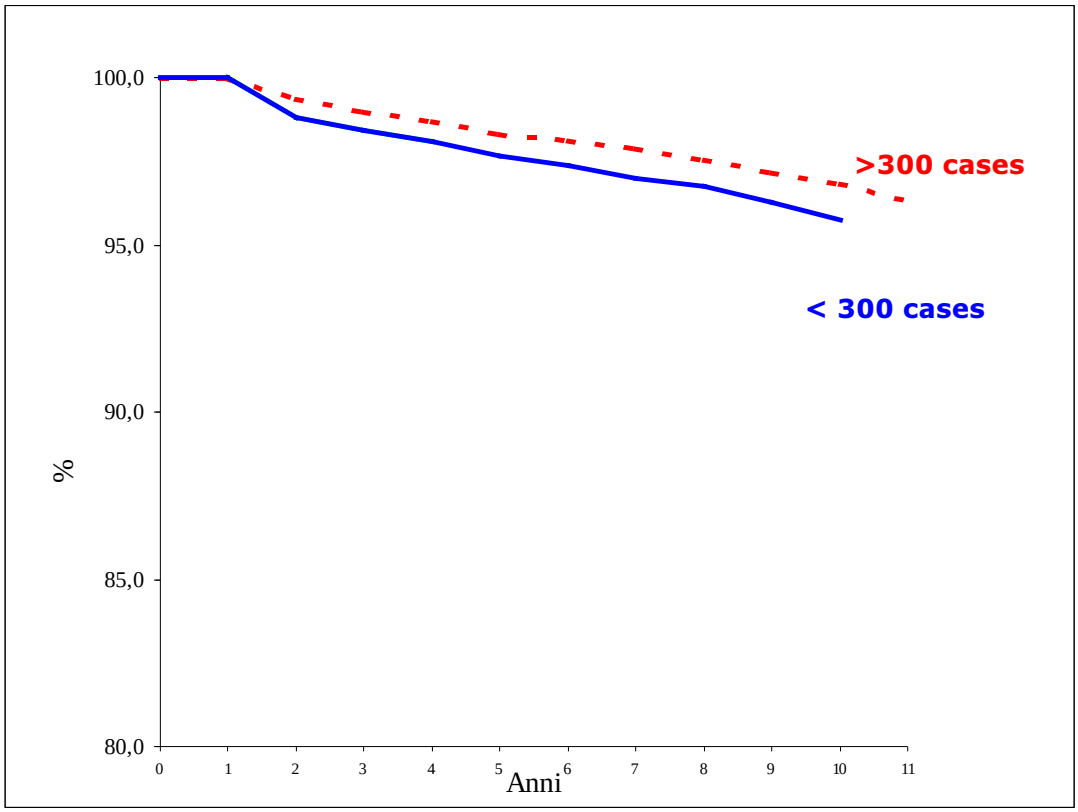
End-point is revision of liner or liner and cup.

The marked dispersion of prosthesis types enables a comparison of only some types of acetabulum.
To provide, anyway, an indication of the survival of the prosthesis types less represented in data banks, they were grouped together to make a class of prostheses of which less than 300 were implanted over 11 years.
They were compared with the prosthesis types of which more than 300 were implanted (those of the previous table), also grouped into a single class.

Analysis of the survival according to commercial type (Cup)

	N.	n. revisions	% revision
Models >300 cases	37.305	629	1.7
Models <300 cases	8.462	189	2.2

Survival curve



Curves are significantly different (p=0.001, Wilcoxon test).

Results in detail

Models <300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.0	98.8	99.2
2	98.7	98.4	98.9
3	98.4	98.1	98.7
4	98.0	97.6	98.3
5	97.8	97.4	98.1
6	97.4	97.0	97.8
7	97.2	96.8	97.7
8	96.8	96.2	97.3
9	96.4	95.8	97.0
10	95.4	94.6	96.3
Models > 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.5	99.4	99.5
2	99.1	99.0	99.2
3	98.8	98.7	98.9
4	98.5	98.3	98.6
5	98.3	98.1	98.4
6	98.1	97.9	98.2
7	97.8	97.6	98.0
8	97.4	97.2	97.7
9	97.1	96.9	97.4
10	96.7	96.3	97.0
11	96.1	95.6	96.7

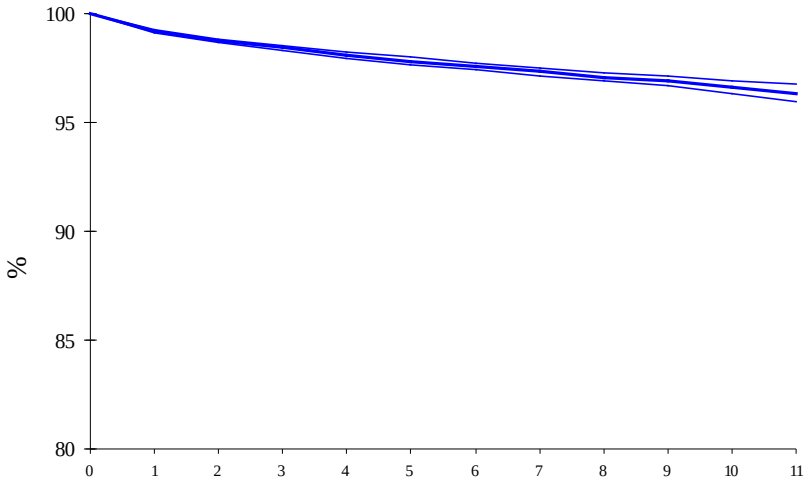
9.11 Survival analysis of stem

Analysis was performed considering only the femoral component. The stem is considered "surviving" up to when it is fully revised or only its proximal component is replaced. The possible revision of a modular neck was considered as the failure of the stem

Number of arthroprostheses	Removals of the stem	% revision
45.767	**908**	**2.0**

*192 revision of modular neck/proximal component only

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.2	99.1	99.3
2	98.8	98.6	98.9
3	98.4	98.3	98.6
4	98.1	98.0	98.2
5	97.8	97.7	98.0
6	97.6	97.4	97.7
7	97.3	97.1	97.5
8	97.1	96.9	97.3
9	96.9	96.7	97.2
10	96.6	96.4	96.9
11	96.3	95.9	96.7

9.12 Analysis of the survivorship of the femoral component according to commercial type

Cemented stem in bold.

Revision of modular neck is considered stem revision.

Stem	From year	N.	% fracture or rare path	n. revision	% survival 5yrs	c.i at 95%	% survival 9 yrs	c.i. at 95%
CLS Sulzer Centerpulse Zimmer	2000	3.165	12.3	62	98.4	97.9-98.9	97.5	96.8-98.2
APTA Ala-Ortho	2004	3.164	13.3	55	97.1	96.2-98.0	-	-
AnCA FIT Wright Cremascoli	2000	3.148	12.8	123	96.5	95.8-97.1	95.7	94.9-96.5
SL PLUS Smith & Nephew	2000	3.148	15.2	44	98.1	97.5-98.7	97.9	97.3-98.6
RECTA Ala-Ortho	2004	2.772	10.7	72	95.6	94.4-96.8	-	-
CONUS Sulzer Centerpulse Zimmer	2000	2.768	11.8	38	98.6	98.1-99.0	98.3	97.7-98.9
ABGII Stryker Howmedic	2000	2.519	14.3	39	98.1	97.5-98.7	97.3	96.2-98.4
CBC Mathys	2000	1.456	22.9	26	96.5	94.6-98.3	96.5	94.6-98.3
TAPERLOC Biomet	2002	1.432	9.4	20	97.9	96.9-98.9	97.9	96.9-98.9
EXETERStryker Howme.	2000	1.098	13.3	13	99.1	98.4-99.7	98.1	97.0-99.2
APTA Cem Ala-Ortho	2004	870	18.7	21	97.1	95.9-98.4	-	-
CFP Link	2000	845	3.4	5	99.3	98.7-99.9	99.3	98.7-99.9
VERSYS FIBER METAL TAPER Zimmer	2000	810	3.8	12	98.4	97.6-99.3	98.4	97.6-99.3
JVC Wright Cremascoli	2000	694	10.2	17	98.2	97.2-99.2	97.5	96.3-98.7
PROXIPLUS ENDOPLANT	2005	677	12.7	5	99.2	98.5-99.9	-	-
SPECTRON Smith & Nephew	2000	670	36.1	21	98.4	97.4-99.5	95.5	93.4-97.6
BASIS Smith & Nephew	2001	668	3.7	10	98.7	97.7-99.8	96.9	94.8-99.0
CORAIL De Puy	2000	617	9.1	7	98.5	97.4-99.7	98.5	97.4-99.7
P507 Samo	2000	586	28.7	8	99.2	98.5-100	98.4	97.2-99.6
Hydra Ala-Ortho	2007	565	11.0	7	-	-	-	-
PROFEMUR Z Wright Cremascoli	2002	496	10.5	17	96.6	95.0-98.3	96.4	94.7-98.1
Modulus Hip System Lima	2001	452	9.1	6	98.5	97.3-99.7	-	-
MRL Wright Cremascoli	2000	452	23.0	11	98.1	96.7-99.4	97.1	95.3-98.8
ABG riv -Stryker Howme.	2000	448	6.7	7	99.3	98.5-100	98.5	97.3-99.7
SYNERGY Smith & Nephew	2000	332	4.8	3	99.7	99.1-100	98.2	96.0-100
Alata acuta S Ala-Ortho	2005	324	10.8	9	96.2	93.6-98.8	-	-
VERSYS CEMENTED Zimmer	2000	319	20.1	4	99.0	97.9-100	98.5	97.1-100
AD Samo	2000	307	38.8	11	96.5	94.2-98.7	95.1	92.1-98.0
C Stem De Puy	2002	300	4.7	1	99.6	98.9-100	99.6	98.6-100
Others (with less than 300 cases each)	2000	10.665	20.5	234	97.8	97.4-98.1	96.6	96.1-97.1
All models	2000	45.767	15.1	908	97.8	97.7-98.0	96.9	96.7-97.2

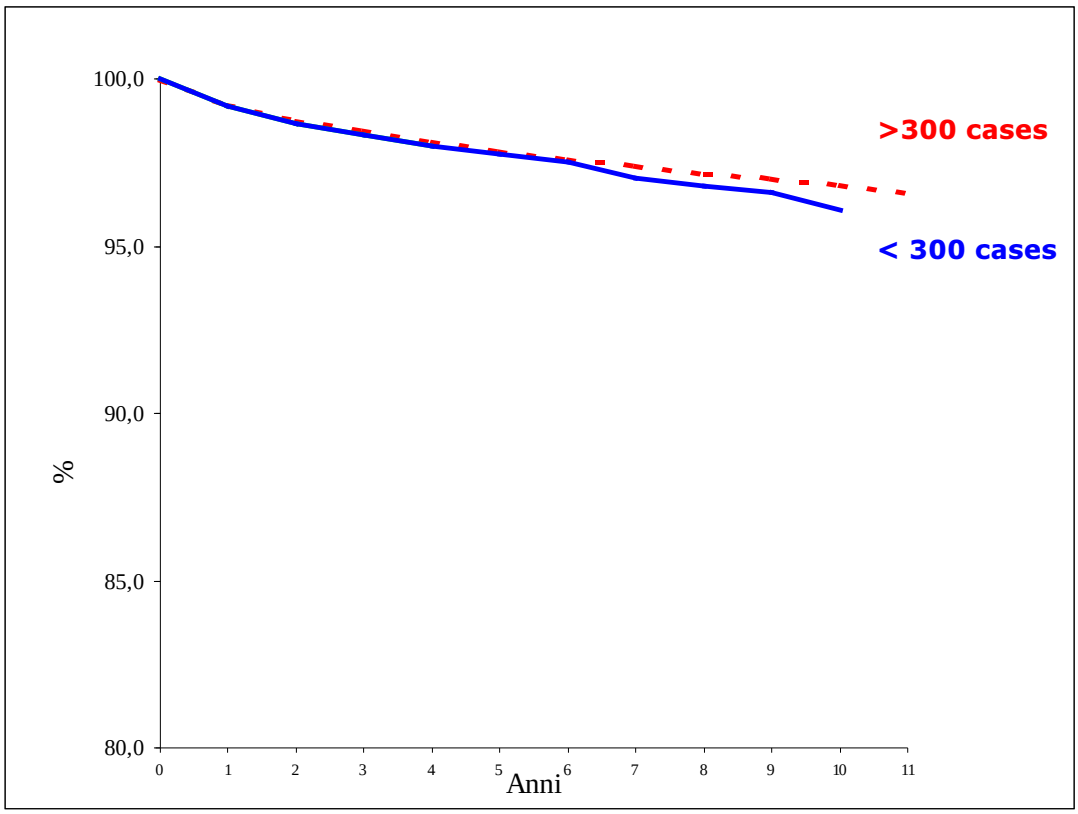
The marked dispersion of prosthesis types enables a comparison of only some types of stem.

To provide, anyway, an indication of the survival of the prosthesis types less represented in data banks, they were grouped together to make a class of prostheses of which less than 300 were implanted over 11 years.
They were compared with the prosthesis types of which more than 300 were implanted (those of the previous table), also grouped into a single class.

Analysis of the survival according to commercial type (stem)

	N.	Removals	% revision
Models >300 cases	35.102	674	1.9
Models <300 cases	10.665	234	2.2

Survival curve



Curves are not significantly different (p=0.281, Wilcoxon test)

Results in detail

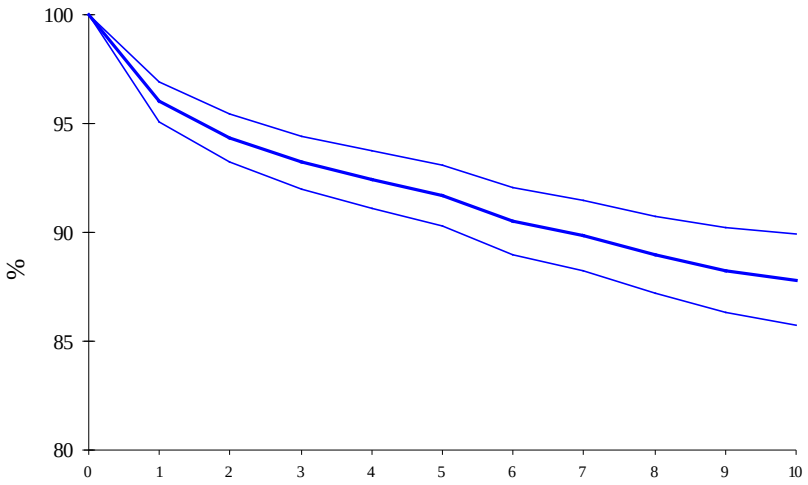
Models < 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.2	99.0	99.4
2	98.7	98.4	98.9
3	98.3	98.1	98.6
4	98.0	97.7	98.3
5	97.8	97.4	98.1
6	97.5	97.1	97.8
7	97.0	96.6	97.5
8	96.8	96.3	97.2
9	96.6	96.1	97.1
10	96.1	95.4	96.7
Models > 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.2	99.1	99.3
2	98.8	98.7	98.9
3	98.5	98.3	98.6
4	98.1	98.0	98.3
5	97.8	97.7	98.0
6	97.6	97.4	97.8
7	97.4	97.2	97.6
8	97.2	97.0	97.4
9	97.0	96.8	97.3
10	96.8	96.5	97.1
11	96.6	96.2	97.0

9.13 Survival analysis of total revision

First total revision implants are considered 'surviving' until it is necessary to revise even one single component (also the liner or the modular neck only).
In the present analysis the survival of the total revision operations was calculated. These operations were considered as "surviving" up to the moment when it was not necessary to perform a second revision of any component (even just a bearing or modular neck).

Number of arthroprostheses	Second revision	% revision
1.843	**156**	**8.5**

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	96.0	95.1	96.9
2	94.3	93.2	95.4
3	93.2	92.0	94.4
4	92.4	91.1	93.7
5	91.7	90.3	93.1
6	90.5	89.0	92.0
7	89.8	88.2	91.5
8	89.0	87.2	90.8
9	88.2	86.3	90.2
10	87.8	85.7	89.9

The following table shows the cause of second revision in total revisions according to **cause of revision**;

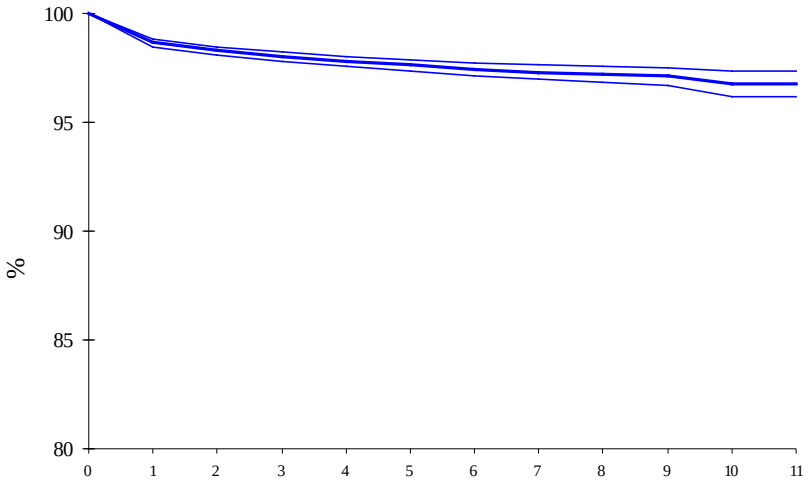
Cause of revision	Rate	%	% distribution of failure causes
Recurrent dislocation	38/1.843	2.1	24.4
Aseptic loosening of the stem	31/1.843	1.7	19.9
Aseptic loosening of the cup	28/1.843	1.5	17.9
Septic loosening	21/1.843	1.1	13.5
Total aseptic loosening	17/1.843	0.9	10.9
Bone fracture	11/1.843	0.6	7.1
Prosthesis breakage	4/1.843	0.2	2.6
Pain without loosening	2/1.843	0.1	1.3
Primary instability	2/1.843	0.1	1.3
Unknown	2/1.843	0.1	1.3
Total	**156/1.843**	**8.5**	**100.0**

9.14 Survival analysis of hemiarthroplasty

Survival of hemiarthroplasty was calculated considering revision of the head as a failure. Also revision of an hemiarthroplasty to total hip prosthesis is considered a failure.

N. of hemiarthroplasty	Removal	% of revision
23.425	**392**	**1.7**

Survival curve



Results in detail

Years	c.i. at 95%	% in site	
0	100.0	100.0	100.0
1	98.7	98.5	98.8
2	98.3	98.1	98.5
3	98.0	97.8	98.2
4	97.8	97.6	98.0
5	97.6	97.4	97.9
6	97.4	97.2	97.7
7	97.3	97.0	97.6
8	97.2	96.9	97.5
9	97.1	96.7	97.5
10	96.8	96.2	97.4
11	96.8	96.2	97.4

The following table shows the rate of revision in hemiarthroplasty according to **cause of revision; percentage distribution of causes for revision is also reported.**

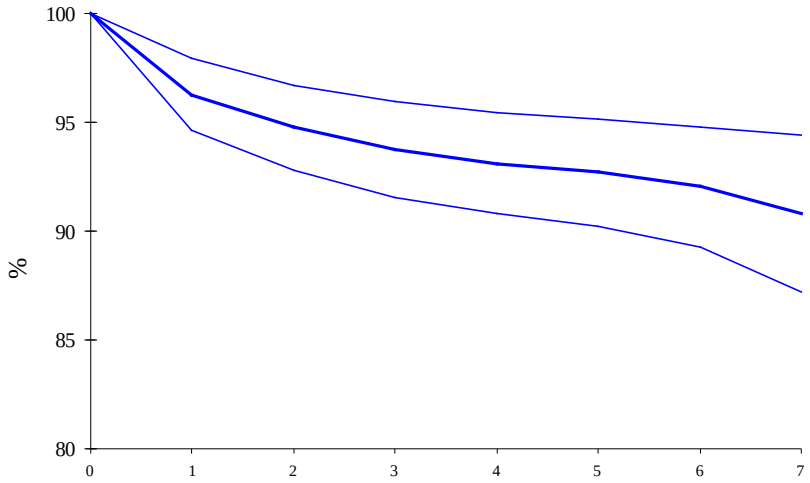
Cause of revision	Rate	%	% distribution of failure causes
Dislocation	**186**/23.425	0.8	47.5
Cotyloiditis	**68**/23.425	0.3	17.3
Aseptic loosening	**66**/23.425	0.3	16.8
Septic loosening	**30**/23.425	0.1	7.7
Bone fracture	**29**/23.425	0.1	7.4
Unknown	**2**/23.425	0.008	0.5
Other	**11**/23.425	0.05	2.8
Total	**392/23.425**	**1.7**	**100.0**

9.15 Survival analysis of resurfacing

region are considered. Due to this, number of observations is strongly reduced compared to last year report.
Maximum follow-up is only 7 years. This should be borne in mind when comparing the curves so far described, where the maximum follow-up is 11 years.

Resurfacing	n. revisions	% of revisions
534	**35**	**6.5**

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	96.3	94.6	97.9
2	94.7	92.8	96.7
3	93.7	91.6	95.9
4	93.1	90.8	95.4
5	92.7	90.2	95.2
6	92.0	89.3	94.8
7	90.8	87.2	94.4

Type of prosthesis	N.	N.of failures	%
BHR - Midland Medical Technologies	273	9	3.3
ADEPT - Finsbury	65	2	3.1
Asr - DePuy	62	8	12.9
Mrs - Lima	41	8	19.5
BMHR SMITH AND NEPHEW	31	1	3.2
MITCH TRH FINSBURY	20	2	10.0
RECAP - Biomet	11	1	9.1
ROMAX MEDACTA	10	0	0.0
Conserve Plus - Wright	9	2	22.2
ICON - International Orthopaedics	9	1	11.1
Durom Hip Resurfacing - Zimmer	2	0	0.0
Unknown	1	1	100.0
Total	**534**	**35**	**6.5**

The following table shows the rate of revision in resurfacing according to **cause of revision**

Cause of revision	Rate	%	Distribution of causes
Aseptic loosening	14/534	2.6	40.0
Periprosthetic bone fracture	13/534	2.4	37.1
Metal sensitization	3/534	0.6	8.6
Prosthesis breakage	2/534	0.4	5.7
Head necrosis	1/534	0.2	2.9
Pain without loosening	1/534	0.2	2.9
Septic loosening	1/534	0.2	2.9
Total	**35/534**	**6.5**	**100.0**

PART TWO: KNEE PROSTHESIS

July 2000 – December 2010

10. RIPO capture

10.1 Percentage of capture

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), according to Agency was **98.5**% for year 2010. Data are referred to primary knee prosthesis (8154), revision (8155;80;81;82;83;84) and prosthesis removal (8006).

10.2 Ratio public/private treatment

Percentage of primary arthroprostheses, hemiarthroplasties and revisions of the knee performed in public hospitals

% of operations performed in public hospitals (AUSL, AOSP, IRCCS)		
Year of operation	**Primary**	**Revision**
2000	57.0	75.0
2001	59.0	71.0
2002	53.0	70.0
2003	49.0	68.0
2004	47.1	58.3
2005	45.3	60.2
2006	42.9	54.3
2007	42.3	49.9
2008	40.6	55.0
2009	37.7	49.8
2010	37.3	50.9

From database SDO

Percentage of primary total knee arthroprostheses and revision performed in public and private hospitals, in year 2010

Type of operation	**Public**	**Private**
	%	**%**
Primary bicompartmental	57.1	69.8
Primary tricompartmental	20.3	11.2
Primary unicompartmental	11.7	11.1
Revision	7.5	5.7
Prosthesis removal	2.4	0.9
Implant of patella	1.0	1.3
Total	**100.0**	**100.0**

11. Type of operation

Bicompartmental implant has only femoral and tibial component, whilst tricompartmental one has patella too.
Implant of patella occurs when a bicompartmental knee prosthesis is transformed into tricompartmental with a second surgery. This is not considered a failure of primary bi-compartimental

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2010, according to **type**

Type of operation	Number	Percentage
Primary bicompartmental	34.425	67.0
Primary unicompartmental	6.688	13.0
Primary tricompartmental	5.611	10.9
Revision	3.008	5.9
Prosthesis removal	641	1.2
Implant of patella	358	0.7
Other prostheses*	199	0.4
Other operations°	474	0.9
Total	**51.404**	**100.0**

** 48 Hemicap – Arthrosurface, 29 Hemicap patello_femoral – Arthrosurface, 37 Avon-Patello-Femoral Joint Stryker, 47 altre protesi femoro-rotulee, 38 Unicompartimental Plus + rotula*
° 131 spacer exchange, 64 stiff knee loosenings, 48 debridments, 5 dislocation reductions

Percentage of different prostheses in the years

Years of operation	% unicompartim	% bicompartim	% tricompartim
2001	10.2	81.3	8.5
2002	12.7	80.1	7.2
2003	12.8	78.5	8.7
2004	12.9	75.7	11.3
2005	12.4	75.6	12.0
2006	10.9	70.0	19.2
2007	11.5	69.3	19.2
2008	11.5	72.1	16.4
2009	12.9	72.3	14.7
2010	12.4	71.5	16.1

12. Descriptive statistics of patients with knee prosthesis

12.1 Age

Number of knee operations carried out on patients with admission date between 1st July2000 and 31st December 2010, according to **type of operation** and **age group** of patients at the time of surgery.

Type of operation	<40		40-49		50-59		60-69		70-79		≥80		Total
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	
Bi-tricomp	139	0.3	479	1.2	2.797	6.8	12.317	30.0	20.763	50.5	4.616	11.2	41.111
Unicomp	11	0.2	147	2.6	998	17.8	2.368	42.2	1.759	31.4	326	5.8	5.609
Revision	15	0.5	73	2.4	279	9.3	896	29.8	1.384	46.0	362	12.0	3.008
Prosthesis. removal	8	1.2	19	3.0	76	11.9	210	32.8	267	41.7	61	9.5	641
Patella only	2	0.6	11	3.1	29	8.1	111	31.0	172	48.0	33	9.2	358
Total*	**175**	**0.3**	**729**	**1.4**	**4.179**	**8.2**	**15.902**	**31.3**	**24.345**	**48.0**	**5.398**	**10.6**	**50.727**

* 4 missing cases (0.008%)

Mean age at surgery, according to type of operation - years 2000-2010

Type of operation	Mean age	Range
Primary bi/tricompartmental	70.8	13–95
Primary unicompartmental	66.4	32-91
Revision	69.9	26-92
Total	**70.3**	**13–95**

Mean age at surgery, according to type of operation - years **2001-2010**

Type of operation	Year 2001		Year 2010	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental	71.2	23-92	70.5	20-95
Primary unicompartmental*	68.9	45-87	65.6	33-89
Revision ^	71.7	26-87	69.8	37-92

*statistically different (t-test, $p<0.001$)
^ statistically different (t-test, $p<0.05$)

Mean age at surgery, according to type of operation.-years 2000-2010 according to **private or public hospital**

Type of operation	Public		Private	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental*	71.2	13-92	70.6	20-95
Primary unicompartmental^	67.4	32-89	65.7	33-91

* mean age for bicompartmental in public and private hospital is significantly different (t-test, p<0.001)
^ mean age for unicompartmental in public and private hospital is significantly different (t-test, p<0.001)

12.2 Gender

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2010, according to **type of operation** and **gender** of patients at the time of surgery.

Type of operation	Males		Females		Totale
	N.	%	N.	%	N.
Bi/tricompartmental	11.089	27.0	30.024	73.0	41.113
Unicompartmental	1.777	31.7	3.834	68.3	5.611
Revision	764	25.4	2245	74.6	3.008
Prosthesis removal	233	36.3	408	63.7	641
Patella only	85	23.7	273	76.3	358
Other	234	34.8	439	65.2	673
Total	**14.182**	**27.6**	**37.223**	**72.4**	**51.404**

12.3 Side of surgery

There is a prevalence of operations performed on the right side (54.9%) in comparison with the left side (45.1%). The percentage was calculated on patients with only one knee prosthesis affected by primary arthritis.

Percentage

Side	Males	Females
Right	51.0	56.4
Left	49.0	43.6

Difference is statistically significant (Chi – squared p<0.001).

12.4 Bilateral arthroplasty

In the period of registry observation (11 years) 6.490 patients underwent bilateral operations.
5.711 (88.0%) chose to undergo the second operation at the same hospital from where the first one was performed.
246 (3.8%) chose to undergo the second operation at a different hospital from where the first one was performed to follow the surgeon.

533 (8.2%) chose to undergo the second operation at a different hospital from where the first one was performed.
In bilateral operations, it was observed that the first knee to be treated was the right one in 53.9% of cases; beside this 4.3% of bilateral patients underwent also to hip prosthesis

12.5 Diseases treated with unicompartmental knee prosthesis

Number of primary unicompartmental knee prosthesis operations carried out on patients with admission date between 1st July 2000 and 31st December 2010, according to diagnosis.

Diagnosis in unicomp. knee prosthesis	Number	Percentage
Primary arthritis	4.811	86.0
Necrosis of the condyle	310	5.5
Deformity	271	4.8
Post-traumatic arthritis	67	1.2
Post-traumatic necrosis	54	1.0
Idiopathic necrosis	31	0.6
Sequelae of fracture	19	0.3
Rheumatic arthritis	13	0.2
Sequelae of osteotomy	9	0.2
Others	9	0.2
Total *	**5.594**	**100.0**

* 17 missing cases (0.3%)

12.6 Diseases treated with bi-tricompartmental knee prosthesis

Number of primary bi-tricompartmental knee prosthesis operations carried out on patients with admission date between 1st July 2000 and 31st December 2010, according to **diagnosis**.

Diagnosis in bi/tricompartmental knee prosth.	Number	Percentage
Primary arthritis	35.546	86.8
Deformity	2.663	6.5
Post-traumatic arthritis	715	1.7
Rheumatic arthritis	703	1.7
Sequelae of fracture	534	1.3
Sequelae of osteotomy	269	0.7
Necrosis of the condyle	234	0.6
Post-traumatic necrosis	64	0.2
Sequelae of septic arthritis	51	0.1
Idiopathic necrosis	34	0.1
Sequelae of poliomyelitis	33	0.1
Tumor	10	0.02
Other	117	0.3
Total*	**40.973**	**100.0**

* 140 missing data, equal to 0.3% of primary arthroprostheses

12.7 Cause di reimpianto ed espianto

Number of revision operations carried out on patients admitted between 1st July 2000 and 31st December 2010, according to **diagnosis**.
In the Table all revisions performed in the Region, without taking care of site and date of primary implant are reported.

Diagnosis in revision	Number	Percentage
Total aseptic loosening	1.260	42.3
Prosthesis removal	526	17.7
Pain without loosening	244	8.2
Aseptic loosening of tibial component	229	7.7
Insert wear	177	5.9
Septic loosening	111	3.7
Aseptic loosening of femoral component	100	3.4
Prosthesis dislocation	59	2.0
Instability	50	1.7
Stiffness	40	1.3
Bone fracture	39	1.3
Breakage of prosthesis	25	0.8
Other	116	3.9
Total*	**2.976**	**100.0**

***** 32 missing data, (1.1%)

Number of prosthesis removal carried out on patients admitted between 1st July 2000 and 31st December 2010, according to **diagnosis**.
In the Table all removals performed in the Region, without taking care of site and date of primary implant are reported.

Diagnosis in removal	Number	Percentage
Septic loosening	578	91.1
Total aseptic loosening	34	5.4
Aseptic loosening of tibial	5	0.8
Bone fracture	4	0.6
Dislocation	3	0.5
Pain	3	0.5
Other	7	1.1
Total*	**634**	**100.0**

* 7 missing data,(1.1%)

13. Types of knee prosthesis

13.1 Unicompartmental prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2010, primary surgery. In primary unicompartmental

All poly tibial components in bold

TYPE OF PROSTHESIS	N.	%
OXFORD UNICOMPARTMENTAL PHASE 3 - Biomet Merck	1.190	21.2
GENESIS UNI - Smith & Nephew	769	13.7
ZIMMER UNI - Zimmer	467	8.3
EFDIOS - Citieffe	463	8.3
PRESERVATION UNI - ALL POLY - DePuy	373	6.6
MITUS - ENDO-MODEL UNI - ALL POLY - Link	340	6.1
ALLEGRETTO UNI - Protek-Sulzer	268	4.8
UC-PLUS SOLUTION - Smith & Nephew	243	4.3
MILLER GALANTE UNI - Zimmer	178	3.2
OPTETRAK - UNI - ALL POLY - Exactech	170	3.0
GENESIS UNI - ALL POLY - Smith & Nephew	167	3.0
MAIOR – Finceramica	154	2.7
HLS - UNI EVOLUTION - ALL POLY – Tornier	153	2.7
GKS - ONE - Permedica	141	2.5
UC-PLUS SOLUTION - ALL POLY – Smith & Nephew	109	1.9
BALANSYS - UNI - Mathys	86	1.5
EIUS UNI - ALL POLY - Stryker Howmedica	59	1.1
UNI SIGMA HP - De Puy Johnson & Johnson	59	1.1
PFC - UNI - De Puy Johnson & Johnson	41	0.7
JOURNEY UNI - ALL POLY - Smith & Nephew	28	0.5
PRESERVATION UNI - DePuy	28	0.5
UNICIA - VECTEUR ORTHOPEDIC - Stratec	27	0.5
TRIATHLON - PKR - Howmedica Osteonics	15	0.3
GKS - ONE - CUSTOM MADE - Permedica	12	0.2
OPTETRAK - ARTHROFOCUS - Exactech	10	0.2
UNI BUK - ALL POLY - Biomet Merck	9	0.2
MITUS - ENDO-MODEL UNICONDYLAR SLED - Link	6	0.1
ADVANCE - UNICOMPARTIMENTAL - ALL POLY - Wright	5	0.1
UNI SIGMA HP – ALL POLY - De Puy Johnson & Johnson	5	0.1
UNIVATION - B Braun	5	0.1
ACCURIS - UNI - Smith & Nephew	2	0.0
DURACON UNI - Howmedica	2	0.0
AMC - UNI – Corin Medical	1	0.0
GKS – ONE - PERMEDICA+UC-PLUS SOLUTION - Smith & Nephew	1	0.0
MILLER GALANTE UNI - ALL POLY - Zimmer	1	0.0
PRESERVATION UNI MOBILE - DePuy	1	0.0
Unknown	23	0.4
Total	**5.611**	**100.0**

13.2 Bi-tricompartmental knee prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2010, primary surgery.bi/tricompartmental

TYPE OF PROSTHESIS	N.	%
NEXGEN – Zimmer	9.955	24.2
PROFIX – Smith & Nephew	4.817	11.7
P.F.C – DePuy	3.423	8.3
GENESIS II – Smith & Nephew	2.473	6.0
SCORPIO – Stryker Howmedica	2.372	5.8
VANGUARD - Biomet Merck France	2.214	5.4
TC-PLUS - SOLUTION - Smith & Nephew	1.429	3.5
GEMINI MK II – Link	1.397	3.4
OPTETRACK – Exactech	1.059	2.6
LCS – DePuy	828	2.0
INTERAX – Stryker Howmedica	733	1.8
ADVANCE – Wright	729	1.8
ROTAGLIDE – Corin Medical	721	1.8
GENUS - Ala-Ortho	631	1.5
T.A.C.K. – Link	631	1.5
AGC – Kirschner Biomet Merck	587	1.4
GENIUS TRICCC – Dedienne Santé	587	1.4
SCORE – Amplitude	580	1.4
FIRST - Symbios Orthopedie Sa	562	1.4
TRIATHLON – Stryker Howmedica Osteonics	561	1.4
G.K.S. – Permedica	455	1.1
MULTIGEN - Lima	414	1.0
GSP - TREKKING - Samo	362	0.9
913 – Wright Cremascoli	357	0.9
HLS – NOETOS – Tornier	319	0.8
ENDO-MODEL – Link	300	0.7
BALANSYS - Mathys	299	0.7
PERFORMANCE – Kirschner Biomet Merck	277	0.7
DURACON – Stryker Howmedica	264	0.6
COLUMBUS - B.Braun	242	0.6
JOURNEY - Smith & Nephew	201	0.5
CONTINUUM KNEE SYSTEM – Stratec Medical	166	0.4
RO.C.C. – Biomet Merck France	163	0.4
E.MOTION - B.Braun	160	0.4
CINETIQUE - Medacta SA	100	0.2
Other (models < 100 cases)	561	1.4
Unknown	184	0.4
Total	**41.113**	**100.0**

Prosthesis system are reported in the Table, even if they are analytically registered (Es: NEXGEN - CR – Zimmer; NEXGEN - LCCK – Zimmer; NEXGEN – LPS – Zimmer; NEXGEN - RHK – Zimmer).

13.3 Revision prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2010, in total revision surgery.

TYPE OF PROSTHESIS	N.	%
NEXGEN - Zimmer	704	28.4
ENDO-MODEL - Link	244	9.9
PFC - DePuy	206	8.3
RT-PLUS - Smith & Nephew	170	6.9
AGC - Biomet Merck France	124	5.0
PROFIX - Smith & Nephew	116	4.7
DURATION MRH - Osteonics	96	3.9
GENESIS - Smith & Nephew	81	3.3
OPTETRAK - Exactech	79	3.2
SCORPIO - Osteonics	77	3.1
SIGMA RP - TC3 - DePuy	72	2.9
GKS - Permedica	71	2.9
LEGION - CONSTRAINED - Smith & Nephew	70	2.8
VANGUARD - Biomet	57	2.3
S-ROM NRH - Johnson & Johnson	35	1.4
INTERAX - Stryker Howmedica	34	1.4
TC-PLUS -SOLUTION - Smith & Nephew	29	1.2
DURACON II - Stryker Howmedica	18	0.7
E.MOTION - B.Braun	18	0.7
GEMINI - Link	15	0.6
TRIATHLON - Howmedica Osteonics	15	0.6
ADVANCE - Wright	14	0.6
GENIUS TRICCC - Dedienne Sante	12	0.5
FIRST - Symbios Orthopedie SA	10	0.4
BALANSYS - Mathys	9	0.4
LCS - De Puy Johnson & Johnson	9	0.4
GENUFITT – Lafitt (femoral comp. and insert) + EFDIOS – Citieffe (tibial component)	8	0.3
ROTAGLIDE - Corin Medical	8	0.3
CONTINUUM KNEE SYSTEM - Stratec Medical	7	0.3
913 - Cremascoli Wright	6	0.2
PRESERVATION UNI - ALL POLY - DePuy	6	0.2
T.A.C.K. - Link	4	0.2
Other (models< 4 cases)	35	1.4
Unknown	16	0.6
TOTAL	**2.475**	**100.0**

13.4 Prosthesis fixation

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31st December 2010, **according to prosthesis fixation**

Fixation	Primary unicomp.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	4.979	88.9	36.652	89.2	2.406	97.3	44.037	89.6
Uncemented	467	8.3	2.326	5.7	34	1.4	2.827	5.8
Fem cementless + tib cemented	147	2.6	1.601	3.9	21	0.8	1.769	3.6
Fem cem + tib cementless	6	0.1	500	1.2	11	0.4	517	1.1
Total*	**5.599**		**41.079**		**2.472**		**49.150**	

* 49 data are missing (0.1%)

Fixation according to year of operation

Years of operation	% Cemented	% Cementless	% cemented tibia	% cemented femur
2001	82.2	8.1	9.0	0.7
2002	78.8	9.0	11.8	0.4
2003	82.6	7.6	9.5	0.4
2004	88.0	7.4	4.0	0.6
2005	89.9	6.2	3.3	0.6
2006	90.7	5.3	3.6	0.4
2007	91.1	4.5	3.0	1.3
2008	91.2	4.2	2.2	2.4
2009	91.5	4.5	1.5	2.5
2010	93.5	4.5	0.9	1.1

13.5 Type of insert

Stabilization of liner in bi-tricompartmental knee prostheses.

Years of operation	% Unstabilized	% Posterior stabilized	% Hinged
2001	47.8	50.2	2.0
2002	51.3	46.2	2.5
2003	45.5	52.3	2.2
2004	41.3	57.0	1.7
2005	36.0	62.5	1.5
2006	33.6	64.8	1.7
2007	34.1	63.9	2.0
2008	38.4	59.9	1.7
2009	40.8	57.4	1.8
2010	36.8	60.7	2.5

Mobility of insert of bi-tricompartmental knee prosthesis according to year of implant

Years of operation	% fixed bearing	% mobile bearing
2001	74.2	25.8
2002	72.2	27.8
2003	69.7	30.3
2004	67.9	32.1
2005	66.0	34.0
2006	58.4	41.6
2007	62.2	37.8
2008	60.7	39.3
2009	59.2	40.8
2010	54.5	45.5

13.6 Articular coupling

Non met-poly coupling according to year of ooperation

	% cupling oxinium® - poly	
Years of operation	Primary unicomp.	Primary bi-tricomp.
2001	-	0.4
2002	-	0.3
2003	0.2	0.5
2004	2.8	1.2
2005	4.0	1.3
2006	6.2	1.8
2007	9.6	3.1
2008	13.2	2.6
2009	16.3	2.3
2010	24.7	3.2

13.7 Bone Cement

Types of cement used since 1-1-2002

In bold bone cement loaded with antibiotic

Cement	%
Surgical Simplex P – Howmedica	27.7
Antibiotic Simplex – Howmedica	***18.2***
Palacos R - Heraeus Medical	7.3
Palacos R+G - Heraeus Medical	***6.3***
Osteobond – Zimmer	3.8
Versabond AB - Smith & Nephew	***3.5***
Versabond - Smith & Nephew	3.1
Palacos R - Biomet	2.9
Aminofix 1 – Groupe Lepine	***2.8***
Cemex System – Tecres	2.8
Cemex – Tecres	2.3
Refobacin Revision - Biomet	***1.5***
Refobacin Bone Cement R - Biomet	***1.4***
Cemex Genta System - Tecres	***1.3***
Amplicem 1 – Amplimedical	1.3
Hi-Fatigue - Zimmer	1.0
Other bone cement without antibiotic	7.9
Other bone cement loaded with antibiotic	***4.9***
Total	**100.0**

Bone cement loaded with antibiotic is used in 40.0% of cases.

14. Complications occurred during hospitalization

The rate of complications in **primary unicompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2010

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Tibial fract	6	*0.1*	Hematoma	29	*0.5*	Hyperpyrexia	13	*0.2*
						Anemia	12	*0.2*
Fem fract	5	*0.1*	DVT	3	*0.1*	Gastro-intestinal	10	*0.2*
						Cardiac	7	*0.1*
			Infection	3	*0.1*	Embolism	5	*0.1*
Anesthesiol.	1	*0.02*				Genito-urinary	5	*0.1*
			SPE paralysis	1	*0.02*	Dyspnoea	4	*0.1*
						Disorientation	3	*0.1*
Other	3	*0.05*	Other	4	*0.1*	Collapse	2	*0.04*
						Other	15	*0.3*
Total	**15**	***0.3***	**Total**	**40**	***0.7***	**Total**	**76**	***1.4***

The rate of complications in primary **Bi-tricompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2010

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Fem fract	34	*0.1*	Hematoma	446	*1.1*	Anemia	813	*2.0*
			DVT	79	*0.2*	Hyperpyrexia	258	*0.6*
Ligament lesion	22	*0.1*	SPE paralysis	35	*0.1*	Genito-urinary	120	*0.3*
			Wound dehiscence	32	*0.1*	Cardiac	119	*0.3*
Anesthes.	22	*0.1*	Edema	31	*0.1*	Gastro-intestinal	117	*0.3*
Hemorragia	21	*0.1*	Bed sores	20	*0.05*	Embolism	63	*0.2*
			Bleeding	16	*0.04*	Respiratorie minori	57	*0.1*
Tibial fracture	19	*0.05*	Infection	14	*0.03*	Disorientation	47	*0.1*
Rupture patellar tendon	14	*0.03*	Instability of ligaments	10	*0.02*			
						Collaps	36	*0.1*
			Prosthesis disloc	6	*0.01*	Infarction	35	*0.1*
Tibial tuberosity fracture	5	*0.01*				Dyspnoea	28	*0.1*
Other	24	*0.1*	Other	64	*0.2*	Other	161	*0.4*
Total	**161**	***0.4***	**Total**	**753**	***1.8***	**Total**	**1.854**	***4.5***

The rate of complications in **revision surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2010

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Rupture patellar tendon	12	*0.4*	Hematoma	52	*1.7*	Anemia	109	*3.6*
			Wound dehiscence	9	*0.3*	Hyperpyrexia	23	*0.8*
Tibial fracture	11	*0.4*	Infection	7	*0.2*	Cardiac	12	*0.4*
						Gastro-intestinal	9	*0.3*
Anesthes.	8	*0.3*	Prosthesis disloc	6	*0.2*	Respiratory	9	*0.3*
						Disorientation	6	*0.2*
Femur fra	7	*0.2*	SPE paralysis	5	*0.2*	Allergic reaction	6	*0.2*
						Genito-urinary	6	*0.2*
Tibial fracture	4	*0.1*	Bleeding	5	*0.2*	Reaction to transfusion	5	*0.2*
Ligament lesion	1	*0.03*	Edema	3	*0.1*	Embolism	4	*0.1*
			DVT	2	*0.1*	Collaps	1	*0.03*
						Infarction	1	*0.03*
Other	8	*0.3*	Other	6	*0.2*	Other	10	*0.3*
Total	**51**	***1.7***	**Total**	**95**	***3.1***	**Total**	**201**	***6.7***

14.1 Deaths occurred during hospitalization

Rate of deaths in knee prosthetic surgery carried out on patients hospitalized between July 1st 2000 and December 31st 2010.

Registered deaths occurred during hospitalization.

Year 2000-2010			
Type of surgery	**Deaths**	**Number of surgery**	**Percentage**
Primary bi/tricomp	41	41.113	0.10
Primary uni	1	5.611	0.02
Revision	4	3.008	0.13
Removal	-	641	-

15. Analysis of survival of primary surgery

15.1 Cox multivariate analysis

Bi-tri compartmental

The Cox multivariate analysis identifies any variables that are independent from each other that can influence the event, in our case the removal of at least one prosthesis component. Analysis was performed on three independent variables, sex, age at surgery, pathology, type of prosthesis (bi/tri comp vs unicomp), type of insert (fix vs mobile).

All primary bi-tri compartmental knee arthroplasties performed in the region between July 2000 and December 2010 only on patients living in the region, were analyzed.

COX PROPORTIONAL RISK MODEL

Variabiles
Dependent: Follow-up
Independent: Age, gender, diagnosis, type of insert

Number of valid observations 27.118
Non revised: 26.412
Revised: 706

Chi-square: 151.58 *p*= 0.0001

VARIABLE	SIGNIFICANCE (P)
Gender (Males vs females)	**NS** (0.704)
Age (less than 70 yrs vs more than 70 yrs)	**S** (0.001)
Diagnosis (arthrosis vs other)	**NS** (0.793)
Type of insert (Fix vs mobile)	**S** (0.001)

The chi-square test, used to test globally the model applied, was significant, which suggested that, on the whole, the variables inserted in the model influenced the outcome of prosthetic surgery. The effect of each variable was compared to the others when equal.
All variables but gender and diagnosis, significantly influence the outcome of surgery. At this point we tested how it acts, either by reducing or increasing the risk.
A relative risk rate below 1 indicated a reduced risk of prosthesis loosening. Conversely, a relative risk rate above 1 indicated an increased risk of prosthesis loosening.

Age	Relative risk rate	Confidence interval 95%		Significance (p)
Less than 70 yrs	2.4	2.0	2.7	0.001

Younger patients have higher risk of revision

Liner	Relative risk rate	Confidence interval 95%		Significance (p)
Mobile	1.3	1.1	1.5	0.001

Mobile liner have higher risk of revision

Uni compartmentale

All primary uni compartmental knee arthroplasties performed in the region between July 2000 and December 2010 only on patients living in the region and affected by arthrosis, were analyzed.
Variables in the model are: gender, age at surgery and type of tibial component (all poly vs metal back).

It resulted that younger patients have a higher risk

Age	Relative risk rate	Confidence interval 95%		Significance (p)
Less than 70 yrs	1.2	1.1	1.4	0.04

Other variables do not influence the risk.

15.2 Rate of failure

As already written in hip section, the recovery of data of operations not reported to RIPO is in progress. The uncertainty due to the failure to report about 10% of operations performed in the Region, may lead to an underestimation of the revision rate that is not quantifiable at the moment.
The following table shows the number of primary joint arthroplasty operations performed in the period from July 2000 to December 2010 in the first column, the second and third columns show the number of revision operations performed on the same patients. Some revision operations were performed in the same hospital as the primary operation while others were performed at other hospitals in the Emilia-Romagna Region.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital	N. Total revisions	% revisions
Primary bicompartmental	22.912	341	266	607	2.6
Primary tricompartmental	4.206	79	20	99	2.4
Primary unicomp.	3.584	139	87	226	6.3
Total revision	1.366	66	42	108	7.9
Total	**32.068**	**625**	**415**	**1.040**	**3.2**

In **40%** of the primary total prostheses that are replaced, the patient undergoes revision surgery in a different hospital from the one where the primary operation was performed.

15.3 Survival curves according to Kaplan Meier

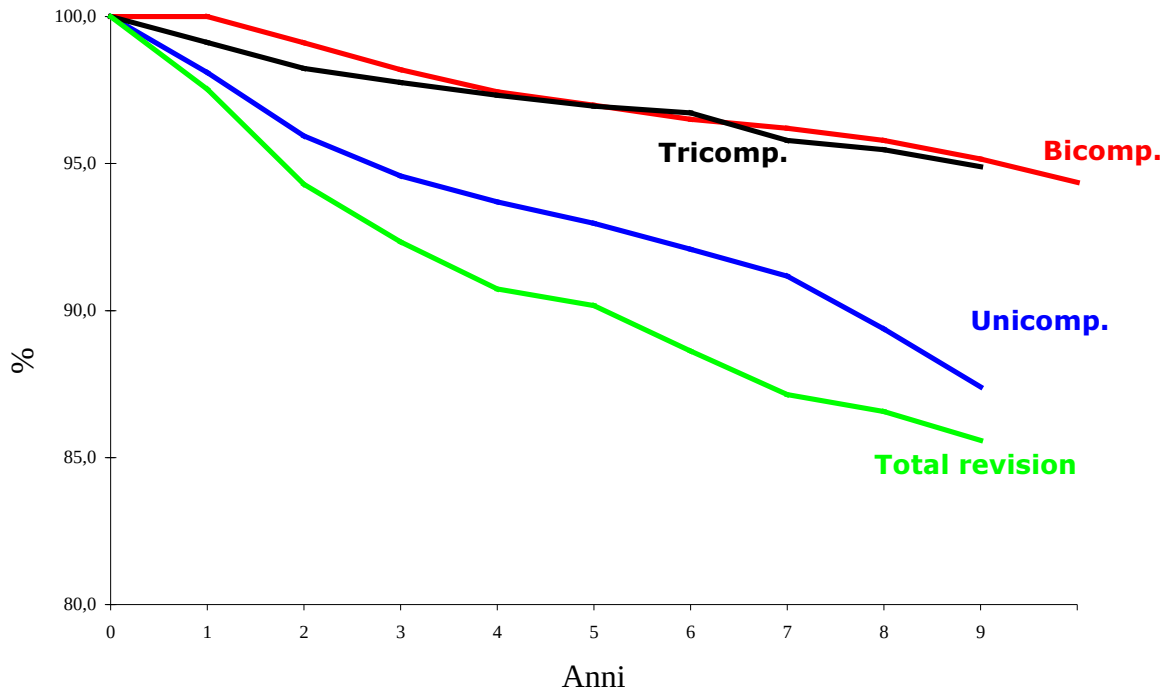
The survival curve calculated by the Kaplan Meier method enables an estimation of the probability that each individual has of maintaining its initial condition (prosthesis in place) over time.
The following paragraphs show the survival curves calculated separately for primary uni, bi/tri compartmental and total joint revision.

15.4 Analysis of survival in primary uni and bi/tri compartmental knee prosthesis

Analysis has been separately performed for uni, bi, tri compartmental prosthesis and total revisions. The revision of a single component (even insert) is considered as a failure.
Prosthetization of patella, in a second surgery, is not considered as a failure.
Major revision is performed when femoral and/or tibial component are revised; minor revision when liner and/or patella are revised.

Type of surgery	N. implants	N. major revisions	N. minor revisions	% revisions
Primary bicompartmental	22.912	529	78	2.6
Primary tricompartmental	4.206	82	17	2.4
Primary unicompartmental	3.584	216	10	6.3
Total revision	1.366	92	16	7.9

Survival curves



Results in detail

Uni-compartmental			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	98.1	97.6	98.6
2	95.9	95.2	96.6
3	94.6	93.8	95.4
4	93.7	92.8	94.6
5	93.0	92.0	94.0
6	92.1	91.0	93.2
7	91.2	89.9	92.4
8	89.4	87.7	91.0
9	87.4	85.2	89.7
Bi-compartimental			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.2	99.1	99.3
2	98.4	98.2	98.5
3	97.7	97.4	97.9
4	97.2	97.0	97.5
5	96.8	96.5	97.1
6	96.5	96.2	96.8
7	96.1	95.8	96.5
8	95.6	95.2	96.0
9	94.9	94.4	95.4
10	94.2	93.5	95.0
Tri-compartimental			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.1	98.8	99.4
2	98.2	97.8	98.7
3	97.8	97.3	98.3
4	97.3	96.7	97.9
5	97.0	96.3	97.6
6	96.7	96.0	97.5
7	95.8	94.7	96.9
8	95.5	94.2	96.7
9	94.9	93.2	96.6
Total revision			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	97.5	96.7	98.4
2	94.3	92.9	95.7
3	92.3	90.7	94.0
4	90.7	88.9	92.6
5	90.2	88.2	92.1
6	88.6	86.4	90.9
7	87.1	84.5	89.8
8	86.6	83.7	89.4
9	85.6	82.2	89.0

Survivorship of unicompartmental prostheses is significantly different at 9 years follow-up from bi and tri compartimental ones. (Wilcoxon, p=0.001).

The following table shows the rate of revision in knee arthroplasty according to cause of revision: the % distribution of the causes of failure is shown

Primary uni-compartmental

Cause of revision	Rate	Percentage	% distribution of cause of failure
Total aseptic loosening	86/3.584	2.4	38.1
Pain without loosening	36/3.584	1.0	15.9
Septic loosening	26/3.584	0.7	11.5
Tibial aseptic loosening	19/3.584	0.5	8.4
Femoral aseptic loosening	15/3.584	0.4	6.6
Liner wear	11/3.584	0.3	4.9
Bone fracture	4/3.584	0.1	1.8
Prosthesis brakage	4/3.584	0.1	1.8
Missing	15/3.584	0.4	6.6
Other	10/3.584	0.3	4.4
Total	**226/3.584**	**6.3**	**100.0**

Primary bi-tricompartmental

Cause of revision	Rate	Percentage	% distribution of cause of failure
Total aseptic loosening	214/27.118	0.79	30.3
Septic loosening	182/27.118	0.67	25.8
Tibial aseptic loosening	64/27.118	0.24	9.1
Pain without loosening	63/27.118	0.23	8.9
Dislocation	35/27.118	0.13	5.0
Liner wear	30/27.118	0.11	4.2
Femoral aseptic loosening	25/27.118	0.09	3.5
Instability	17/27.118	0.06	2.4
Stiffness	17/27.118	0.06	2.4
Bone fracture	12/27.118	0.04	1.7
Prosthesis breakage	5/27.118	0.02	0.7
Missing	34/27.118	0.13	4.8
Other	8/27.118	0.03	1.1
Total	**706/27.118**	**2.6**	**100.0**

Total revision

Cause of revision	Rate	Percentage	% distribution of cause of failure
Septic loosening	33/1.366	2.4	30.6
Total aseptic loosening	26/1.366	1.9	24.1
Tibial aseptic loosening	12/1.366	0.9	11.1
Instability	8/1.366	0.6	7.4
Femoral aseptic loosening	5/1.366	0.4	4.6
Pain without loosening	5/1.366	0.4	4.6
Dislocation	5/1.366	0.4	4.6
Prosthesis breakage	3/1.366	0.2	2.8
Liner wear	3/1.366	0.2	2.8
Missing	5/1.366	0.4	4.6
Other	3/1.366	0.2	2.8
Total	**108/1.366**	**7.9**	**100.0**

15.5 Mobility of the bearing

The multivariate analysis presented in paragraph 16.1 shows that the bearing loosening increases the risk of failure.

To expand the subject further data are given.

The following table shows the revision rate in primary bi-tricompartmental arthroplasties according to the **mobility of bearing**

Type of poly liner	n. of operation	Removals	Rate	%
Fisso	16.851	406	406/16.851	2.4
Mobile	10.241	297	297/10.241	2.9

Primary surgery-fixed insert

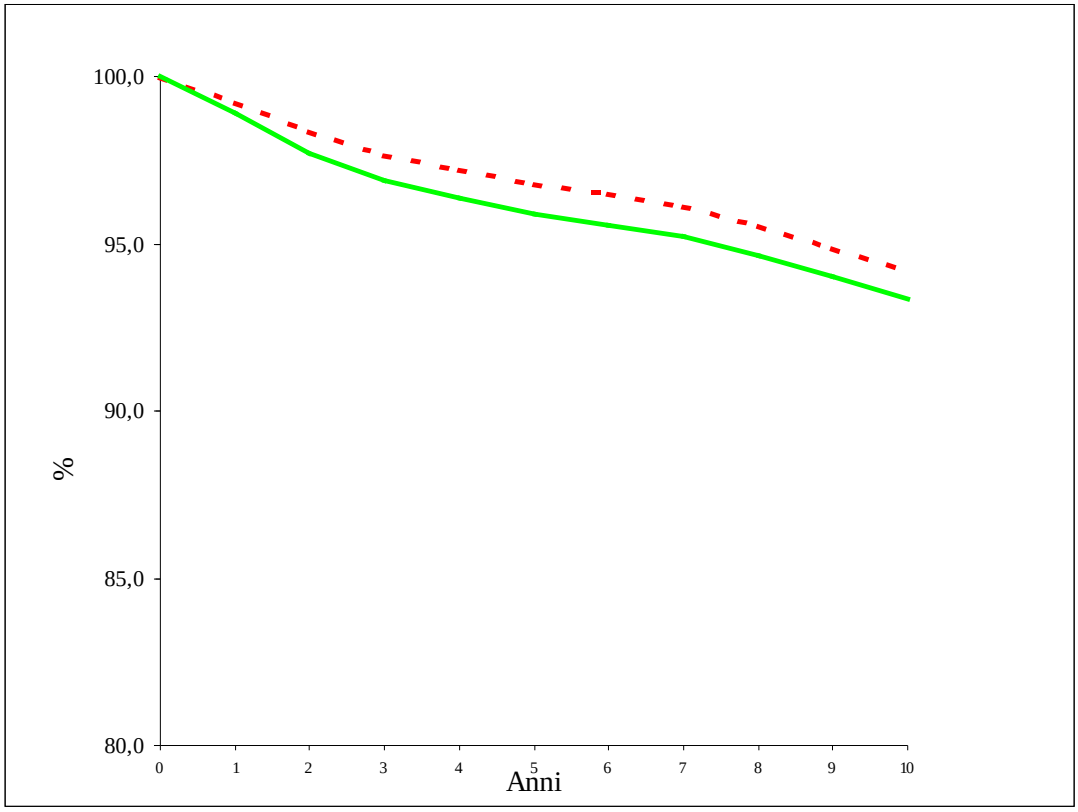
Cause of revision	Rate	Percentage	% distribution of cause of failure
Septic loosening	**117**/16.851	0.69	28.8
Total aseptic loosening	**110**/16.851	0.65	27.1
Tibial aseptic loosening	**42**/16.851	0.25	10.3
Pain without loosening	**37**/16.851	0.22	9.1
Liner wear	**17**/16.851	0.10	4.2
Dislocation	**14**/16.851	0.08	3.5
Instability	**13/**16.851	0.08	3.2
Femoral aseptic loosening	**11**/16.851	0.07	2.7
Bone fracture	**10**/16.851	0.06	2.5
Stiffness	**9**/16.851	0.05	2.2
Other	**6**/16.851	0.04	1.5
Prosthesis breakage	**3**/16.851	0.02	0.7
Unknown	**17**/16.851	0.10	4.2
Total	**406**/16.851	**2.4**	**100.00**

Primary surgery – mobile insert

Cause of revision	Rate	Percentage	% distribution of cause of failure
Total aseptic loosening	**101**/10.241	0.99	24.9
Septic loosening	**66**/10.241	0.64	16.3
Tibial aseptic loosening	**22**/10.241	0.21	5.4
Pain without loosening	**26**/10.241	0.25	6.4
Dislocation	**21**/10.241	0.21	5.2
Liner wear	**13**/10.241	0.13	3.2
Femoral aseptic loosening	**14**/10.241	0.14	3.4
Stiffness	**8**/10.241	0.08	2.0
Instability	**4**/10.241	0.04	1.0
Bone fracture	**3**/10.241	0.03	0.7
Prosthesis breakage	**2**/10.241	0.02	0.5
Unknown	**17**/10.241	0.17	4.2
Total	**297/**10.241	**2.9**	**100.0**

15.6 Re-operation due to replacement of only the patella component

In rare cases bicompartmental prosthesis were transformed into tricompartmental prosthesis, with the addition of the patella component, during a second operation.
That was done in 181 cases (out of 22.912 bicompartmental prostheses recorded in the RIPO).
The mean time lapse between primary bicompartmental arthroplasty and implanting the patella was 1.6 years (CI at 95% 1.4-1.8).
These 181 re-operations were not states considered as failures of the bicompartmental prosthesis as in dotted line. For comparison, when resurfacing is considered a failure, the survival is treaced as solid line
Survival at 10 yrs is 93.3% and 94.2% respectively



15.7 Analysis of the survival of unicompartmental prosthesis according to the most widely used commercial type in Emilia-Romagna

To perform a comparison among the survival of several prosthesis types correctly, it is necessary to introduce a parameter that takes into account the complexity of the series treated. As in the Swedish register, the calculation of a case-mix was chosen.
According to the Cox multivariate analysis, the knee prosthesis has a greater risk of failure in patients under 70 years old. The percentage of patients with these characteristics treated by primary knee arthroplasty in Emilia Romagna is 62.6%.
Series with a higher percentage should be considered as complex series.

In bold all poly

Type	Starting Years	n.	% of patients younger than 70	n. failures	% survival at 5	c.i. at 95%	% survival at 8	c.i. at 95%
OXFORD UNICOMPARTIMENTAL PHASE 3 - Biomet Merck	2000	781	67.0	70	91.5	89.3-93.6	87.1	83.6-90.5
GENESIS UNI - Smith & Nephew	2000	496	66.7	26	92.8	89.8-95.8	91.0	87.2-94.9
EFDIOS - Citieffe	2000	313	62.0	25	94.1	91.0-97.2	89.0	84.3-93.7
ZIMMER UNI - Zimmer	2005	227	59.5	3	97.9	95.6-100.0	-	-
MITUS - ENDO-MODEL UNI – ALL POLY - Link	2003	225	64.9	16	91.6	87.5-95.6	91.6	87.5-95.6
ALLEGRETTO UNI - Protek-Sulzer	2000	210	59.5	17	92.6	88.8-96.3	90.8	86.6-94.9
PRESERVATION UNI – ALL POLY - DePuy	2002	185	59.5	15	91.5	87.0-96.0	87.8	80.9-94.7
UC-PLUS SOLUTION - Smith & Nephew	2000	177	64.2	3	98.3	96.3-100.0	-	-
HLS - UNI EVOLUTION - ALL POLY - Tornier	2001	143	46.2	8	94.3	89.7-98.8	89.6	81.8-97.4
OPTETRAK UNI – ALL POLY -Exactech	2005	128	52.3	0	-	-	-	-
MILLER GALANTE UNI - Zimmer	2001	118	64.4	5	95.7	92.0-99.4	95.7	92.0-99.4
UC-PLUS SOLUTION – ALL POLY - Smith & Nephew	2004	108	42.1	6	-	-	-	-
GKS - ONE – Permedica	2006	100	53.5	3	-	-	-	-
Other (models with less than 100 cases)	2000	373	68.8	29	89.8	85.8-93.8	83.4	75.5-91.3
Total	**2000**	**3.584**	**62.6**	**226**	**93.0**	**92.0-94.0**	**89.4**	**87.7-91.0**

15.8 Analysis of the survival of bicompartmental prosthesis according to the most widely used commercial type in Emilia-Romagna

Type	Starting Years	N.	% of patients younger than 70	n. failures	% survival at 5	c.i. at 95%	% survival at 8	c.i. at 95%
NEXGEN – Zimmer	2001	6.940	38.9	127	97.9	97.5-98.3	97.0	96.4-97.6
PROFIX– Smith&Neph	2000	2.759	36.0	89	96.7	96.0-97.5	95.2	94.0-96.3
P.F.C – DePuy	2000	2.078	38.2	46	97.5	96.7-98.3	96.3	95.0-97.5
GENESIS II– Smith&Neph	2000	1.901	42.9	23	98.0	97.2-98.9	98.0	97.2-98.9
VANGUARD - Biomet Merck Fran	2005	1.393	46.4	20	97.5	96.2-98.8	-	-
SCORPIO – Stryker Howmedica	2002	1.370	34.7	35	96.1	94.8-97.5	95.5	93.6-97.3
GEMINI MKII–Link	2002	1.108	36.5	13	98.2	97.2-99.2	98.2	97.2-99.2
TC-PLUS - SOLUTION - Smith & Nephew	2002	978	36.7	16	96.0	93.3-98.8	-	-
LCS – DePuy	2000	720	44.9	20	97.2	95.9-98.5	96.9	95.4-98.4
OPTETRACK – Exactech	2000	655	33.9	22	95.4	93.3-97.6	93.4	90.0-96.9
Other (< than 100 cases)	2000	643	35.7	19	96.9	95.3-98.5	95.3	93.1-97.5
ROTAGLIDE–Corin	2000	587	33.9	32	94.0	91.8-96.2	93.1	90.6-95.6
INTERAX – Stryker Howmedica	2000	568	31.7	45	94.6	92.7-96.5	92.0	89.5-94.6
T.A.C.K. – Link	2000	528	37.3	42	93.7	91.6-95.8	92.2	89.8-94.6
GENIUS TRICCC – Dedienne Santé	2000	527	25.8	30	94.6	92.4-96.8	92.2	89.1-95.2
ADVANCE – Wright	2000	475	26.7	18	95.6	93.5-97.6	95.6	93.5-97.6
TRIATHLON – Stryker Howmedica Osteonics	2005	462	43.3	7	96.6	94.0-99.2	-	-
SCORE– Amplitude	2004	437	29.3	7	97.8	95.9-99.7	-	-
GENUS – Ala-Ortho	2008	398	32.7	5	-	-	-	-
FIRST - Symbios Orthopedie Sa	2006	365	43.3	10	96.1	93.7-98.5	-	-
MULTIGEN -Lima	2001	284	26.8	13	94.7	91.9-97.6	-	-
AGC – Kirschner Biomet Merck	2000	278	29.5	7	97.2	95.2-99.3	97.2	95.2-99.3
ENDO-MODEL Link	2000	232	39.2	8	95.9	92.5-99.2	93.9	89.6-98.1
HLS - NOETOS - TORNIER	2002	211	31.3	4	97.5	94.9-100	-	-
NUOVA DURACON II – Stryker Howmedica	2000	198	29.8	8	96.4	93.8-99.0	94.9	90.9-98.8
913 – Wright Crem	2000	156	25.6	4	98.7	96.9-100	97.7	95.2-100.0
GSP - TREKKING - Samo	2005	152	33.6	4	96.1	92.4-99.9	-	-
RO.C.C. – Biomet Merck France	2003	149	47.7	16	89.8	84.9-94.7	-	-
GKS– Permedicca	2001	144	31.9	5	96.3	92.6-100	94.2	88.6-100.0
BALANSYS-Mathys	2005	140	43.6	2	96.6	91.9-100	-	-
COLUMBUS-B.Braun	2007	115	37.4	2	-	-	-	-
JOURNEY- Smith&Neph	2006	113	49.6	4	94.9	89.9-99.9	-	-
UNKNOWN	2000	54	44.4	3	95.6	89.5-100	-	-
Total	**2000**	**27.117**	**37.6**	**706**	**96.8**	**96.5-97.1**	**95.6**	**95.2-96.0**

PART THREE: SHOULDER PROSTHESIS

July 2008 – December 2010

16. RIPO capture

16.1 Capture for RIPO

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), was **93.5**% in 2010. Data are referred to primary total prosthesis (8180), hemiarthroplasty (8181), revision (8197) and prosthesis removal (8001).

16.2 Ratio public/private treatment

Percentage of implants performed in public hospitals.

% of operations performed in public hospitals (AUSL, AOSP, IRCCS)			
Year of surgery	**Primary arthroprosthesis**	**Revision / removal**	**Hemiarthroplasty**
2008	73.9%	100.0%	93.0%
2009	65.7%	93.3%	83.6%
2010	59.6%	81.3%	84.6%

From database SDO

17. Type of operation

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to **type**

Type of operation	Number of operation	Percentage
Inverse prosthesis	478	43.9
Hemiarthroplasty	282	25.9
Resurfacing	123	11.3
Anatomical prosthesis	111	10.2
Revisions	74	6.8
Prosthesis removal	15	1.4
Other	5	0.5
Total	**1.088**	**100.0**

18. Descriptive statistics of patients

18.1 Gender

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to **type of operation** and **gender** of patients.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Inverse prosthesis	87	18.2	391	81.8	**478**
Hemiarthroplasty	84	29.8	198	70.2	**282**
Resurfacing	57	46.3	66	53.7	**123**
Anatomical prosthesis	45	40.5	66	59.5	**111**
Revisions	21	28.4	53	71.6	**74**
Prosthesis removal	6	40.0	9	60.0	**15**
Total	**300**	**27.7**	**783**	**72.3**	**1.083**

18.2 Age

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to **mean age** and **gender** of patients.

Gender	N.	%	Mean age	C.I. at 95%
Males	273	27.5	63.5	61.9-65.1
Females	721	72.5	71.7	71.0-72.4

18.3 Pathologies

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to **type of operation** and **diagnosis** of patients.

Diagnosis	Total reverse arthroplasty	
	N.	%
Eccentric osteoarthritis	248	51.9
Concentric osteoarthritis	82	17.2
Fracture	65	13.6
Sequelae of fracture	12	2.5
Necrosis	12	2.5
Arthropaty of the cuff	10	2.1
Dislocation	10	2.1
Osteoarthritis	7	1.5
Rheumatic	4	0.8
Post-traumatic osteoarthritis	3	0.6
Pain	3	0.6
Osteomielitis	2	0.4
Missing	*13*	2.7
Other	*7*	1.5
Total	**478**	**100.0**

Diagnosis	Anatomic arthroplasty	
	N.	%
Concentric osteoarthritis	80	72.1
Eccentric osteoarthritis	7	6.3
Fracture	7	6.3
Rheumatic	6	5.4
Osteonecrosis	5	4.5
Osteoarthritis	3	2.7
Sequelae of fracture	2	1.8
Condromatosis	1	0.9
Total	**111**	**100.0**

Diagnosis	Hemiarthroplasty	
	N.	%
Fracture	178	63.1
Concentric osteoarthritis	34	12.1
Eccentric osteoarthritis	23	8.2
Osteonecrosis	19	6.7
Sequelae of fracture	12	4.3
Dislocation	4	1.4
Post traumatic necrosis	3	1.1
Osteomielitis	3	1.1
Reumatic arthritis	2	0.7
Missing	1	0.4
Other	3	1.1
Total	***279***	***100.0***

Diagnosis	Resurfacing	
	N.	%
Concentric osteoarthritis	58	47.2
Osteonecrosis	27	22.0
Eccentric osteoarthritis	17	13.8
Osteoarthritis	4	3.3
Sequelae of fracture	*4*	*3.3*
Reumatic arthritis	3	2.4
Osteonecrosis (steoid)	*2*	*1.6*
Fracture	1	0.8
Post traumatic arthrosis	1	0.8
Missing	*3*	*2.4*
Other	*3*	*2.4*
Total	**123**	**100.0**

Number of shoulder r**evisions** carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to **diagnosis** and type of revision.

Diagnosis	N.	%
Humeral loosening	11	14.9
Glenoid erosion	11	14.9
Two steps revision	9	12.1
Glenoid loosening	8	10.8
Anterior instability	6	8.1
Superior instability	5	6.8
Dislocation	4	5.4
Cuff lesion	4	5.4
Infection	4	5.4
Pain	4	5.4
Bone fracture	2	2.7
Other	*2*	2.7
Missing	*4*	5.4
Total	**72**	**100.0**

19. Surgical technique anesthesia and antithromboembolic prophylaxis,

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to **surgical approach**

Type of operation	Deltoideo-pettorale	Trans-deltoideo	Superior lateral
Anatomical	110	-	-
Inverse	426	31	11
Hemy	275	4	-
Resurfacing	117	2	-
Removal	15	-	-
Revision	71	3	-
Total*	**1.014**	**40**	**11**

18 missing data, (1.7%)

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to **anesthesia**

Anesthesia	N.	%
Mixed	479	48.5
General	471	47.7
Loco-regional	37	3.8
Total	**987**	**100.0**

96 missing data, (8.8%)

Antithromboembolic prophylaxysis
Eparin is used in 74.2% of primary surgery, no prophylaxis in 13.3% and datusm is missing in 11.6%.

20. Type of prosthesis

20.1 Prosthesis fixation

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to **type of prosthesis** and **stem fixation**

Stem fixation	Anatomic	%	Inverse	%	Hemy	%
Cemented	25	22.5	136	28.6	159	56.4
Cementless	86	77.5	339	71.4	123	43.6
Total	**111**	**100.0**	**475***	**100.0**	**282**	**100.0**

*3 missing data, (0.6%)

20.2 Type of prosthesis

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to the **type of prosthesis**

Model of prosthesis	Inverse		Anatomic + hemy	
	N	%	N	%
Delta Xtend - DePuy	197	41.2	17	4.3
SMR Alettato– Lima	105	21.9	91	23.2
Aequalis Reversed - Tornier	84	17.6	-	-
Anatomical Shoulder - Zimmer	24	5.0	25	6.3
SMR Cementato – Lima	17	3.6	31	7.9
Promos - Plus orthopedics AG	14	2.9	6	1.5
Delta CTA - DePuy	12	2.5	-	-
Equinoxe Primary - Exactech	6	1.3	-	-
T.E.S.S - Biomet	6	1.3	-	-
SMR Revision – Lima	3	0.6	6	1.5
Trabecular Metal – Zimmer	3	0.6	5	1.3
Affinis - Mathys	1	0.2	3	0.8
Scultra II Inversa - Euros	1	0.2	-	-
Verso shoulder System - Biomet	1	0.2	-	-
Bigliani/Flatow - Zimmer	-	-	96	24.5
LTO - Lima	-	-	31	7.9
Anatomical Shoulder Fracture - Zimmer	-	-	22	5.6
Global FX - DePuy	-	-	16	4.1
Global Advantage - DePuy	-	-	15	3.8
Aequalis Fracture - Tornier	-	-	8	2.1
Modular NEER 3 – Smith & Nephew	-	-	8	2.0
Affinis Fracture – Mathys	-	-	2	0.5
Epoca - Synthes	-	-	2	0.5
Other	-	-	*9*	*2.2*
Missing	*4*	*0.8*	-	-
Total	**478**	**100.0**	**393**	**100.0**

Number of shoulder **resurfacing** carried out on patients with admission date between 1st July 2008 and 31st December 2010, according to the **type of prosthesis.**

Type of prosthesis	Resurfacing	
	N	%
T.E.S.S - Biomet	41	33.3
SMR RESURFACING - Lima	18	14.6
ECLIPSE - Arthrex	18	14.6
COPELAND SHOULDER - Biomet	18	14.6
EPOCA RH - Synthes	13	10.6
GLOBAL CAP – DePuy	7	5.7
DUROM SHOULDER - Zimmer	4	3.3
AEQUALIS RESURFACING - Tornier	2	1.6
HEMICAP - Arthrosurface	1	0.8
CAPICA - Implantcast	1	0.8
Total	**123**	**100.0**

21. Duration of pre- and post-operative hospitalization

Year 2010			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean post-op. (range)**
Anatomical primary total arthropl.	57	1.1 (0-6)	4.0 (2-11)
Inverse primary total arthropl.	231	1.3 (0-15)	5.7 (2-20)
Hemiarthropl.	130	2.9 (0-20)	5.5 (1-30)
Resurfacing	63	0.9 (0-1)	4.7 (2-18)
Revisions	31	1.8 (0-8)	6.3 (2-26)

Year 2010			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean post-op. (range)**
Elective	359	1.0 (0-8)	5.1 (1-24)
Emergency	116	4.0 (0-20)	5.9 (2-34)

22. Failures

Follow up is very short, so only this datum can be presented

Type of operation	**n. implants**	**n. revisions**	**rate**
Anatomical	111	-	-
Inverse	478	12	2.5
Hemi	282	7	2.5
Resurfacing	123	2	1.6