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 2009

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA

Foreword

This is the tenth 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 2009.
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 87.000 hip, 44.000 knee and 600 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

A major change has been introduced in this report: survival analyses are performed only on patients living in the Emilia-Romagna region.
This decision was made in consequence of the observation that the survival curves of prostheses implanted in non-resident patients appeared significantly better than for resident patients. This inevitably leads to a bias resulting from the 'loss' of non-resident patients. The difference in survival at 9 years is 1% for primary hip arthroplasty.
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 in past years, 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' 97% of hip and knee operations.
That, theoretically, introduces uncertainty in the conclusions, a doubt that, however, is the same that burdens all the other main joint prosthesis registers that have comparable support to that of RIPO.
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 4 and 8 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 2009 nearly 6700 implants were registered; 95 different types of cup and 115 of stem were used. 36% of the stems have a modular neck, as it was noted the previous

year.
Cemented prostheses were 62% in year 2000 and 92% in year 2009, whilst hybrid fixation was 22% and it is now 6%. Cemented prostheses are now only 2%, and they were 15% in year 2000.
Most common articular coupling is ceramic on ceramic, that in 2009 represents 50% (it was 18% in 2000); second most common is ceramic on poly (20%). Metal on poly, that was 45% in 2000 is now reduced to 19%. Nearly half of poly is cross-linked.
The survival of the hip prostheses is confirmed at very high levels. Over 94% of prostheses implanted in Emilia-Romagna region are still in place 10 years after the operation.
1147 revision were performed on 41.033 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)
Resurfacing still represent 2.4% of all primary THA.
Their survival, at 5 years, is slightly lower than THA (92.7%, statistically significant).
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 87% at 9 years follow up.

Knee
High percentage of these prostheses are implanted in private structures (73% in 2009, vs 43% in 2000). In 2009 11% of implanted prostheses are unicompartmental, 68% bicompartmental and 13% tricompartmental.
Implanted prostheses are mainly cemented, with very small variations during the years, equally distributed between non-stabilized and posteriorly stabilized ones.
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 95% at 9 years. Survival of the unicompartmental one is significantly lower (86.5% at 8 years), as repeatedly reported by other registers.
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.

Shoulder
Data refers to a very short follow-up (18 months) and few implants (approx. 500). Interesting data are emerging.

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 2009, to be lined up with the contents of the present report.

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PART ONE: HIP PROSTHESES

January 2000 – December 2009

1. RIPO data collection

1.1 Data collection for RIPO per hospital in 2009

Percentage of R.I.P.O. data collection calculated versus hospital discharge data (S.D.O. – Schede di Dimissione Ospedaliera), is **97.3**% in the year 2009. Data are referred to primary total hip replacements (8151;74;75;76;85;86), hemiarthroplasties (8152), revision (8153) and prosthesis removal (8153;70;71;72;73).

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

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 2009, according to **type of surgery**.
Primary THA is used to indicate total conventional hip arthroplasty. Resurfacing are not comprised.

Type of surgery	Number of surgeries	Percentage
Primary THA	54538	62.5
Total and partial revision*	8870	10.2
Hemiarthroplasty	21740	24.9
Resurfacing	1158	1.3
Prosthesis removal	558	0.6
Other**	414	0.5
Total	**87278**	**100.0**

***** 2733 total revisions, 3647 cup revisions, 1548 stem revisions, 942 head/liner/modular neck revisions.

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

Year of operation	N.
2000	-
2001	5
2002	36
2003	74
2004	115
2005	179
2006	215
2007	202
2008	165
2009	167

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.
2000	4274	-	716	-
2001	4575	+7.0	853	+19.1
2002	4641	+1.4	863	+1.2
2003	5030	+8.4	861	-0.2
2004	5358	+6.5	852	-1.0
2005	5556	+3.7	825	-3.2
2006	5821	+4.8	934	+13.2
2007	6249	+7.4	1014	+8.6
2008	6357	+1.7	977	-3.6
2009	6677	+5.0	975	-0.3

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 2009, 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	1701	3.1	3456	6.3	7799	14.3	15928	29.2	19888	36.5	5766	10.6	54538
Resurfacing	179	15.5	300	25.9	404	34.9	222	19.2	52	4.5	1	0.1	1158
Hemiarthroplasty	17	0.1	43	0.2	135	0.6	764	3.5	5375	24.7	15406	70.9	21740
Revision	170	1.9	365	4.1	912	10.3	2312	26.1	3626	40.9	1485	16.7	8870
Prosthesis removal	18	3.2	25	4.5	55	9.9	145	26.0	225	40.3	90	16.1	558
Other	20	4.8	20	4.8	50	12.1	106	25.6	140	33.8	78	18.8	414
Total*	**2105**	**2.4**	**4209**	**4.8**	**9355**	**10.7**	**19477**	**22.3**	**29306**	**33.6**	**22826**	**26.2**	**87278**

Mean age at surgery

Type of operation	Mean age	Range
Primary THA	66.6	14-101
Hemiarthroplasty	82.8	20-109
Resurfacing	51.4	15-81
Revision	69.6	17-98
Global	**70.8**	**14-109**

Mean age of patients, per type of operation, comparison 2000-2009

	Year 2000		Year 2009	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Primary THA	66.5	16-100	66.6	14-97
Hemiarthroplasty	82.9	32-104	83.4	20-102
Revision	69.1	23-98	69.4	29-97
Global	**71.0**	**16-104**	**70.6**	**14-102**

	Year 2003		Year 2009	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Resurfacing	49.8	18-72	53.2	21-77

Mean age at surgery of patients affected by coxarthrosis

	THA			
	Year 2000		Year 2009	
Gender	**Mean age**	**Range**	**Mean age**	**Range**
Males	67.4	33-92	66.8	24-91
Females	68.9	33-93	70.0	25-92

3.2 Gender

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2009, according to **type of operation** and **sex** of patient.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Primary THA	21076	38.6	33462	61.4	**54.538**
Hemiarthroplasty	5305	24.4	16435	75.6	**21.740**
Revision	2789	31.4	6081	68.6	**8.870**
Prosthesis removal	201	36.0	357	64.0	**558**
Resurfacing	772	66.7	386	33.3	**1.158**
Other	160	38.6	254	61.4	**414**
Total*	**30.303**	**34.7**	**56.975**	**65.3**	**87.278**

3.3 Side of surgery

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

Side	Males	Females
Right	53.0	62.8
Left	47.0	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 2009, according to **diagnosis**.

Diagnosis	Number	Percentage
Primary arthritis *	36293	66.8
Sequelae of LCA and DCA	6120	11.3
Femoral neck fracture	4869	9.0
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	3131	5.8
Post traumatic arthritis	1330	2.4
Post traumatic necrosis	757	1.4
Rheumatic arthritis	669	1.2
Femoral neck fracture sequelae	371	0.7
Epiphysiolysis sequelae	150	0.3
Perthes disease sequelae	126	0.2
Septic coxitis sequelae	97	0.2
Tumor	94	0.2
Paget disease	62	0.1
TBC coxitis sequelae	43	0.1
Other	187	0.3
Total**	**54299**	**100.0**

**239 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
Primary arthrosis	65.1	67.7	67.2	67.5
Sequelae of LCA and DCA	14.0	12.3	10.5	8.5
Femoral neck fracture	9.1	8.3	8.9	10.0
Femoral head necrosis idiopathic	5.1	5.3	5.9	6.5
Post traumatic arthritis	2.5	2.4	2.5	2.4
Post traumatic necrosis	1.5	1.3	1.4	1.2
Rheumatic arthritis	1.5	1.2	1.0	1.1
Other	1.2	1.5	2.6	2.7

Number of **resurfacing** operations carried out on patients with admission date between 1st January 2000 and 31st December 2009, according to **diagnosis**.

Diagnosis in resurfacing	Number	Percentage
Primary arthrosis	833	72.1
Sequelae of LCA and DCA	131	11.3
Post traumatic arthritis	67	5.8
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	62	5.4
Rheumatic arthritis	21	1.8
Post traumatic necrosis	11	1.0
Femoral neck fracture sequelae	8	0.7
Epiphysiolysis sequelae	7	0.6
Perthes disease sequelae	6	0.5
Septic coxitis sequelae	3	0.3
Anchylosing spondylitis	2	0.2
Paget's disease sequelae	1	0.1
Poliomyelitis sequelae	1	0.1
TBC coxitis sequelae	1	0.1
Femoral neck fracture	1	0.1
Total*	**1155**	**100.0**

*3 missing data

3.5 Causes for revision

Number of revision operations carried out on patients admitted between 1st January 2000 and 31st December 2009 according to ***diagnosis***
In italic revisions of hemiarthroplasty.

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	2714	31.0
Total aseptic loosening	2054	23.5
Stem aseptic loosening	986	11.3
Prosthesis dislocation	714	8.2
Bone fracture	360	4.1
Two steps prosthesis removal	333	3.8
Prosthesis breakage*	287	3.3
Poly wear	235	2.7
Hemiarthroplasty stem loosening	218	2.5
Hemiarthroplasty dislocation	205	2.3
Cotiloiditis	198	2.3
Septic loosening	111	1.3
Pain without loosening	110	1.3
Other	67	0.8
Primary instability	65	0.7
Bone fracture in hemiarthroplasty	38	0.4
Loosening of resurfacing	34	0.4
Bone fracture in resurfacing	24	0.3
Total**	**8753**	**100.0**

***** Failure of 40 cups, 42 stems, 62 heads, 75 liners, 46 modular necks and 6 proximal parts of the stem, 16 unknown components.

****** 117 missing data

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	2000-2006		2007-2008		2009	
	No.	%	No.	%	No.	%
CONTEMPORARY Stryker Howmedica	615	15.9	112	22.4	37	20.1
ZCA Zimmer	481	12.4	86	17.2	32	17.4
Cupule Avantage cemented Biomet	13	0.3	13	2.6	22	12.0
MULLER Sulzer-Centerpulse-Zimmer	397	10.3	27	5.4	15	8.2
MULLER Samo	401	10.4	23	4.6	12	6.5
MULLER Lima	168	4.3	51	10.2	11	6.0
MULLER Link	19	0.5	7	1.4	11	6.0
PE Ala-Ortho	85	2.2	64	12.8	7	3.8
MULLER Smith & Nephew	364	9.4	59	11.8	5	2.7
MULLER Citieffe	32	0.8	13	2.6	5	2.7
MULLER Wright Cremascoli	950	24.5	3	0.6	1	0.5
LUNA Amplitude	80	2.1	7	1.4	1	0.5
MULLER Groupe Lepine	54	1.4	3	0.6	0	0.0
CCB Mathys	49	1.3	1	0.2	0	0.0
Other (< 50 cases)	161	4.2	32	6.4	25	13.6
Total	**3869**	**100.0**	**501**	**100**	**184**	**100**

Cementless cup	2000-2006		2007-2008		2009	
	N.	%	N.	%	N.	%
FIXA TI-POR Ala-Ortho	0	0.0	670	5.5	1272	19.6
FIXA Ala-Ortho	2753	8.8	2888	23.9	803	12.4
EP-FIT PLUS - Endoplus	604	1.9	1268	10.5	717	11.1
TRIDENT - Stryker Howmedica	1057	3.4	484	4.0	263	4.1
ABGII - Stryker Howmedica	1693	5.4	444	3.7	241	3.7
FITMORE Sulzer - Centerpulse-Zimmer	1936	6.2	399	3.3	221	3.4
PINNACLE SECTOR II - DePuy	285	0.9	197	1.6	207	3.2
EXPANSION - Mathys	338	1.1	483	4.0	204	3.2
EXCEED ABT - Biomet	3	0.0	163	1.3	192	3.0
RECAP RESURFACING - Biomet	136	0.4	299	2.5	184	2.8
SELEXYS TH - Mathys	49	0.2	322	2.7	161	2.5
TRABECULAR METAL- Zimmer	90	0.3	220	1.8	144	2.2
DELTA PF - Lima	522	1.7	474	3.9	138	2.1
BICON PLUS - Endoplus	750	2.4	328	2.7	124	1.9
VERSAFITCUP CC - Medacta	81	0.3	196	1.6	114	1.8
REFLECTION - Smith & Nephew	1221	3.9	341	2.8	113	1.7
CLS Sulzer-Centerpulse-Zimmer	2903	9.3	277	2.3	93	1.4
DELTA TT - Lima	0	0.0	62	0.5	85	1.3
SPARKUP - Samo	0	0.0	51	0.4	83	1.3
TRILOGY AB - Zimmer	180	0.6	104	0.9	74	1.1
Beta Cup - Link	0	0.0	77	0.6	70	1.1
DUROM HIP RESURFACING - Zimmer	82	0.3	169	1.4	70	1.1
CUPULE RELOAD AVANTAGE - Biomet	0	0.0	52	0.4	66	1.0
BS - Citieffe	50	0.2	151	1.2	63	1.0
POLARCUP ORTHO-ID	7	0.0	80	0.7	48	0.7
MOBILIS I- OTHESIO	4	0.0	62	0.5	40	0.6
TRILOGY - Zimmer	949	3.0	89	0.7	40	0.6
EASY HIT - Medica	213	0.7	39	0.3	39	0.6
DUOFIT PDT - Samo	52	0.2	108	0.9	37	0.6
MRS RIVESTIMENTO - Lima	48	0.2	71	0.6	37	0.6
PROCOTYL-L - Wright Cremascoli	1	0.0	105	0.9	35	0.5
COOPER - Permedica	118	0.4	92	0.8	28	0.4
CFP - Link	385	1.2	103	0.9	23	0.4
BHR - Smith & Nephew	76	0.2	32	0.3	18	0.3
MALLORY - Biomet	141	0.5	57	0.5	17	0.3
AnCA FIT - Wright Cremascoli	6579	21.0	103	0.9	16	0.2
ALLOFIT S - Zimmer	167	0.5	61	0.5	13	0.2
HILOCK LINE - Symbios	426	1.4	99	0.8	12	0.2
DUOFIT PSF - Samo	1331	4.2	24	0.2	11	0.2
MBA - Groupe Lepine	152	0.5	50	0.4	9	0.1
TRABECULAR METAL MONOBLOCK-Zimmer	311	1.0	96	0.8	9	0.1
SPH BLIND - Lima	148	0.5	49	0.4	3	0.0
M2A - Biomet	167	0.5	18	0.1	1	0.0
ABG - Stryker Howmedica	227	0.7	0	0.0	0	0.0
ALBI + Wright Cremascoli	152	0.5	0	0.0	0	0.0
CUPULE AVANTAGE - Biomet	221	0.7	77	0.6	0	0.0
ELLIPTICAL CUP HEDROCEL - Stratec	154	0.5	0	0.0	0	0.0
ELLIPTICAL CUP - Stratec	197	0.6	0	0.0	0	0.0
EXCEED PC - Biomet	170	0.5	15	0.1	0	0.0
MARBURG - Zimmer	174	0.6	0	0.0	0	0.0
METASUL STAR CUP - Sulzer	145	0.5	0	0.0	0	0.0
OSTEOLOCK - Stryker Howmedica	170	0.5	0	0.0	0	0.0
SECUR-FIT - Stryker Osteonics	170	0.5	0	0.0	0	0.0

SPH CONTACT - Lima	234	0.7	0	0.0	0	0.0
STANDARD CUP - Protek Sulzer Zimmer	1293	4.1	12	0.1	0	0.0
Other (< 100 cases)	2017	6.4	525	4.3	337	5.2
Total	**31332**	**100.0**	**12086**	**100.0**	**6475**	**100.0**

4.2 Cups used in total revision surgery

Cemented cup	2000-2006		2007-2008		2009	
	N.	%	N.	%	N.	%
MULLER Protek-Sulzer-Centerpulse-Zimmer	123	25.4	28	36.4	4	16.7
MULLER - Samo	47	9.7	10	13.0	4	16.7
CONTEMPORARY - Stryker Howmedica	101	20.9	12	15.6	4	16.7
CUPULE AVANTAGE CEMENTED - Biomet	14	2.9	5	6.5	1	4.2
MULLER - Lima	32	6.6	4	5.2	1	4.2
ZCA - Zimmer	26	5.4	5	6.5	1	4.2
MULLER - Smith & Nephew	12	2.5	1	1.3	1	4.2
CCB - Mathys	19	3.9	-	-	-	-
MULLER - Wright Cremascoli	58	12	-	-	-	-
Other (< 10 cases)	52	10.7	12	15.6	8	33.3
Total	**484**	**100.0**	**77**	**100.0**	**24**	**100.0**

Cementless cup	2000-2006		2007-2008		2009	
	N.	%	N.	%	N.	%
AnCA FIT - Wright Cremascoli	297	19.6	2	0.5	0	0.0
CLS - Zimmer	38	2.5	2	0.5	0	0.0
CONICAL SCREW CUP - Protek	25	1.6	0	0.0	0	0.0
DELTA PF - Lima	15	1.0	19	4.5	1	0.5
DUOFIT PSF - Samo	49	3.2	0	0.0	0	0.0
EP-FIT PLUS - Endoplus	4	0.3	11	2.6	7	3.5
FITMORE - Zimmer	46	3.0	4	0.9	2	1.0
FIXA Ala-Ortho	56	3.7	62	14.7	8	4.0
FIXA Ti-Por Ala-Ortho	0	0.0	9	2.1	25	12.6
LOR ALLOPRO - Sulzer	43	2.8	0	0.0	0	0.0
MC MINN - Link	81	5.3	6	1.4	0	0.0
OMNIA Ala-Ortho	0	0.0	28	6.6	8	4.0
OSTEOLOCK - Stryker Howmedica	47	3.1	0	0.0	0	0.0
PINNACLE MULTIHOLE II - DePuy	29	1.9	1	0.2	1	0.5
PROCOTYL-E - Wright Cremascoli	35	2.3	1	0.2	0	0.0
PROCOTYL-Z-PIVOT - Wright Cremascoli	16	1.1	5	1.2	1	0.5
REFLECTION - Smith & Nephew	11	0.7	13	3.1	5	2.5
SECUR-FIT - Stryker Osteonics	25	1.6	0	0.0	0	0.0
STANDARD CUP PROTEK - Sulzer	131	8.6	1	0.2	0	0.0
TRABECULAR METAL - Zimmer	29	1.9	43	10.2	28	14.1
TRIDENT ARC2F - Stryker Howmedica	18	1.2	16	3.8	2	1.0
TRIDENT - Stryker Howmedica	81	5.3	48	11.3	15	7.6
TRILOGY - Zimmer	103	6.8	24	5.7	1	0.5
BICON PLUS - Endoplus	9	0.6	5	1.2	7	3.5
Hermes BS Rev Citieffe	0	0.0	8	1.9	13	6.6
Other (< 20 cases)	328	21.6	115	27.2	74	37.4
Total	**1516**	**100.0**	**423**	**100.0**	**198**	**100.0**

4.3 Stems used in primary surgery

Cemented stem	2000-2006		2007-2008		2009	
	N.	%	N.	%	N.	%
APTA Ala-Ortho	576	6.5	298	22.2	99	19.4
BASIS Smith & Nephew	538	6.1	174	12.9	72	14.1
EXETER Stryker Howmedica	891	10.1	239	17.8	71	13.9
MERCURIUS Ala-Ortho	0	0.0	80	5.9	22	4.3
CCA Mathys	120	1.4	40	3.0	20	3.9
VERSYS ADVOCATE Zimmer	132	1.5	69	5.1	19	3.7
P507 Samo	578	6.6	57	4.2	16	3.1
LUBINUS SP2 Link	274	3.1	8	0.6	15	2.9
AB Citieffe	56	0.6	30	2.2	15	2.9
LC Samo	348	4.0	6	0.4	12	2.3
AD Samo	351	4.0	19	1.4	11	2.2
SPECTRON Smith & Nephew	645	7.3	63	4.7	9	1.8
ARCAD SO Symbios	25	0.3	34	2.5	5	1.0
DUOFIT CKA Samo	37	0.4	9	0.7	4	0.8
SL Lima	52	0.6	19	1.4	3	0.6
DEFINITION Stryker Howmedica	323	3.7	16	1.2	2	0.4
MS 30 Zimmer	178	2.0	4	0.3	1	0.2
MULLER AUTOBLOCCANTE Sulzer	48	0.5	4	0.3	1	0.2
VERSYS CEMENTED LD Zimmer	127	1.4	3	0.2	1	0.2
C STEM DePuy	295	3.4	19	1.4	0	0.0
DUOFIT CFS Samo	67	0.8	5	0.4	0	0.0
MBA Groupe Lepine	67	0.8	18	1.3	0	0.0
ABGII Stryker Howmedica	55	0.6	1	0.1	0	0.0
JVC Wright Cremascoli	725	8.2	2	0.1	0	0.0
ABG Stryker Howmedica	223	2.5	0	0.0	0	0.0
AHS Wright Cremascoli	293	3.3	0	0.0	0	0.0
ANCA Wright Cremascoli	89	1.0	0	0.0	0	0.0
FULLFIX Mathys	66	0.8	0	0.0	0	0.0
MRL Wright Cremascoli	469	5.3	0	0.0	0	0.0
PERFECTA RA Wright	60	0.7	0	0.0	0	0.0
ULTIMA Johnson & Johnson	198	2.3	0	0.0	0	0.0
VERSYS CEMENTED Zimmer	336	3.8	0	0.0	0	0.0
Other (< 50 cases)	525	6.0	128	9.5	113	22.1
Total	**8767**	**100**	**1345**	**100**	**511**	**100**

Uncemented stem	2000-2006		2007-2008		2009	
	N.	%	N.	%	N.	%
APTA Ala-Ortho	576	6.5	298	22.2	99	19.4
BASIS Smith & Nephew	538	6.1	174	12.9	72	14.1
EXETER Stryker Howmedica	891	10.1	239	17.8	71	13.9
MERCURIUS Ala-Ortho	0	0.0	80	5.9	22	4.3
CCA Mathys	120	1.4	40	3.0	20	3.9
VERSYS ADVOCATE Zimmer	132	1.5	69	5.1	19	3.7
P507 Samo	578	6.6	57	4.2	16	3.1
LUBINUS SP2 Link	274	3.1	8	0.6	15	2.9
AB Citieffe	56	0.6	30	2.2	15	2.9
LC Samo	348	4.0	6	0.4	12	2.3
AD Samo	351	4.0	19	1.4	11	2.2
SPECTRON Smith & Nephew	645	7.3	63	4.7	9	1.8
ARCAD SO Symbios	25	0.3	34	2.5	5	1.0
DUOFIT CKA Samo	37	0.4	9	0.7	4	0.8
SL Lima	52	0.6	19	1.4	3	0.6
DEFINITION Stryker Howmedica	323	3.7	16	1.2	2	0.4
MS 30 Zimmer	178	2.0	4	0.3	1	0.2
MULLER AUTOBLOCCANTE Sulzer	48	0.5	4	0.3	1	0.2
VERSYS CEMENTED LD Zimmer	127	1.4	3	0.2	1	0.2
C STEM DePuy	295	3.4	19	1.4	0	0.0
DUOFIT CFS Samo	67	0.8	5	0.4	0	0.0
MBA Groupe Lepine	67	0.8	18	1.3	0	0.0
ABGII Stryker Howmedica	55	0.6	1	0.1	0	0.0
JVC Wright Cremascoli	725	8.2	2	0.1	0	0.0
ABG Stryker Howmedica	223	2.5	0	0.0	0	0.0
AHS Wright Cremascoli	293	3.3	0	0.0	0	0.0
ANCA Wright Cremascoli	89	1.0	0	0.0	0	0.0
FULLFIX Mathys	66	0.8	0	0.0	0	0.0
MRL Wright Cremascoli	469	5.3	0	0.0	0	0.0
PERFECTA RA Wright	60	0.7	0	0.0	0	0.0
ULTIMA Johnson & Johnson	198	2.3	0	0.0	0	0.0
VERSYS CEMENTED Zimmer	336	3.8	0	0.0	0	0.0
Other (< 50 cases)	525	6.0	128	9.5	113	22.1
TOTAL	**8767**	**100**	**1345**	**100**	**511**	**100**

4.4 Stems used in total revision surgery

Cemented stem	2000-2006		2007-2008		2009	
	N.	%	N.	%	N.	%
EXETER Stryker Howmedica	55	17.2	15	23.1	3	16.7
APTA Ala-Ortho	16	5.0	12	18.5	2	11.1
JVC Wright Cremascoli	29	9.1	4	6.2	-	-
AD Samo	27	8.5	2	3.1	-	-
VERSYS REVISION CALCAR Zimmer	14	4.4	2	3.1	1	5.6
AnCA Wright Cremascoli	25	7.8	-	-	-	-
Mercurius Ala-Ortho	-	-	2	3.1	3	16.7
Other (< 10 cases)	153	48.0	28	43.1	9	50.0
Total	**319**	**100.0**	**65**	**100.0**	**18**	**100.0**

13 missing data

Uncemented stem	2000-2006		2007-2008		2009	
	N.	%	N.	%	N.	%
ABG Stryker Howmedica	329	1.2	0	0.0	0	0.0
ABGII Stryker Howmedica	1885	7.1	614	5.5	310	5.0
ACCOLADE Stryker Osteonics	197	0.7	77	0.7	54	0.9
ADR Endoplus	0	0.0	91	0.8	108	1.8
ALATA ACUTA S Ala-Ortho	95	0.4	246	2.2	112	1.8
ALLOCLASSIC SL ALLOPRO Sulzer	214	0.8	46	0.4	40	0.7
ANCA FIT Wright Cremascoli	4253	16.1	194	1.7	40	0.7
APTA Ala-Ortho	1507	5.7	1635	14.6	949	15.4
ARCAD HA Symbios	76	0.3	110	1.0	22	0.4
BHS Smith & Nephew	407	1.5	24	0.2	0	0.0
C2 Lima	456	1.7	290	2.6	66	1.1
CBC Mathys	319	1.2	707	6.3	300	4.9
CFP Link	471	1.8	239	2.1	160	2.6
CITATION Stryker Howmedica	112	0.4	0	0.0	0	0.0
CLS Zimmer	3251	12.3	264	2.4	147	2.4
CONELOCK SHORT Biomet	47	0.2	142	1.3	54	0.9
CONUS Zimmer	2877	10.9	682	6.1	339	5.5
CORAIL DePuy	336	1.3	149	1.3	175	2.8
DUOFIT RKT Samo	283	1.1	20	0.2	2	0.0
DUOFIT RTT Samo	39	0.1	53	0.5	22	0.4
EASY Hitmedica	207	0.8	17	0.2	3	0.0
EHS Wright Cremascoli	311	1.2	1	0.0	0	0.0
FIT STEM Lima	203	0.8	80	0.7	13	0.2
G3 Citieffe	177	0.7	0	0.0	0	0.0
HIPSTAR Stryker Howmedica	310	1.2	129	1.1	70	1.1
HYDRA Ala-Ortho	0	0.0	140	1.2	179	2.9
MAYO Zimmer	75	0.3	31	0.3	12	0.2
MBA HAP Groupe Lepine	77	0.3	34	0.3	9	0.1
MODULUS HIP SYSTEM Lima	191	0.7	149	1.3	74	1.2
MULTIFIT Samo	26	0.1	53	0.5	63	1.0
NANOS Endoplant gmbh	25	0.1	70	0.6	74	1.2
PBF Permedica	130	0.5	68	0.6	36	0.6
PORO-LOCK II HIT Medica	75	0.3	39	0.3	39	0.6
PPF Biomet	220	0.8	10	0.1	11	0.2
PROFEMUR Z Wright Cremascoli	629	2.4	10	0.1	2	0.0
PROXILOCK FT Stratec	304	1.2	0	0.0	0	0.0
PROXIPLUS Endoplant Gmbh	194	0.7	451	4.0	179	2.9
QUADRA-H Medacta	35	0.1	70	0.6	35	0.6
QUADRA-S Medacta	72	0.3	80	0.7	22	0.4
RECTA Ala-Ortho	730	2.8	1299	11.6	737	12.0
SL PLUS Endoplus	1401	5.3	1184	10.5	591	9.6
SL REVISION Zimmer	100	0.4	22	0.2	15	0.2
SPS MODULAR Symbios	40	0.2	69	0.6	0	0.0
SPS Symbios	210	0.8	11	0.1	0	0.0
STEM Wright Cremascoli	209	0.8	0	0.0	0	0.0
SUMMIT DePuy	107	0.4	44	0.4	42	0.7
SYNERGY Smith & Nephew	256	1.0	159	1.4	44	0.7
TAPERLOC Biomet	522	2.0	533	4.7	325	5.3
TAPERLOC MICROPLASTY Biomet	0	0.0	8	0.1	119	1.9
VERSYS FIBER METAL TAPER Zimmer	773	2.9	215	1.9	69	1.1
Z1 Citieffe	41	0.2	131	1.2	58	0.9
Other (< 100 cases)	1584	6.0	544	4.8	425	6.9
TOTAL	**26388**	**100**	**11234**	**100**	**6146**	**100**

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

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

Year of operation	Total revision	
	Stems	Cups
2000	48	58
2001	55	64
2002	48	59
2003	60	62
2004	40	46
2005	44	45
2006	55	55
2007	50	60
2008	49	50
2009	42	54

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%

Types of resurfacing implanted between **1st January 2000** and **31st December 2009**

Type	N.	%
BHR – Smith & Nephew	695	60.0
ADEPT – Finsbury	125	10.8
MITCH TRH – Finsbury	81	7.0
ASR – DePuy	71	6.1
RECAP – Biomet	51	4.4
MRS – Lima	46	4.0
BMHR – Smith & Nephew	28	2.4
ICON – International Orthopaedics	21	1.8
CONSERVE PLUS – Wright	19	1.6
ROMAX – Medacta	11	0.9
DURON Hip Resurfacing – Zimmer	8	0.7
Cormet – Corin	1	0.1
Tribofit – Active Implants	1	0.1
Total	**1158**	**100.0**

4.7 Modular neck

31.5% of stems implanted in primary surgery have modular neck.

Year of surgery	Primary surgery	
	Standard neck	Modular neck
2000	78.2	21.8
2001	74.8	25.2
2002	71.0	29.0
2003	72.9	27.1
2004	69.5	30.5
2005	67.2	32.8
2006	63.9	36.1
2007	65.4	34.6
2008	64.2	35.8
2009	63.9	36.1

Types of stems with proximal modularity	2000-2006		2007		2008	
	N.	%	N.	%	N.	%
APTA Ala-Ortho	2084	20.0	1933	41.3	1049	41.7
RECTA Ala-Ortho	730	7.0	1300	27.8	737	29.3
HYDRA Ala-Ortho	-	-	141	3.0	181	7.2
ALATA ACUTA S Ala-Ortho	95	0.9	247	5.3	112	4.4
STELO MODULARE NDS1 Citieffe	95	0.9	247	5.3	112	4.4
MODULUS HIP SYSTEM Lima	191	1.8	149	3.2	74	2.9
MULTIFIT Samo	26	0.2	53	1.1	63	2.5
ANCA FIT Wright Cremascoli	4252	40.7	194	4.1	40	1.6
ABGII MODULAR Howmedica	-	-	20	0.4	27	1.1
SAM-FIT Lima	-	-	9	0.2	25	1.0
MERCURIUS Ala-Ortho	-	-	80	1.7	22	0.9
S-ROM DePuy	24	0.2	28	0.6	13	0.5
HARMONY Symbios	-	-	52	1.1	12	0.5
MBA HAP Groupe Lepine	77	0.7	34	0.7	9	0.4
PROFEMUR L Wright Cremascoli	47	0.4	45	1.0	3	0.1
PROFEMUR Z Wright Cremascoli	629	6.0	10	0.2	2	0.1
SPS MODULAR Symbios	40	0.4	69	1.5	-	-
MBA Groupe Lepine	67	0.6	18	0.4	-	-
JVC Wright Cremascoli	725	6.9	2	0.0	-	0.0
EHS Wright Cremascoli	311	3.0	1	0.0	-	0.0
ANCA-FIT Dual fit Wright Cremascoli	314	3.0	-	-	-	-
STEM Wright Cremascoli	209	2.0	-	-	-	-
G3 Citieffe	177	1.7	-	-	-	-
PROFEMUR C Wright Cremascoli	86	0.8	-	-	-	-
ALBI PTC Wright Cremascoli	35	0.3	-	-	-	-
STELO MODULARE NDS1 Citieffe	75	0.7	1	-	-	-
S. ROM Johnson e Johnson	54	0.5	1	0.0	-	-
Other <30 cases	103	1.0	45	1.0	37	1.4
Total	10446	100.0	4679	100.0	2518	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 2009, according to the ***type of operation and articular coupling.***

Articular coupling	Total hip arthroplasty		Total revision	
	No.	%	No.	%
Metal-polyethylene	12391	23.3	706	26.7
Metal-crosslinked polyethylene	4449	8.4	401	15.1
Ceramic-polyethylene	9995	18.8	696	26.3
Ceramic-crosslinked polyethylene	2276	4.3	174	6.6
Ceramic-ceramic	18431	34.6	581	21.9
Metal-metal	5276	9.9	90	3.4
Cerid-polyethylene	180	0.3	0	0.0
Biolox delta-metal	116	0.2	0	0.0
Metal-policarbonate urethane	91	0.2	0	0.0
Total*	**53205**	**100.0**	**2648**	**100.0**

* Data are missing in 1084 primary and in 71 revision operations

Percentage of total hip arthroplasty interventions between 2000 and 2009, according to the ***type of polyethylene*** *used***.**

Year of surgery	Primary surgery		
	Standard poly	Crosslinked poly	Not defined poly
2000	76.7	9.7	13.6
2001	82.5	15.9	1.6
2002	84.6	14.3	1.1
2003	83.5	16.3	0.2
2004	79.6	20.3	0.1
2005	77.8	22.0	0.2
2006	76.7	23.3	-
2007	73.0	26.9	0.1
2008	65.4	34.6	-
2009	52.8	47.2	-

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

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

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

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	14.0	17.6	9.5	19.5	35.3	4.1

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	61.8	19.1
40-49	9.3	14.6	56.3	19.8
50-59	13.6	17.3	50.4	18.8
60-69	26.2	23.5	39.7	10.6
70-79	40.9	28.9	25.3	4.9
≥80	60.4	22.5	13.5	3.6

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2009, 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.	%
Biolox forte	-	-	-	-	16755	45.3	4695	63.8	3062	41.6	-	-
Cr-Co	163	78	16	76	15925	43.1	845	11.5	827	11.2	1992	84.7
Biolox Delta	-	-	-	-	637	1.7	1644	22.3	3478	47.2	355	15.1
Stainless steel	45	22	5	24	3007	8.1	148	2.0	-	-	-	-
Zirconia	-	-	-	-	289	0.8	2	-	-	-	-	-
Oxinium	-	-	-	-	182	0.5	23	0.3	-	-	-	-
Cerid	-	-	-	-	180	0.5	-	-	-	-	-	-
Titanium nitrited coated	-	-	-	-	-	-	-	-	-	-	5	0.2
Ceramic for revision	-	-	-	-	-	-	1	0.0	1	0.0	-	-
Bionium-Diamant	-	-	-	-	2	0.0	-	-	-	-	-	-
Total	208	100	21	100	36977	100	7358	100	7368	100	2352	10-

*254 missing data

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	43324	79.6	1912	70.1
Hybrid (cemented stem and cementless cup)	6513	12.0	230	8.4
Cemented	4169	7.7	172	6.3
Reverse hybrid (cementless stem and cemented cup)	389	0.7	415	15.2
Total*	**54395**	**100.0**	**2729**	**100.0**

*143 primary and 4 revision data are missing

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

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

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

Age class	Elective primary THA 2000-2009			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0.8	97.7	1.0	0.5
40-49	0.3	98.5	0.9	0.3
50-59	0.7	96.5	2.5	0.4
60-69	1.7	88.3	9.5	0.4
70-79	9.1	71.9	18.2	0.8
≥80	27.0	52.7	18.5	1.8

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 2009

Age class	Elective primary surgery year 2009			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0.5	99.5	-	-
40-49	-	98.6	1.4	-
50-59	0.3	99.2	0.1	0.3
60-69	0.5	97.1	2.2	0.3
70-79	1.3	89.9	8.0	0.8
≥80	7.0	71.6	18.6	2.8

Percentage of total revision surgery **according to fixation**, during the years

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

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

Age class	Total revision			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	2.2	89.1	2.2	6.5
40-49	5.0	88.0	3.0	4.0
50-59	1.9	83.3	4.3	10.5
60-69	3.6	74.4	6.7	15.3
70-79	5.6	67.7	9.5	17.1
≥80	16.2	54.8	12.7	16.2

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	34.0	30.5	7.0
Cemex System – Tecres	12.7	32.7	2.4
Palacos R – Biomet	8.5	2.4	4.0
Amplicem 3 – Amplimedical	5.7	5.5	-
Antibiotic Simplex – Howmedica	***4.4***	***2.3***	***73.1***
Smartset HV – Depuy	3.9	1.3	5.5
CMW 3 – Depuy	3.0	2.5	-
Cemex RX – Tecres	2.4	8.1	0.2
Cemex + Cemex System - Tecres	2.4	-	-
Cemex – Tecres	2.2	4.0	0.4
Amplicem 1 + Amplicem 3 – Amplimedical	1.9	-	-
Cemex RX + Cemex System - Tecres	1.6	-	-
Exolent High – Elmdown	1.5	0.9	-
Sulcem 3 – Centerpulse	1.4	1.5	0.1
Amplicem 1 – Amplimedical + Smartset HV – Depuy	1.3	-	-
Cemex System – Tecres + Surgical Simplex P – Howmedica	1.3	-	-
Cemfix 1 – Teknimed	1.2	0.2	-
Versabond – Smith & Nephew	1.1	-	0.2
Cemfix 3 – Teknimed	1.0	-	-
Cemex Genta - Cemex Genta System – Tecres	***0.9***	***-***	***-***
Aminofix 1 – Groupe Lepine	***0.8***	***-***	***-***
Palacos R 40 – SP Europe	0.7	0.1	-
Palacos R – Heraeus Medical	0.6	0.9	-
Smartset MV – Depuy	0.5	0.6	0.1
Amplicem 1 - Amplimedical	0.5	0.4	0.4
Cemex Genta System – Tecres	***0.4***	***1.4***	***2.7***
Cemex Genta – Tecres	***0.4***	***0.5***	***0.1***
Vacu Mix Plus CMW 3 - Depuy	0.4	0.7	-
Amplicem 3G – Amplimedical	***0.3***	***-***	***-***
Cemex XL – Tecres	*0.2*	0.9	-
Refobacin Bone Cement R – Biomet	***0.2***	***-***	***0.1***
Palacos R – Heraeus Medical + Surgical Simplex P – Howmedica		-	-
CMW 1 – Depuy	0.2	0.5	-
Cemfix 1 + Cemfix 3 - Teknimed	0.2	-	-
Other with antibiotic	***1.1***	***0.4***	***0.3***
Other without antibiotic	1.5	1.8	3.2
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.

61.8% of THA is implanted through lateral approach, 29.3% through postero-lateral.

78.8% of resurfacing prostheses is implanted through postero-lateral approach and 19.1 % TROUGH LATERAL.

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

In 13.7% of revision surgery of cups, reinforcement rings were used.

5. Types of hemiarthroplasty

5.1 Heads and stem

Hemiarthroplasty (head + stem)	No.	%
C1 Citieffe + AB Citieffe	2296	10.7
SPERI LOCK Hit Medica + SPERI SYSTEM II Hit Medica	1924	8.9
SPERI LOCK Hit Medica + SL STREAKES Hit Medica	1145	5.3
UHR Osteonics + ACCOLADE Osteonics	1050	4.9
SPERI LOCK Hit Medica + SL Hit Medical	679	3.2
CUPOLA MOBILE BIARTICOLARE Permedica + SL Permedica	677	3.1
CUPOLA SEM DMO + SEM II DMO	636	3.0
CUPOLA BIPOLARE Mathys + CCA Mathys	613	2.8
CUPOLA MOBILE Zimmer + ORTHO-FIT Zimmer	564	2.6
JANUS Bioimpianti + FIN Bioimpianti	521	2.4
ULTIMA MONK Depuy + G2 Depuy	505	2.3
MODULAR BIPOLAR Zimmer + STANDARD STRAIGHT Zimmer	490	2.3
TESTA BIARTICOLARE LOCK Lima + SL Lima	479	2.2
CUPOLA MOBILE Cremascoli + JVC Cremascoli	471	2.2
TESTA BIARTICOLARE LOCK Lima + LOGICA MIRROR Lima	470	2.2
TESTA BIARTICOLARE Lima + SL Lima	426	2.0
UHR OSTEONICS + RELIANCE Howmedica	418	1.9
TESTA ELLITTICA Samo + LC Samo	417	1.9
UHR OSTEONICS + EXETER Howmedica	355	1.6
SPHERIC Amplitude + APTA Ala-Ortho	332	1.5
ULTIMA Depuy + ULTIMA LX Depuy	307	1.4
CUPOLA MOBILE Cremascoli + AHS Cremascoli	307	1.4
CENTRAX Howmedica + HIP FRACTURE Howmedica	288	1.3
BI-POLAR Biomet + PPF Biomet	262	1.2
CUPOLA MOBILE Zimmer + STANDARD STRAIGHT Zimmer	246	1.1
JANUS Bioimpianti + S-TAPER Bioimpianti	213	1.0
TESTA BIARTICOLARE LOCK Lima + LOGICA Lima	212	1.0
RETENTIVE MOBILE CUP Cedior + ORTHO-FIT Zimmer	211	1.0
BICENTRIC Howmedica + RELIANCE Howmedica	200	0.9
CUPOLA NEMAUSUS Transysteme + APTA Ala-Ortho	199	0.9
BI-POLAR Depuy + G2 Depuy	185	0.9
C1 Citieffe + VERSYS Zimmer	183	0.8
CUPOLA MOBILE Cremascoli + VERSYS Zimmer	181	0.8
CUPOLA MOBILE Medacta + QUADRA-C Medacta	171	0.8
CORON Tantum + ENDON Tantum	163	0.8
UHR Osteonics + DEFINITION Howmedica	157	0.7
CUPOLA BIPOLARE Zimmer + VERSYS Zimmer	156	0.7
TESTA BIPOLARE Amplimedical + SL Amplimedical	155	0.7
CUPOLA BIPOLARE Zimmer + VERSYS HERITAGE Zimmer	145	0.7
CUPOLA MOBILE Cremascoli + MRL Cremascoli	130	0.6
CENTRAX Howmedica + EXETER Howmedica	129	0.6
SPERI LOCK Hit Medica + MRL Cremascoli	107	0.5
TESTA BIPOLARE Samo + DUOFIT CKA Samo	100	0.5
Other 344 types with less than 100 cases each	2655	12.3
TOTAL*	**21530**	**100**

* 210 missing data

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	20028	92.4
Preassembled bipolar head	1099	5.1
Monopolar head	537	2.5
Total*	**21664**	**100.0**

***76 missing data

6. Blood transfusion

Percentages of operations performed on patients admitted between 1st January 2003 and 31st December 2009 **according to type of operation and transfusion**

Type of surgery	None	Autologous (recovery)	Autologous (predeposit)	Homologous	Autologous and homologous
Emergency primary	7.5	11.7	-	58.7	7.5
Elective primary	11.6	19.5	41.5	16.3	11.1
Revision	8.4	13.4	19.9	41.5	16.7

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	31.2	4.3	64.0	0.5
Private	8.4	35.8	26.0	29.7
AUSL	36.4	5.1	54.8	3.7
IOR	2.9	1.2	95.9	0.0

Elective THA				
Type of hospital	**None**	**Autologous**	**Homologous**	**Autologous and homologous**
AOSP	15.9	64.1	16.4	3.7
Private	5.9	70.9	6.1	17.1
AUSL	19.1	51.6	17.7	11.6
IOR	3.0	61.8	28.7	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 2009.

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	198	*0.4*	Hematoma	597	*1.1*	Anemia	2.516	*4.6*
Diaphyseal fracture	183	*0.3*	Prosthesis disloc	249	*0.5*	Hyperpyrexia	451	*0.8*
Greater toch fracture	101	*0.2*	SPE paralysis	112	*0.2*	Genito-urinary	240	*0.4*
			Deep vein thromb	80	*0.1*	Gastro-intestinal	220	*0.4*
Anaesthesiolog complications	84	*0.2*	Bleeding	77	*0.1*	Cardiovascular	134	*0.2*
			Bed sores	61	*0.1*	Embolism	86	*0.2*
Cotyle fracture	76	*0.1*	Crural paralysis	58	*0.1*	Respiratory	83	*0.2*
Hemorragia	22	*0.04*	Infection	49	*0.1*	Collapse	70	*0.1*
			Secretion	41	*0.1*	Infarction	65	*0.1*
Instability	15	*0.03*				Dyspnoea	51	*0.1*
Other	50	*0.1*	Other	181	*0.3*	Others	352	*0.6*
Total	**729**	***1.3***	**Total**	**1.505**	***2.8***	**Total**	**4.268**	***7.8***

The rate of complications in **revision surgery** carried out on patients hospitalised between January 1st 2000 and December 31st 2009

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Diaphyseal fracture	134	*1.5*	Hematoma	132	*1.5*	Anemia	511	*5.8*
Calcar fracture	46	*0.5*	Prosthesis disloc	80	*0.9*	Hyperpyrexia	57	*0.6*
			Bleeding	44	*0.5*	Cardiovascular	34	*0.4*
Anaesthesiologic complications	32	*0.4*	SPE paralysis	42	*0.5*	Collapse	24	*0.3*
			Infection	26	*0.3*	Gastro-intestinal	30	*0.3*
Greater troch fracture	28	*0.3*	Bed sores	15	*0.2*	Genito-urinary	26	*0.3*
			Deep vein thromb	13	*0.1*	Infarction	19	*0.2*
Cotyle fracture	14	*0.2*	Crural paralysis	6	*0.1*	Respiratory	14	*0.2*
Hemorragia	12	*0.1*				Embolism	14	*0.2*
Other	16	*0.2*	Other	37	*0.4*	Other	87	*1.0*
Total	**282**	***3.2***	**Total**	**395**	***4.5***	**Total**	**816**	***9.2***

The rate of complications in **hemiarthroplasty** carried out on patients hospitalised between January 1st 2000 and December 31st 2009.

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Anaesthesiol. complications	61	*0.3*	Hematoma	154	*0.7*	Anemia	1.565	*7.2*
			Prosthesis disloc	98	*0.5*	Hyperpyrexia	199	*0.9*
Calcar fracture	59	*0.3*	Bed sores	90	*0.4*	Genito-urinary	189	*0.9*
			Deep vein thromb	61	*0.3*	Cardiovascular	120	*0.6*
Greater toch fracture	44	*0.2*	SPE paralysis	55	*0.3*	Gastro-intestinal	117	*0.5*
						Respiratory	108	*0.5*
Diaphyseal fracture	32	*0.2*	Infection	30	*0.1*	Collapse	79	*0.4*
Hemorragia	12	*0.1*	Bleeding	12	*0.1*	Embolism	76	*0.4*
						Infarction	54	*0.2*
Instability	4	*0.02*	Crural paralysis	1	*0.005*	Disorientation	38	*0.2*
Cotyle fracture	2	*0.01*				Dyspnoea	37	*0.2*
Other	18	*0.1*	Other	25	*0.1*	Other	173	*0.8*
Total	**232**	***1.1***	**Total**	**526**	***2.4***	**Total**	**2.755**	***12.7***

7.1 Deaths during hospitalization

Number of deaths in prosthetic surgery on patients hospitalized between January 1st 2000 and December 31st 2009.
(the deaths recorded are those that occurred during hospitalization).

Years 2000-2009			
	Deaths	**n. of operations**	**Percentage**
Primary THA	150	54.538	0.3
Hemiarthroplasty	951	21.740	4.4
Revision	55	8.870	0.6
Prosthesis removal	14	558	2.5
Resurfacing prostheses	-	1.158	-

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			
	Deaths	**n. of operations**	**Percentage**
2000	177	1755	10.1
2001	178	2128	8.4
2002	157	1938	8.1
2003	146	2033	7.2
2004	173	2232	7.8
2005	177	2303	7.7
2006	159	2374	6.7
2007	166	2141	7.8
2008	135	2437	5.5
2009	171	2399	7.1
Total	**1639**	**21740**	**7.5**

8. Duration of pre-operative hospitalization

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

Year2000			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	4292	2.4	0-49
Hemiarthropl	1756	3.5	0-44
Revision	720	4.0	0-52
Prosthesis removal	38	5.2	0-20
Year 2009			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	6671	1.7	0-141
Hemiarthropl	2399	3.9	0-135
Revision	971	3.6	0-89
Resurfacing	167	1.4	0-9
Prosthesis removal	65	7.0	0-60

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 2009 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 41.033

Non revised: 39.886
Revised: 1.127

Chi-square: 59.9 *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 2.0-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..)	2.0	1.1	3.8	S (0.025)
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. The analysis was repeated (data not shown) also by dividing the class into two subclassess (fractures of the femur and their outcomes). The result does not change. Both fractures of neck of femur and their outcome represent a risk factor. The data are not presented because the model is more reliable in the version shown in the table.

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 2009 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 10 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	41.033	836	311
Hemiarthroplasty	20.956	250	76
Total revision	1.705	100	48
Total	**63.694**	**1186**	**435**

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 5 years

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital
Resurfacing	485	28	1

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	867	280	1147/41.033	2.8
Hemiarthroplasty	314	12	326/20.956	1.6
Resurfacing	29	-	29/485	6.0
Total revision	120	28	148/1.705	8.7

9.3 Survival curves according to Kaplan Meier

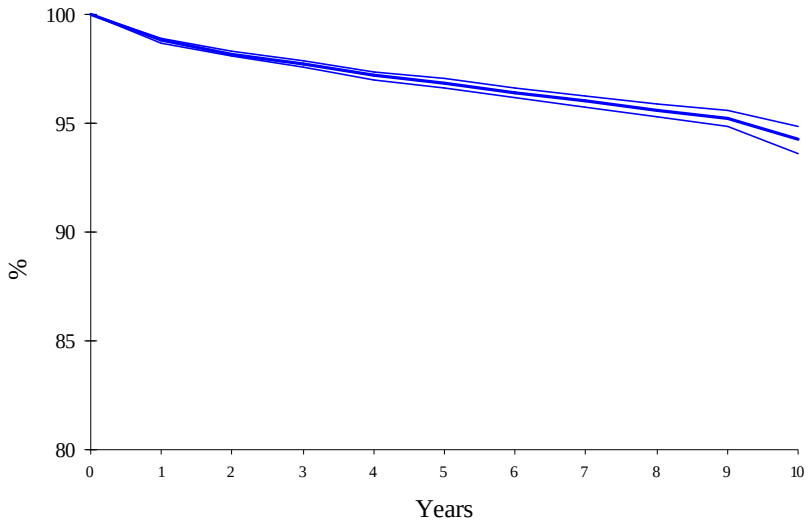
The survival curve calculated by the Kaplan Meier method enables an estimation of the probability that each individual has of maintaining its initial condition (prosthesis in place) over time.
The following paragraphs show the survival curves calculated separately for primary prosthesis, endoprosthesis, 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

41033 primary arthroprostheses are under observation. Of these, 1147 revisions were carried out for the reasons given at the bottom of the table.

Number of arthroprostheses	n. revisions	% revision
41.033	**1.147**	**2.8**

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	98.2	98.1	98.3
3	97.7	97.5	97.9
4	97.2	97.0	97.4
5	96.8	96.6	97.0
6	96.4	96.2	96.7
7	96.0	95.8	96.3
8	95.6	95.3	95.9
9	95.2	94.9	95.6
10	94.2	93.6	94.9

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	**292**/41033	0.7	**25.5**
within 60 days	*155/41033*		
over 60 days	*137/41033*		
Aseptic loosening of the stem	**210**/41033	0.5	**18.3**
within 60 days	*9/41033*		
over 60 days	*201/41033*		
Aseptic loosening of the cup	**174**/41033	0.4	**15.2**
within 60 days	*19/41033*		
over 60 days	*155/41033*		
Global aseptic loosening	**76**/41033	0.2	**6.6**
within 60 days	*1/41033*		
over 60 days	*75/41033*		
Periprosthetic bone fracture	**125**/41033	0.3	**10.9**
within 60 days	*47/41033*		
over 60 days	*78/41033*		
Septic loosening	**64**/41033	0.16	**5.6**
within 60 days	*8/41033*		
over 60 days	*56/41033*		
Breakage of prosthesis	**103**/41033	0.25	**9.0**
Pain without loosening	**24**/41033	0.06	**2.1**
Primary instability	**30**/41033	0.07	**2.6**
Others	**24**/41033	0.06	**2.1**
Unknown	**15**/41033	0.04	**1.3**
Total	**1147/41033**	**2.8**	**100.0**

Percentage of causes of revision according to follow-up

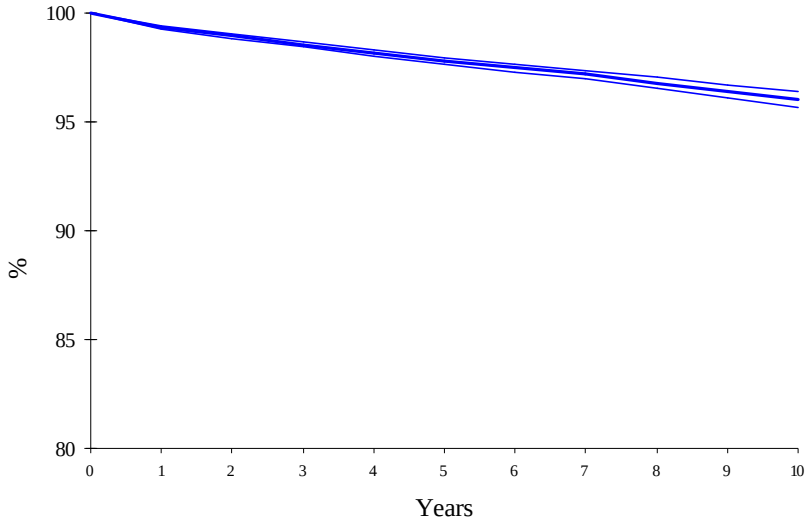
Cause of revision	0-2 Years	3-4 Years	>5 Years
Pain w/o loosening	1.9	3.2	1.5
Periprosthetic bone fracture	12.2	9.6	7.5
Primary instability	4.1	0.0	0.0
Recurrent prosthesis dislocation	32.9	11.9	13.1
Aseptic loosening	30.4	53.2	61.3
Septic loosening	6.0	6.4	3.0
Breakage of prosthesis	7.4	12.8	10.6
Poly wear	0.7	0.9	1.5
Other	4.4	1.8	1.5

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

41.033 primary arthroprostheses are under observation. Of these, 867 revisions were carried out to remove cup and/or stem

Number of arthroprostheses	n. of revisions	% revision
41.033	**867**	**2.1**

Survival curve



Results in detail
(c.i = confidence interval)

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.4	99.3	99.4
2	99.0	98.9	99.1
3	98.6	98.4	98.7
4	98.1	98.0	98.3
5	97.8	97.6	98.0
6	97.5	97.3	97.7
7	97.2	97.0	97.4
8	96.8	96.5	97.0
9	96.4	96.1	96.7
10	96.0	95.6	96.4

9.6 Analysis of the survivorship of the prosthesis according to commercial type

Case-mix
To perform a comparison among the survival of several prosthesis types correctly (Tables 10.6, 10.10 and 10.12), 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 3 yrs	c.i. at 95%	% survival 7 yrs	c.i. at 95%
ABGII (ABGII) Stryker Howmedica	2000	1658	12.4	23	99.0	98.4-99.5	97.4	96.1-98.7
AnCA Fit (AnCa Fit) Wright Cremascoli	2000	2833	12.1	120	96.8	96.1-97.4	95.2	94.3-96.1
AnCA Fit (PROFEMUR Z) Wright Cremascoli	2002	420	10.5	24	95.2	93.2-97.3	94.0	91.6-96.3
BICON PLUS (SL PLUS) Endoplus	2000	873	9.6	21	97.2	96.0-98.5	95.9	93.7-98.1
CFP (CFP) Link	2001	392	1.0	7	97.9	96.4-99.5	97.9	96.4-99.5
CLS (CLS) Sulzer Centerpulse Zimmer	2000	1471	15.2	41	98.1	97.4-98.8	96.6	95.4-97.7
CLS (CONUS) Sulzer Centerpulse Zimmer	2000	577	14.7	19	97.6	96.3-98.9	95.9	94.0-97.8
CLS Zimmer (SL PLUS) Endoplus	2001	306	11.1	4	97.1	94.2-100	97.1	94.2-100
CONTEMPORARY (**EXETER**) Stryker Howmedica	2000	452	18.6	9	97.6	96.1-99.2	97.6	96.1-99.2
DUOFIT PSF (**P507**) Samo	2000	492	30.9	10	98.9	98.0-99.9	97.3	95.6-99.0
EP-FIT PLUS (PROXIPLUS) Endoplus	2004	562	12.5	5	99.0	98.1-99.9	-	-
EP-FIT PLUS (SL PLUS) ENDOPLUS	2003	1236	18.9	12	98.0	96.7-99.3	-	-
EXPANSION (CBC) Mathys	2000	720	29.0	14	96.7	94.6-98.8	-	-
FITMORE (CLS) Sulzer Centerpulse Zimmer	2000	762	7.3	19	97.3	96.1-98.5	96.8	95.3-98.4
FITMORE (CONUS) Sulzer Centerpulse Zimmer	2000	833	13.0	20	97.3	96.1-98.5	96.8	95.3-98.2
FIXA (APTA) Ala-Ortho	2004	2239	13.3	47	97.5	96.7-98.2	-	-
FIXA (RECTA) Ala-Ortho	2004	2021	9.4	49	95.5	94.1-97.0	-	-
Fixa TI-por (Apta) Ala-Ortho	2007	830	13.4	8	-	-	-	-
MULLER (**JVC**) Wright Cremascoli	2000	325	12.6	7	98.7	97.4-100	97.5	95.3-99.6
MULLER (**MRL**) Wright Cremascoli	2000	305	23.0	11	97.2	95.3-99.1	95.8	93.3-98.3
MULLER (**SPECTRON**) Smith and Nephew	2000	303	38.9	10	96.0	93.6-98.5	96.0	93.6-98.5

PINNACLE SECTOR II (CORAIL) DEPUY	2002	300	7.4	4	98.6	97.1-100	-	-
RECAP RESURFACING (TAPERLOC) Biomet	2005	352	12.8	7	97.0	94.5-99.4	-	-
REFLECTION (**BASIS**) Smith & Nephew	2001	526	3.8	15	97.2	95.5-98.9	93.9	90.2-97.6
SELEXYS TH MATHYSCBC MATHYS	2006	398	12.8	5	98.5	97.2-99.8	-	-
STANDARD CUP (CLS) Sulzer Centerpulse Zimmer	2000	322	13.0	7	98.7	97.5-100	97.2	95.2-99.3
TRIDENT (ABGII) Stryker Howmedica	2002	355	11.8	13	95.3	92.6-97.9	94.5	91.5-97.5
TRILOGY (VERSYS FIBER) Zimmer	2000	496	2.6	15	97.1	95.5-98.6	97.1	95.5-98.6
Other *(models< 300 cases)*	2000	18671	17.1	601	97.0	96.7-97.2	95.1	94.7-95.5
All models	2000	41033	15.1	1147	97.2	97.0-97.4	95.6	95.3-95.9

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.

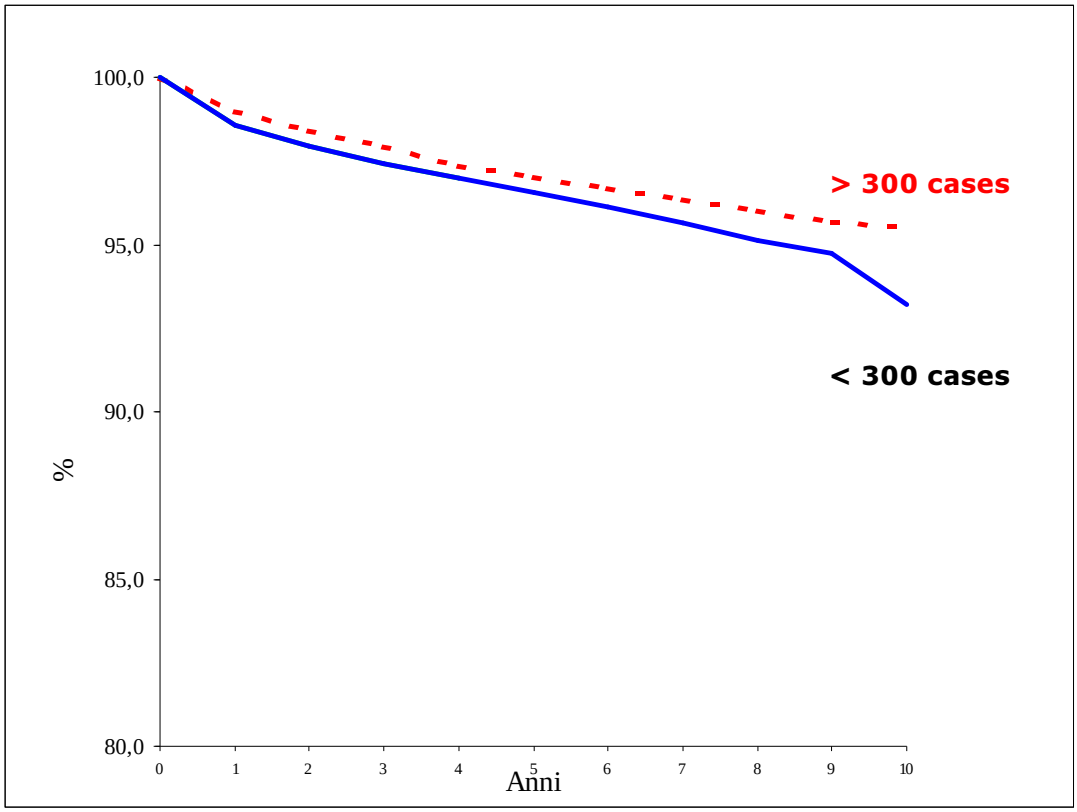
To provide, anyway, an indication of the survival of the prosthesis types less represented in data banks, they were grouped together to make a class of prostheses of which less than 300 were implanted over 9 years.

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	18671	601	3.2
Models > 300 cases	22362	546	2.4

Survival curve



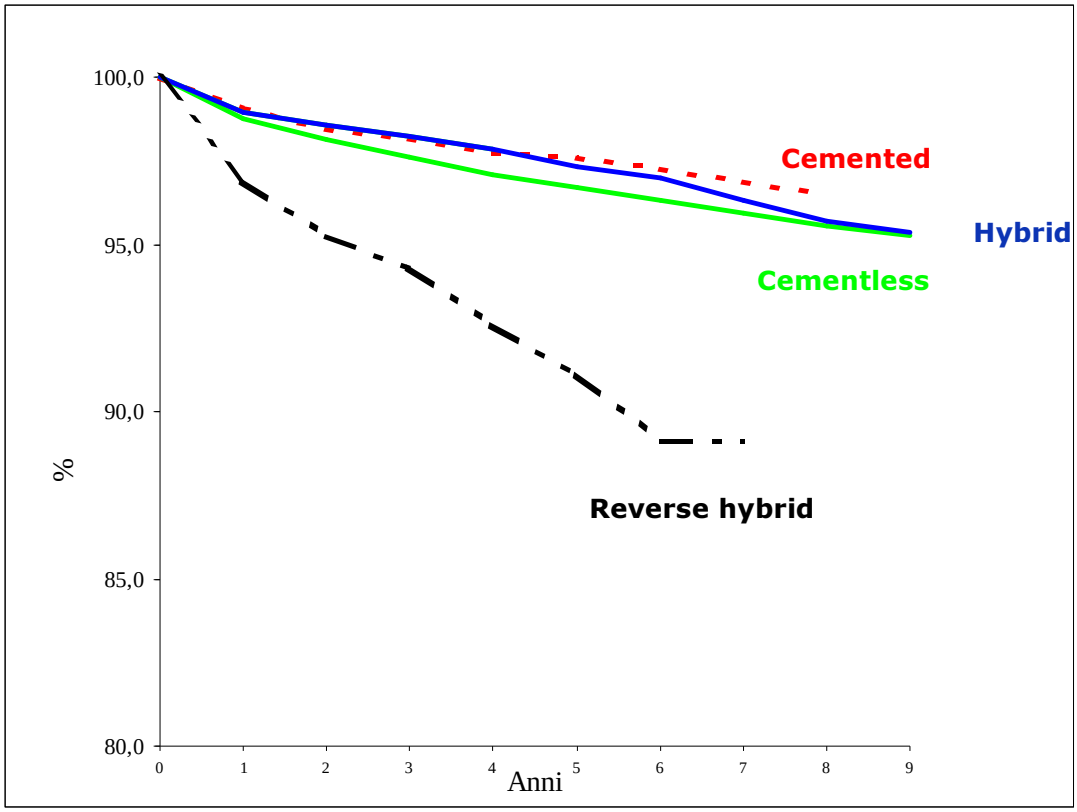
Curves are significantly different (p=0.001, Test di Wilcoxon)

Results in detail

Models < *300 cases*			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	98.6	98.4	98.8
2	97.9	97.7	98.1
3	97.4	97.2	97.7
4	97.0	96.7	97.2
5	96.6	96.3	96.9
6	96.1	95.8	96.5
7	95.6	95.3	96.0
8	95.1	94.7	95.5
9	94.8	94.3	95.3
10	93.2	92.2	94.2
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	98.6
3	97.9	97.7	98.1
4	97.4	97.1	97.6
5	97.0	96.8	97.3
6	96.7	96.4	97.0
7	96.3	96.0	96.7
8	96.0	95.6	96.4
9	95.7	95.2	96.2
10	95.5	94.9	96.1

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

Fixation	N.	Removals	% revision
Cementless	31.501	860	2.7
Hybrid (cemented stem, cementless cup)	5.307	153	2.9
Cemented	3.768	97	2.6
Reverse hybrid (cementless stem, cemented cup)	318	22	6.9



Results in detail

Cemented			
Years	**% in site**	**c.i. 95%**	
0	100.0	100.0	100.0
1	99.1	98.8	99.4
2	98.5	98.1	98.9
3	98.2	97.7	98.6
4	97.8	97.2	98.3
5	97.6	97.1	98.2
6	97.3	96.7	97.8
7	96.9	96.2	97.6
8	96.5	95.7	97.3
Cementless			
Years	**% in site**	**c.i. 95%**	
0	100.0	100.0	100.0
1	98.8	98.6	98.9
2	98.1	98.0	98.3
3	97.6	97.4	97.8
4	97.1	96.9	97.3
5	96.7	96.5	97.0
6	96.3	96.1	96.6
7	96.0	95.7	96.3
8	95.6	95.2	95.9
9	95.3	94.8	95.7
Hybrid			
Years	**% in site**	**c.i. 95%**	
0	100.0	100.0	100.0
1	98.9	98.7	99.2
2	98.6	98.2	98.9
3	98.2	97.8	98.6
4	97.8	97.4	98.3
5	97.3	96.8	97.8
6	97.0	96.4	97.5
7	96.3	95.7	97.0
8	95.7	95.0	96.5
9	95.4	94.5	96.2
Reverse hybrid			
Years	**% in site**	**c.i. 95%**	
0	100.0	100.0	100.0
1	96.9	94.9	98.9
2	95.2	92.7	97.8
3	94.3	91.4	97.1
4	92.6	89.2	96.0
5	91.1	87.2	95.0
6	89.1	84.4	93.8
7	89.1	84.4	93.8
8	89.1	84.4	93.8

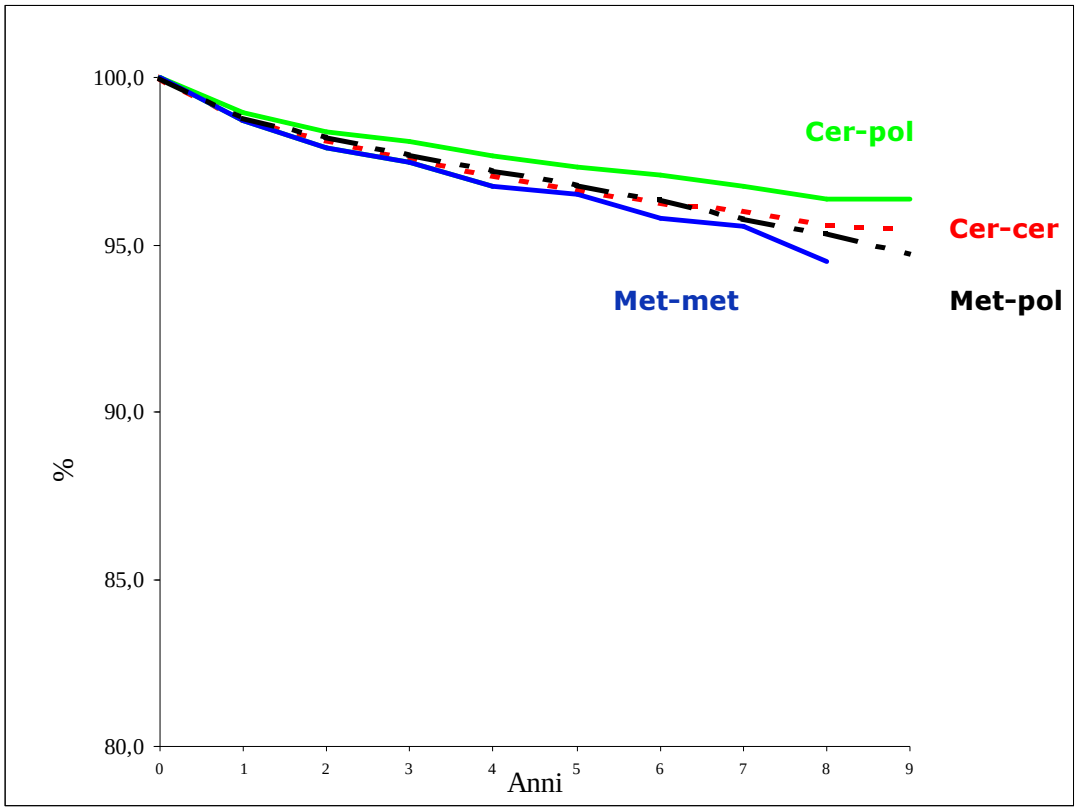
Difference is statistically significant (p=0.001, Test di Wilcoxon).

	Cemented		
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**25**/3768	0.7	25.8
Recurrent prosthesis dislocation	**21**/3768	0.6	21.6
Global aseptic loosening	**16**/3768	0.4	16.5
Septic loosening	**11**/3768	0.3	11.3
Aseptic loosening of the stem	**14**/3768	0.4	14.4
Primary instability	**4**/3768	0.1	4.1
Periprosthetic bone fracture	**5**/3768	0.1	5.2
Breakage of prosthesis	**1**/3768	0.0	1.0
Other	**0**/3768	0.0	0.0
Total	**97/3768**	**2.6**	**100.0**
	Cementless		
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**215**/31501	0.7	25.0
Aseptic loosening of the stem	**136**/31501	0.4	15.8
Aseptic loosening of the cup	**121**/31501	0.4	14.1
Periprosthetic bone fracture	**108**/31501	0.3	12.6
Breakage of prosthesis	**100**/31501	0.3	11.6
Primary instability	**24**/31501	0.1	2.8
Pain without loosening	**23**/31501	0.1	2.7
Septic loosening	**41**/31501	0.1	4.8
Global aseptic loosening	**50**/31501	0.2	5.8
Poly wear	**6**/31501	0.0	0.7
Other	**21**/31501	0.1	2.4
Missing	**15**/31501	0.0	1.7
Total	**860/31501**	**2.7**	**100.0**
	Hybrid		
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**51**/5307	1.0	33.3
Aseptic loosening of the stem	**50**/5307	0.9	32.7
Aseptic loosening of the cup	**14**/5307	0.3	9.2
Global aseptic loosening	**8**/5307	0.2	5.2
Periprosthetic bone fracture	**8**/5307	0.2	5.2
Septic loosening	**11**/5307	0.2	7.2
Primary instability	**2**/5307	0.0	1.3
Breakage of prosthesis	**2**/5307	0.0	1.3
Poly wear	**3**/5307	0.1	2.0
Pain without loosening	**1**/5307	0.0	0.7
Other	**3**/5307	0.1	2.0
Total	**153/5307**	**2.9**	**100.0**
	Reverse hybrid		
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**9**/318	2.8	40.9
Aseptic loosening of the stem	**5**/318	1.6	22.7
Recurrent prosthesis dislocation	**4**/318	1.3	18.2
Global aseptic loosening	**1**/318	0.3	4.5
Periprosthetic bone fracture	**3**/318	0.9	13.6
Septic loosening	**0**/318	0.0	0.0
Missing	**0**/318	0.0	0.0
Total	**22/318**	**6.9**	**100.0**

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

Coupling	N.	Revisions	% revision
Metal-poly	14.412	453	3.1
Ceramic-ceramic	12.444	301	2.4
Ceramic-poly	9.760	245	2.5
Metal-metal	3.891	118	3.0

Survival curve



Detailed results

Met-poly			
Yrs	**% in site**	**c.i. al 95%**	
0	100.0	100.0	100.0
1	98.8	98.6	99.0
2	98.2	98.0	98.5
3	97.7	97.5	98.0
4	97.2	96.9	97.5
5	96.8	96.5	97.1
6	96.4	96.0	96.7
7	95.8	95.4	96.2
8	95.4	94.9	95.9
9	94.7	94.1	95.3
Cer-cer			
Yrs	**% in site**	**c.i. al 95%**	
0	100.0	100.0	100.0
1	98.8	98.6	99.0
2	98.1	97.9	98.4
3	97.6	97.2	97.9
4	97.1	96.7	97.4
5	96.7	96.2	97.1
6	96.3	95.8	96.7
7	96.0	95.5	96.5
8	95.6	95.0	96.2
9	95.5	94.8	96.2
Cer-poly			
Yrs	**% in site**	**c.i. al 95%**	
0	100.0	100.0	100.0
1	99.0	98.8	99.2
2	98.4	98.1	98.7
3	98.1	97.8	98.4
4	97.6	97.3	98.0
5	97.3	97.0	97.7
6	97.1	96.7	97.5
7	96.7	96.3	97.2
8	96.4	95.9	96.9
9	96.4	95.9	96.9
Met-met			
Yrs	**% in site**	**c.i. al 95%**	
0	100.0	100.0	100.0
1	98.7	98.4	99.1
2	97.9	97.4	98.4
3	97.5	96.9	98.0
4	96.8	96.1	97.4
5	96.5	95.8	97.2
6	95.8	94.9	96.6
7	95.6	94.6	96.5
8	94.5	93.3	95.7

	Met-poly		
Cause of revision	**Rate**	**%**	**% distribution of failure causes**
Recurrent prosthesis dislocation	**125**/14412	0.87	27.6
Aseptic loosening of the stem	**100**/14412	0.69	22.1
Aseptic loosening of the cup	**88**/14412	0.61	19.4
Periprosthetic bone fracture	**46**/14412	0.32	10.2
Global aseptic loosening	**37**/14412	0.26	8.2
Septic loosening	**21**/14412	0.15	4.6
Primary instability	**9**/14412	0.06	2.0
Pain without loosening	**12**/14412	0.08	2.6
Breakage of prosthesis	**4**/14412	0.03	0.9
Unknown	**4**/14412	0.03	0.9
Poly wear	**6/**14412	0.04	1.3
Other	**1**/14412	0.01	0.2
Total	**453/14412**	**3.1**	**100.0**
	Cer-cer		
Cause of revision	**Rate**	**%**	**% distribution of failure causes**
Recurrent prosthesis dislocation	**78**/12444	0.63	25.9
Periprosthetic bone fracture	**45**/12444	0.36	15.0
Ceramic head fracture	**30**/12444	0.24	10.0
Aseptic loosening of the stem	**31**/12444	0.25	10.3
Ceramic liner fracture	**25**/12444	0.20	8.3
Aseptic loosening of the cup	**14**/12444	0.11	4.7
Breakage of stem	**25**/12444	0.20	8.3
Septic loosening	**11**/12444	0.09	3.7
Primary instability	**9**/12444	0.07	3.0
Global aseptic loosening	**9**/12444	0.07	3.0
Pain without loosening	**6**/12444	0.05	2.0
Others	**15**/12444	0.12	5.0
Unknown	**3**/12444	0.02	1.0
Total	**301/12444**	**2.4**	**100.0**
	Cer-pol		
Cause of revision	**Rate**	**%**	**% distribution of failure causes**
Recurrent prosthesis dislocation	**66**/9760	0.68	26.9
Aseptic loosening of the stem	**53**/9760	0.54	21.6
Aseptic loosening of the cup	**29**/9760	0.30	11.8
Periprosthetic bone fracture	**19**/9760	0.19	7.8
Septic loosening	**21**/9760	0.22	8.6
Global aseptic loosening	**16**/9760	0.16	6.5
Primary instability	**8**/9760	0.08	3.3
Breakage of stem	**5**/9760	0.05	2.0
Breakage of cup	**2**/9760	0.02	0.8
Pain without loosening	**4**/9760	0.04	1.6
Breakage of prosthesis	**2**/9760	0.02	0.8
Breakage of head	**3**/9760	0.03	1.2
Poly wear	**4**/9760	0.04	1.6
Unknown	**8**/9760	0.08	3.3
Other	**5**/9760	0.05	2.0
Total	**245/9760**	**2.5**	**100.0**

	Met-met		
Cause of revision	**Rate**	**%**	**% distribution of failure causes**
Aseptic loosening of the cup	**34**/3891	0.87	28.8
Recurrent prosthesis dislocation	**17**/3891	0.44	14.4
Aseptic loosening of the stem	**17**/3891	0.44	14.4
Periprosthetic bone fracture	**13**/3891	0.33	11.0
Septic loosening	**10**/3891	0.26	8.5
Global aseptic loosening	**12**/3891	0.31	10.2
Primary instability	**4**/3891	0.10	3.4
Breakage of cup	**5**/3891	0.13	4.2
Pain without loosening	**3**/3891	0.08	2.5
Breakage of stem	**3**/3891	0.08	2.5
Other	**2**/3891	0.05	1.7
Total	**118/3891**	**3.0**	**100.0**

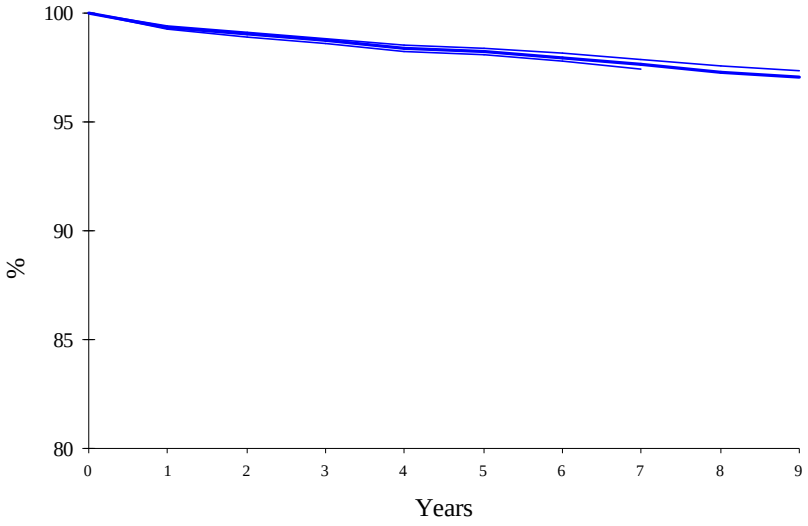
9.9 Survival analysis of acetabular component

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
41.033	**665**	**1.6**

*177 of them liner only

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.3	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	98.1	98.4
6	98.0	97.8	98.1
7	97.6	97.4	97.8
8	97.3	97.1	97.5
9	97.0	96.8	97.3

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

Cemented cups in bold

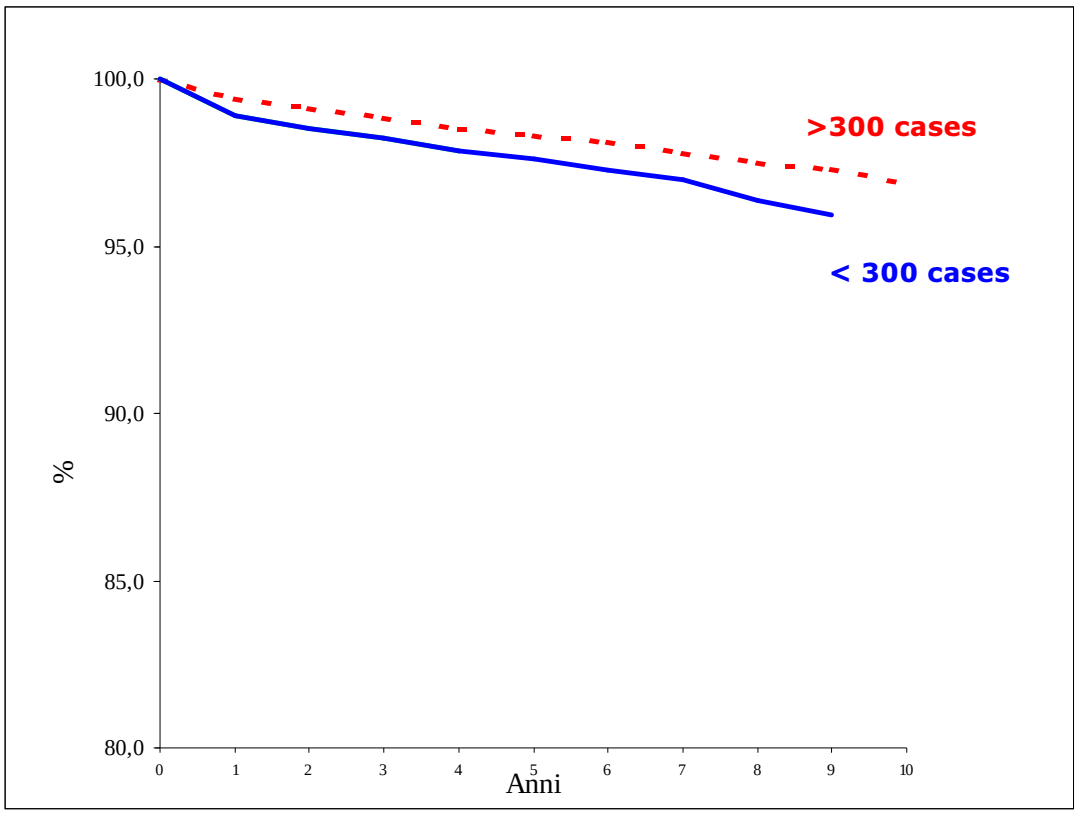
Cup	From year	N.	% fracture and rare path	n. revisions	% survival	c.i at 95%	% survival 8yrs	c.i at 95%
ABGII Stryker Howmedica	2000	1967	11.5	21	99.2	98.7-99.6	98.3	97.4-99.1
AnCA FIT Wright Cremascoli	2000	4928	12.5	90	98.6	98.3-99.0	97.8	97.3-98.3
BICON PLUS Endoplus	2000	1104	9.3	21	97.7	96.7-98.8	96.8	95.1-98.4
CFP Link	2000	438	3.4	8	98.1	96.7-99.5	95.8	91.1-100
CLS Sulzer, Centerpulse,Zimmer	2000	2946	16.8	55	98.7	98.2-99.1	97.6	96.9-98.3
CONTEMPORARY Stryker Howmedica	2000	677	15.7	14	98.2	97.1-99.3	96.6	94.5-98.7
DELTA PF – Lima	2003	766	10.3	6	99.1	98.3-99.8	-	-
DUOFIT PSF Samo	2000	984	28.2	22	98.1	97.2-99.0	97.4	96.3-98.5
EP-FIT Plus – Endoplus	2003	1989	17.5	12	99.1	98.6-99.7	-	-
EXPANSION Mathys	2003	919	28.3	15	97.0	95.2-98.8	94.0	88.1-100
FITMORE Sulzer	2000	1873	11.4	31	98.2	97.6-98.9	97.8	96.9-98.7
FIXA Ala-Ortho	2004	4694	12.0	37	98.8	98.4-99.2	-	-
FIXATi por – Ala-Ortho	2007	1305	12.1	10	-	-	-	-
HILOCK LINE Symbios	2000	438	9.1	17	95.9	93.9-98.0	94.8	92.3-97.4
MULLER Wright Cremascoli	2000	882	16.4	14	98.9	98.2-99.6	97.9	96.7-99.1
MULLER Smith & Nephew	2000	398	30.7	10	97.4	95.8-99.1	96.9	94.9-98.9
MULLER Samo	2000	350	40.6	13	95.9	93.6-98.2	95.0	92.1-97.9
PE (Muller Protek) Sulzer	2000	389	43.4	12	97.9	96.4-99.5	95.7	93.2-98.1
Pinnacle Sector II – Depuy	2002	511	6.8	5	98.8	97.6-100	97.7	95.3-100
RECAP RESURF. - Biomet	2005	463	13.6	6	97.8	96.0-99.7	-	-
REFLECTION Smith & Nephew	2000	1257	5.2	19	98.9	98.3-99.6	96.8	95.1-98.4
SELEXYS TH - Mathys	2006	483	12.6	2	99.5	98.8-100	-	-
STANDARD CUP PROTEK Sulzer	2000	867	14.5	18	98.7	97.9-99.5	97.4	96.1-98.6
TRIDENT Stryker Howmedica	2002	1028	10.2	13	98.5	97.6-99.4	98.2	97.1-99.2
TRILOGY Zimmer	2000	831	6.1	14	98.6	97.8-99.4	97.9	96.7-99.2
ZCA Zimmer	2000	581	30.1	4	99.4	98.7-100	99.0	98.0-100
Other (with less than 300 cases each)	2000	7965	18.0	176	97.9	97.5-98.2	96.4	95.7-97.0
All Models	2000	41.033	15.1	665	98.4	98.2-98.5	97.3	97.1-97.5

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 8 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	7.965	176	2.2
Models >300 cases	33.068	489	1.5

Survival curve



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

Results in detail

Models <300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	98.9	98.6	99.1
2	98.5	98.2	98.8
3	98.2	97.9	98.6
4	97.9	97.5	98.2
5	97.6	97.2	98.0
6	97.3	96.8	97.7
7	97.0	96.5	97.5
8	96.4	95.7	97.0
9	95.9	95.2	96.7
Models > 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.4	99.4	99.5
2	99.1	99.0	99.2
3	98.8	98.7	99.0
4	98.5	98.4	98.7
5	98.3	98.2	98.5
6	98.1	97.9	98.3
7	97.8	97.6	98.0
8	97.5	97.3	97.8
9	97.3	97.0	97.6
10	96.9	96.4	97.4

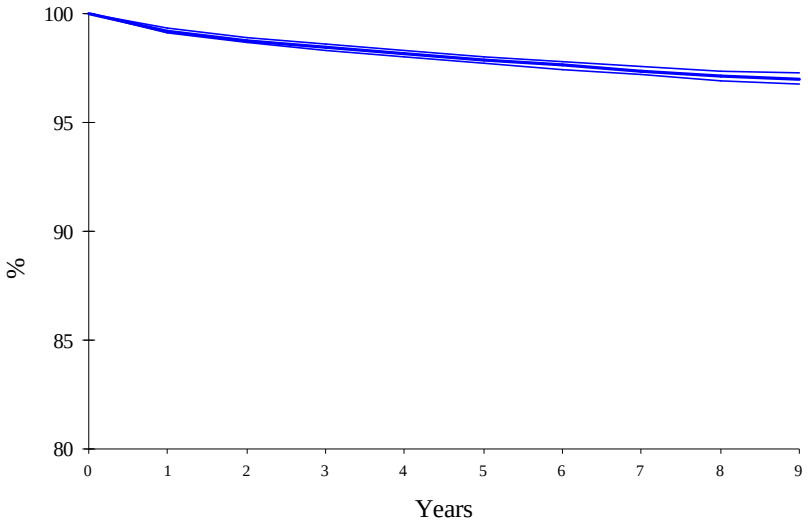
9.11 Survival analysis of stem

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
41.033	**744**	**1.8**

*160 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	98.7	98.9
3	98.5	98.3	98.6
4	98.2	98.0	98.3
5	97.9	97.7	98.0
6	97.6	97.5	97.8
7	97.4	97.2	97.6
8	97.1	96.9	97.4
9	97.0	96.7	97.3

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.

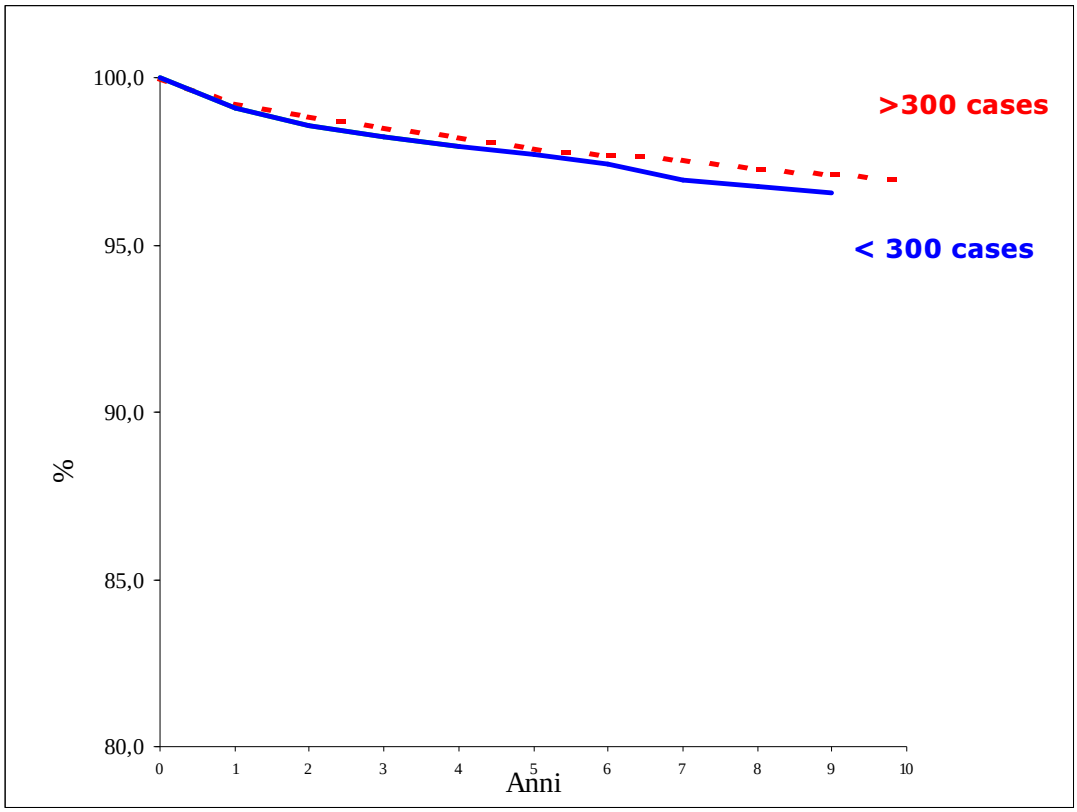
Stem	From year	N.	% fracture or rare path	n. revision	% survival 4yrs	c.i at 95%	% survival 8 yrs	c.i. at 95%
ABG riv -Stryker Howme.	2000	446	6.7	6	99.5	98.9-100	98.7	97.6-99.8
ABGII Stryker Howmedic	2000	2284	13.6	30	98.7	98.2-99.3	98.2	97.5-98.9
AD Samo	2000	304	39.8	11	96.3	94.0-98.7	94.4	90.9-97.9
AnCA FIT Wright Cremascoli	2000	3132	12.8	113	97.0	96.4-97.6	95.8	95.0-96.6
APTA Ala-Ortho	2004	2506	12.8	40	97.4	96.5-98.3	-	-
APTA Cem Ala-Ortho	2004	826	18.3	18	97.3	96.0-98.6	-	-
BASIS Smith & Nephew	2001	630	3.8	9	98.8	97.8-99.9	96.4	93.8-99.0
C Stem De Puy	2002	300	4.7	1	99.6	98.8-100	99.6	98.8-100
CBC Mathys	2000	1198	22.0	14	98.7	98.0-99.4	97.5	95.0-99.9
CFP Link	2000	734	3.3	5	99.2	98.4-99.9	99.2	98.4-99.9
CLS Sulzer Centerpulse Zimmer	2000	3036	12.2	53	98.6	98.2-99.1	97.8	97.2-98.4
CONUS Sulzer Centerpulse Zimmer	2000	2596	12.2	33	98.6	98.2-99.1	98.5	98.0-99.0
CORAIL De Puy	2000	527	9.5	6	98.9	97.9-99.9	98.4	97.0-99.7
EXETERStryker Howme.	2000	1082	12.8	10	99.2	98.7-99.8	98.3	97.0-99.6
JVC Wright Cremascoli	2000	693	10.2	16	98.2	97.2-99.2	97.2	95.8-98.6
Modulus Hip System Lima	2001	359	8.1	5	98.5	97.1-99.8	-	-
MRL Wright Cremascoli	2000	451	23.1	9	98.8	97.8-99.8	97.6	96.1-99.2
P507 Samo	2000	583	28.8	7	99.6	99.1-100	98.1	96.7-99.6
PROFEMUR Z Wright Cremascoli	2002	478	10.9	17	97.0	95.5-98.6	96.2	94.4-98.0
PROXIPLUS ENDOPLANT	2005	581	12.6	5	99.0	98.2-99.9	-	-
RECTA Ala-Ortho	2004	2322	11.5	54	95.5	94.1-96.9	-	-
SL PLUS Endoplus	2000	2774	15.5	23	98.8	98.3-99.3	98.5	97.7-99.3
SPECTRON Smith & Nephew	2000	670	36.1	18	98.8	97.9-99.7	96.0	93.9-98.0
SYNERGY Smith & Nephew	2000	304	4.6	3	99.7	99.0-100	97.9	95.5-100
TAPERLOC Biomet	2002	1130	8.4	15	98.2	97.2-99.2	97.7	96.2-99.1
VERSYS CEMENTED Zimmer	2000	319	19.7	3	99.3	98.4-100	99.0	97.9-100
VERSYS FIBER METAL TAPER Zimmer	2000	781	4.0	11	98.5	97.6-99.4	98.5	97.6-99.4
Hydra Ala-Ortho	2007	300	10.8	3	-	-	-	-
Others (with less than 300 cases each)	2000	9688	20.5	206	98.0	97.6-98.3	96.7	96.2-97.2
All models	2000	41.033	15.1	744	97.9	97.7-98.0	97.0	96.7-97.3

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 8 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	9.688	206	2.1
Models >300 cases	31.345	538	1.7

Survival curve



Curves are not significantly different (p=0.05, Test di Wilcoxon)

Results in detail

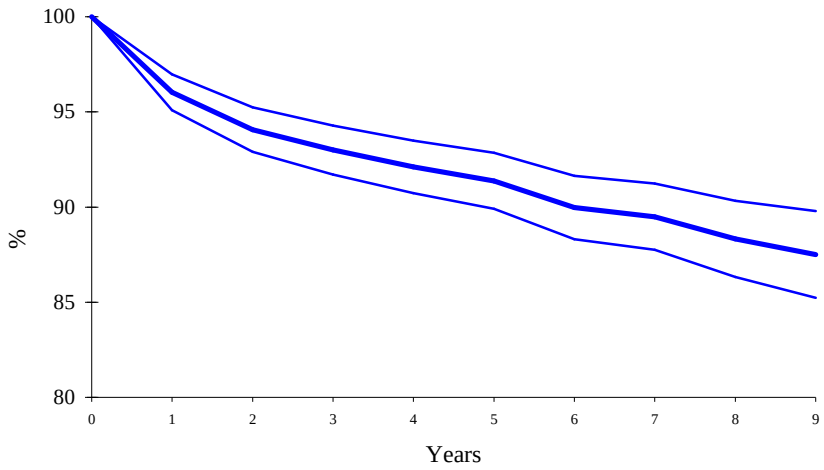
Models < 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.1	98.9	99.3
2	98.6	98.3	98.8
3	98.2	98.0	98.5
4	98.0	97.6	98.3
5	97.7	97.3	98.0
6	97.4	97.0	97.8
7	96.9	96.5	97.4
8	96.7	96.2	97.2
9	96.6	96.0	97.1
Models > 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.3	99.2	99.4
2	98.8	98.7	99.0
3	98.5	98.4	98.7
4	98.2	98.1	98.4
5	97.9	97.7	98.1
6	97.7	97.5	97.9
7	97.5	97.3	97.8
8	97.3	97.0	97.6
9	97.1	96.9	97.4
10	96.9	96.5	97.4

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
1.705	**148**	**8.7**

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	96.0	95.1	97.0
2	94.1	92.9	95.2
3	93.0	91.7	94.3
4	92.1	90.7	93.5
5	91.4	89.9	92.8
6	90.0	88.3	91.6
7	89.5	87.7	91.2
8	88.3	86.3	90.3
9	87.5	85.2	89.8

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

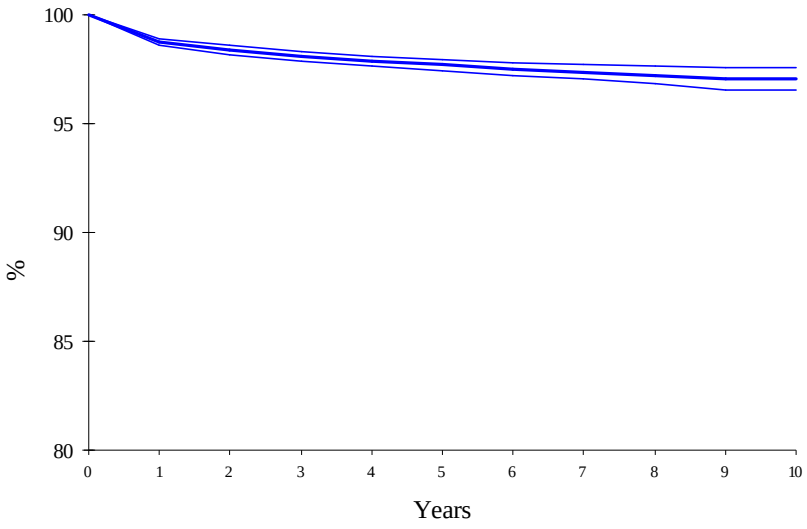
Cause of revision	Rate	%	% distribution of failure causes
Prosthesis luxation	**34**/1.705	2.0	23.0
Aseptic loosening of the cup	**29**/1.705	1.7	19.6
Aseptic loosening of the stem	**28**/1.705	1.6	18.9
Septic loosening	**19**/1.705	1.1	12.8
Total aseptic loosening	**18**/1.705	1.1	12.2
Bone fracture	**11**/1.705	0.6	7.4
Prosthesis breakage	**3**/1.705	0.2	2.0
Pain without loosening	**2**/1.705	0.1	1.4
Primary instability	**3**/1.705	0.2	2.0
Missing	**1**/1.705	0.1	0.7
Total	**148/1.705**	**8.7**	**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
20.956	**326**	**1.6**

Survival curve



Results in detail

% in site	c.i. at 95%	% in site	
0	100.0	100.0	100.0
1	98.8	98.6	98.9
2	98.4	98.2	98.6
3	98.1	97.9	98.3
4	97.9	97.6	98.1
5	97.7	97.4	98.0
6	97.5	97.2	97.8
7	97.4	97.0	97.7
8	97.2	96.8	97.6
9	97.1	96.6	97.6
10	97.1	96.6	97.6

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	151/20.956	0.7	46.3
Aseptic loosening	65/20.956	0.3	19.9
Cotyloiditis	57/20.956	0.3	17.5
Bone fracture	18/20.956	0.1	5.5
Septic loosening	27/20.956	0.1	8.3
Missing	1/20.956	0.0	0.3
Other	7/20.956	0.03	2.1
Total	**326/20.956**	**1.6**	**100.0**

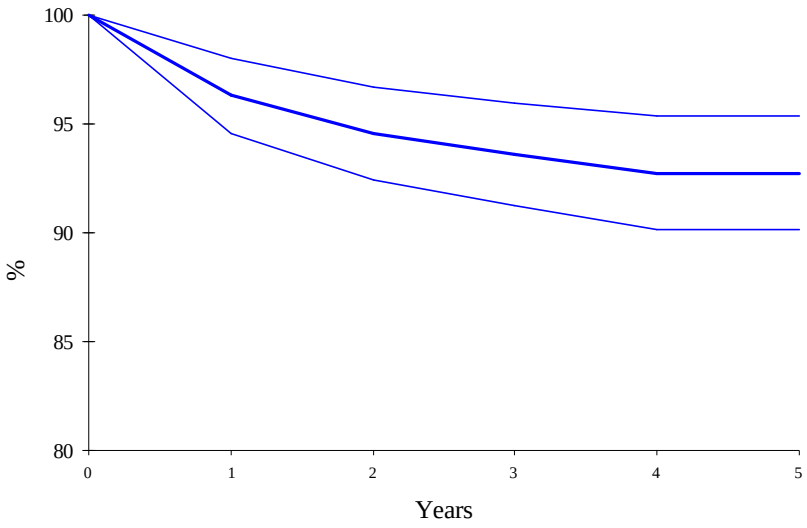
9.15 Survival analysis of resurfacing

Also in this analysis only prostheses implanted on patient living in Emilia-Romagna region are considered. Due to this, number of observations is strongly reduced compared to last year report.

Maximum follow-up is only 5 years. This should be borne in mind when comparing the curves so far described, where the maximum follow-up is 8 years.

Resurfacing	n. revisions	% of revisions
485	**29**	**6.0**

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	96.3	94.6	98.0
2	94.5	92.4	96.7
3	93.6	91.2	96.0
4	92.7	90.1	95.4
5	92.7	90.1	95.4

Type of prosthesis	N.	N.of failures	%
BHR - Midland Medical Technologies	259	9	3.5
Asr - Depuy	60	5	8.3
ADEPT - Finsbury	51	2	3.9
Mrs - Lima	43	8	18.6
BMHR SMITH AND NEPHEW	20	1	5.0
MITCH TRH FINSBURY	20	2	10.0
Conserve Plus - Wright	9	1	11.1
ICON - International Orthopaedics	9	1	11.1
RECAP - Biomet	8	0	0.0
ROMAX MEDACTA	4	0	0.0
Durom Hip Resurfacing - Zimmer	2	0	0.0
Total	**485**	**29**	**6.0**

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

Cause of revision	Rate	%	Distribution of causes
Periprosthetic bone fracture	11/485	2.3	37.9
Septic loosening	11/485	2.3	37.9
Metal sensitization	2/485	0.4	7.0
Head necrosis	1/485	0.2	3.4
Pain without loosening	1/485	0.2	3.4
Septic loosening	1/485	0.2	3.4
Prosthesis breakage	2/485	0.4	7.0
Total	**29/485**	**6.0**	**100.0**

PART TWO: KNEE PROSTHESIS

July 2000 – December 2009

10. RIPO capture

10.1 Capture for RIPO per hospital in years 2000-2009

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), according to Agency was 97.6% for year 2009. 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

From database SDO

Percentage of primary total knee arthroprostheses and revision performed in public and private hospitals, in year 2009

Type of operation	**Public**	**Private**
	%	**%**
Primary bicompartmental	59.3	70.1
Primary tricompartmental	18.7	10.4
Primary unicompartmental	11.9	11.8
Revision	7.1	6.3
Prosthesis removal	2.1	0.6
Implant of patella	0.9	0.8
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 2009, according to **type**

Type of operation	Number	Percentage
Primary bicompartmental	29.830	67.6
Primary unicompartmental	4.813	10.9
Primary tricompartmental	5.665	12.8
Revision^	2.554	5.8
Prosthesis removal	526	1.2
Implant of patella	272	0.6
Other (debridment…)*	484	1.1
Total	**44.144**	**100.0**

* including 49 *Hemicap – Arthrosurface*, 32 *Avon-Patello-Femoral Joint Stryker*, 6 other patello-femoral,104 spacer replacements, 52 stiff knee loosenings, 38 surgical cleaning and 5 dislocation reductions.
^ 244 liner replacements, 57 femoral component only replacements, 149 tibial component only replacements, 2086 total replacements and 18 replacement of patella

Percentage of different prostheses in the years

Years of operation	% unicompartim	% bicompartim	% tricompartim
2001	10.0	81.4	8.6
2002	12.7	80.0	7.3
2003	12.8	78.5	8.7
2004	12.9	75.7	11.4
2005	12.4	75.6	12.0
2006	10.9	69.8	19.3
2007	11.6	69.2	19.2
2008	11.5	72.1	16.4
2009	13.0	72.2	14.8

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 2009, 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	126	0.4	398	1.1	2.367	6.7	10.624	29.9	17.980	50.7	3.999	11.3	35.494
Unicomp	9	0.2	122	2.5	851	17.7	2.007	41.7	1.537	31.9	286	5.9	4.812
Revision	14	0.5	66	2.6	227	8.9	764	29.9	1.181	46.2	302	11.8	2.554
Prosthesis. removal	7	1.3	16	3.0	62	11.8	169	32.1	224	42.6	48	9.1	526
Patella only	2	0.7	8	2.9	19	7.0	92	33.8	127	46.7	24	8.8	272
Other	22	4.5	40	8.3	114	23.6	156	32.2	134	27.7	18	3.7	484
Total*	**180**	**0.4**	**650**	**1.5**	**3.640**	**8.2**	**13.812**	**31.3**	**21.183**	**48.0**	**4.677**	**10.6**	**44.142**

*2 data are missing

Mean age at surgery, according to type of operation - years 2000-2009

Type of operation	Mean age	Range
Primary bi/tricompartmental	70.9	13–94
Primary unicompartmental	66.6	32-91
Revision	69.9	26-90
Total	**70.3**	**13–94**

Mean age at surgery, according to type of operation - years 2001-2009

Type of operation	Year 2001		Year 2009	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental	71.2	23-92	70.4	23-90
Primary unicompartmental*	68.9	45-87	65.9	36-88
Revision ^	71.7	26-87	68.8	27-90

* mean age of uni in 2000 and 2009 is statistically different (t-test, p=0.001)
^ mean age of revision in 2000 and 2007 is statistically different (t-test, p=0.001)

Mean age at surgery, according to type of operation.-years 2000-2009 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	21-94
Primary unicompartmental^	67.6	32-88	65.8	37-91

* 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 2009, according to **type of operation** and **gender** of patients at the time of surgery.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Bi/tricompartmental	9.467	26.7	26.028	73.3	35.495
Unicompartmental	1.499	31.1	3.314	68.9	4.813
Revision	632	24.7	1.922	75.3	2.554
Prosthesis removal	190	36.1	336	63.9	526
Patella only	62	22.8	210	77.2	272
Other	171	35.3	313	64.7	484
Total	**12.021**	**27.2**	**32.123**	**72.8**	**44.144**

12.3 Side of surgery

There is a prevalence of operations performed on the right side (53.4%) in comparison with the left side (46.6%). The percentage was calculated on patients with only one knee prosthesis affected by primary arthritis.

Side	Males	Females
Right	50.3	54.6
Left	49.7	45.4

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

12.4 Bilateral arthroplasty

In the period of registry observation (10 years) 5350 patients underwent bilateral operations.
4747 (88.7%) chose to undergo the second operation at the same hospital from where the first one was performed.

192 (3.6%) chose to undergo the second operation at a different hospital from where the first one was performed to follow the surgeon.
192 (3.6%) 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 53.8% of cases; beside this 3.4% 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 2009, according to diagnosis.

Diagnosis in unicomp. knee prosthesis	Number	Percentage
Primary arthritis	4.112	85.7
Necrosis of the condyle	275	5.7
Deformity	226	4.7
Post-traumatic arthritis	59	1.2
Post-traumatic necrosis	48	1.0
Idiopathic necrosis	30	0.6
Sequelae of fracture	16	0.3
Rheumatic arthritis	12	0.3
Sequelae of osteotomy	9	0.2
Others	10	0.2
Total *	**4.797**	**100.0**

* 16 missing data

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 2009, according to **diagnosis**.

Diagnosis in bi/tricompartmental knee prosth.	Number	Percentage
Primary arthritis	30.747	87.0
Deformity	2.200	6.2
Rheumatic arthritis	628	1.8
Post-traumatic arthritis	619	1.8
Sequelae of fracture	458	1.3
Sequelae of osteotomy	235	0.7
Necrosis of the condyle	204	0.6
Post-traumatic necrosis	52	0.1
Sequelae of septic arthritis	45	0.1
Idiopathic necrosis	32	0.1
Sequelae of poliomyelitis	27	0.1
Tumor	12	0.03
Other	100	0.3
Total*	**35.359**	**100.0**

* 136 missing data, equal to 0.4% of primary arthroprostheses

12.7 Causes for revision or removal

*Number of revision operations carried out on patients admitted between 1st July 2000 and 31st December 2009, according to **diagnosis**.*

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*
Total aseptic loosening	1.059	42.0
Prosthesis removal	437	17.3
Pain without loosening	205	8.1
Aseptic loosening of tibial component	198	7.9
Insert wear	167	6.6
Septic loosening	102	4.0
Aseptic loosening of femoral component	83	3.3
Prosthesis dislocation	60	2.4
Bone fracture	40	1.6
Prosthesis fracture	40	1.6
Stiffness	35	1.4
Instability	31	1.2
Other	62	2.5
Total*	**2.519**	**100.0**

*****35 missing data (1.4%)

Number of prosthesis removal carried out on patients admitted between 1st July 2000 and 31st December 2009, according to **diagnosis**.

In the Table all removals 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 removal	Number	*Percentage*
Septic loosening	488	93.7
Total aseptic loosening	19	3.6
Other	14	0.8
Total*	**521**	**100.0**

*5 missing data, (1.0%)

13. Types of knee prosthesis

13.1 Unicompartmental prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2009, primary surgery.

In bulk all poly tibia

TYPE OF PROSTHESIS	N.	%
OXFORD UNICOMPARTMENTAL PHASE 3 - Biomet Merck	1.122	23.3
GENESIS UNI - Smith & Nephew	622	12.9
EFDIOS - Citieffe	426	8.9
PRESERVATION UNI - ALL POLY - DePuy	353	7.3
MITUS - ENDO-MODEL UNI - ALL POLY - Link	320	6.6
ZIMMER UNI - Zimmer	298	6.2
ALLEGRETTO UNI - Protek-Sulzer	253	5.3
UC-PLUS SOLUTION - Endoplus	239	5.0
MILLER GALANTE UNI - Zimmer	177	3.7
MAIOR – Finceramica	154	3.2
HLS - UNI EVOLUTION - ALL POLY – Tornier	153	3.2
OPTETRAK - UNI - ALL POLY - Exactech	126	2.6
GKS - ONE - Permedica	112	2.3
GENESIS UNI - ALL POLY - Smith & Nephew	100	2.1
UC-PLUS SOLUTION - ALL POLY – Endoplus	77	1.6
BALANSYS - UNI - Mathys	61	1.3
EIUS UNI - ALL POLY - Stryker Howmedica	59	1.2
PFC - UNI - DePuy Johnson & Johnson	41	0.9
UNICIA - VECTEUR ORTHOPEDIC - Stratec	27	0.6
PRESERVATION UNI - DePuy	14	0.3
UNI SIGMA HP - DePuy Johnson & Johnson	11	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 - UNICOMPARTMENTAL - ALL POLY - Wright	5	0.1
GKS - ONE - CUSTOM MADE - Permedica	5	0.1
TRIATHLON - PKR - Howmedica Osteonics	3	0.1
ACCURIS - UNI - Smith & Nephew	2	0.0
DURACON UNI - Howmedica	2	0.0
UNIVATION - B Braun	2	0.0
AMC - UNI – Corin Medical	1	0.0
GKS - ONE - PERMEDICA+UC-PLUS SOLUTION - Endoplus	1	0.0
MILLER GALANTE UNI - ALL POLY - Zimmer	1	0.0
PRESERVATION UNI MOBILE - DePuy	1	0.0
Unknown	20	0.4
Total	**4.813**	**100.0**

13.2 Bi-tricompartmental knee prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2009, primary surgery

TYPE OF PROSTHESIS	N.	%
NEXGEN – Zimmer	8.920	25.1
PROFIX – Smith & Nephew	4.669	13.2
P.F.C – DePuy	2.767	7.8
SCORPIO – Stryker Howmedica	2.057	5.8
GENESIS II – Smith & Nephew	1.991	5.6
VANGUARD - Biomet Merck France	1.577	4.4
GEMINI MK II – Link	1.140	3.2
TC-PLUS - SOLUTION - Endoplus	1.076	3.0
OPTETRACK – Exactech	945	2.7
LCS – DePuy	770	2.2
INTERAX – Stryker Howmedica	732	2.1
ADVANCE – Wright	674	1.9
ROTAGLIDE – Corin Medical	650	1.8
T.A.C.K. – Link	631	1.8
AGC – Kirschner Biomet Merck	585	1.6
SCORE – Amplitude	580	1.6
GENIUS TRICCC – Dedienne Santé	540	1.5
MULTIGEN - Lima	413	1.2
TRIATHLON – Stryker Howmedica Osteonics	401	1.1
913 – Wright Cremascoli	357	1.0
G.K.S. – Permedica	357	1.0
FIRST - Symbios Orthopedie Sa	342	1.0
GENUS - Ala-Ortho	326	0.9
HLS – EVOLUTION – Tornier	301	0.8
PERFORMANCE – Kirschner Biomet Merck	279	0.8
ENDO-MODEL – Link	273	0.8
DURACON – Stryker Howmedica	266	0.7
GSP - TREKKING - Samo	246	0.7
COLUMBUS - B.Braun	192	0.5
BALANSYS - Mathys	172	0.5
JOURNEY - Smith & Nephew	170	0.5
CONTINUUM KNEE SYSTEM – Stratec Medical	166	0.5
RO.C.C. – Biomet Merck France	163	0.5
E.MOTION - B.Braun	130	0.4
CINETIQUE - Medacta SA	100	0.3
Other (models < 100 cases)	473	1.3
Unknown	64	0.2
Total	**35.495**	**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 2009, in total revision surgery

TYPE OF PROSTHESIS	N.	%
NEXGEN - Zimmer	609	29,2
ENDO-MODEL - Link	215	10,3
PFC - DePuy	174	8,3
AGC - Biomet Merck France	121	5,8
RT-PLUS - Endoplus	121	5,8
PROFIX - Smith & Nephew	110	5,3
DURATION MRH - Osteonics	84	4,0
GENESIS - Smith & Nephew	68	3,3
OPTETRAK - Exactech	66	3,2
SCORPIO - Osteonics	62	3,0
SIGMA RP - TC3 - DePuy	61	2,9
GKS - Permedica	57	2,7
LEGION - CONSTRAINED - Smith & Nephew	49	2,3
VANGUARD - Biomet	38	1,8
INTERAX - Stryker Howmedica	36	1,7
S-ROM NRH - Johnson & Johnson	28	1,3
TC-PLUS -SOLUTION - Endoplus	20	1,0
DURACON II - Stryker Howmedica	18	0,9
GEMINI - Link	14	0,7
ADVANCE - Wright	13	0,6
E.MOTION - B.Braun	11	0,5
GENIUS TRICCC - Dedienne Sante	10	0,5
LCS - DePuy Johnson & Johnson	9	0,4
GENUFITT – Lafitt (femoral comp. and insert) + EFDIOS – Citieffe (tibial component)	8	0,4
ROTAGLIDE - Corin Medical	8	0,4
TRIATHLON - Howmedica Osteonics	8	0,4
CONTINUUM KNEE SYSTEM - Stratec Medical	7	0,3
FIRST - Symbios Orthopedie SA	7	0,3
913 - Cremascoli Wright	6	0,3
BALANSYS - Mathys	4	0,2
T.A.C.K. - Link	4	0,2
Unknown	11	0,5
Other (models< 4 cases)	29	1,4
TOTAL	**2.086**	**100.0**

13.4 Prosthesis fixation

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31st December 2009, **according to prosthesis fixation**

Fixation	Primary unicomp.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	4.275	89.0	31.397	88.6	2.025	97.2	37.697	89.0
Uncemented	444	9.2	2.072	5.8	28	1.3	2.544	6.0
Fem cementless + tib cemented	81	1.7	1.552	4.4	21	1.0	1.654	3.9
Fem cem + tib cementless	6	0.1	437	1.2	10	0.5	453	1.1
Total*	**4.806**		**35.458**		**2.084**		**42.348**	

* 46 data are missing (0.1%)

Fixation of TKA (bi and tri comp) according to year of implant

Years of operation	% Cemented	% Cementless	% cemented tibia	% cemented femur
2001	82.2	8.8	9.1	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	91.4	4.5	1.5	2.5

13.5 Type of insert

Stabilization of liner in bi-tricompartmental knee prostheses

Years of operation	% Unstabilized	% Posterior stabilized	% Hinged
2001	48.1	50.1	1.8
2002	51.3	46.2	2.5
2003	45.4	52.4	2.2
2004	42.5	55.8	1.7
2005	38.4	60.1	1.5
2006	35.9	62.4	1.7
2007	37.0	60.9	2.1
2008	38.4	59.9	1.7
2009	41.0	57.3	1.7

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	72.3	27.7
2003	69.7	30.3
2004	68.0	32.0
2005	66.0	34.0
2006	58.4	41.6
2007	62.2	37.8
2008	60.7	39.3
2009	59.1	40.9

13.6 Articular coupling

Articular coupling according to year of implant. The majority of implants have met-poly coupling

	% 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	16.2	2.3

13.7 Bone Cement

Types of cement used since 1-1-2002

In bold bone cement loaded with antibiotic

Cement	%
Surgical Simplex P – Howmedica	28.7
Antibiotic Simplex – Howmedica	***19.3***
Palacos R - Heraeus Medical	5.8
Palacos R+G - Heraeus Medical	***5.7***
Palacos R - Biomet	4.2
Osteobond – Zimmer	3.8
Versabond AB - Smith & Nephew	***3.5***
Cemex System – Tecres	3.1
Aminofix 1 - Groupe Lepine	***3.0***
Versabond - Smith & Nephew	3.0
Refobacin Bone Cement R - Biomet	***2.5***
Cemex - Tecres	2.4
Refobacin Revision - Biomet	***2.2***
Amplicem 1 – Amplimedical	1.3
Cemex Genta System - Tecres	***1.3***
CMW 3 G - DePuy	***0.9***
Other bone cement without antibiotic	*5.6*
Other bone cement loaded with antibiotic	***3.7***
Total	**100.0**

Bone cement loaded with antibiotic is used in 42,1% 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 2009

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Tibial fract	6	*0.1*	Hematoma	22	*0.5*	Anemia	12	*0.2*
						Hyperpyrexia,	11	*0.2*
Fem fract	3	*0.1*	DVT	3	*0.1*	Gastro-intestinal	8	*0.2*
						Cardiac	5	*0.1*
			Infection	3	*0.1*	Dyspnoea	4	*0.1*
Anesthesiol.	1	*0.02*				Embolism	3	*0.1*
			SPE paralysis	1	*0.02*	Disorientation	3	*0.1*
						Genito-urinary	2	*0.04*
Other	2	*0.04*	Other	4	*0.1*	Collapse	2	*0.04*
						Other	16	*0.3*
Total	**12**	***0.3***	**Total**	**33**	***0.7***	**Total**	**66**	***1.4***

The rate of complications in primary **Bi-tricompartmental surgery** carried out on **patients hospitalized between July 1st 2000 and December 31st 2009**

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Fem fract	27	*0.1*	Hematoma	383	*1.1*	Anemia	574	*1.6*
			DVT	69	*0.2*	Hyperpyrexia	243	*0.7*
Ligament lesion	21	*0.1*	SPE paralysis	31	*0.1*	Genito-urinary	102	*0.3*
			Edema	29	*0.1*	Gastro-intestinal	98	*0.3*
Anesthes.	19	*0.05*	Wound dehiscence	22	*0.1*	Cardiac	91	*0.3*
Tibial fracture	14	*0.04*	Bed sores	20	*0.1*	Respiratory	53	*0.1*
			Bleeding	16	*0.05*	Embolism	44	*0.1*
Rupture patellar tendon	10	*0.03*	Infection	13	*0.04*	Disorientation	40	*0.1*
			Instability of ligaments	9	*0.03*			
						Collaps	32	*0.1*
Tibial tuberosity fracture,	5	*0.01*	Prosthesis disloc	5	*0.01*	Infarction	26	*0.1*
Hemorragia	18	*0.05*				Dyspnoea	26	*0.1*
Other	17	*0.05*	Other	52	*0.1*	Other	128	*0.4*
Total	**131**	***0.4***	**Total**	**649**	***1.8***	**Total**	**1.457**	***4.1***

The rate of complications in revision **surgery** carried out on **patients hospitalized between July 1st 2000 and December 31st 2009**

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Rupture patellar tendon	9	*0.4*	Hematoma	43	*1.7*	Anemia	62	*2.4*
			Wound dehiscence	7	*0.3*	Hyperpyrexia	20	*0.8*
Tibial fracture	7	*0.3*	Prosthesis disloc	6	*0.2*	Cardiac	10	*0.4*
						Gastro-intestinal	9	*0.4*
Femur fract	6	*0.2*	Bleeding	5	*0.2*	Respiratory	8	*0.3*
						Disorientation	6	*0.2*
Tibial tuberosity fracture,	4	*0.2*	Infection	4	*0.2*	Allergic reaction	6	*0.2*
						Embolism	4	*0.2*
Anesthes.	3	*0.1*	Edema	3	*0.1*	Genito-urinary	4	*0.2*
Ligament lesion	1	*0.04*	SPE paralysis	3	*0.1*	Reaction to transfusion	4	*0.2*
						Collapse	1	*0.04*
Other	7	*0.3*	Other	7	*0.3*	Other	5	*0.2*
Total	**37**	***1.4***	**Total**	**78**	***3.1***	**Total**	**139**	***5.4***

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 2009.

Registered deaths occurred during hospitalization

Year 2000-2009			
Type of surgery	**Deaths**	**Number of surgery**	***Percentage***
Primary uni	-	4.813	-
Primary bi/tricomp	37	35.495	0.1
Revision	3	2.554	0.1
Removal	1	526	0.2

15. Analysis of survival of primary surgery

15.1 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, pathology, type of prosthesis (bi/tri comp vs unicomp), type of insert (fix vs mobile).
All primary knee arthroplasties performed in the region between July 2000 and December 2009 only on patients living in the region, were analyzed.

COX PROPORTIONAL RISK MODEL

Variabili

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

Number of valid observations 28.642
Non revised 27.933
Revised: 709

Chi-square: 248.2 *p*= 0.0001

VARIABLE	SIGNIFICANCE (P)
Gender (Males vs females)	**NS** (0.291)
Age (less than 70 yrs vs more than 70 yrs)	**S** (0.001)
Diagnosis (arthrosis vs other)	**NS** (0.645)
Type of prosthesis (bi-tri compartmental vs uni)	**S** (0.0001)
Type of insert (Fix vs mobile)	**S** (0.005)

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.

For age

Age	Relative risk rate	Confidence interval 95%		Significance (p)
Less than 70 yrs	2.2	1.9	2.5	0.001

Younger patients have higher risk of revision

For liner

Liner	Relative risk rate	Confidence interval 95%		Significance (p)
Mobile	1.1	1.0	1.2	0.005

Mobile liner have higher risk of revision

For type of prosthesis

Type of prosthesis	Relative risk rate	Confidence interval 95%		Significance (p)
Uni compartmental	1.5	1.4	1.6	0.0001

Unicompartmental have higher risk of revision

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 2009 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	19.912	277	173	450	2.3
Primary tricompartmental	3.560	65	12	77	2.2
Primary unicomp.	3.134	119	63	182	5.8
Total revision	1.146	57	33	90	7.8
Total	**27.752**	**518**	**281**	**799**	**2.9**

In 35% 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.

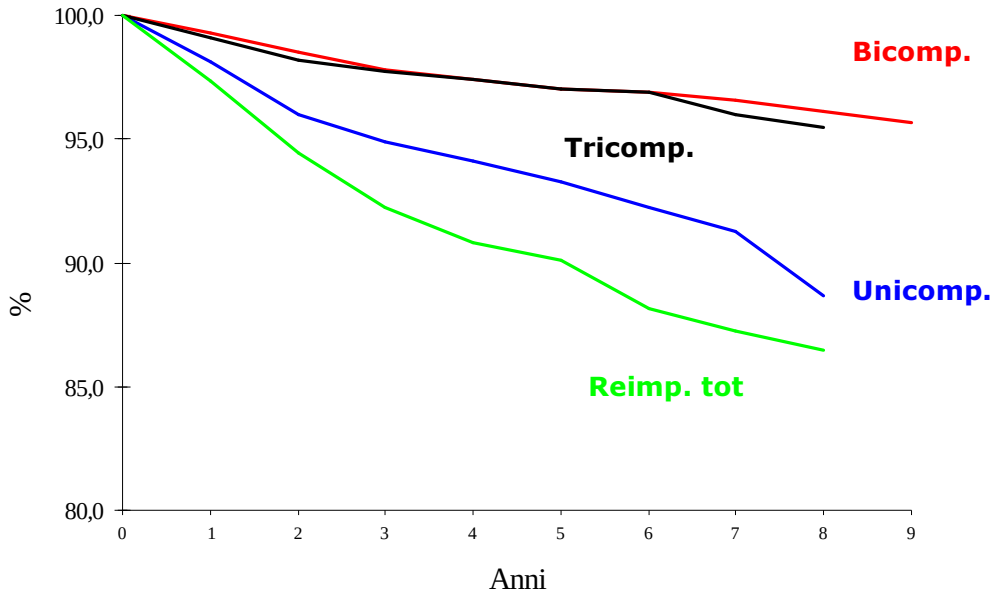
The following paragraphs show the survival curves calculated separately for primary uni, bi/tri compartmental and total joint revision.

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	19.912	386	64	2.3
Primary tricompartmental	3.560	63	14	2.2
Primary unicompartmental	3.134	172	10	5.8
Total revision	1.146	77	13	7.8

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	96.0	95.2	96.7
3	94.9	94.0	95.8
4	94.1	93.1	95.0
5	93.2	92.2	94.3
6	92.3	91.0	93.5
7	91.3	89.8	92.7
8	88.7	86.5	90.9

Bi-compartimental			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.3	99.2	99.4
2	98.5	98.3	98.7
3	97.8	97.6	98.0
4	97.4	97.2	97.7
5	97.0	96.8	97.3
6	96.9	96.5	97.2
7	96.6	96.2	96.9
8	96.1	95.7	96.6
9	95.6	95.0	96.2
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	97.7	98.7
3	97.7	97.2	98.3
4	97.4	96.7	98.0
5	97.1	96.3	97.8
6	96.9	96.1	97.7
7	96.0	94.7	97.3
8	95.5	93.8	97.1
Total revision			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	97.4	96.4	98.3
2	94.4	93.0	95.9
3	92.2	90.4	94.0
4	90.8	88.8	92.8
5	90.1	88.0	92.2
6	88.2	85.6	90.8
7	87.2	84.4	90.1
8	86.5	83.3	89.7

Survivorship of unicompartmental prostheses is significantly different at 8 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	70/3134	2.2	38.5
Pain without loosening	31/3134	1.0	17.0
Tibial aseptic loosening	16/3134	0.5	8.8
Femoral aseptic loosening	14/3134	0.4	7.7
Septic loosening	22/3134	0.7	12.1
Liner wear	10/3134	0.3	5.5
Bone fracture	2/3134	0.1	1.1
Missing	6/3134	0.2	3.3
Other	11/3134	0.4	6.0
Total	**182/3134**	**5.8**	**100.0**

Primary bi-tricompartmental

Cause of revision	Rate	Percentage	% distribution of cause of failure
Total aseptic loosening	157/23472	0.67	29.8
Septic loosening	148/23472	0.63	28.1
Tibial aseptic loosening	56/23472	0.24	10.6
Pain without loosening	50/23472	0.21	9.5
Femoral aseptic loosening	20/23472	0.09	3.8
Liner wear	24/23472	0.10	4.6
Instability	10/23472	0.04	1.9
Bone fracture	10/23472	0.04	1.9
Dislocation	21/23472	0.09	4.0
Stiffness	16/23472	0.07	3.0
Missing	5/23472	0.02	0.9
Other	10/23472	0.04	1.9
Total	**527/23472**	**2.2**	**100.0**

Total revision

Cause of revision	Rate	Percentage	% distribution of cause of failure
Septic loosening	31/1146	2.7	34.4
Total aseptic loosening	20/1146	1.7	22.2
Tibial aseptic loosening	10/1146	0.9	11.1
Femoral aseptic loosening	5/1146	0.4	5.6
Instability	5/1146	0.4	5.6
Pain without loosening	4/1146	0.3	4.4
Dislocation	4/1146	0.3	4.4
Prosthesis breakage	3/1146	0.3	3.3
Liner wear	2/1146	0.2	2.2
Missing	1/1146	0.1	1.1
Other	5/1146	0.4	5.6
Total	**90/1146**	**7.8**	**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	%
Fixed	14.869	314	314/14.869	2.1
Mobile	8.576	211	211/8.576	2.5

Primary surgery-fixed insert

Cause of revision	Rate	Percentage	% distribution of cause of failure
Septic loosening	**96**/14869	0.65	30.6
Total aseptic loosening	**85**/14869	0.57	27.1
Tibial aseptic loosening	**35**/14869	0.24	11.1
Pain without loosening	**30**/14869	0.20	9.6
Liner wear	**14**/14869	0.09	4.5
Femoral aseptic loosening	**10**/14869	0.07	3.2
Instability	**9/**14869	0.06	2.9
Dislocation	**8**/14869	0.05	2.5
Bone fracture	**8**/14869	0.05	2.5
Rigidity	**8**/14869	0.05	2.5
Other	**5**/14869	0.03	1.6
Prosthesis breakage	**3**/14869	0.02	1.0
Unknown	**3**/14869	0.02	1.0
Total	**314**/14869	**2.1**	**100.0**

Primary surgery – mobile insert

Cause of revision	Rate	Percentage	% distribution of cause of failure
Total aseptic loosening	**70**/8576	0.82	33.2
Septic loosening	**52**/8576	0.61	24.6
Tibial aseptic loosening	**21**/8576	0.24	10.0
Pain without loosening	**20**/8576	0.23	9.5
Dislocation	**13**/8576	0.15	6.2
Liner wear	**10**/8576	0.12	4.7
Femoral aseptic loosening	**10**/8576	0.12	4.7
Rigidity	**8**/8576	0.09	3.8
Bone fracture	**2**/8576	0.02	0.9
Prosthesis breakage	**2**/8576	0.02	0.9
Unknown	**2**/8576	0.02	0.9
Instability	**1**/8576	0.01	0.5
Total	**211/8576**	**2.5**	**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 166 cases (out of 29.830 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 166 re-operations were not states considered as failures of the bicompartmental prosthesis.

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 37.1%.
Series with a higher percentage should be considered as complex series.

Type	Starting Years	n.	% of patients younger than 70	n. failures	% survival at 4	c.i. at 95%	% survival at 7	c.i. at 95%
ALLEGRETTO UNI - Protek-Sulzer	2000	198	58.1	15	94.1	90.7-95.8	91.6	87.5-93.7
EFDIOS - Citieffe	2000	289	60.9	20	95.9	93.2-97.2	92.5	88.6-94.5
GENESIS UNI - Smith & Nephew	2000	395	64.8	21	93.0	89.7-94.7	89.7	84.9-92.2
HLS - UNI EVOLUTION - ALL POLY - Tornier	2001	143	46.2	6	96.0	92.1-98.0	91.6	84.4-95.3
MILLER GALANTE UNI - Zimmer	2001	118	64.4	4	96.6	93.3-98.3	96.6	93.3-98.3
MITUS - ENDO-MODEL UNI – ALL POLY - Link	2003	214	65.0	14	91.7	87.3-93.9	91.7	87.3-93.9
OXFORD UNICOMPARTIMENTAL PHASE 3 - Biomet Merck	2000	750	66.4	58	92.9	90.9-93.9	89.9	87.0-91.4
PRESERVATION UNI – ALL POLY - DePuy	2002	178	58.4	12	94.0	90.1-95.9	84.0	69.0-91.7
UC-PLUS SOLUTION - Endoplus	2000	177	64.4	3	98.2	96.3-99.3	-	-
ZIMMER UNI - Zimmer	2005	150	60.7	0	100	-	-	-
Total	2000	3134	61.8	182	94.1	93.1-95.0	91.3	89.8-92.7

In bold all poly models

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 4	c.i. at 95%	% survival at 7	c.i. at 95%
913 – Wright Cremascoli	2000	156	25.6	3	99.4	98.7-100	98.7	97.8-100
ADVANCE – Wright	2000	449	26.3	15	96.6	95.7-98.4	96.2	95.3-98.1
AGC – Kirschner Biomet Merck	2000	278	29.5	6	97.6	96.7-99.5	97.6	96.7-99.5
ENDO-MODEL – Link	2000	211	38.4	5	98.2	97.1-100	96.3	94.7-99.6
FIRST - Symbios Orthopedie Sa	2006	227	44.1	3	97.9	96.7-100	-	-
GEMINI MK II – Link	2002	898	35.5	9	98.3	97.8-99.4	98.3	97.8-99.4
GENESIS II – Smith & Nephew	2000	1511	43.1	13	98.5	98.0-99.3	98.5	98.0-99.3
GENIUS TRICCC – Dedienne Santé	2000	483	25.1	20	95.9	94.9-97.8	95.1	94.0-97.3
GENUS – ADLER	2008	210	31.9	0	-	-	-	-
GKS – Permedica	2001	131	32.8	3	98.3	97.2-100	97.0	95.2-100
GSP - TREKKING - Samo	2005	104	30.8	2	97.2	95.3-100	-	-
INTERAX – Stryker Howmedica	2000	567	31.6	32	95.6	94.7-97.3	94.6	93.6-96.5
LCS – DePuy	2000	666	44.0	13	98.1	97.6-99.2	97.3	96.4-98.9
MULTIGEN - Lima	2001	280	26.4	11	94.4	92.6-97.9	94.4	92.6-97.9
NEXGEN – Zimmer	2001	6243	38.6	97	98.3	98.1-98.7	97.6	97.3-98.2
NON NOTA	2000	54	44.4	2	94.7	91.0-100	-	-
NUOVA DURACON II – Stryker Howmedica	2000	198	29.8	8	96.4	95.0-99.0	96.4	95.0-99.0
OPTETRACK – Exactech	2000	584	34.2	14	97.5	96.8-99.0	96.4	95.3-98.5
P.F.C – DePuy	2000	1715	37.8	40	97.7	97.3-98.5	96.6	95.9-97.8
PROFIX – Smith & Nephew	2000	2667	36.1	73	97.2	96.8-97.9	96.3	95.8-97.2
RO.C.C. – Biomet Merck France	2003	149	47.7	13	91.2	88.9-95.8	-	-

ROTAGLIDE – Corin Medical	2000	535	33.8	27	95.0	94.0-97.0	93.4	92.1-96.0
SCORE – Amplitude	2004	437	29.3	5	98.7	98.1-99.8	-	-
SCORPIO – Stryker Howmedica	2002	1133	33.4	28	96.5	95.9-97.9	96.2	95.5-97.7
T.A.C.K. – Link	2000	528	37.3	35	95.6	94.8-97.4	93.4	92.3-95.5
TC-PLUS - SOLUTION - Endoplus	2002	698	36.7	12	96.2	94.7-99.0	-	-
TRIATHLON – Stryker Howmedica Osteonics	2005	337	41.5	4	95.5	93.1-100	-	-
VANGUARD - Biomet Merck France	2005	1034	48.8	15	97.4	96.6-98.9	-	-
Other (models with less than 100 cases)	2000	989	36.0	19	96.9	94.9-98.9	96.9	94.9-98.9
Total	**2000**	**23472**	**37.2**	**527**	**97.4**	**97.2-97.7**	**96.5**	**96.2-96.9**

PART THREE: SHOULDER PROSTHESIS

July 2008 – December 2009

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 89.1% in 2009.
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%

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 2009, according to **type**

Type of operation	Number of operation	Percentage
Anatomical prosthesis	54	9.6
Inverse prosthesis	254	45.2
Hemiarthroplasty	167	29.7
Resurfacing	38	6.8
Revisions	44	7.8
Prosthesis removal	5	7.8
Total	**562**	**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 2009, according to **type of operation** and **gender** of patients.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Anatomical prosthesis	21	13.6	33	8.1	**54**
Inverse prosthesis	43	27.9	211	51.7	**254**
Hemiarthroplasty	56	36.4	111	27.2	**167**
Resurfacing	20	13.0	18	4.4	**38**
Revisions	12	7.8	32	7.9	**44**
Prosthesis removal	2	1.3	3	0.7	**5**
Total	**154**	**100.0**	**408**	**100.0**	**562**

18.2 Age

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2009, according to **mean age** and **gender** of patients.

Gender	N.	%	Mean age	C.I. at 95%
Males	120	25.3	65.9	63.5-68.3
Females	355	74.7	72.5	71.7-73.3

18.3 Pathologies

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2009, according to **type of operation** and **diagnosis** of patients.

Diagnosis	Total reverse arthroplasty	
	N.	%
Eccentric osteoarthritis	132	52.0
Concentric osteoarthritis	56	22.0
Fracture	33	13.0
Sequelae of fracture	13	5.1
Necrosis	6	2.4
Post-traumatic arthrosis	3	1.2
Rheumatic	2	0.8
Missing	*9*	*3.5*
Total	**254**	**100.0**

Diagnosis	Anatomic arthroplasty	
	N.	%
Concentric osteoarthritis	42	77.8
Necrosis	5	9.3
Eccentric osteoarthritis	4	7.4
Sequelae of fracture	2	3.7
Condromatosis	1	1.9
Total	**54**	**100.0**

Diagnosis	Hemiarthroplasty	
	N.	%
Fracture	102	61.1
Concentric osteoarthritis	28	16.8
Eccentric osteoarthritis	12	7.2
Necrosis	10	6.0
Sequelae of fracture	9	5.4
Post traumatic necrosis	2	1.2
Rheumatic	1	0.6
Dislocation	1	0.6
Missing	*2*	*1.2*
Total	**167**	**100.0**

Diagnosis	Resurfacing	
	N.	%
Concentric osteoarthritis	18	47.3
Necrosis	13	34.2
Eccentric osteoarthritis	3	7.9
Fracture	1	2.6
Rheumatic	1	2.6
Post traumatic arthrosis	1	2.6
Arthrosis	1	2.6
Missing	*1*	*2.6*
Total	**38**	**100.0**

Number of shoulder r**evisions** carried out on patients with admission date between 1st July 2008 and 31st December 2009, according to **diagnosis** and type of revision.

Diagnosis	N.	%
Revision after removal	7	15.9
Humeral loosening	7	15.9
Glenoid erosion	6	13.6
Superior instability	6	13.6
Anterior instability	5	11.4
Rotator cuff massive failure	3	6.8
Infection	3	6.8
Loosening of glenoid	3	6.8
Periprosthetic fracture	1	2.3
Pain	1	2.3
Missing	*2*	*4.5*
Total	**44**	**100.0**

Type of revision	N.	%
From hemy to inverse	15	34.1
From inverse to inverse	8	18.2
From hemy to hemy	7	15.9
From anatomical to inverse	6	13.6
Prosthesis removal	5	11.4
From anatomical to anatomical	1	2.3
From resurfacing to inverse	1	2.3
From hemy to anatomical	1	2.3
Total	**44**	**100.0**

19. Surgical techniques and anesthesia

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2009, according to **surgical approach**

Type of operation	Deltoideo-pettorale	Trans-deltoideo	A spallina
Anatomical	54	-	-
Inverse	230	14	1
Hemy	163	-	-
Resurfacing	37	-	-
Removal	5	-	-
Revision	42	1	-
Total*	**531**	**15**	**1**

15 missing data (2.7%)

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2009, according to **anesthesia**

Anesthesia	N.	%
Mixed	259	48.6
General	265	49.7
Loco-regional	9	1.7
Total	**533**	**100.0**

29 missing data (5.1%)

20. Type of prosthesis

20.1 Fixation

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2009, according to **type of prosthesis** and **stem fixation**

Stem fixation	Anatomic	%	Inverse	%	Hemy	%
Cemented	10	18.5	84	33.1	92	55.1
Cementless	44	81.5	170	66.9	75	44.9
Total	**54**	**100.0**	**254**	**100.0**	**167**	**100.0**

20.2 Type of prosthesis

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2009, according to the **type of prosthesis**

Model of prosthesis	Inverse		Anatomic + hemy	
	N	%	N	%
Aequalis fracture - Tornier	0	-	1	0.5
Aequalis Reversed - Tornier	40	15.7	0	-
Affinis - Mathys	0	-	2	0.9
Affinis fracture – Tornire	0	-	3	1.4
Anatomical shoulder - Zimmer	14	5.5	13	5.9
Anatomical shoulder fracture - Zimmer	0	-	15	6.8
Bigliani/flatow - Zimmer	0	-	49	22.2
Delta CTA - Depuy Orthopaedics	9	3.5	0	-
Delta Xtend - Depuy Orthopaedics	102	40.2	4	1.8
Eclipse - Arthrex	0	-	5	2.3
Epoca - Synthes	0	-	2	0.9
Global Advantage - Depuy Orthopaedics	0	-	11	5.0
Global FX - Depuy Orthopaedics	0	-	4	1.8
LTO - Lima	0	-	20	9.0
Modular NEER 3 – Smith & Nephew	0	-	8	3.6
Promos - Plus orthopedics AG	8	3.1	5	2.3
SMR – Lima	67	26.4	10	4.5
SMR trauma – Lima	0	-	42	19.0
T.E.S.S. - Biomet	9	3.5	13	5.9
Trabecular Metal – Zimmer	3	1.2	14	6.3
Verso shoulder System - Biomet	1	0.4	0	-
Missing	*1*	*0.4*	*0*	-
Total	**254**	**100.0**	**221**	**100.0**

Number of shoulder resurfacing carried out on patients with admission date between 1st July 2008 and 31st December 2009, according to the **type of prosthesis.**

Type of prosthesis	Resurfacing	
	N	%
COPELAND SHOULDER - Biomet	15	39.5
EPOCA RH - Synthes	6	15.8
AEQUALIS RESURFACING - Tornier	1	2.6
CAPICA - Implantcast	1	2.6
GLOBAL CAP - DePuy	1	2.6
ECLIPSE - Arthrex	7	18.4
T.E.S.S - Biomet	3	7.9
HEMICAP - Arthrosurface	1	2.6
DUROM SHOULDER - Zimmer	3	7.9
Total	**38**	**100.0**

21. Complications occurred during hospitalization

The rate of complications in **primary surgery** carried out on patients hospitalized between July 1st 2008 and December 31st 2009.

During the period considered, the following intra-operative complications were registered: 2 fractures, 1 coracoid fracture, 1 dialysis fracture and 1 muscle wound.
As for post-operative local complications we observed 2 hematoma, 2 edema, 1 prosthesis dislocation and 1 neurological complication.
Post-operative general complications registered were 1 DVT, 1 pneumonia, 1 renal acute infection and 14 cases of anemia.

22. Duration of pre- and post-operative hospitalization

Year 2009			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean pre-op. (range)**
Anatomical primary total arthropl.	38	2.0 (0-13)	5.2 (3-27)
Inverse primary total arthropl.	195	1.7 (0-17)	5.4 (2-22)
Hemiarthropl.	120	2.7 (0-19)	7.0 (0-62)
Resurfacing	32	0.8 (0-1)	5.1 (2-25)
Revisions	33	1.4 (0-10)	5.7 (2-25)

Year 2009			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean pre-op. (range)**
Elective	241	1.4 (0-17)	5.6 (1-27)
Emergency	92	4.0 (0-19)	6.8 (0-62)

23. Failures

Due to the very short follow-up only the rate of revision is reported.

Type of operation	n. implants	n. revisions	rate
Anatomical	54	-	-
Inverse	254	2	0.79
Hemi	167	1	0.60
Resurfacing	38	-	-