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 2012

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA

Foreword

This is the 13th report, elaborated by the Register of Orthopedic Prosthetic Implantology (RIPO). It presents the most significant results of the descriptive and survival 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 2012**.
The aim of this report is the presentation of the overall regional data:

- for the hip, total arthroplasty, hemiarthroplasty, resurfacing, revision and removal operations;
- for the knee, uni-, bi- and tricompartmental arthroplasty, revision and removal operations;
- for the shoulder (since July 2008), anatomical and inverse arthroplasty, resurfacing, revision and removal operations.

Altogether data of 118.000 hip, 66.000 knee and 1.900 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.
Starting from today this document accompanies the brief evaluations that authorized persons may make alone via the Register's website (https://ripo.cineca.it).

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 supply orthopedic surgeons with a very useful tool to give the patient timely information;
- to collaborate in a post-marketing surveillance, allowing surgeons to easily identify patients implanted with a re-called implant;
- 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 and Australian registers, which were the models that inspired the RIPO analysis;
- 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 other National or European Institutions.

Methodological notes

As for last year, descriptive analyses are done on all cases, while survival analyses are performed only on patients living in the Emilia-Romagna region, in order to avoid the bias resulting from the 'loss' of non-resident patients.
Therefore, all survival analyses presented in this report are based on primary operations in patients resident in Emilia-Romagna and on revisions of same prostheses, wherever performed.

The number of implants for which survival is calculated is obviously lower than the amount present in the database, but the analysis is more accurate.

As for last year, the validity of the data reported in the present report is based on the complete adhesion to the register and degree of reliability of the information given.
The assessment of the completeness is made by comparison with the data from the Hospital Discharge database; in the last year the Register has 'captured' 98% of hip and knee operations.
As far as concerns the reliability of the data given, RIPO handles two types of data: incontrovertible data, either that RIPO checks by comparison with other data banks (labels of the components implanted, demographic data of the patients, dates of admission, any date of death), and not verifiable data such as disease that led to replacement or revision or the complications that arose during hospitalization. Reliability is checked by sampling the data, by asking for confirmation of some information. The percentage of responses obtained is increasing.

Explanatory guide for the survival analysis

The survival of the prosthesis is illustrated by tables and graphs.
The survival curves are calculated only on patients living in Region Emilia-Romagna; 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 at the moment where the period of follow-up begins. The prosthesis is considered to be 'surviving' up to when it was necessary 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 and the number of failed prostheses.
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.
In the report both complete hip and knee prostheses and single components (acetabulum and stems) were compared, if there was a sufficient number of implants (at least 300 cases). The comparison tables show the number of implants and survival rate at 5 and 10 years.

Summary of the main results presented

Hip
During 2012 primary THA was performed in nearly 6500 patients to treat pathologies well known, mainly primary arthrosis; arthrosis secondary to developmental dysplasia is progressively slightly decreasing. Mean age at surgery is stable (70,4yrs for women and 67,0yrs for men).
In 2012, as in past years, 90 different types of cup and 109 of stem were used; 12 and 20 of them are 'new', not implanted in previous years. 40% of the stems have a modular neck, slightly decreasing compared to past years.
Uncemented prostheses were 62% in year 2000 and 95% in year 2012, whilst hybrid fixation was 22% and it is now 3,4%. Cemented prostheses are now only 1%, and they were 15% in year 2000.
Most common articular coupling is ceramic on ceramic, that in 2012 represents 61,5% of primary surgery (it was 18% in 2000); second most common is ceramic on poly (27%). Metal on poly, that was 45% in 2000, is now reduced to 10%. Nearly half of poly is cross-linked in met-poly and nearly two thirds in cer-poly.
Resurfacing, that starting from 2006 were progressively decreasing, during 2011 showed an important increasing, representing 4,3% of primary surgery.

The survival of the hip prostheses is confirmed at very high levels. 91,5% of the 55.186 prostheses implanted in Emilia-Romagna region on resident patients are still in place 13 years after the operation.
Part (76%) of the 2.076 revisions is major revisions, where at least one component interfacing with bone, has been revised. The remaining 24% are minor revisions (liner, head, and modular neck).
High incidence of prosthesis breakage was observed among causes of failure; this phenomenon is partially related to the extensive use of ceramic components and of exchangeable necks.
Survival of resurfacing, at 9 years, is slightly lower than THA (90,2%, statistically significant). This datum is affected by the recall of a particular model of prostheses. The most frequently implanted resurfacing, on the contrary, shows survival comparable to conventional THA.
Partially confirming past years results, multivariate analysis demonstrated that survival is lower for males and young patients.
At maximum 13 years of follow up failure seems not to be affected by fixation and articular coupling, but these two variables cannot be introduced in the Cox multivariate analysis, as they are not independent and they are linked to other variables, such as age at surgery. Survival curves for fixation and coupling are traced without adjusting.
We found no prosthesis (cup and stem) with sufficient number of cases, having a survival significantly lower than the mean of the region. In the analysis of single stems or cups, very few have survival slightly lower than the regional mean, barely statistically significant.
Hemiarthroplasty has an optimal survival of the implant (96,3% at 13 years) even if it is burdened by a high rate of patient's deaths due to age and general conditions of the patients.
Total revisions are not revised the second time in 85,1% of cases at 13 yrs.

Knee

High percentage of primary knee prostheses is implanted in private structures (66% in 2012, vs 43% in 2000).
In 2012, 12% of implanted prostheses are unicompartmental, 73% are bicompartmental with no patella resurfacing and the remaining 15% have patella resurfacing.
95% of implants are cemented. In half of them cement is antibiotic loaded.
Procedure involving cruciate sacrifice is slightly increasing. (62,8% during last year), while mobile inserts are used in 41,2% of implants in year 2012, slightly decreasing compared to previous year.
Types of implanted prostheses are less numerous and more stable during years compared to hip. Survival of bicompartmental is 94,5% at 11 yrs, survival of tricompartmental is 95,3% and survival of unicompartmental is significantly lower (85,8%). In these analyses patella resurfacing after primary TKA is not considered as a failure.
As requested by the Board, bicompartmental TKA survival has been calculated also considering patella resurfacing as a failure.
The incidence of revisions due to infection in the prosthesis remains high, in particular in total implants, where it represents a quarter of the causes of failure. At present it is irrelevant the use of antibiotic-loaded cement than conventional one.
Cox multivariate analysis shows that the survival of bi-tricompartmental knee prostheses 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). In unicompartmental implants, age of the patient influence negatively survival, while type of tibial component seems to be irrelevant (monoblock vs metal-back).
Some models of have prosthetic survival slightly below the regional average, as already observed in previous report. None of these models are still used in Emilia-Romagna region.

Shoulder

Data refers to a short follow-up (4 years and half). Interesting data are emerging particularly for types of prosthesis and epidemiology of surgery.
Reverse prosthesis is the most frequently implanted one (51%). Women are more affected than men, either for fracture and elective surgery.

Mean age at surgery for reverse prostheses is 74 for women and 71 for men. Patients are younger in anatomic prostheses (respectively 67 and 64). In hemiarthroplasty women are much older than men (74 vs 62).
Reverse prosthesis is impalnted mainly in arthrosis and in fracture (17%).
Anatomic prosthesis is implanted in concentric arthrosis (82%) while hemiartrhoplasties treat both fractures (62%) and arthrosis.
Fixation of total is mainly cementless; fixation for hemi is equally distributed between cemented and cementless.
Survival at 4 yrs is 99,2% for anatomical, 97,4% for reverse and 93,5% for hemi.

Units supporting RIPO, Head of Orthopaedic 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 November 2013.

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Technological partner for computer management of the database is CINECA of Bologna.

Bologna, 1st december 2013

PART ONE: HIP PROSTHESES

January 2000 – December 2012

1. RIPO data collection

1.1 Percentage of R.I.P.O. data collection

Percentage of R.I.P.O. data collection calculated versus hospital discharge data (S.D.O. – Schede di Dimissione Ospedaliera), is **97.9**% in the year 2012. Data are referred to primary total hip replacements (8151;74;75;76;85;86), hemiarthroplasties (8152), revision (8153;70;71;72;73) and prosthesis removal (8005).

1.2 Ratio public/private treatment

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

% of operations performed in public hospitals (AUSL, AOSP, IRCCS)			
Year of surgery	**Total hip arthroplasties**	**Hemiarthroplasties**	**Revisions**
2000	77,0	97,0	78,0
2001	81,0	97,3	77,0
2002	78,0	97,5	79,0
2003	75,1	98,4	76,1
2004	75,3	97,6	76,1
2005	72,9	98,3	77,7
2006	74,8	99,0	74,5
2007	70,8	98,6	73,6
2008	71,6	98,9	76,0
2009	70,9	99,3	76,3
2010	71,8	99,3	76,8
2011	69,9	99,3	78,8
2012	68,1	99,2	75,8

From SDO database

2. Quality of data

The quality of the data supplied to RIPO is still improving compared to previous years. The use of self-adhesive labels describing the prostheses enables unequivocal identification of the implant and the registration of the production batch.

3. Types of surgery

Number of hip surgeries carried out on patients with admission date between 1st January 2000 and 31st December 2012, according to **type of surgery**.

Type of surgery	Number of surgeries	Percentage
Primary THA	74.161	62,6
Hemiarthroplasty	29.274	24,7
Total and partial revision*	11.904	10,0
Resurfacing	1.711	1,4
Prosthesis removal	834	0,7
Hemiarthroplasty with buffer°	118	0,1
Other	555	0,5
Total	**118.557**	**100,0**

° acetabular buffer

***** 3.433 total revision, 4.865 cup revisions, 2.184 stem revisions, 1.422 revisions of other components.

Number of hip operations carried out with **resurfacing prostheses** by year

Year of operation	N.
2000	3
2001	7
2002	34
2003	77
2004	113
2005	178
2006	217
2007	200
2008	162
2009	166
2010	122
2011	138
2012	294

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

Year of operation	Primary THA		Revision (total + partial)	
	N.	Increase %	N.	Increase %
2000	4.374		743	
2001	4.584	4,8	856	15,2
2002	4.643	1,3	871	1,8
2003	5.046	8,7	862	-1,0
2004	5.360	6,2	860	-0,2
2005	5.566	3,8	828	-3,7
2006	5.834	4,8	945	14,1
2007	6.251	7,1	1.019	7,8
2008	6.380	2,1	985	-3,3
2009	6.740	5,6	987	0,2
2010	6.596	-2,1	1.032	4,6
2011	6.387	-3,2	914	-11,4
2012	6.518	2,1	1.002	9,6

4. Descriptive statistics of patients

4.1 Age

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2012, 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	2.312	3,1	4.744	6,4	10.647	14,4	21.370	28,8	27.025	36,4	8.060	10,9	**74.158**
Hemiarthroplasty	19	0,1	56	0,2	171	0,6	938	3,2	6.767	23,1	21.322	72,8	**29.273**
Revision	235	2,0	488	4,1	1.260	10,6	2.982	25,1	4.780	40,2	2.159	18,1	**11.904**
Resurfacing	243	14,2	441	25,8	588	34,4	358	20,9	79	4,6	2	0,1	**1.711**
Prosthesis removal	29	3,5	44	5,3	89	10,7	211	25,3	324	38,8	137	16,4	**834**
Hemiarthroplasty with buffer	-	-	2	1,7	3	2,5	15	12,7	36	30,5	62	52,5	**118**
Other	24	4,3	34	6,1	70	12,6	137	24,7	191	34,4	99	17,8	**555**
Total*	**2.862**	**2,4**	**5.809**	**4,9**	**12.828**	**10,8**	**26.011**	**21,9**	**39.202**	**33,1**	**31.841**	**26,9**	**118.553**

*4 missing data

Mean age at surgery

Type of operation	Mean age	Range
Primary THA	66,6	12-101
Hemiarthroplasty	83,1	20-109
Resurfacing	51,8	15-82
Revision	69,8	15-100

Mean age of patients, per type of operation, comparison 2000-2012

	Year 2000		Year 2012	
Type of operation	**Mean age**	**Range**	**Età media**	**Range**
Primary THA	66,0	16-99	66,7	14-93
Hemiarthroplasty	82,4	35-104	84,1	25-104
Revision	68,6	22-97	69,9	23-96

	Year 2003		Year 2012	
Type of operation	**Mean age**	**Range**	**Età media**	**Range**
Resurfacing	49,7	18-72	54,1	26-82

Mean age at surgery of patients affected by coxarthrosis

	THA			
	Year 2000		Year 2012	
Gender	**Mean age**	**Range**	**Mean age**	**Range**
Males	67,2	34-92	67,0	29-90
Females	68,9	31-93	70,4	25-93

4.2 Gender

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2012, according to **type of operation** and **sex of patient**.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Primary THA	29.252	39,4	44.909	60,6	**74.161**
Hemiarthroplasty	7.363	25,2	21.911	74,8	**29.274**
Revision	3.908	32,8	7.996	67,2	**11.904**
Resurfacing	1.196	69,9	515	30,1	**1.711**
Removal	330	39,6	504	60,4	**834**
Hemiarthroplasty with buffer	25	21,2	93	78,8	**118**
Other	238	42,9	317	57,1	**555**
Total	**42.312**	**35,7**	**76.245**	**64,3**	**118.557**

4.3 Side of surgery

Coxarthrosis more often affects right hip (57.4%). The percentage has been calculated on patients affected by primary coxarthrosis, on first side operated.
Percentage of operations carried out on the right or left side, considered by gender

Side	Males	Females
Right	53,1	60,6
Left	46,9	39,4

The difference is statistically significant (Chi – squared p<0,001).

4.4 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 2012, according to **diagnosis**

Diagnosis in primary arthroplasty	Number	Percentage
Primary arthritis	49.790	67,3
Sequelae of LCA and DCA	7.913	10,7
Femoral neck fracture	6.699	9,1
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	4.339	5,9
Post traumatic arthritis	1.781	2,4
Post traumatic necrosis	990	1,3
Rheumatic arthritis	870	1,2
Femoral neck fracture sequelae	622	0,8
Epiphysiolysis sequelae	208	0,3
Perthes disease sequelae	177	0,2
Septic coxitis sequelae	142	0,2
Tumor	111	0,2
Paget disease	74	0,1
TBC coxitis sequelae	54	0,1
Other	218	0,3
Total**	**73.988**	**100,0**

**291 missing data (0,4%)

Prostheses for bone tumor resection are not registered by R.I.P.O.
In 96,6% of hemi diagnosis was Femoral neck fracture.

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

Diagnosis in primary arthroplasty	Percentage			
	2000-2002	2003-2005	2006-2008	2009-2012
Primary arthrosis	65,0	67,2	67,1	68,2
Sequelae of LCA and DCA	13,3	11,7	10,5	8,8
Femoral neck fracture	9,1	8,4	9,0	9,3
Idiopathic femoral head necrosis	5,2	5,3	5,8	5,9
Post traumatic arthritis	2,5	2,4	2,5	2,3
Post traumatic necrosis	1,5	1,4	1,4	1,2
Rheumatic arthritis	1,5	1,3	1,1	1,0
Other	1,9	2,3	2,6	3,3
Total	**100,0**	**100,0**	**100,0**	**100,0**

Percentage distribution of diseases leading to THA according to **age group**

Diagnosis in primary arthroplasty	Age group					
	<40	40-49	50-59	60-69	70-79	≥80
Primary arthrosis	11,9	35,7	57,1	72,3	75,7	72,1
Sequelae of LCA and DCA	30,7	32,8	20,8	9,4	4,6	2,3
Femoral neck fracture	1,7	2,9	5,7	8,3	11,0	14,0
Idiopathic femoral head necrosis	15,5	11,2	7,0	4,3	4,2	5,9
Post traumatic arthritis	10,8	6,5	3,3	2,0	1,3	1,3
Post traumatic necrosis	8,1	2,6	1,6	0,9	0,8	1,3
Rheumatic arthritis	5,3	2,1	1,4	1,0	0,9	0,6
Femoral neck fracture sequelae	1,2	1,1	0,7	0,5	0,7	1,9
Epiphysiolysis sequelae	3,6	1,1	0,4	0,1	0,0	0,0
Perthes disease sequelae	2,6	1,0	0,3	0,1	0,0	0,0
Septic coxitis sequelae	1,9	0,3	0,3	0,1	0,1	0,0
Steroid-induced necrosis	2,0	0,6	0,2	0,1	0,0	0,0
Tumor	0,0	0,3	0,2	0,1	0,1	0,0
Coxa profunda	0,3	0,1	0,1	0,1	0,1	0,1
Paget's disease sequelae	0,0	0,0	0,1	0,1	0,1	0,2
TBC coxitis sequelae	0,2	0,2	0,1	0,1	0,0	0,0
Other	4,1	1,4	0,9	0,5	0,3	0,3
Totale	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Diagnosis in primary arthroplasty	Age group						Totale
	<40	40-49	50-59	60-69	70-79	≥80	
Primary arthrosis	0,6	3,4	12,2	31,0	41,1	11,7	**100,0**
Sequelae of LCA and DCA	9,0	19,7	27,9	25,3	15,8	2,3	**100,0**
Femoral neck fracture	0,6	2,1	9,0	26,6	44,7	17,0	**100,0**
Idiopathic femoral head necrosis	8,6	12,7	18,0	21,9	27,4	11,4	**100,0**
Post traumatic arthritis	13,9	17,3	19,5	24,2	19,3	5,7	**100,0**
Post traumatic necrosis	18,8	12,5	17,7	19,4	20,6	11,0	**100,0**
Rheumatic arthritis	14,1	11,3	16,7	25,1	27,2	5,6	**100,0**
Femoral neck fracture sequelae	4,5	8,4	12,7	16,8	32,0	25,6	**100,0**
Epiphysiolysis sequelae	40,4	25,5	18,8	9,1	5,3	1,0	**100,0**
Perthes disease sequelae	34,7	26,1	16,5	16,5	4,5	1,7	**100,0**
Septic coxitis sequelae	32,1	10,9	24,1	17,5	14,6	0,7	**100,0**
Steroid-induced necrosis	40,9	25,5	14,5	12,7	6,4	0,0	**100,0**
Tumor	1,2	16,0	24,7	29,6	25,9	2,5	**100,0**
Coxa profunda	8,2	8,2	19,2	24,7	28,8	11,0	**100,0**
Paget's disease sequelae	0,0	0,0	9,9	29,6	42,3	18,3	**100,0**
TBC coxitis sequelae	7,4	18,5	24,1	37,0	11,1	1,9	**100,0**
Other	20,3	14,5	19,4	23,3	17,5	4,9	**100,0**

Number of **resurfacing** operations carried out on patients with admission date between 1st January 2000 and 31st December 2012, according to **diagnosis**

Diagnosis in resurfacing	Number	Percentage
Primary arthrosis	1.294	75,8
Sequelae of LCA and DCA	166	9,7
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	86	5,0
Post traumatic arthritis	79	4,6
Rheumatic arthritis	29	1,7
Post traumatic necrosis	12	0,7
Epiphysiolysis sequelae	10	0,6
Perthes disease sequelae	9	0,5
Femoral neck fracture sequelae	8	0,5
Septic coxitis sequelae	3	0,2
Paget's disease sequelae	3	0,2
TBC coxitis sequelae	1	0,1
Other	6	0,4
Total*	**1.706**	**100,0**

*5 missing data (0,3%)

4.5 Causes for revision

Number of revision operations carried out on patients admitted between 1st January 2000 and 31st December 2012 according to **diagnosis**

In the Table are reported **all revisions of primary THA** performed in the Region, without taking care of site and date of primary implant. No indication of follow-up time is in these data.

Diagnosis in revision of primary THA	Number	Percentage
Cup aseptic loosening	3.552	33,1
Total aseptic loosening	2.400	22,4
Stem aseptic loosening	1.363	12,7
Prosthesis dislocation	983	9,2
Bone fracture	553	5,2
Prosthesis breakage*	495	4,6
Two steps prosthesis removal	482	4,5
Poly wear	358	3,3
Pain without loosening	171	1,6
Septic loosening	130	1,2
Primary instability	81	0,8
Heterotopic bone	42	0,4
Trauma	26	0,2
Metallosis	21	0,2
Acetabulum fracture	12	0,1
Other	57	0,5
Total°	**10.726**	**100,0**

° 141 missing data (1,2%)

***** Failure of 158 modular necks, 112 liners, 91 heads, 62 stems, 58 cups. 14 failure not specified

In the Table are reported **all revisions of resurfacing** performed in the Region, without taking care of site and date of primary implant. No indication of follow-up time is in these data.

Diagnosis in revision of resurfacing	Number	Percentage
Aseptic loosening	46	45,1
Bone fracture	36	35,3
Pain without loosening	9	8,8
Metallosis	8	7,8
Breakage of prosthesis	3	2,9
Total	**102**	**100,0**

In the Table are reported **all revisions of hemiarthroplasty** performed in the Region, without taking care of site and date of primary implant. No indication of follow-up time is in these data.

Diagnosis in revision of hemiarthroplasty	Number	Percentage
Prosthesis dislocation	312	33,4
Cotiloiditis	260	27,8
Stem aseptic loosening	243	26,0
Periprosthetic bone fracture	71	7,6
Two steps prosthesis removal	17	1,8
Septic loosening	8	0,9
Breakage of prosthesis	6	0,6
Instability	5	0,5
Heterotopic bone	2	0,2
Other	11	1,2
Total	**935**	**100,0**

5. 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.

5.1 Cups used in primary surgery

In 97 cases model or cup fixation was not communicated to RIPO.

Cemented cups	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
MULLER Citieffe	10	0,3	40	2,6	47	16,2
ZCA Zimmer	375	12,2	235	15,5	38	13,1
CUPULE AVANTAGE Biomet	2	0,1	46	3,0	34	11,7
MULLER Sulzer-Centerpulse-Zimmer	357	11,6	82	5,4	30	10,3
CONTEMPORARY Stryker Howmedica	458	14,9	311	20,6	27	9,3
MULLER Samo	351	11,5	85	5,6	21	7,2
PE Adler-Ortho	-	-	157	10,4	10	3,4
MULLER Lima	117	3,8	120	7,9	10	3,4
CCB Mathys	47	1,5	4	0,3	4	1,4
REFLECTION ALL-POLY Smith and Nephew	163	5,3	117	7,7	3	1,0
MULLER Smith & Nephew	96	3,1	48	3,2	1	0,3
MULLER Wright Cremascoli	903	29,5	58	3,8	-	-
MULLER Groupe Lepine	39	1,3	18	1,2	-	-
LUNA Amplitude	-	-	88	5,8	-	-
Other (< 50 cases)	147	4,8	104	6,9	66	0,2
Total	**3.065**	**100,0**	**1.513**	**100,0**	**291**	**100,0**

Cementless cup	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
FIXA TI-POR Adler-Ortho	-	-	1.946	6,7	5.640	29,4
EP-FIT PLUS Smith & Nephew	24	0,1	2577	8,9	1.683	8,8
R3 Smith & Nephew	-	-	49	0,2	1.109	5,8
FIXA Adler-Ortho	16	0,1	6.435	22,1	923	4,8
PINNACLE SECTOR II DePuy	69	0,3	622	2,1	805	4,2
EXCEED ABT Biomet	-	-	367	1,3	752	3,9
CONTINUUM Zimmer	-	-	10	0,0	668	3,5
DELTA PF Lima	96	0,5	1.042	3,6	480	2,5
DELTA TT Lima	-	-	147	0,5	454	2,4
EXPANSION Mathys	51	0,2	980	3,4	411	2,1
ALLOFIT S Zimmer	-	-	16	0,1	380	2,0
TRIDENT Stryker Howmedica	459	2,2	1.346	4,6	370	1,9
VERSAFITCUP CC Medacta	-	-	392	1,3	364	1,9
SPARKUP Samo	-	-	134	0,5	331	1,7
ABGII Stryker Howmedica	1.311	6,3	1.082	3,7	328	1,7
FITMORE Sulzer-Centerpulse-Zimmer	1.320	6,3	1.193	4,1	289	1,5
RECAP RESURFACING Biomet	-	-	637	2,2	256	1,3
REFLECTION Smith & Nephew	869	4,2	817	2,8	252	1,3
SELEXYS TH+ Mathys	-	-	-	-	179	0,9
CUPULE RELOAD AVANTAGE Biomet	-	-	118	0,4	174	0,9
JUMP Permedica	30	0,1	54	0,2	172	0,9
FIN II Biompianti	-	-	9	0,0	164	0,9
MAXERA Zimmer	-	-	-	-	150	0,8
Cupule April Symbios	-	-	77	0,3	143	0,7

HILOCK LINE Symbios	245	1,2	294	1,0	140	0,7
ADAPTIVE WINGS Samo	-	-	-	-	125	0,7
VERSAFITCUP CC TRIO Medacta	-	-	-	-	122	0,6
REGENEREX RINGLOC+ Biomet	-	-	53	0,2	120	0,6
BETA CUP Link	-	-	147	0,5	117	0,6
BS Citieffe	-	-	264	0,9	116	0,6
RM Mathys	2	0,0	5	0,0	113	0,6
DELTAMOTION Finsbury	-	-	1	0,0	113	0,6
ALLOFIT IT Zimmer	-	-	-	-	111	0,6
POLARCUP Ortho-Id	-	-	136	0,5	109	0,6
CLS Sulzer-Centerpulse-Zimmer	2.480	11,9	800	2,7	92	0,5
TRABECULAR METAL Zimmer	17	0,1	437	1,5	88	0,5
BHR Smith & Nephew	33	0,2	94	0,3	75	0,4
BICON PLUS Smith & Nephew	325	1,6	898	3,1	70	0,4
COOPER Permedica	37	0,2	201	0,7	66	0,3
MALLORY Biomet	74	0,4	141	0,5	62	0,3
SELEXYS TH Mathys	-	-	532	1,8	50	0,3
CUPULE AVANTAGE 3P Biomet	8	0,0	58	0,2	48	0,3
CFP Link	216	1,0	296	1,0	34	0,2
TRILOGY Zimmer	809	3,9	273	0,9	28	0,1
M2A Biomet	72	0,3	114	0,4	21	0,1
DUOFIT PDT Samo	29	0,1	169	0,6	20	0,1
MRS RIVESTIMENTO Lima	-	-	160	0,5	20	0,1
TRILOGY AB Zimmer	115	0,6	243	0,8	17	0,1
EASY HIT Medica	155	0,7	140	0,5	16	0,1
ALLOFIT Zimmer	92	0,4	149	0,5	16	0,1
PROCOTYL-L Wright Cremascoli	-	-	141	0,5	11	0,1
DUROM HIP RESURFACING Zimmer	10	0,0	311	1,1	9	0,0
DUOFIT PSF Samo	1.056	5,1	310	1,1	8	0,0
MOBILIS I Othesio	-	-	107	0,4	7	0,0
MBA Groupe Lepine	102	0,5	111	0,4	6	0,0
PROTESI DA RIVESTIMENTO ASR Depuy	5	0,0	95	0,3	3	0,0
AnCA FIT Wright Cremascoli	6.022	28,8	689	2,4	-	-
STANDARD CUP Protek Sulzer Zimmer	1.151	5,5	154	0,5	-	-
SPH CONTACT Lima	227	1,1	10	0,0	-	-
ABG Stryker Howmedica	224	1,1	-	-	-	-
ELLIPTICAL CUP HEDROCEL Stratec	197	0,9	-	-	-	-
OSTEOLOCK Stryker Howmedica	173	0,8	-	-	-	-
MARBURG Zimmer	171	0,8	3	0,0	-	-
SECUR-FIT Stryker Osteonics	170	0,8	-	-	-	-
ALBI + Wright Cremascoli	159	0,8	-	-	-	-
ELLIPTICAL CUP Stratec	154	0,7	-	-	-	-
TRABECULAR METAL MONOBLOCK Zimmer	150	0,7	267	0,9	-	-
METASUL STAR CUP Sulzer	145	0,7	-	-	-	-
FITEK Sulzer	106	0,5	2	0,0	-	-
EXCEED PC Biomet	87	0,4	98	0,3	-	-
SPH BLIND Lima	81	0,4	121	0,4	-	-
CUPULE AVANTAGE Biomet	79	0,4	220	0,8	-	-
Other (< 100 cases)	1.463	7,0	809	2,8	728	3,8
Total	**20.886**	**100,0**	**29.103**	**100,0**	**19.158**	**100,0**

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

5.2 Cups used in total revision surgery

In 15 cases model or cup fixation was not communicated to RIPO.

Cemented cups	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
MULLER Protek-Sulzer-Centerpulse-Zimmer	95	24,2	59	29,6	20	27,8
CONTEMPORARY Stryker Howmedica	85	21,6	31	15,6	13	18,1
ZCA Zimmer	22	5,6	11	5,5	8	11,1
MULLER Samo	40	10,2	21	10,6	7	9,7
MULLER Lima	33	8,4	13	6,5	6	8,3
CUPULE AVANTAGE CEMENTED Biomet	1	0,3	19	9,5	6	8,3
CCB Mathys	19	4,8	-	-	1	1,4
MULLER Wright Cremascoli	53	13,5	5	2,5	-	-
Other (< 10 cases)	45	11,5	40	20,1	11	15,3
Total	**393**	**100,0**	**199**	**100,0**	**72**	**100,0**

Cementless cup	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
TRILOGY Zimmer	79	7,1	49	4,8	14	2,3
TRIDENT Stryker Howmedica	27	2,4	117	11,4	13	2,1
TRIDENT ARC2F Stryker Howmedica	-	-	36	3,5	-	-
TRABECULAR METAL Zimmer	2	0,2	98	9,6	58	9,5
TRABECULAR METAL Rev Zimmer	1	0,1	10	1,0	16	2,6
STANDARD CUP Protek Sulzer	128	11,4	4	0,4	-	-
SECUR-FIT Stryker Osteonics	25	2,2	-	-	-	-
REGENEREX RINGLOC+ Biomet	-	-	10	1,0	31	5,1
REFLECTION Smith & Nephew	9	0,8	20	2,0	1	0,2
PROCOTYL-Z-PIVOT Wright Cremascoli	4	0,4	18	1,8	-	-
PROCOTYL-E Wright Cremascoli	32	2,9	4	0,4	-	-
PINNACLE MULTIHOLE II DePuy	7	0,6	24	2,3	1	0,2
OSTEOLOCK Stryker Howmedica	47	4,2	-	-	-	-
OMNIA Adler-Ortho	-	-	38	3,7	16	2,6
MC MINN Link	63	5,6	24	2,3	3	0,5
LOR ALLOPRO Sulzer	42	3,8	6	0,6	-	-
Hermes BS Rev Citieffe	-	-	21	2,1	34	5,6
FIXA Ti-Por Adler-Ortho	-	-	34	3,3	101	16,6
FIXA Adler-Ortho	-	-	125	12,2	5	0,8
FITMORE Zimmer	35	3,1	17	1,7	2	0,3
EP-FIT PLUS Smith & Nephew	-	-	22	2,1	16	2,6
DUOFIT PSF Samo	30	2,7	19	1,9	-	-
DELTA TT Lima	-	-	12	1,2	30	4,9
DELTA REVISION TT Lima	-	-	1	0,1	33	5,4
DELTA PF Lima	-	-	35	3,4	8	1,3
DELTA ONE TT Lima	-	-	5	0,5	64	10,5
CONTINUUM Zimmer	-	-	1	0,1	31	5,1
CONICAL SCREW CUP Protek	25	2,2	-	-	-	-
CLS Zimmer	34	3,0	7	0,7	2	0,3
BOFOR ENDOPLUS	3	0,3	12	1,2	7	1,1
BICON PLUS Smith & Nephew	5	0,4	17	1,7	3	0,5
AnCA FIT Wright Cremascoli	282	25,2	18	1,8	-	-
ABGII Stryker Howmedica	12	1,1	8	0,8	1	0,2
Other (< 20 cases)	228	20,4	212	20,7	120	19,7
Total	**1.120**	**100,0**	**1.024**	**100,0**	**610**	**100,0**

5.3 Stems used in primary surgery

In 161 cases model or stem fixation was not communicated to RIPO.

Cemented stem	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
APTA Adler-Ortho	-	-	973	25,2	139	15,9
C-STEM AMT DePuy	-	-	19	0,5	132	15,1
BASIS Smith & Nephew	336	4,7	449	11,6	125	14,3
EXETER Stryker Howmedica	641	9,0	565	14,7	79	9,0
AB Citieffe	23	0,3	78	2,0	63	7,2
LC Samo	315	4,4	51	1,3	45	5,1
CCA Mathys	37	0,5	142	3,7	41	4,7
SL Lima	39	0,5	33	0,9	25	2,9
VERSYS ADVOCATE Zimmer	33	0,5	189	4,9	22	2,5
TAPERLOC CEM Biomet	1	0,0	44	1,1	20	2,3
LUBINUS SP2 Link	225	3,2	66	1,7	10	1,1
AD Samo	313	4,4	66	1,7	9	1,0
MERCURIUS Adler-Ortho	-	-	102	2,6	8	0,9
P507 Samo	455	6,4	196	5,1	6	0,7
VERSYS HERITAGE Zimmer	31	0,4	16	0,4	5	0,6
SPECTRON Smith & Nephew	551	7,7	170	4,4	3	0,3
DUOFIT CKA Samo	15	0,2	35	0,9	3	0,3
MS 30 Zimmer	174	2,4	9	0,2	2	0,2
SL STREAKES Hitmedica	40	0,6	8	0,2	2	0,2
ARCAD SO Symbios	-	-	64	1,7	2	0,2
ABGII Stryker Howmedica	54	0,8	1	0,0	-	-
JVC Wright Cremascoli	669	9,4	58	1,5	-	-
MRL Wright Cremascoli	468	6,6	1	0,0	-	-
VERSYS CEMENTED Zimmer	333	4,7	2	0,1	-	-
ANCA-FIT CLU Wright Cremascoli	303	4,2	11	0,3	-	-
AHS Wright Cremascoli	302	4,2	4	0,1	-	-
DEFINITION Stryker Howmedica	272	3,8	75	1,9	-	-
ABG Stryker Howmedica	230	3,2	-	-	-	-
C STEM DePuy	230	3,2	84	2,2	-	-
ULTIMA Johnson & Johnson	197	2,8	-	-	-	-
VERSYS CEMENTED LD Zimmer	123	1,7	10	0,3	-	-
ANCA Wright Cremascoli	89	1,2	-	-	-	-
FULLFIX Mathys	67	0,9	-	-	-	-
DUOFIT CFS Samo	60	0,8	13	0,3	-	-
PERFECTA RA Wright	51	0,7	9	0,2	-	-
MBA Groupe Lepine	46	0,6	41	1,1	-	-
MULLER AUTOBLOCCANTE Sulzer	43	0,6	11	0,3	-	-
Other (< 50 cases)	364	5,1	260	6,7	134	15,3
Total	**7.130**	**100,0**	**3.855**	**100,0**	**875**	**100,0**

Uncemented stem	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
APTA Adler-Ortho	10	0,1	4.078	15,3	2.829	15,2
RECTA Adler-Ortho	6	0,0	2.731	10,2	1.560	8,4
HYDRA Adler-Ortho	-	-	317	1,2	1.239	6,7
TAPERLOC Biomet	158	0,9	1.243	4,6	926	5,0
SL PLUS Smith & Nephew	535	3,2	2.676	10,0	825	4,4
CONUS Zimmer	2.177	13,0	1.706	6,4	757	4,1
SL PLUS MIA STEM Smith & Nephew	-	-	5	0,0	735	4,0
CBC Mathys	104	0,6	1.226	4,6	672	3,6
CORAIL DePuy	219	1,3	447	1,7	592	3,2
ABGII Stryker Howmedica	1.230	7,3	1.584	5,9	525	2,8
CLS Zimmer	2.558	15,2	1.110	4,2	464	2,5
PROXYPLUS Endoplant Gmbh	-	-	823	3,1	444	2,4
FITMORE Zimmer	-	-	95	0,4	436	2,3
ADR Smith & Nephew	-	-	200	0,7	420	2,3
NANOS Endoplant gmbh	-	-	170	0,6	320	1,7
PARVA Adler-Ortho	-	-	4	0,0	301	1,6
MODULUS HIP SYSTEM Lima	44	0,3	371	1,4	291	1,6
ALATA ACUTA S Adler-Ortho	-	-	453	1,7	286	1,5
MINIMAX Medacta	-	-	96	0,4	270	1,5
TAPERLOC MICROPLASTY Biomet	-	-	128	0,5	248	1,3
POLARSTEM Endoplus	-	-	11	0,0	198	1,1
SAM-FIT Lima	-	-	36	0,1	191	1,0
SPS MODULAR Symbios	-	-	111	0,4	188	1,0
GTS Biomet	-	-	-	-	181	1,0
CFP Link	237	1,4	624	2,3	171	0,9
MULTIFIT Samo	-	-	142	0,5	167	0,9
VERSYS FIBER METAL TAPER Zimmer	594	3,5	463	1,7	159	0,9
PLS Lima	-	-	32	0,1	159	0,9
PBF Permedica	71	0,4	166	0,6	154	0,8
S-TAPER Bioimpianti	-	-	10	0,0	146	0,8
SYNERGY Smith & Nephew	220	1,3	245	0,9	135	0,7
TWINSYS MATHYS	-	-	13	0,0	129	0,7
DUOFIT RTT Samo	23	0,1	92	0,3	127	0,7
TRI-LOCK DEPUY	-	-	-	-	122	0,7
C2 Lima	298	1,8	540	2,0	117	0,6
CLS BREVIUS Zimmer	-	-	-	-	114	0,6
QUADRA-H Medacta	-	-	138	0,5	110	0,6
AMISTEM Medacta	-	-	-	-	109	0,6
SUMMIT DePuy	1	0,0	192	0,7	105	0,6
H-MAX M Lima	-	-	-	-	102	0,5
ACCOLADE Stryker Osteonics	92	0,5	236	0,9	100	0,5
QUADRA-S Medacta	3	0,0	171	0,6	95	0,5
Z1 Citieffe	-	-	230	0,9	89	0,5
HARMONY Symbios	-	-	64	0,2	66	0,4
PROFEMUR Z Wright Cremascoli	574	3,4	68	0,3	65	0,4
CONELOCK SHORT Biomet	-	-	248	0,9	49	0,3
ALLOCLASSIC SL ALLOPRO Sulzer	169	1,0	129	0,5	48	0,3
SL REVISION Zimmer	67	0,4	71	0,3	47	0,3
PORO-LOCK II HIT Medica	48	0,3	108	0,4	39	0,2
ARCAD HA Symbios	5	0,0	203	0,8	32	0,2
HIPSTAR + Stryker Howmedica	-	-	192	0,7	29	0,2
PPF Biomet	168	1,0	75	0,3	28	0,2
MAYO Zimmer	36	0,2	82	0,3	25	0,1
HIPSTAR Stryker Howmedica	124	0,7	193	0,7	21	0,1
DUOFIT RKT Samo	201	1,2	103	0,4	9	0,0
S. ROM Johnson e Johnson	79	0,5	86	0,3	9	0,0
ANCA FIT Wright Cremascoli	3.819	22,8	678	2,5	6	0,0
MBA HAP Groupe Lepine	37	0,2	83	0,3	6	0,0

SPS Symbios	156	0,9	65	0,2	4	0,0
ABG Stryker Howmedica	330	2,0	-	-	-	-
PROXILOCK FT Stratec	287	1,7	17	0,1	-	-
BHS Smith & Nephew	272	1,6	160	0,6	-	-
EHS Wright Cremascoli	252	1,5	60	0,2	-	-
STEM Wright Cremascoli	208	1,2	1	0,0	-	-
G3 Citieffe	179	1,1	-	-	-	-
EASY Hitmedica	150	0,9	77	0,3	-	-
CITATION Stryker Howmedica	112	0,7	-	-	-	-
FIT STEM Lima	69	0,4	227	0,8	-	-
Other (< 100 cases)	858	5,1	833	3,1	779	4,2
Total	**16.780**	**100,0**	**26.738**	**100,0**	**18.570**	**100,0**

5.4 Stems used in total revision surgery

In 55 cases model or stem fixation was not communicated to RIPO.

Cemented stem	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
EXETER Stryker Howmedica	39	16,3	35	21,3	5	8,5
APTA Adler-Ortho	-	-	30	18,3	4	6,8
VERSYS REVISION CALCAR Zimmer	8	3,3	10	6,1	2	3,4
JVC Wright Cremascoli	24	10,0	9	5,5	-	-
AD Samo	26	10,8	3	1,8	-	-
ANCA Wright Cremascoli	25	10,4	-	-	-	-
ANCA-FIT CLU Wright Cremascoli	10	4,2	-	-	-	-
Other (< 10 cases)	108	45,0	77	47,0	48	81,4
Total	**240**	**100,0**	**164**	**100,0**	**59**	**100,0**

Uncemented stem	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
SL REVISION Sulzer Centerpulse Zimmer	281	22,8	154	14,6	114	18,3
REVISION HIP Lima	6	0,5	41	3,9	103	16,5
ALATA AEQUA REVISION Adler-Ortho	-	-	86	8,1	96	15,4
RESTORATION Stryker Howmedica	11	0,9	192	18,1	52	8,3
CONELOCK REVISION Stratec	21	1,7	64	6,0	40	6,4
ALATA ACUTA S Adler-Ortho	-	-	25	2,4	36	5,8
MGS Samo	43	3,5	56	5,3	17	2,7
MODULUS HIP SYSTEM Lima	-	-	17	1,6	16	2,6
APTA Adler-Ortho	-	-	16	1,5	11	1,8
SL PLUS Smith & Nephew	9	0,7	20	1,9	9	1,4
SLR PLUS Smith & Nephew	8	0,6	12	1,1	9	1,4
MP RECONSTRUCTION PROSTHESIS Link	33	2,7	17	1,6	8	1,3
CLS Zimmer	26	2,1	8	0,8	7	1,1
CONUS Zimmer	54	4,4	28	2,6	5	0,8
ZMR REVISION TAPER CONE Zimmer	12	1,0	30	2,8	5	0,8
S. ROM Johnson&Johnson	91	7,4	52	4,9	3	0,5
VERSYS FIBER METAL TAPER Zimmer	9	0,7	10	0,9	3	0,5
PROFEMUR R VERS. 4 Wright Cremascoli	350	28,4	58	5,5	2	0,3
C2 Lima	33	2,7	29	2,7	2	0,3
EMPERION Smith & Nephew	-	0,0	21	2,0	2	0,3
RESTORATION T3 Stryker Howmedica	74	6,0	-	-	-	-
ANCA FIT Wright Cremascoli	55	4,5	4	0,4	-	-
ZMR REVISION TAPER Zimmer	30	2,4	-	-	-	-
CBK REVISION STEM Mathys	18	1,5	2	0,2	-	-
Other (< 20 cases)	70	5,7	116	11,0	83	13,3
Total	**1.234**	**100,0**	**1.058**	**100,0**	**623**	**100,0**

5.5 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	
	Cups	Stems
2000	87	93
2001	92	98
2002	90	94
2003	94	110
2004	84	99
2005	90	110
2006	87	98
2007	100	113
2008	105	114
2009	95	115
2010	91	109
2011	100	107
2012	90	109

In 2012 were implanted 12 different types of cup and 20 stems not used in 2011.

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

Year of operation	Total revision	
	Cups	Stems
2000	58	48
2001	64	55
2002	59	48
2003	62	60
2004	46	40
2005	45	44
2006	55	55
2007	60	50
2008	50	49
2009	54	42
2010	49	46
2011	49	49
2012	41	41

When only the brand has changed as a result of acquisitions of companies, such as Sulzer – Centerpulse - Zimmer or Johnson & Johnson – DePuy, models were not considered different.

5.6 Resurfacing surgery

In the following table percentage of primary conventional and resurfacing are presented.

Year of surgery	Primary	
	Conventional	Resurfacing
2000	99,9	0,1
2001	99,8	0,2
2002	99,3	0,7
2003	98,5	1,5
2004	97,9	2,1
2005	96,9	3,1
2006	96,4	3,6
2007	96,9	3,1
2008	97,5	2,5
2009	97,6	2,4
2010	98,2	1,8
2011	97,9	2,1
2012	95,7	4,3

Types of resurfacing implanted between **1st January 2000** and **31st December 2012**

Type	N.	%
BHR – Smith & Nephew	912	53,3
ADEPT – Finsbury	308	18,0
BMHR* – Smith & Nephew	135	7,9
MITCH TRH – Finsbury	87	5,1
ASR – DePuy	74	4,3
RECAP – Biomet	65	3,8
MRS* – Lima	44	2,6
ROMAX – Medacta	33	1,9
ICON – International Orthopaedics	21	1,2
CONSERVE PLUS – Wright	19	1,1
DURON Hip Resurfacing – Zimmer	8	0,5
WAGNER METASUL - Protek	3	0,2
CORMET – Corin	1	0,1
TRIBOFIT – Active Implants	1	0,1
Total	**1.711**	**100,0**

* considered similar to resurfacing

In 2012 were implanted 135 Adept Matortho, 91 BHR - Smith And Nephew, 67 BMHR SMITH AND NEPHEW and 1 Recap Biomet.

5.7 Modular neck

33.8% of stems implanted in primary surgery have modular neck.

Year of surgery	Primary surgery	
	Standard neck	Modular neck
2000	78,1	21,9
2001	74,6	25,4
2002	70,9	29,1
2003	72,5	27,5
2004	69,4	30,6
2005	67,1	32,9
2006	63,9	36,1
2007	65,4	34,6
2008	64,3	35,7
2009	64,0	36,0
2010	60,5	39,5
2011	58,2	41,8
2012	60,8	39,2

Types of stems with proximal modularity	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
APTA Adler-Ortho	10	0,2	5.063	46,9	2.968	38,0
RECTA Adler-Ortho	6	0,1	2.773	25,7	1.561	20,0
HYDRA Adler-Ortho	-	-	324	3,0	1.271	16,3
PARVA Adler-Ortho	-	-	4	0,0	302	3,9
MODULUS HIP SYSTEM Lima	44	0,7	371	3,4	291	3,7
ALATA ACUTA S Adler-Ortho	-	-	454	4,2	286	3,7
SAM-FIT Lima	-	-	36	0,3	191	2,4
SPS MODULAR Symbios	-	-	111	1,0	188	2,4
MULTIFIT Samo	-	-	142	1,3	167	2,1
CLS BREVIUS Zimmer	-	-	-	-	114	1,5
H-MAX M Lima	-	-	-	-	102	1,3
VITAE Adler-Ortho	-	-	-	-	96	1,2
PROFEMUR Z Wright Cremascoli	574	8,8	68	0,6	65	0,8
HARMONY Symbios	-	-	64	0,6	60	0,8
SMF SMITH AND NEPHEW	-	-	-	-	47	0,6
ABGII MODULAR Howmedica	-	-	48	0,4	14	0,2
S. ROM Johnson e Johnson	79	1,2	86	0,8	9	0,1
MERCURIUS Adler-Ortho	-	-	102	0,9	8	0,1
ANCA FIT Wright Cremascoli	3820	58,9	678	6,3	6	0,1
MBA HAP Groupe Lepine	37	0,6	83	0,8	6	0,1
PROFEMUR L Wright Cremascoli	-	-	95	0,9	1	0,0
JVC Wright Cremascoli	669	10,3	58	0,5	-	-
ANCA-FIT Dual fit Wright Cremascoli	303	4,7	11	0,1	-	-
EHS Wright Cremascoli	252	3,9	60	0,6	-	-
STEM Wright Cremascoli	208	3,2	1	0,0	-	-
G3 Citieffe	179	2,8	-	-	-	-
PROFEMUR C Wright Cremascoli	87	1,3	-	-	-	-
STELO MODULARE NDS1 Citieffe	60	0,9	16	0,1	-	-
MBA Groupe Lepine	46	0,7	41	0,4	-	-
ALBI PTC Wright Cremascoli	31	0,5	4	0,0	-	-
Other (< 30 cases)	82	1,3	94	0,9	67	0,9
Total	**6.487**	**100,0**	**10.787**	**100,0**	**7.820**	**100,0**

5.8 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 2012, according to the **type of operation** and **articular coupling**.

Articular coupling	Primary		Total revision	
	N.	%	N.	%
Cer-cer	29.922	40,5	840	24,6
Met-poly	13.716	18,6	786	23,0
Cer-poly	11.521	15,6	791	23,2
Met-met	6.235	8,4	95	2,8
Met-X linked poly	5.584	7,6	484	14,2
Cer-X linked poly	5.235	7,1	334	9,8
Met-poly undefined*	826	1,1	52	1,5
Cer-poly undefined*	421	0,6	34	1,0
Biolox delta-met	222	0,3	-	-
Cerid-poly	180	0,2	-	-
Total^	**73.862**	**100,0**	**3416**	**100,0**

* missing label did not allow classification of poly
^299 missing data in primary surgery and 17 in total revision

Percentage of total hip arthroplasty interventions between 2001 and 2012, according to the **type of polyethylene** used.

Year of surgery	Primary surgery		
	Standard poly	Crosslinked poly	Not defined poly
2001	80,0	16,1	3,8
2002	83,6	14,6	1,8
2003	82,4	16,5	1,1
2004	79,1	20,4	0,5
2005	76,4	22,6	1,0
2006	75,5	24,3	0,2
2007	71,7	28,1	0,2
2008	64,8	35,0	0,2
2009	55,1	44,9	0,0
2010	46,7	53,3	0,0
2011	42,0	58,0	0,0
2012	34,2	65,8	0,0

Percentage of total hip arthroplasty according **to articular coupling** during the years 2001 - 2012.

Year of surgery	Primary surgery					
	met-pol	met-xlk	cer-pol	cer-xlk	cer-cer	met-met
2001	31,2	10,0	29,1	1,6	20,5	7,6
2002	30,8	8,9	29,3	1,5	22,3	7,3
2003	29,9	9,9	27,1	1,3	23,7	8,1
2004	25,5	10,0	25,1	2,9	27,9	8,6
2005	24,7	9,5	19,7	3,2	33,6	9,3
2006	22,3	7,9	14,3	3,4	39,8	12,4
2007	21,9	7,4	11,5	4,9	42,5	11,8
2008	16,4	6,3	9,8	7,4	47,4	12,8
2009	12,1	7,1	9,7	10,3	49,8	10,9
2010	8,8	5,5	7,6	13,4	56,6	8,3
2011	7,4	6,0	8,0	14,9	59,5	4,1
2012	4,6	5,7	8,1	18,4	61,5	1,7

Percentage of total revision surgeryarthroplasty according **to articular coupling** during the years 2001 - 2012.

Year of surgery	Total revision surgery					
	met-pol	met-xlk	cer-pol	cer-xlk	cer-cer	met-met
2001	36,4	12,3	35,5	3,5	10,3	2,1
2002	31,8	9,7	40,5	4,3	11,7	2,0
2003	29,2	11,8	40,0	4,9	13,1	1,0
2004	29,6	14,2	28,9	2,0	19,4	5,9
2005	26,1	16,5	21,3	6,1	23,0	7,0
2006	25,1	19,9	18,5	4,4	26,2	5,9
2007	19,3	22,5	13,5	8,4	33,5	2,9
2008	18,4	17,9	13,5	13,5	33,2	3,6
2009	14,5	17,2	14,0	14,9	35,3	4,1
2010	12,7	10,2	18,6	18,2	38,1	2,1
2011	12,2	14,0	10,0	27,6	36,2	-
2012	8,5	11,7	10,3	29,6	39,9	-

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

Age class	Elective THA			
	met-pol	cer-pol	cer-cer	met-met
<40	5,4	12,3	65,5	16,8
40-49	8,0	14,0	60,7	17,3
50-59	11,8	17,0	54,7	16,5
60-69	22,7	22,8	44,4	10,1
70-79	36,0	28,4	30,4	5,1
Over 80	55,0	24,5	17,2	3,3

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2012, 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.	%
Allumina	-	-	-	-	17.122	42,8	5.095	38,0	3.395	22,0	-	-
Cr-Co	260	84,4	20	76,9	17.273	43,2	1.684	12,6	1.270	8,2	2.589	53,3
Biolox Delta	-	-	-	-	1.752	4,4	6.385	47,6	10.415	67,5	2.095	43,2
Stainless steel	47	15,3	5	19,2	3.158	7,9	162	1,2	20	0,1	-	-
Zirconia	1	0,3	1	3,8	287	0,7	2	0,0	2	0,0	-	-
Surface-treated metal	-	-	-	-	384	1,0	84	0,6	337	2,2	76	1,6
Revision ceramic	-	-	-	-	1	0,0	5	0,0	2	0,0	94	1,9
Total*	**308**	**100,0**	**26**	**100,0**	**39.977**	**100,0**	**13.417**	**100,0**	**15.441**	**100,0**	**4.854**	**100,0**

*256 missing data (0,3%)

Year of surgery	Diameter of the head (mm) in THA					
	<=28 cer	<=28 met	32 cer	32 met	>=36 cer	>=36 met
2000	46,8	49,7	1,1	1,3	0,0	1,1
2001	51,0	46,5	0,7	0,4	0,0	1,4
2002	52,6	45,6	0,9	0,1	0,0	0,8
2003	51,2	46,4	0,9	0,1	0,3	1,2
2004	50,7	42,1	3,2	0,6	1,3	2,2
2005	34,1	38,3	16,6	1,6	5,5	3,9
2006	23,1	33,8	18,9	2,1	14,8	7,2
2007	15,7	29,1	20,5	4,0	21,7	9,1
2008	14,2	21,9	20,2	3,8	29,4	10,4
2009	11,4	17,5	21,5	3,1	36,5	9,9
2010	8,5	10,1	23,7	4,8	44,2	8,7
2011	6,3	8,2	27,1	5,2	45,6	7,6
2012	6,7	5,4	28,2	4,0	50,0	5,6

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

5.9 Prosthesis fixation

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2012, according to **type of operation** and **fixation**

Fixation	Primary THA	%	Total revision	%
Cementless	62.019	83,7	2.491	72,7
Hybrid (cemented stem and cementless cup)	7.215	9,7	267	7,8
Cemented	4.354	5,9	189	5,5
Reverse hybrid (cementless stem and cemented cup)	521	0,7	478	14,0
Total*	**74.109**	**100,0**	**3.425**	**100,0**

*170 primary THA and 8 total revision missing data

Percentage of total hip arthroplasties **according to fixation**, during the years 2000 – 2012

Year	Primary surgery			
	Cemented	Cementless	Hybrid	Reverse hybrid
2000	15,0	61,9	22,1	1,0
2001	14,2	66,4	18,6	0,8
2002	12,1	71,2	15,8	0,8
2003	11,0	73,3	15,0	0,7
2004	8,6	78,3	12,4	0,7
2005	7,0	80,5	11,6	0,8
2006	6,1	83,1	10,2	0,6
2007	4,3	87,0	8,0	0,6
2008	2,5	90,4	6,5	0,6
2009	2,0	91,5	5,7	0,8
2010	1,2	94,1	4,1	0,6
2011	0,8	95,2	3,5	0,6
2012	0,6	95,3	3,4	0,7

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

Age class	Elective primary THA 2000-2012			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0,7	98,1	0,8	0,5
40-49	0,2	98,8	0,7	0,3
50-59	0,5	97,3	1,9	0,3
60-69	1,4	90,9	7,3	0,4
70-79	6,8	77,9	14,6	0,8
≥80	20,1	61,0	17,1	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	93,1	5,2	0,9
40-49	0,4	96,1	3,1	0,4
50-59	1,5	88,7	9,5	0,3
60-69	5,8	70,4	23,3	0,6
70-79	21,5	46,5	30,5	1,4
≥80	54,1	27,3	16,9	1,7

Percentage of total hip arthroplasties **according to fixation and class age** - year 2012

Age class	Elective primary surgery year 2012			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0,0	100,0	0,0	0,0
40-49	0,3	99,4	0,3	0,0
50-59	0,0	99,6	0,3	0,1
60-69	0,2	98,9	0,5	0,4
70-79	0,4	95,8	3,4	0,4
≥80	2,3	81,2	14,0	2,5

Percentage of total revision surgery according to **fixation** and **year**

Year	Total revision			
	Cemented	Cementless	Hybrid	Reverse hybrid
2000	9,4	62,5	9,4	18,8
2001	7,9	64,3	8,2	19,6
2002	6,0	66,0	7,3	20,7
2003	7,2	69,3	6,9	16,7
2004	7,1	69,0	7,9	15,9
2005	7,5	68,0	8,3	16,2
2006	6,3	72,8	10,3	10,7
2007	4,0	73,6	9,8	12,7
2008	3,1	78,2	8,4	10,2
2009	1,8	82,4	6,8	9,0
2010	1,7	83,9	5,9	8,5
2011	5,0	79,6	7,7	7,7
2012	1,3	88,3	3,1	7,2

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

Age class	Total revision			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	1,6	92,2	1,6	4,7
40-49	4,2	88,1	3,4	4,2
50-59	1,7	86,1	3,1	9,2
60-69	3,2	76,7	6,5	13,6
70-79	4,9	70,4	8,8	16,0
≥80	14,0	58,8	11,9	15,3

5.10 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	34,7	33,8	14,6
Cemex System - Tecres	12,0	27,8	1,8
Palacos R - Biomet	7,3	1,8	1,6
Antibiotic Simplex - Howmedica	***5,2***	***2,8***	***66,7***
Amplicem 3 - Amplimedical	5,1	4,4	-
Smartset Hv - Depuy	4,6	6,3	4,1
Cmw 3 - Depuy	2,7	1,9	-
Cemex + Cemex System - Tecres	2,2	-	-
Cemex Rx - Tecres	2,2	6,3	0,1
Cemex - Tecres	2,0	3,0	0,3
Amplicem 1 + Amplicem 3 - Amplimedical	1,7	-	-
Exolent High - Elmdown	1,5	0,7	-
Cemex Rx + Cemex System - Tecres	1,4	-	-
Cemex System - Tecres + Surgical Simplex P - How	1,3	-	-
Sulcem 3 - Centerpulse	1,3	1,2	0,1
Amplicem 1 - Amplimedical + Smartset Hv - Depuy	1,2	-	-
Cemfix 1 - Teknimed	1,2	0,2	-
Versabond - Smith And Nephew	1,0	-	3,3
Palacos R - Heraeus Medical	1,0	1,2	0,2
Cemex Genta + Cemex Genta System - Tecres	***1,0***	***-***	***-***
Cemfix 3 - Teknimed	0,9	0,1	-
Aminofix 1 - Groupe Lepine	***0,7***	***-***	***-***
Cemex Genta - Tecres	***0,6***	***0,4***	***0,1***
Palacos R 40 - Sp Europe	0,6	0,1	-
Bone Cement R - Biomet	0,5	0,1	1,3
Cemex Genta System - Tecres	***0,5***	***2,0***	***1,8***
Amplicem 1 - Amplimedical	0,4	0,3	0,2
Smartset Mv - Depuy	0,4	0,5	0,1
Vacu Mix Plus Cmw 3 - Depuy	0,4	0,9	-
Amplicem 3G - Amplimedical	***0,3***	***-***	***-***
Refobacin Bone Cement R - Biomet	***0,3***	***-***	***-***
Palacos R+G - Heraeus Medical	***0,2***	***0,1***	***0,1***
Cemsys 1 - Mathys	0,2	-	-
Cmw 1 - Depuy	0,2	0,4	-
Cemex Xl - Tecres	0,2	0,7	-
Osteobond - Zimmer	0,2	-	1,5
Cemfix 1 + Cemfix 3 - Teknimed	0,2	-	-
Other with antibiotic	***1,3***	***0,7***	***0,4***
Other without antibiotic	1,5	2,6	1,7
Total	**100,0**	**100,0**	**100,0**

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

Percentage of operations performed on patients admitted between 1st January 2000 and 31st December 2012 **according to type of operation and surgical approach**

Surgical approach	% in THA	% in hemiarthro plasties	% in resurfacing
Lateral	59,6	53,8	11,3
Postero-lateral	29,0	43,3	84,8
Other	10,6	2,9	3,9

In 12,9% of cup revision were used **reinforcing rings**

Acetabular Bone grafts were used In 30,3% of revision ; femoral bone grafts were used, in 5,6% **of revisions**

6. Types of hemiarthroplasty

6.1 Heads and stem

Monoblock	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
THOMPSON - Corin	39	52,7	37	97,4	-	-
AUSTIN MOORE - Amplimedical	16	21,6	-	-	-	-
THOMPSON - Amplimedical	14	18,9	-	-	-	-
THOMPSON -Stryker Howmedica	4	5,4	-	-	-	-
THOMPSON - Bioimpianti	1	1,4	-	-	-	-
THOMPSON - Surgival	-	-	1	2,6	-	-
Total	**74**	**100,0**	**38**	**100,0**	**-**	**-**

Monoarticular head	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
TESTA ELLITTICA - Samo	212	99,5	210	99,0	-	-
Other	1	0,5	2	1,0	-	-
Total	**213**	**100,0**	**212**	**100,0**	**-**	**-**

Biarticular head	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
C1 - Citieffe	867	8,9	1.772	15,5	2.113	28,5
BI-POLAR - DePuy	2	0,0	209	1,8	1.148	15,5
SPHERI-LOCK - Hit Medica	2.042	21,0	2.213	19,4	955	12,9
JANUS - Bioimpianti	291	3,0	557	4,9	880	11,9
UHR Osteonics Stryker Howmedica	444	4,6	1.633	14,3	797	10,8
CUPOLA NEMAUSUS - Transysteme	-	-	238	2,1	565	7,6
TESTA BIARTICOLARE LOCK - Lima	243	2,5	1.100	9,6	526	7,1
CUPOLA BIPOLARE - Mathys	404	4,2	233	2,0	65	0,9
TESTA BIPOLARE - Samo	100	1,0	2	0,0	55	0,7
BI-POLAR - Biomet	143	1,5	231	2,0	46	0,6
CUPOLA BIPOLARE - Zimmer	94	1,0	326	2,9	30	0,4
CUPOLA MOBILE - Zimmer	360	3,7	500	4,4	21	0,3
CORON - Tantum	1	0,0	174	1,5	15	0,2
CUPOLA MOBILE - Medacta	-	-	185	1,6	6	0,1
CUPOLA MOBILE BIARTICOLARE – Permedica	461	4,7	259	2,3	3	0,0
BICENTRIC - Stryker Howmedica	233	2,4	3	0,0	-	-
CENTRAX - Stryker Howmedica	525	5,4	12	0,1	-	-
MODULAR BIPOLAR - Zimmer	63	0,6	201	1,8	-	-
CUPOLA MOBILE MODULARE - Cremascoli	886	9,1	286	2,5	-	-
CUPOLA SEM - D.M.O.	431	4,4	299	2,6	-	-
MODULAR BIPOLAR - Protek	342	3,5	5	0,0	-	-
RETENTIVE MOBILE CUP - Cedior	292	3,0	-	-	-	-
SPHERIC - Amplitude	-	-	351	3,1	-	-
TESTA BIARTICOLARE - Lima	608	6,3	4	0,0	-	-
TESTA BIPOLARE -Amplimedical	193	2,0	-	-	-	-
ULTIMA MONK - Johnson+Johnson	528	5,4	476	4,2	-	-
Other (less than 100 cases)	171	1,8	167	1,5	178	2,4
Total*	**9.724**	**100,0**	**11.436**	**100,0**	**7.403**	**100,0**

***174** missing data (0,6%)

CEMENTED STEM	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
AB - Citieffe	623	6,9	1.662	17,8	1.977	37,0
G2 - Citieffe	53	0,6	693	7,4	748	14,0
APTA - Adler-Ortho	-	-	538	5,7	478	8,9
SL - Lima	439	4,9	288	3,1	354	6,6
SL STREAKES - Hit Medica	276	3,1	890	9,5	336	6,3
SPERI-SYSTEM II - Hit Medica	888	9,8	1.103	11,8	282	5,3
EXETER - Stryker Howmedica	204	2,3	347	3,7	278	5,2
S-TAPER - Bioimpianti	-	-	3	0,0	264	4,9
SL -Hit Medica	731	8,1	8	0,1	125	2,3
C-STEM AMT - Depuy	-	-	10	0,1	102	1,9
DUOFIT CKA - Samo	116	1,3	36	0,4	51	1,0
STANDARD STRAIGHT - Zimmer	525	5,8	232	2,5	22	0,4
CCA - Mathys	400	4,4	214	2,3	19	0,4
LOGICA MIRROR - Lima	131	1,5	376	4,0	19	0,4
VERSYS LD/FX - Zimmer	237	2,6	300	3,2	9	0,2
VERSYS HERITAGE - Zimmer	83	0,9	68	0,7	2	0,0
QUADRA-C - Medacta	-	-	173	1,8	2	0,0

SL - Permedica	426	4,7	252	2,7	1	0,0
ORTHO-FIT - Allopro	387	4,3	442	4,7	-	-
SEM II - DMO	361	4,0	276	2,9	-	-
ULTIMA LX - Johnson&Johnson	315	3,5	-	-	-	-
RELIANCE - Stryker Howmedica	305	3,4	318	3,4	-	-
JVC - Cremascoli	272	3,0	209	2,2	-	-
MRL - Cremascoli	270	3,0	-	-	-	-
AHS - Cremascoli	256	2,8	9	0,1	-	-
FIN - Bioimpianti	229	2,5	295	3,2	-	-
HIP FRACTURE - Stryker Howmedica	162	1,8	-	-	-	-
SL - Amplimedical	158	1,8	-	-	-	-
ULTIMA STRAIGHT- J&J	156	1,7	-	-	-	-
LOGICA - Lima	141	1,6	106	1,1	-	-
ALBI PTC - Cremascoli	134	1,5	15	0,2	-	-
DEFINITION - Stryker Howmedica	68	0,8	168	1,8	-	-
Other (less than 100 cases)	675	7,5	330	3,5	274	5,1
Total*	**9.021**	**100,0**	**9.361**	**100,0**	**5.343**	**100,0**

***166** missing data

UNCEMENTED STEM	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
S-TAPER - Bioimpianti	-	-	217	10,4	534	25,9
ACCOLADE – Osteonics Stryker Howmedica	282	40,3	833	40,0	501	24,3
LOGICA CS - Lima	-	-	52	2,5	145	7,0
SL - Lima	3	0,4	206	9,9	93	4,5
G2 – De Puy	-	-	1	0,0	88	4,3
RECTA - Adler-Ortho	-	-	48	2,3	79	3,8
APTA - Adler-Ortho	-	-	47	2,3	73	3,5
Z1 - Citieffe	-	-	2	0,1	70	3,4
KORUS - Bioimpianti	-	-	-	-	59	2,9
HYDRA - Adler-Ortho	-	-	4	0,2	46	2,2
TWINSYS - Mathys	-	-	9	0,4	46	2,2
Taperloc - Biomet	1	0,1	5	0,2	43	2,1
SPS MODULAR - Symbios	-	-	-	-	37	1,8
POLARSTEM ENDOPLUS	-	-	-	-	30	1,5
SUMMIT – De Puy	-	-	4	0,2	28	1,4
PORO-LOCK II - Hit Medica	-	-	52	2,5	22	1,1
ENDON - Tantum	1	0,1	172	8,3	15	0,7
CONUS - Centerpulse	5	0,7	12	0,6	13	0,6
C2 – Lima	3	0,4	11	0,5	13	0,6
COXAFIT HIP STEM - Fgl Arge	-	0,0	11	0,5	13	0,6
VERSYS FIBER METAL TAPER - Zimmer	3	0,4	35	1,7	7	0,3
PROFEMUR Z - Cremascoli	2	0,3	13	0,6	7	0,3
SL PLUS - Endoplus	1	0,1	15	0,7	7	0,3
SL REVISION - Sulzer	7	1,0	17	0,8	4	0,2
MRP BIOIMPIANTI	-	0,0	25	1,2	2	0,1
H-AC STEM FURLONG JRI	67	9,6	7	0,3	-	-
EURO HIP SYSTEM - Cremascoli	17	2,4	23	1,1	-	-
HIP FRACTURE - Stryker Howmedica	133	19,0	-	-	-	-
PPF - Biomet	112	16,0	154	7,4	-	-
Other (less than 20 cases)	63	9,0	108	5,2	88	4,3
Total	**700**	**100,0**	**2.083**	**100,0**	**2.063**	**100,0**

6.2 Other characteristics of hemiarthroplasties

Number of surgeries according to **head type**

Head type	N.	%
Bipolar head to be assembled in the operating theatre	27.635	94,4
Preassembled bipolar head	1.102	3,8
Monoarticular head	425	1,5
Monoblock prosthesis	112	0,4
Total	**29.274**	**100,0**

In 83,4% of hemi, stem was cemented and in 7,8% the stem had a modular neck.

7. Blood transfusion

Percentage of operations performed on patients admitted between 1st January 2003 and 31st December 2012 **according to type of operation and transfusion**

Type of surgery	None	Autologous (recovery)	Autologous (predeposit)	Homologous	Autologous and homologous
Emergency primary	23,9	10,9	-	58,1	7,1
Elective primary	14,1	22,1	36,4	16,8	10,6
Revision	10,3	14,2	16,5	43,8	15,2

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**	**Homologous**	**Autologous and homologous**
AOSP	29,0	3,3	67,3	0,4
Private	9,0	37,1	25,0	28,9
AUSL	36,2	5,0	55,3	3,5
IOR	2,5	0,7	96,8	0,0

Elective THA				
Type of hospital	**None**	**Autologous**	**Homologous**	**Autologous and homologous**
AOSP	20,8	56,8	19,2	3,2
Private	6,2	71,9	5,1	16,8
AUSL	22,1	48,0	19,2	10,7
IOR	6,3	59,4	28,4	5,9

8. Complications occurred during hospitalization

The rate of complications in **primary surgery** carried out on patients hospitalised between January 1st 2000 and December 31st 2012

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	309	*0,4*	Hematoma	843	*1,1*	Anemia	4.405	*5,9*
Diaphyseal fracture	237	*0,3*	Prosthesis disloc.	303	*0,4*	Hyperpyrexia	563	*0,8*
Greater troch. fracture	158	*0,2*	SPE paralysis	154	*0,2*	Genito-urinary	320	*0,4*
			Deep vein thromb	86	*0,1*	Gastro-intestinal	320	*0,4*
Anaesthesiolog. complications	120	*0,2*	Bleeding	83	*0,1*	Cardiovasc.	191	*0,3*
			Bed sores	77	*0,1*	Embolism	132	*0,2*
Acetabulum fracture	114	*0,2*	Crural paralysis	72	*0,1*	Respiratory	117	*0,2*
Hemorragia	34	*0,05*	Infection	72	*0,1*	Collapse	108	*0,1*
			Secretion	57	*0,1*	Infarction	96	*0,1*
Instability	21	*0,03*				Disorientation	93	*0,1*
						Dyspnoea	56	*0,1*
Other	71	*0,1*	Other	290	*0,4*	Other	447	*0,6*
Total	**1.064**	***1,4***	**Total**	**2.037**	**2,7**	**Total**	**6.848**	**9,2**

The rate of complications in **revision surgery** carried out on patients hospitalised between January 1st 2000 and December 31st 2012

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Diaphyseal fracture	180	*1,5*	Hematoma	172	*1,4*	Anemizzazione	885	*7,4*
Calcar fracture	64	*0,5*	Prosthesis disloc.	108	*0,9*	Hyperpyrexia	73	*0,6*
			SPE paralysis	61	*0,5*	Cardiovasc.	56	*0,5*
Anaesthesiolog. complications	47	*0,4*	Bleeding	45	*0,4*	Gastro-intestinal	49	*0,4*
			Infection	38	*0,3*	Genito-urinary	44	*0,4*
Greater troch. fracture	41	*0,3*	Bed sores	23	*0,2*	Collapse	41	*0,3*
			Deep vein thromb	19	*0,2*	Infarction	26	*0,2*
Acetabulum fracture	20	*0,2*	Crural paralysis	8	*0,1*	Embolism	25	*0,2*
Hemorragia	17	*0,1*				Respiratory	22	*0,2*
Other	18	*0,2*	Other	55	*0,5*	Other	119	*1,0*
Total	**387**	***3,3***	**Total**	**529**	***4,4***	**Total**	**1.340**	***11,3***

The rate of complications in **hemiarthroplasty** carried out on patients hospitalised between January 1st 2000 and December 31st 2012

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	120	*0,4*	Hematoma	254	*0,9*	Anemizzazione	2.997	*10,2*
			Prosthesis disloc.	138	*0,5*	Hyperpyrexia	251	*0,9*
Anaesthesiolog. complications	113	*0,4*	Bed sores	113	*0,4*	Genito-urinary	273	*0,9*
			SPE paralysis	*76*	*0,3*	Collapse	232	*0,8*
Greater troch. fracture	*79*	*0,3*	Deep vein thromb	69	*0,2*	Respiratory	210	*0,7*
						Gastro-intestinal	180	*0,6*
Diaphyseal fracture	50	*0,2*	Infection	47	*0,2*	Cardiovasc.	176	*0,6*
Anemia	24	*0,1*	Bleeding	12	*0,04*	Embolism	151	*0,5*
Hemorragia	16	*0,1*				Infarction	102	*0,3*
Acetabulum fracture	4	*0,01*	Crural paralysis	3	*0,01*	Disorientation	70	*0,2*
						Dyspnoea	43	*0,1*
Other	31	*0,1*	Other	52	*0,2*	Other	244	*0,8*
Total	**437**	***1,5***	**Total**	**764**	***2,6***	**Total**	**4.929**	***16,8***

8.1 Deaths during hospitalization

Number of deaths in prosthetic surgery on patients hospitalized between January 1st 2000 and December 31st 2012.

The deaths recorded are those that occurred during hospitalization.

Years 2000-2012			
Type of surgery	**Deaths**	**n. of operations**	**Percentage**
Primary THA	188	74.161	0,3
Hemiarthroplasty	1.343	29.274	4,6
Revision	79	11.904	0,7
Resurfacing prostheses	0	1.711	-
Prosthesis removal	20	834	2,4
Hemiarthroplasty with buffer	0	118	-

9. Duration of pre-operative hospitalization

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

Year 2000			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	4.369	2,4	0-49
Hemiarthropl.	1.754	3,5	0-44
Revision	743	3,9	0-52
Prosthesis removal	40	5,0	1-20
Year 2012			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	6.518	1,5	0-44
Hemiarthropl.	2.433	3,1	0-54
Revision	1.002	3,5	0-45
Resurfacing	294	1,4	0-8
Prosthesis removal	67	5,1	0-64

10. Analysis of survival of primary surgery

10.1 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 2012 were analyzed.
As in past year, 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: 55.186

Non revised: 53.110
2.076

Chi-square: 102,1 *p*= 0,0001

VARIABLE	SIGNIFICANCE (P)
Gender	**S** (0,001)
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, a relative risk rate over 1 indicated an increased risk of prosthesis revision.

To analyze the influence of the disease, the patients were divided into 7 groups:
- arthritis
- rheumatic arthritis (rheumatoid arthritis, psoriasis, rhizomelic spondylitis)
- femoral fractures
- femoral neck fracture sequelae (necrosis and post-traumatic arthrosis)
- idiopathic necrosis of the femoral head
- sequelae of congenital and infantile diseases (LCA, DCA, Perthes, epiphysiolysis)
- "other" that include sequelae of septic coxitis, coxitis from TBC, ankylosis, and metastasis

Patients of the grup 'Other pathologies' had a 1,9-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

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.

10.2 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 10% of missing reports, over 13 yrs, 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 2012 **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.

Maximum follow-up is 13 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	55.186	1.443	633
Hemiarthroplasty*	28.278	414	122
Total revision	2.092	142	65

* hemiartroplasties with acetabular buffer are not considered, 17 failures were observed in 110 implants

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

Maximum follow-up is 9 years.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital
Resurfacing	635	40	5

As for other registies, 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
Primary THA	1.588	488	2.076/55.186
Hemiarthroplasty	520	16	536/28.278
Resurfacing	45	-	45/635
Total revision	169	38	207/2.092

10.3 Survival curves according to Kaplan Meier

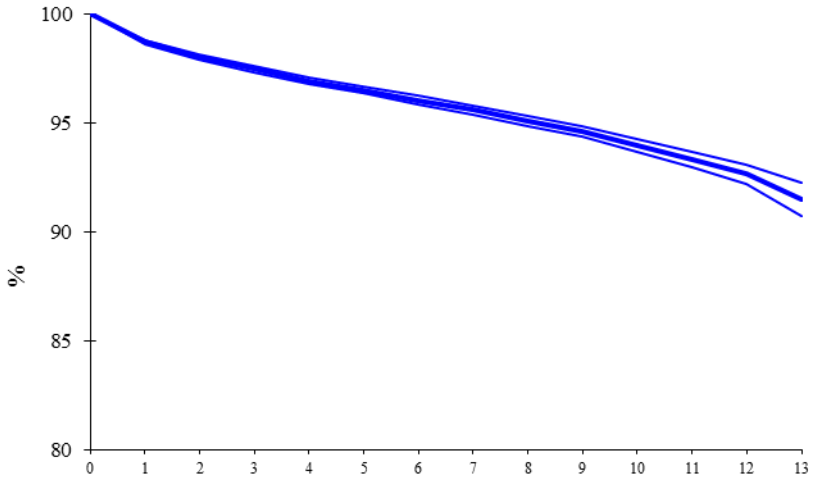
The survival curve calculated by the Kaplan Meier method enables an estimation of the probability that each individual has of maintaining its initial condition (prosthesis in place) over time.
The following paragraphs show the survival curves calculated separately for primary prosthesis, endoprosthesis,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

10.4 Analysis of survival in primary total hip arthroplasty

55.186 primary arthroprostheses are under observation. Of these, 2.076 revisions were carried out.

Number of arthroprostheses	n. revisions	% survival at 13 yrs	Confidence interval 95%
55.186	2.076	91,5	90,7-92,2

Survival curve



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	**399**/55.186	0,72	**23,0**
within 60 days	*206/55.186*		
over 60 days	*193/55.186*		
Aseptic loosening of the stem	**370**/55.186	0,67	**21,3**
within 60 days	*14/55.186*		
oltre i 60 days	*356/55.186*		
Aseptic loosening of the cup	**330**/55.186	0,60	**19,0**
within 60 days	*25/55.186*		
oltre i 60 days	*305/55.186*		
Periprosthetic bone fracture	**236**/55.186	0,43	**13,6**
within 60 days	*66/55.186*		
oltre i 60 days	*170/55.186*		
Breakage of prosthesis	**229**/55.186	0,41	**13,2**
Septic loosening	**130**/55.186	0,24	**7,5**
within 60 days	*14/55.186*		
oltre i 60 days	*116/55.186*		
Global aseptic loosening	**125**/55.186	0,23	**7,2**
within 60 days	*2/55.186*		
oltre i 60 days	*123/55.186*		
Primary instability	**47**/55.186	0,09	**2,7**
Pain without loosening	**53**/55.186	0,10	**3,1**
Poly wear	**27**/55.186	0,05	**1,6**
Heterotopic bone	**21**/55.186	0,04	**1,2**
Other	**32**/55.186	0,06	**1,8**
Unknown	**77**/55.186	0,14	**4,4**
Total	**2.076/55.186**	**3,8**	**100,0**

Percentage of causes of revision according to follow-up

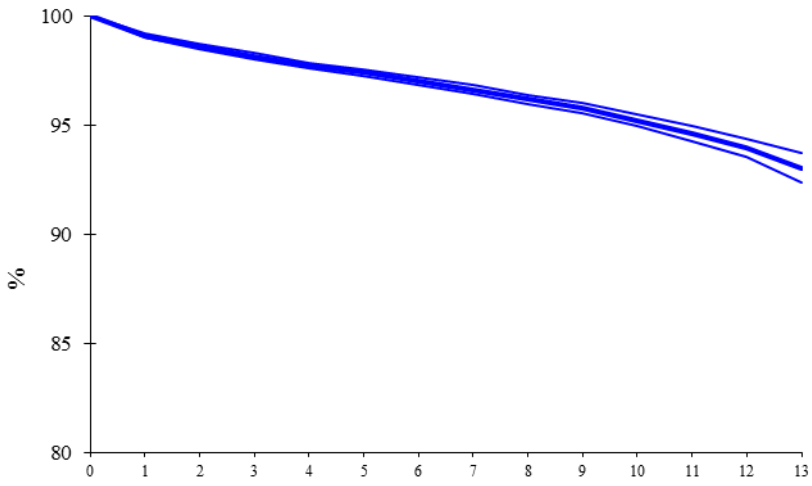
Cause of revision	0-2 Years	3-4 Years	>=5 Years
Prosthesis dislocation	27,9	9,6	9,1
Aseptic loosening of the stem	16,2	22,0	18,2
Periprosthetic bone fracture	11,3	10,1	12,4
Aseptic loosening of the cup	10,6	18,1	24,4
Breakage of prosthesis	7,6	18,4	12,7
Septic loosening	7,5	6,0	4,1
Primary instability	4,1	0,5	0,0
Global aseptic loosening	3,4	6,7	10,5
Pain without loosening	3,0	3,1	1,4
Heterotopic bone	1,6	0,5	0,2
Poly wear	0,5	0,8	3,1
Other	1,5	1,3	1,7
Unknown	4,8	2,8	2,2

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

55.186 primary arthroprostheses are under observation. Of these, 1.588 revisions were carried out to remove cup and/or stem

Number of arthroprostheses	N. revisions	% survival at 13 yrs	Confidence interval 95%
55.186	1.588	93,0	92,4-93,7

Survival curve



10.6 Analysis of survival according to model of prosthesis

Survival analysis has benne calculated either for association of cup and stems and for single component (10.10 and 10.12)
In the following table the prosthesis is considered 'failed' when even a single component has been revised.
Neither articular coupling nor case mix are considered. These two parameters may be differently distributed among groups.

Cemented cups and stems are in bold

Cup (stem) Manufacturer	From years	N.	n. revisions	% survival 5 yrs	c.i. at 95%	% survival 10 yrs	c.i. at 95%
AnCA Fit (AnCA Fit) Wright Cremascoli	2000	2.873	163	96,0	95,2-96,7	93,7	92,8-94,7
FIXA (RECTA) Adler-Ortho	2004	2.641	97	95,9	95,0-96,7	-	-
Fixa TI-por (Apta) Adler-Ortho	2007	2.533	34	97,7	96,7-98,6	-	-
ABGII (ABGII) Stryker Howmedica	2000	1.946	40	98,1	97,5-98,8	97,2	96,2-98,2
EP-FIT PLUS (SL PLUS) ENDOPLUS	2003	1.779	37	97,5	96,6-98,3	95,9	93,0-98,7
FIXA (APTA) Adler-Ortho	2004	1.702	69	96,6	95,8-97,5	-	-
CLS (CLS) SulzerCenterpulse Zimmer	2000	1.516	66	97,6	96,9-98,4	94,0	92,3-95,7
Fixa TI-por (Hydra) Adler-Ortho	2007	1.109	18	95,3	92,7-98,0	-	-
EXPANSION (CBC) Mathys	2000	1.059	43	94,8	93,2-96,5	92,7	89,7-95,7
FITMORE (CONUS) SulzerCenterpulse Zimmer	2000	1.030	34	96,8	95,6-97,9	95,2	93,3-97,0
BICON PLUS (SL PLUS) Smith & Nephew	2000	911	48	96,0	94,7-97,3	92,4	89,3-95,4
EP-FIT PLUS (PROXYPLUS) Smith & Nephew	2004	874	10	98,6	97,8-99,5	-	-
Fixa TI-por (RECTA) Adler-Ortho	2007	793	22	93,2	87,2-99,3	-	-
FITMORE (CLS) SulzerCenterpulse Zimmer	2000	774	27	97,2	96,0-98,4	95,8	94,1-97,4
REFLECTION (**BASIS**) Smith & Nephew	2001	628	26	96,8	95,3-98,3	93,3	90,6-96,1
Exceed ABT (TAPERLOC) Biomet	2006	606	6	98,7	97,7-99,8		
CLS (CONUS) SulzerCenterpulse Zimmer	2000	592	38	97,0	95,6-98,4	94,1	91,9-96,2
FIXA (**APTA**) Adler-Ortho	2004	572	17	97,0	95,6-98,5	-	-

PINNACLE SECTOR II (CORAIL) DePuy	2002	499	12	96,8	94,9-98,7	96,8	94,9-98,7
TRILOGY (VERSYS FIBER) Zimmer	2000	496	19	96,7	95,1-98,3	95,9	94,0-97,7
DUOFIT PSF (**P507**) Samo	2000	492	15	98,3	97,1-99,5	96,7	94,8-98,5
TRIDENT (ABGII) Stryker Howmedica	2002	489	25	94,7	92,3-97,1	90,7	86,4-94,9
RECAP RESURFACING (TAPERLOC) Biomet	2005	485	13	96,9	95,3-98,6	-	-
R3 (SL PLUS MIA) Smith & Nephew	2010	480	7	-	-	-	-
CONTEMPORARY (**EXETER**) Stryker Howmedica	2000	473	17	96,6	94,9-98,4	95,1	92,6-97,6
SELEXYS TH (CBC) MATHYS	2006	435	24	92,4	89,2-95,5	-	-
AnCA Fit (PROFEMUR Z) Wright Cremascoli	2002	420	29	94,7	92,6-96,9	91,7	88,2-95,3
CFP (CFP) Link	2001	396	12	97,6	96,1-99,2	95,3	92,1-98,6
REFLECTION (**SYNERGY**) Smith & Nephew	2000	359	13	97,0	94,8-99,1	93,1	89,2-97,0
MULLER (**JVC**) Wright Cremascoli	2000	326	12	98,4	97,0-99,8	95,6	92,6-98,5
STANDARD CUP (CLS) SulzerCenterpulse Zimmer	2000	322	10	98,7	97,5-100,0	96,7	94,6-98,9
DELTA PF (MODULUS HIP SYSTEM) Lima	2003	320	8	97,2	95,3-99,1	97,2	95,3-99,1
CLS Zimmer (SL PLUS) Smith & Nephew	2001	311	9	97,2	95,2-99,1	94,5	89,0-100,0
MULLER (**MRL**) Wright Cremascoli	2000	305	15	96,5	94,4-98,6	94,8	92,1-97,5
TRIDENT (**EXETER**) Howmedica	2002	305	2	99,3	98,4-100,0	99,3	98,4-100,3
Other (models < 300 cases)	2000	24.075	995	96,3	96,0-96,5	93,6	93,2-94,1
All models*	**2000**	**55.186**	**2.076**	**96,5**	**96,3-96,7**	**94,0**	**93,7-94,3**

*260 data missing

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 13 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.

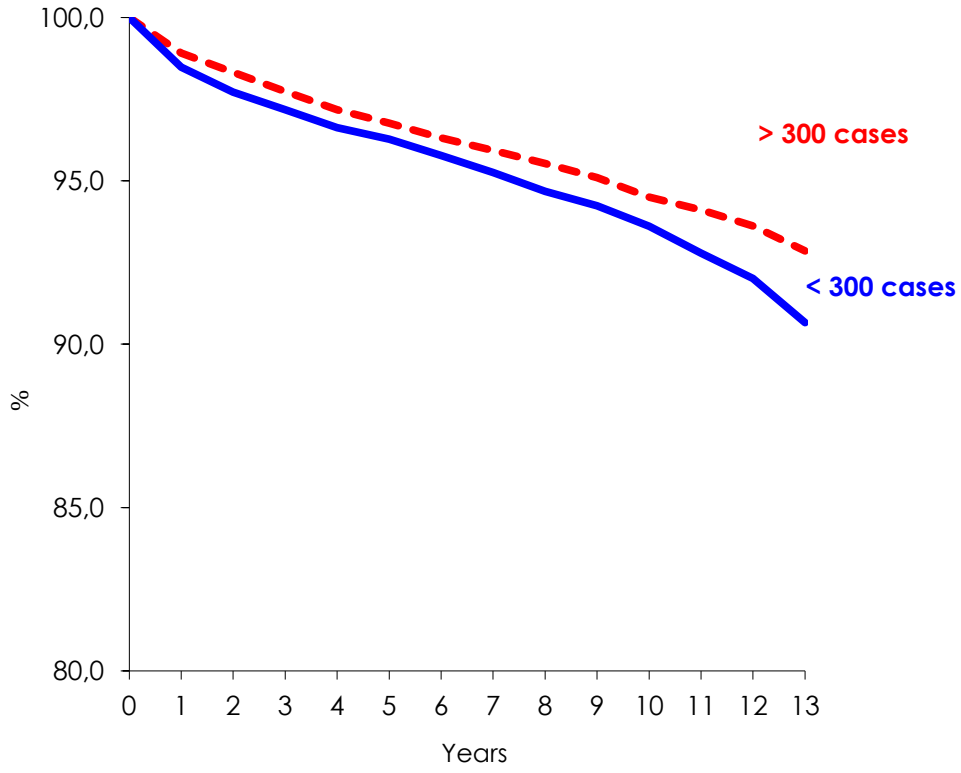
Survival is not adjusted for articular coupling.

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

	Number of implants	n. revisions	% survival at 13 yrs	Confidence interval 95%
Models > 300 cases	30.851	1.037	92,9	91,9-93,8
Models < 300 cases	24.075	995	90,7	89,6-91,7

Survival curve

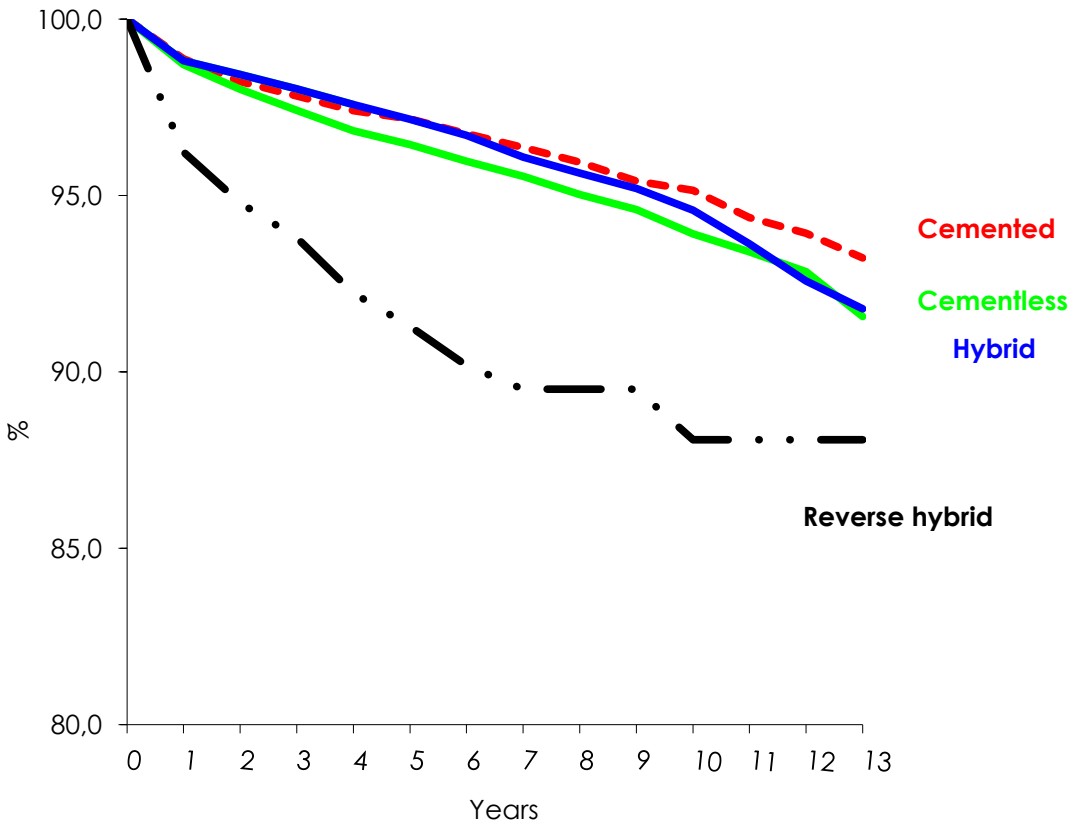
Curves are significantly different (p=0.001, Wilcoxon test)



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

Fixation	N.	Removals	% survival at 13 yrs	Confidence interval 95%
Cementless	44.811	1.616	91,6	90,6-92,5
Hybrid (cemented stem, cementless cup)	5.845	243	91,8	90,2-93,4
Cemented	3.927	148	93,2	91,4-95,0
Reverse hybrid (cementless stem, cemented cup)	426	33	88,1	83,5-92,6

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



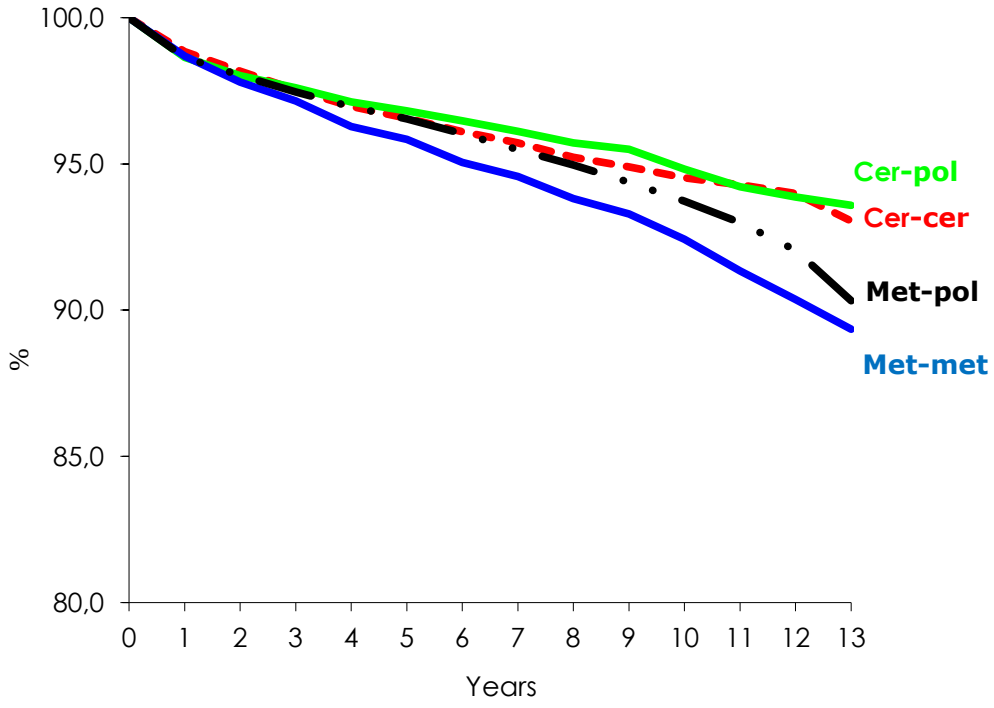
Cemented			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**44**/3.927	1,1	29,7
Recurrent prosthesis dislocation	**26**/3.927	0,7	17,6
Global aseptic loosening	**25**/3.927	0,6	16,9
Aseptic loosening of the stem	**17**/3.927	0,4	11,5
Septic loosening	**15**/3.927	0,4	10,1
Periprosthetic bone fracture	**11**/3.927	0,3	7,4
Primary instability	**4**/3.927	0,1	2,7
Breakage of prosthesis	**1**/3.927	0,03	0,7
Unknown	**5**/3.927	0,1	3,4
Total	**148/3.927**	**3,8**	**100,0**
Cementless			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**298**/44.811	0,7	18,4
Aseptic loosening of the stem	**265**/44.811	0,6	16,4
Aseptic loosening of the cup	**243**/44.811	0,5	15,0
Breakage of prosthesis	**223**/44.811	0,5	13,8
Periprosthetic bone fracture	**199**/44.811	0,4	12,3
Septic loosening	**94**/44.811	0,21	5,8
Global aseptic loosening	**78**/44.811	0,17	4,8
Pain without loosening	**51**/44.811	0,11	3,2
Primary instability	**41**/44.811	0,09	2,5
Heterotopic bone	**17**/44.811	0,04	1,1
Poly wear	**18**/44.811	0,04	1,1
Other	**28**/44.811	0,06	1,7
Unknown	**61**/44.811	0,14	3,8
Total	**1.616/44.811**	**3,6**	**100,0**
Hybrid			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the stem	**77**/5.845	1,3	31,7
Recurrent prosthesis dislocation	**64**/5.845	1,1	26,3
Aseptic loosening of the cup	**23**/5.845	0,4	9,5
Septic loosening	**18**/5.845	0,3	7,4
Periprosthetic bone fracture	**18**/5.845	0,3	7,4
Global aseptic loosening	**17**/5.845	0,3	7,0
Breakage of prosthesis	**5**/5.845	0,1	2,1
Poly wear	**5**/5.845	0,1	2,1
Heterotopic bone	**3**/5.845	0,1	1,2
Primary instability	**2**/5.845	0,0	0,8
Pain without loosening	**1**/5.845	0,0	0,4
Other	**3**/5.845	0,1	1,2
Unknown	**7**/5.845	0,1	2,9
Total	**243/5.845**	**4,2**	**100,0**

Reverse hybrid			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**12**/426	2,8	36,4
Aseptic loosening of the stem	**6**/426	1,4	18,2
Recurrent prosthesis dislocation	**6**/426	1,4	18,2
Periprosthetic bone fracture	**5**/426	1,2	15,2
Global aseptic loosening	**2**/426	0,5	6,1
Unknown	**1**/426	0,2	3,0
Septic loosening	**1**/426	0,2	3,0
Total	**33/426**	**7,7**	**100,0**

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

Articular coupling	N.	Removals	% survival at 13 yrs	Confidence interval 95%
Metal-poly	16.462	732	90,3	89,0-91,7
Ceramic-ceramic	20.545	605	93,1	91,6-94,5
Ceramic-poly	13.007	455	93,6	92,7-94,5
Metal-metal	4.623	231	89,3	86,7-92,0

Survival curve



Difference is statistically significant (p=0,010, Wilcoxon test).
Met-met vs others is statistically significant (p=0.02, Wilcoxon test)

Protesi met-pol			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**158**/16.462	1,0	21,6
Aseptic loosening of the cup	**149**/16.462	0,9	20,4
Aseptic loosening of the stem	**145**/16.462	0,9	19,8
Periprosthetic bone fracture	**85**/16.462	0,5	11,6
Global aseptic loosening	**63**/16.462	0,4	8,6
Septic loosening	**43**/16.462	0,3	5,9
Pain without loosening	**20**/16.462	0,1	2,7
Poly wear	**17**/16.462	0,1	2,3
Primary instability	**11**/16.462	0,1	1,5
Breakage of prosthesis	**9**/16.462	0,1	1,2
Other	**9**/16.462	0,1	1,2
Unknown	**23**/16.462	0,1	3,1
Total	**732/16.462**	**4,4**	**100,0**
Protesi cer-cer			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**108**/20.545	0,5	17,9
Breakage of stem	**98**/20.545	0,5	16,2
Periprosthetic bone fracture	**85**/20.545	0,4	14,0
Aseptic loosening of the stem	**74**/20.545	0,4	12,2
Breakage of liner	**42**/20.545	0,2	6,9
Breakage of head	**42**/20.545	0,2	6,9
Aseptic loosening of the cup	**39**/20.545	0,2	6,4
Septic loosening	**31**/20.545	0,2	5,1
Primary instability	**18**/20.545	0,1	3,0
Pain without loosening	**17**/20.545	0,1	2,8
Global aseptic loosening	**11**/20.545	0,1	1,8
Heterotopic bone	**11**/20.545	0,1	1,8
Other	**12**/20.545	0,1	2,0
Unknown	**17**/20.545	0,1	2,8
Total	**605/20.545**	**2,9**	**100,0**
Protesi cer-pol			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**105**/13.007	0,81	23,1
Aseptic loosening of the stem	**102**/13.007	0,78	22,4
Aseptic loosening of the cup	**65**/13.007	0,50	14,3
Periprosthetic bone fracture	**42**/13.007	0,32	9,2
Septic loosening	**30**/13.007	0,23	6,6
Global aseptic loosening	**25**/13.007	0,19	5,5
Breakage of stem	**13**/13.007	0,10	2,9
Primary instability	**13**/13.007	0,10	2,9
Pain without loosening	**10**/13.007	0,08	2,2
Poly wear	**7**/13.007	0,05	1,5
Heterotopic bone	**7**/13.007	0,05	1,5
Breakage of head	**4**/13.007	0,03	0,9
Breakage of cup	**4**/13.007	0,03	0,9
Other	**5**/13.007	0,04	1,1
Unknown	**23**/13.007	0,18	5,1
Total	**455/13.007**	**3,50**	**100,0**

Protesi met-met			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**67**/4.623	1,4	29,0
Aseptic loosening of the stem	**39**/4.623	0,8	16,9
Septic loosening	**23**/4.623	0,5	10,0
Global aseptic loosening	**22**/4.623	0,5	9,5
Recurrent prosthesis dislocation	**21**/4.623	0,5	9,1
Periprosthetic bone fracture	**15**/4.623	0,3	6,5
Breakage of stem	**10**/4.623	0,2	4,3
Breakage of cup	**7**/4.623	0,2	3,0
Primary instability	**5**/4.623	0,1	2,2
Pain without loosening	**5**/4.623	0,1	2,2
Heterotopic bone	**2**/4.623	0,0	0,9
Other	**6**/4.623	0,1	2,6
Unknown	**9**/4.623	0,2	3,9
Total	**231/4.623**	**5,0**	**100,0**

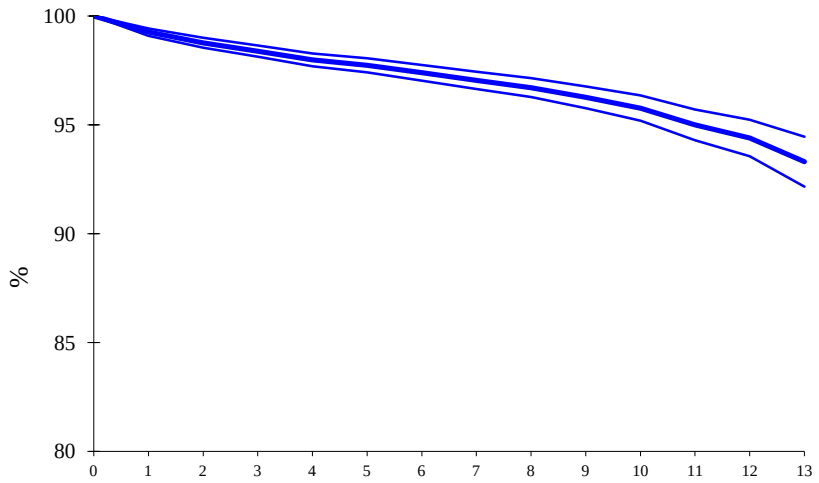
10.9 Survival analysis of acetabular component

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

Number of arthroprostheses	n. revisions	% survival at 13 yrs	Confidence interval 95%
55.186	1.215*	94,8	94,3-95,2

*297 of them liner only

Survival curve



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

Cemented cups in bold

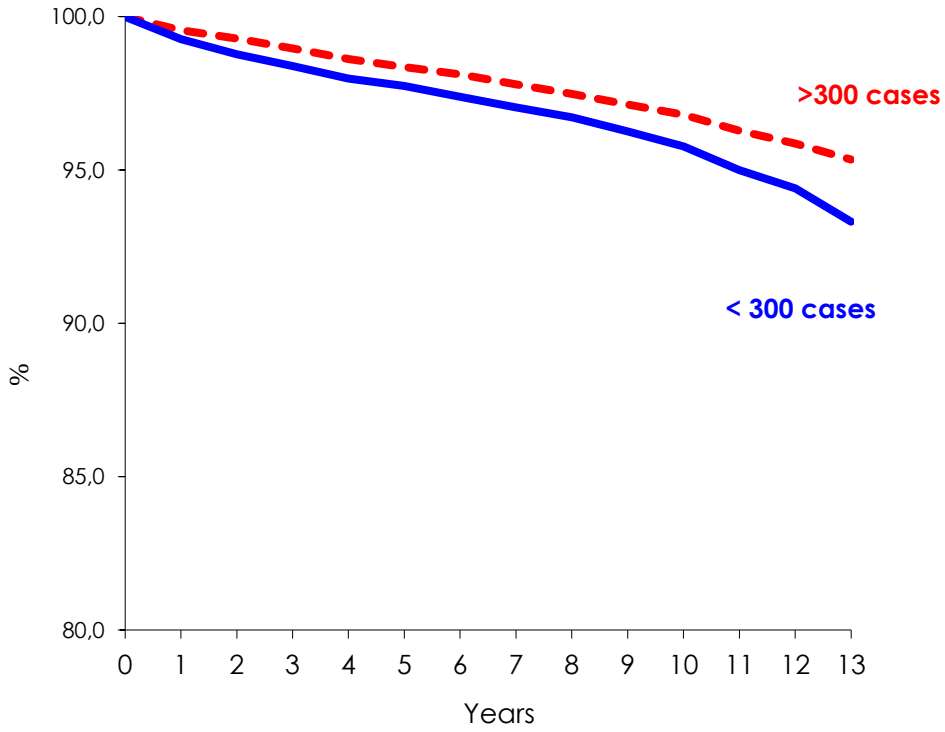
Cup	From year	N.	n. revisions	% survival 5 yrs	c.i at 95%	% survival 10 yrs	c.i at 95%
FIXA Adler-Ortho	2004	5.504	70	98,8	98,5-99,1	-	-
FIXATi por – Adler-Ortho	2007	5.182	30	99,1	98,6-99,6	-	-
AnCA FIT Wright Cremascoli	2000	4.940	126	98,5	98,2-98,9	97,3	96,8-97,8
EP-FIT Plus – Smith & Nephew	2003	3.358	21	99,3	98,9-99,6	96,9	92,2-100
CLS Sulzer, Centerpulse,Zimmer	2000	3.013	115	98,3	97,8-98,8	96,1	95,3-96,9
ABGII Stryker Howmedica	2000	2.261	31	99,0	98,5-99,4	98,1	97,4-98,8
FITMORE Sulzer	2000	2.103	47	98,2	97,6-98,8	97,1	96,2-98,0
REFLECTION Smith & Nephew	2000	1.458	41	98,7	98,1-99,4	95,5	93,9-97,0
TRIDENT Stryker Howmedica	2002	1.310	21	98,3	97,6-99,1	98,0	97,1-98,9
EXPANSION Mathys	2003	1.286	38	97,0	95,8-98,1	87,9	76,8-98,9
DELTA PF – Lima	2003	1.184	17	98,0	97,1-99,0	98,0	97,1-99,0
BICON PLUS Smith & Nephew	2000	1.183	52	96,8	95,8-97,9	94,3	92,5-96,1
DUOFIT PSF Samo	2000	986	34	97,8	96,9-98,7	96,5	95,3-97,8
Pinnacle Sector II – DePuy	2002	973	12	98,8	98,0-99,6	98,0	96,7-99,3
EXCEED ABT Biomet	2006	957	5	99,3	98,7-99,9	-	-
MULLER Wright Cremascoli	2000	884	25	98,6	97,8-99,4	97,2	96,0-98,4
STANDARD CUP PROTEK Sulzer	2000	867	30	98,5	97,6-99,3	96,8	95,6-98,1
R3 SMITH AND NEPHEW	2009	847	4	-	-	-	-
TRILOGY Zimmer	2000	847	19	98,3	97,4-99,2	97,4	96,2-98,6
CONTEMPORARY Stryker Howmedica	2000	701	23	97,7	96,6-98,9	96,0	94,1-97,9
RECAP RESURFACING - Biomet	2005	687	14	97,7	96,4-98,9	-	-
ZCA Zimmer	2000	619	11	98,8	97,8-99,7	98,0	96,6-99,4
VERSAFITCUP CC Medacta	2005	573	17	96,1	94,3-98,0	-	-
HILOCK LINE Symbios	2000	552	34	95,8	93,9-97,6	90,0	86,5-93,5
DELTA TT – Lima	2007	532	5	98,9	97,9-99,9	-	-
SELEXYS TH - Mathys	2006	527	19	95,6	93,5-97,6	-	-
CFP Link	2000	443	12	97,7	96,2-99,1	96,8	95,0-98,7
PE (Muller Protek) Sulzer	2000	417	16	97,6	96,0-99,1	95,3	92,9-97,7
Continuum – Zimmer		371	-	-	-	-	-
MULLER Samo	2000	367	16	95,5	93,2-97,8	94,4	91,6-97,1
Other (with < 300 cases each)	2000	10.102	285	97,7	97,4-98,1	95,8	95,2-96,3
ALL MODELS	**2000**	**55.186**	**1.215**	**98,2**	**98,1-98,4**	**96,5**	**96,3-96,8**

Cup is failed when even only liner has been exchanged.
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 13 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	% survival at 13 yrs	Confidence interval 95%
Models >300 cases	44.932	905	95,3	94,9-95,8
Models <300 cases	10.102	285	93,3	92,2-94,5

Survival curve



Curves are significantly different (p=0,001, Wilcoxon test).

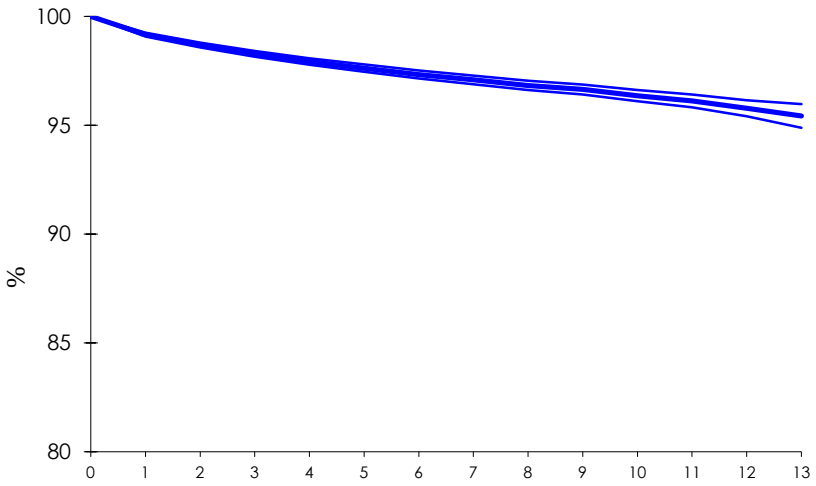
10.11 Survival analysis of stem

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	n. revisions	% survival at 13 yrs	Confidence interval 95%
55.186	1.360*	95,0	94,5-95,5

*291 revision of modular neck/proximal component only

Survival curve



10.12 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.	n. revision	% survival 5 yrs	c.i at 95%	% survival 10 yrs	c.i. at 95%
APTA Adler-Ortho	2004	4.287	101	97,1	96,4-97,7	-	-
SL PLUS Smith & Nephew	2000	3.552	75	97,9	97,3-98,4	96,0	94,5-97,5
RECTA Adler-Ortho	2004	3.510	115	95,9	95,0-96,7	-	-
CLS Sulzer Centerpulse Zimmer	2000	3.323	79	98,3	97,8-98,8	97,0	96,3-97,7
AnCA FIT Wright Cremascoli	2000	3.146	146	96,3	95,6-96,9	94,9	94,1-95,7
CONUS Sulzer Centerpulse Zimmer	2000	3.031	53	98,3	97,9-98,8	97,8	97,2-98,5
ABGII Stryker Howmedic	2000	2.722	56	98,1	97,5-98,6	97,1	96,3-97,9
TAPERLOC Biomet	2002	1.901	29	98,0	97,3-98,8	98,0	97,3-98,8
CBC Mathys	2000	1.827	46	96,7	95,6-97,7	96,4	95,2-97,5
Hydra Adler-Ortho	2007	1.334	23	96,3	94,5-98,0	-	-
EXETER Stryker Howmedic	2000	1.151	13	99,1	98,6-99,7	98,5	97,6-99,3
PROXIPLUS ENDOPLANT	2005	931	10	98,7	97,9-99,5	-	-
APTA Cem Adler-Ortho	2004	931	25	97,1	96,0-98,3	-	-
VERSYS FIBER METAL TAPER Zimmer	2000	879	15	98,3	97,4-99,2	98,1	97,1-99,1
CFP Link	2000	860	9	99,2	98,5-99,8	97,4	94,8-100,0
CORAIL De Puy	2000	824	13	97,9	96,7-99,1	97,9	96,7-99,1
BASIS Smith & Nephew	2001	733	19	98,3	97,2-99,4	95,5	93,4-97,6
JVC Wright Cremascoli	2000	694	24	97,9	96,8-99,0	96,2	94,6-97,9
SPECTRON Smith & Nephew	2000	675	25	98,5	97,5-99,5	94,7	92,5-96,9
Modulus Hip System Lima	2001	623	12	97,7	96,3-99,0	97,7	96,3-99,0
SL PLUS MIA Smith & Nephew	2009	610	5	-	-	-	-
P507 Samo	2000	586	12	99,3	98,5-100,0	97,5	95,8-99,1
PROFEMUR Z Wright Cremascoli	2002	529	19	96,8	95,2-98,3	96,1	94,3-97,8
MRL Wright Cremascoli	2000	452	16	97,6	96,1-99,1	96,4	94,6-98,3
ABG riv -Stryker Howme.	2000	448	11	99,3	98,5-100	98,2	96,9-99,5
Alata acuta S Adler-Ortho	2005	430	15	95,6	93,2-97,9	-	-
SYNERGY Smith & Nephew	2000	401	3	99,7	99,2-100,2	98,5	96,6-100,3
ADR Endoplus	2007	344	5	97,8	95,9-99,8	-	-
VERSYS CEMENTED Zimmer	2000	319	6	99,0	97,9-100,1	98,6	97,2-100,0
AD Samo	2000	310	12	96,1	93,8-98,5	94,9	92,0-97,8

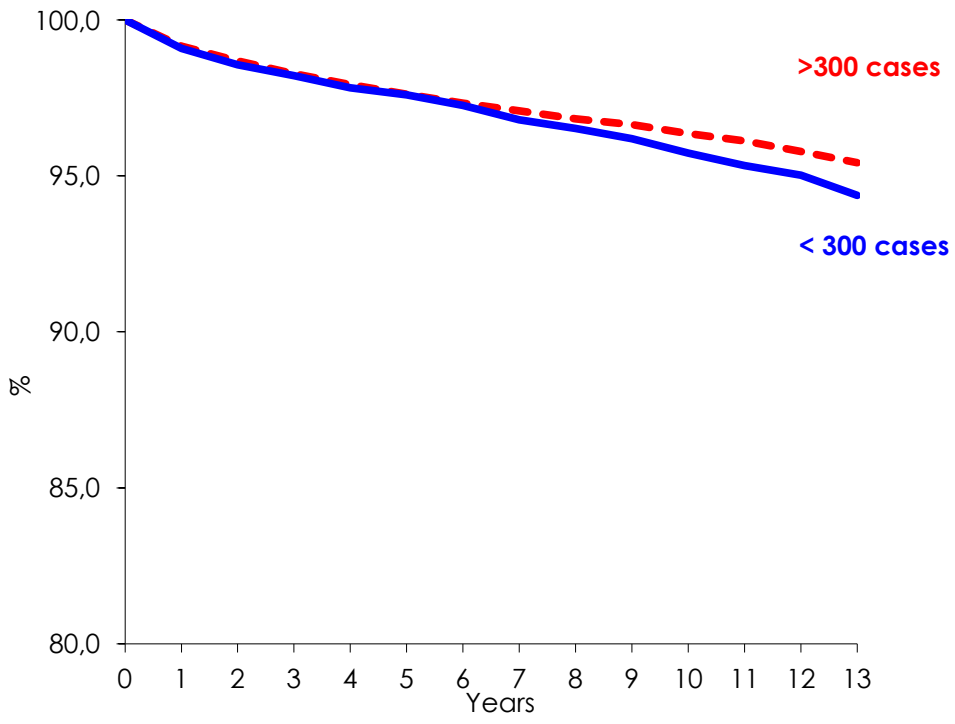
Minimax Medacta	2007	304	5	97,5	95,3-99,7	-	-
Other (with less than 300 cases each))	2000	13.311	339	97,6	97,3-97,9	95,7	95,2-96,3
ALL MODELS	**2000**	**55.186**	**1.360**	**97,6**	**97,5-97,7**	**96,1**	**95,9-96,4**

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 13 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.	N. revisions	% survival at 13 yrs	Confidence interval 95%
Models >300 cases	41.667	997	95,4	94,9-96,0
Models <300 cases	13.311	339	94,4	93,3-95,5

Survival curve



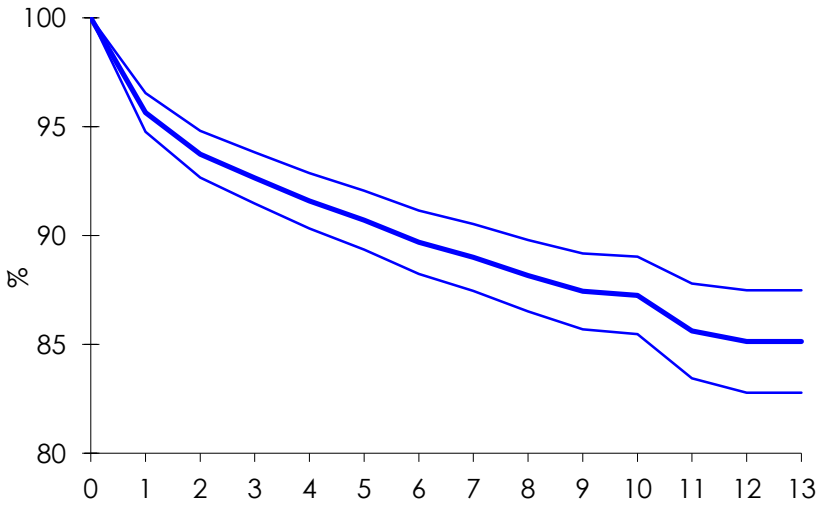
Curves are not significantly different (p=0,207, Wilcoxon test)

10.13 Survival analysis of total revision

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 total first revision	Second revision	% survival at 13 yrs	Confidence interval 95%
2.092	207	85,1	82,8-87,5

Survival curve



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

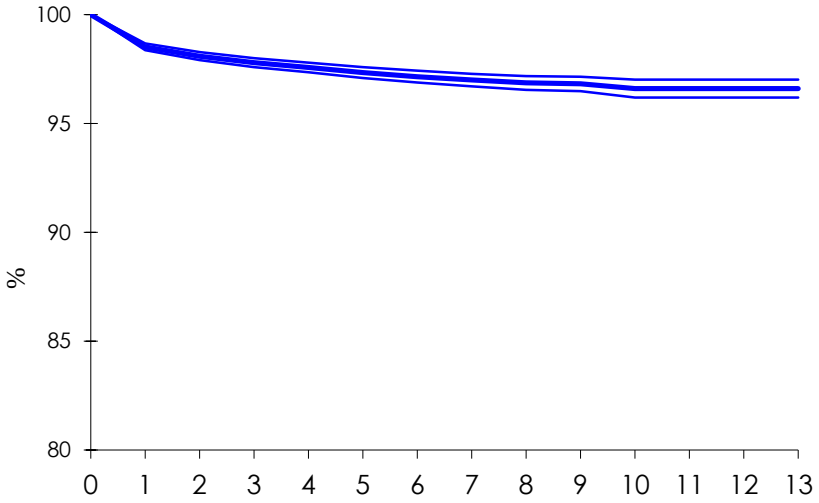
Cause of revision	Rate	%	% distribution of failure causes
Recurrent prosthesis dislocation	**47**/2.092	2,2	22,7
Aseptic loosening of the cup	**42**/2.092	2,0	20,3
Aseptic loosening of the stem	**31**/2.092	1,5	15,0
Septic loosening	**29**/2.092	1,4	14,0
Global aseptic loosening	**19**/2.092	0,9	9,2
Periprosthetic bone fracture	**12**/2.092	0,6	5,8
Primary instability	**3**/2.092	0,1	1,4
Breakage of prosthesis	**3**/2.092	0,1	1,4
Pain without loosening	**3**/2.092	0,1	1,4
Other	**2**/2.092	0,1	1,0
Unknown	**16**/2.092	0,8	7,7
Total	**207/2.092**	**9,9**	**100,0**

10.14 Survival analysis of hemiarthroplasty

Survival of hemiarthroplasty was calculated considering end point either head revision andimplant of a cup to transform hemiarthroplasty to total hip prosthesis.

N. of hemiarthroplasty	N. revisions	% survival at 13 yrs	Confidence interval 95%
28.278	536	96,6	96,2-97,0

Survival curve



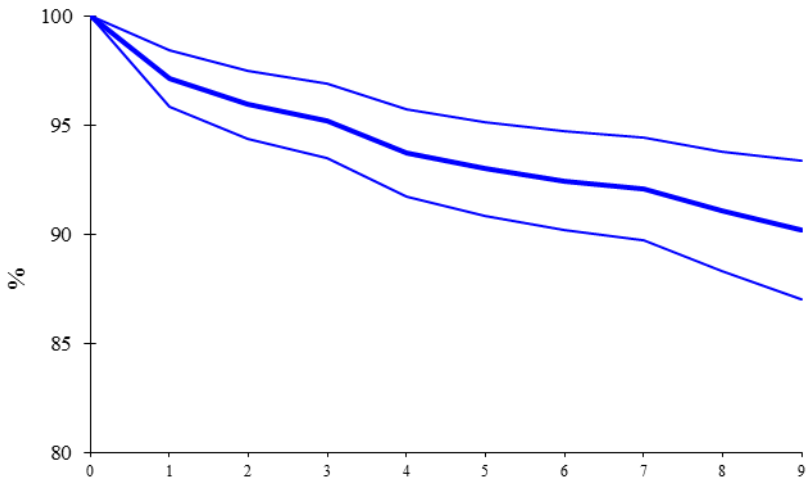
The following table shows the rate of revision in hemiarthroplasty according to **cause of revision**; percentage distribution of causes for revision is also reported.

Cause of revision	Rate	%	% distribution of failure causes
Dislocation	**247**/28.278	0,9	46,1
Aseptic loosening of the stem	**92**/28.278	0,3	17,2
Cotyloiditis	**84**/28.278	0,3	15,7
Periprosthetic bone fracture	**44**/28.278	0,2	8,2
Septic loosening	**40**/28.278	0,1	7,5
Unknown	**14**/28.278	0,05	2,6
Primary instability	**9**/28.278	0,03	1,7
Other	**6**/28.278	0,02	1,1
Total	**455/28.278**	**1,9**	**100,0**

10.15 Survival analysis of resurfacing

N. of resurfacing	Removal	% survival at 9 yrs	Confidence interval 95%
635	45	90,2	87,0-93,4

Survival curve



Type of prosthesis	First implant	N.	Rev. (in all period)	% survival at 5 yrs	Confidence interval
BHR – Smith & Nephew	2001	315	13	96,5	94,3-98,6
ADEPT – Finsbury	2005	92	2	97,6	94,2-100,0
ASR – DePuy	2004	63	13	79,5	69,1-90,0
MRS – Lima	2005	42	9	80,9	69,1-92,8
BMHR – Smith & Nephew	2007	59	1	98,0	94,1-100,0
Other (< 40 cases)	2003	64	7	90,5	83,3-97,7
Total	**2001**	**635**	**45**	**93,0**	**90,9-95,1**

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

Cause of revision	Rate	%	% distribution of failure causes
Periprosthetic bone fracture	**15**/635	2,4	33,3
Aseptic loosening	**17**/635	2,7	37,8
Pain without loosening	**6**/635	0,9	13,3
Metal sensitization	**4**/635	0,6	8,9
Breakage of prosthesis	**2**/635	0,3	4,4
Septic loosening	**1**/635	0,2	2,2
Total	**45/635**	**7,1**	**100,0**

PART TWO: KNEE PROSTHESIS

July 2000 – December 2012

11. RIPO capture

11.1 Percentage of capture

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), according to Agency was **97,9**% for year 2012. Data are referred to primary knee prosthesis (8154), revision (8155;80;81;82;83;84) and prosthesis removal (8006).

11.2 Ratio public/private treatment

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

% of operations performed in public hospitals (AUSL, AOSP, IRCCS)		
Year of operation	**Primary**	**Revision**
2000	57,0	75,0
2001	59,0	71,0
2002	53,0	70,0
2003	49,0	68,0
2004	47,1	58,3
2005	45,3	60,2
2006	42,9	54,3
2007	42,3	49,9
2008	40,6	55,0
2009	37,7	49,8
2010	37,3	50,9
2011	35,9	45,5
2012	33,8	43,9

From database SDO

Percentage of primary total knee arthroprostheses and revision performed in public and private hospitals, in year 2012

Type of operation	Public	Private
	%	%
Primary bicompartmental	56,9	69,9
Primary tricompartmental	24,7	11,1
Primary unicompartmental	8,0	10,3
Revision	7,2	6,7
Prosthesis removal	2,0	1,3
Implant of patella	1,1	0,6
Total	**100,0**	**100,0**

12. 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 2012, according to **type**

Type of operation	Number	Percentage
Primary bicompartmental	43.963	66,6
Primary tricompartmental	8.905	13,5
Primary unicompartmental	6.933	10,6
Revision^	3.981	6,0
Prosthesis removal	870	1,3
Implant of patella	494	0,8
Other prostheses*	291	0,4
Other operations°	569	0,9
Total	**66.006**	**100,0**

*49 Hemicap – Arthrosurface, 29 Hemicap patello_femoral – Arthrosurface, 42 Avon-Patello-Femoral Joint Stryker, 83 other patella-femoral, 53 Unicompartimental Plus + rotula

°216 spacer exchange, 68 stiff knee loosenings, 64 debridments, 5 dislocation reductions

^among them 349 liner, 7 femoral component, 1 tibial component, 80 femoral component and liner, 224 tibial component and liner, 3293 total, 27 patella

Percentage of different prostheses in the years

Years of operation	% unicompartim	% bicompartim	% tricompartim
2001	10,2	81,3	8,5
2002	12,7	80,1	7,2
2003	12,8	78,5	8,7
2004	12,9	75,7	11,4
2005	12,4	75,6	12,0
2006	10,8	70,0	19,2
2007	11,5	69,3	19,2
2008	11,5	72,1	16,4
2009	13,0	72,3	14,7
2010	12,5	71,5	16,0
2011	9,8	73,4	16,8
2012	10,5	72,2	17,3

13. Descriptive statistics of patients with knee prosthesis

13.1 Age

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2012, 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	189	0,4	641	1,2	3.720	7,0	16.062	30,4	26.345	49,8	5.907	11,2	**52.864**
Unicomp	17	0,2	195	2,8	1.296	18,7	2.917	42,1	2.119	30,6	387	5,6	**6.931**
Revision	19	0,5	97	2,4	364	9,1	1.221	30,7	1.795	45,1	485	12,2	**3.981**
Prosthesis removal	8	0,9	25	2,9	97	11,1	292	33,6	359	41,3	89	10,2	**870**
Patella only	4	0,8	15	3,0	38	7,7	146	29,6	241	48,8	50	10,1	**494**
Total*	**237**	**0,4**	**973**	**1,5**	**5.515**	**8,5**	**20.638**	**31,7**	**30.859**	**47,4**	**6.918**	**10,6**	**65.140**

* 6 missing cases casi (0,009%)

Mean age at surgery, according to type of operation - years 2000-2012

Type of operation	Mean age	Range
Primary bi/tricompartmental	70,7	13–96
Primary unicompartmental	66,1	24-91
Revision	69,8	18-92
Total	**70,1**	**13–96**

Mean age at surgery, according to type of operation - years 2001-2012

Type of operation	Year 2001		Year 2012	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental°	71,2	23-92	70,2	22-91
Primary unicompartmental*	68,9	45-87	64,8	24-90
Revision^	71,7	26-87	69,7	29-89

° statistically different (t-test, p<0,001)
* statistically different (t-test, p<0,001)
^ statistically different (t-test, p<0,05)

Mean age at surgery, according to type of operation - years 2000-2012 - according to **private or public hospital**

Type of operation	Public		Private	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental*	71,0	13-92	70,4	20-96
Primary unicompartmental^	67,2	24-89	65,4	33-91

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

13.2 Gender

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2012, according to **type of operation** and **gender** of patients

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Bi/tricompartmental	14.628	27,7	38.240	72,3	52.868
Unicompartmental	2.242	32,3	4.691	67,7	6.933
Revision	1.031	25,9	2.950	74,1	3.981
Prosthesis removal	322	37,0	548	63,0	870
Patella only	116	23,5	378	76,5	494
Other	324	37,7	536	62,3	860
Total	**18.663**	**28,3**	**47.343**	**71,7**	**66.006**

13.3 Side of surgery

There is a prevalence of operations performed on the right side (55,1%) in comparison with the left side (44,9%). The percentage was calculated on patients affected by primary arthritis, on first side operated.

Percentage

Side	Males	Females
Right	51,4	56,6
Left	48,6	43,4

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

13.4 Bilateral arthroplasty

In the period of registry observation (13 years), 8.862 patients underwent bilateral operations.
7.620 (86,0%) chose to undergo the second operation at the same hospital from where the first one was performed.
416 (4,7%) chose to undergo the second operation at a different hospital from where the first one was performed to follow the surgeon.

826 (9,3%) chose to undergo the second operation at a different hospital from where the first one was performed.
In bilateral operations, it was observed that the first knee to be treated was the right one in 53,9% of cases.

13.5 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 2012, according to **diagnosis**.

Diagnosis in unicomp. knee prosthesis	Number	Percentage
Primary arthritis	5.959	86,2
Necrosis of the condyle	367	5,3
Deformity	348	5,0
Post-traumatic arthritis	81	1,2
Post-traumatic necrosis	60	0,9
Idiopathic necrosis	31	0,4
Sequelae of fracture	29	0,4
Rheumatic arthritis	16	0,2
Sequelae of osteotomy	10	0,1
Other	16	0,2
Total*	**6.917**	**100,0**

* 16 missing cases (0,2%)

13.6 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 2012, according to **diagnosis**.

Diagnosis in bi/tricompartmental knee prosth.	Number	Percentage
Primary arthritis	45.570	86,5
Deformity	3.717	7,1
Post-traumatic arthritis	895	1,7
Rheumatic arthritis	836	1,6
Sequelae of fracture	673	1,3
Necrosis of the condyle	303	0,6
Sequelae of osteotomy	291	0,6
Post-traumatic necrosis	77	0,1
Sequelae of septic arthritis	60	0,1
Sequelae of poliomyelitis	40	0,1
Idiopathic necrosis	35	0,1
Tumor	12	0,0
Other	194	0,4
Total*	**52.703**	**100,0**

* 165 missing data (0,3%)

13.7 Causes of revision and removal

Number of **revision operations** carried out on patients admitted between 1st July 2000 and 31st December 2012, according to **diagnosis**.

In the Table all revisions performed in the Region, without taking care of site and date of primary implant are reported.

Diagnosis in revision	Number	Percentage
Total aseptic loosening	1.647	41,8
Prosthesis removal	718	18,2
Pain without loosening	345	8,8
Aseptic loosening of tibial component	340	8,6
Insert wear	191	4,8
Septic loosening	129	3,3
Aseptic loosening of femoral component	122	3,1
Prosthesis dislocation	78	2,0
Instability	73	1,9
Periprosthetic bone fracture	55	1,4
Stiffness	47	1,2
Breakage of prosthesis	30	0,8
Other	166	4,2
Total*	**3.941**	**100,0**

***** 40 missing data (1,0%)

Number of **prosthesis removal** carried out on patients admitted between 1st July 2000 and 31st December 2012, according to **diagnosis**.

In the Table all removals performed in the Region, without taking care of site and date of primary implant are reported.

Diagnosis in removal	Number	Percentage
Septic loosening	777	90,9
Total aseptic loosening	50	5,8
Prosthesis dislocation	5	0,6
Aseptic loosening of tibial component	5	0,6
Pain without loosening	4	0,5
Periprosthetic bone fracture	4	0,5
Other	10	1,2
Total*	**855**	**100,0**

* 15 missing data (1,7%)

14. Types of knee prosthesis

14.1 Unicompartmental prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2012, primary unicompartmental surgery.

All poly tibial components in bold

TYPE OF PROSTHESIS	2000-2004		2005-2009		2010-2012	
	N.	%	N.	N.	%	N.
ZIMMER UNI - Zimmer	-	-	300	9,1	340	16,1
GENESIS UNI - Smith & Nephew	131	8,6	492	15,0	317	15,0
UNI SIGMA HP - De Puy Johnson & Johnson	-	-	11	0,3	253	12,0
JOURNEY UNI - ALL POLY - Smith & Nephew	-	-	-	-	189	8,9
OXFORD UNICOMPARTMENTAL PHASE 3 - Biomet Merck	428	27,9	691	21,0	187	8,8
GENESIS UNI - ALL POLY - Smith & Nephew	16	1,0	84	2,6	183	8,6
JOURNEY UNI - Smith & Nephew	-	-	-	-	89	4,2
GKS - ONE - ALL POLY - Permedica	-	-	107	3,3	84	4,0
BALANSYS - UNI - Mathys	-	-	62	1,9	72	3,4
UC-PLUS SOLUTION - ALL POLY - Endoplus	3	0,2	79	2,4	62	2,9
MITUS - ENDO-MODEL UNI - ALL POLY - Link	76	5,0	245	7,5	58	2,7
EFDIOS - Citieffe	254	16,6	171	5,2	49	2,3
ALLEGRETTO UNI - Protek-Sulzer	204	13,3	49	1,5	45	2,1
OPTETRAK - UNI - ALL POLY - Exactech	-	-	126	3,8	45	2,1
UNI SIGMA HP - ALL POLY - De Puy Johnson & Johnson	-	-	-	-	45	2,1
PRESERVATION UNI - ALL POLY - Depuy	125	8,2	228	6,9	21	1,0
TRIATHLON - PKR - HOWMEDICA Osteonics	-	-	3	0,1	19	0,9
GKS - ONE - CUSTOM MADE - Permedica	-	-	5	0,2	17	0,8
PRESERVATION UNI - Depuy	-	-	14	0,4	13	0,6
UC-PLUS SOLUTION - Endoplus	45	2,9	194	5,9	3	0,1
MILLER GALANTE UNI - Zimmer	103	6,7	75	2,3	1	0,05
HLS - UNI EVOLUTION - ALL POLY - Tornier	53	3,5	100	3,0	1	0,05
MAIOR - Finceramica	-	-	154	4,7	-	-
EIUS UNI - ALL POLY - STRYKER Howmedica	5	0,3	54	1,6	-	-
PFC - UNI - De Puy Johnson & Johnson	41	2,7	-	-	-	-
UNICIA - VECTEUR ORTHOPEDIC - Stratec	27	1,8	-	-	-	-
OPTETRAK - ARTHROFOCUS - Exactech	-	-	10	0,3	-	-
Other (models with less than 10 cases)	1	0,1	17	0,5	3	0,1
Unknown	20	1,3	14	0,4	20	0,9
Total	**1.532**	**100,0**	**3.285**	**100,0**	**2116**	**100,0**

14.2 Bi-tricompartmental knee prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2012, primary bi/tricompartmental surgery.

TYPE OF PROSTHESIS	2000-2004		2005-2009		2010-2012	
	N.	%	N.	N.	%	N.
NEXGEN – Zimmer	3024	27,1	5926	24,3	3006	17,4
P.F.C – DePuy	904	8,1	1894	7,8	2279	13,2
VANGUARD – Biomet Merck France	-	-	1579	6,5	2180	12,6
GENESIS - Smith & Nephew	212	1,9	1781	7,3	1843	10,7
TC-PLUS - SOLUTION - Smith & Nephew	13	0,1	1066	4,4	1144	6,6
TRIATHLON – Stryker Howmedica Osteonics	-	-	401	1,6	785	4,5
GENUS – Adler-Ortho	-	-	328	1,3	756	4,4
GEMINI - Link	151	1,4	991	4,1	737	4,3
FIRST - Symbios Orthopedie SA	-	-	345	1,4	550	3,2
SCORPIO – Stryker Howmedica	526	4,7	1534	6,3	519	3,0
G.K.S. – Permedica	106	0,9	252	1,0	443	2,6
BALANSYS - Mathys	-	-	173	0,7	421	2,4
GSP - TREKKING - Samo	-	-	246	1,0	390	2,3
PROFIX – Smith & Nephew	1854	16,6	2823	11,6	340	2,0
INNEX - Protek Sulzer	12	0,1	34	0,1	193	1,1
ADVANCE - Wright	292	2,6	384	1,6	192	1,1
OPTETRACK – Exactech	289	2,6	659	2,7	184	1,1
LCS – DePuy	417	3,7	354	1,5	150	0,9
ROTAGLIDE – Corin Medical	295	2,6	362	1,5	149	0,9
APEX - Omnilife Science	-	-	-	-	121	0,7
LEGION - Smith & Nephew	-	-	8	0,03	112	0,6
COLUMBUS - B.Braun	-	-	192	0,8	107	0,6
GENIUS TRICCC - Dedienne Sante	295	2,6	246	1,0	94	0,5
JOURNEY – Smith & Nephew	-	-	170	0,7	85	0,5
HLS – Tornier	137	1,2	164	0,7	73	0,4
ENDO-MODEL - Link	149	1,3	123	0,5	65	0,4
E.MOTION - B.Braun	-	-	130	0,5	51	0,3
MULTIGEN - Lima	20	0,2	393	1,6	22	0,1
AGC - Biomet Merck France	58	0,5	527	2,2	5	0,03
SCORE – Amplitude	38	0,3	542	2,2	-	-
INTERAX - Stryker Howmedica	639	5,7	95	0,4	-	-
DURACON – Stryker Howmedica	178	1,6	89	0,4	-	-
CONTINUUM KNEE SYSTEM – Stratec Medical	101	0,9	65	0,3	-	-
RO.C.C. – Biomet Merck France	102	0,9	61	0,2	-	-
913 – Wright Cremascoli	315	2,8	42	0,2	-	-
PERFORMANCE – Kirschner Biomet Merck	239	2,1	40	0,2	-	-
T.A.C.K. – Link	616	5,5	16	0,1	-	-
Other (models with less than 100 cases)	169	1,5	323	1,3	297	1,7
Unknown	10	0,1	47	0,2	9	0,1
Total	**11.161**	**100,0**	**24.405**	**100,0**	**17.302**	**100,0**

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

14.3 Revision prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2012, in total revision surgery.

TYPE OF PROSTHESIS	2000-2004		2005-2009		2010-2012	
	N.	%	N.	%	N.	%
NEXGEN - Zimmer	163	27,2	453	30,2	285	23,9
LEGION - CONSTRAINED - Smith & Nephew	-	-	49	3,3	120	10,1
RT-PLUS - Smith & Nephew	5	0,8	117	7,8	108	9,1
ENDO-MODEL - Link	112	18,7	101	6,7	100	8,4
SIGMA RP - TC3 - DePuy	-	-	61	4,1	92	7,7
PFC - DePuy	59	9,8	115	7,7	78	6,5
GENESIS - Smith & Nephew	2	0,3	66	4,4	62	5,2
VANGUARD - Biomet	-	-	39	2,6	47	3,9
GKS - Permedica	13	2,2	44	2,9	46	3,9
DURATION MRH - Osteonics	12	2,0	73	4,9	24	2,0
TRIATHLON - Howmedica Osteonics	-	-	8	0,5	24	2,0
SCORPIO - Osteonics	2	0,3	61	4,1	22	1,8
OPTETRAK - Exactech	13	2,2	53	3,5	20	1,7
S-ROM NRH - Johnson & Johnson	10	1,7	19	1,3	18	1,5
TC-PLUS -SOLUTION - Smith & Nephew	1	0,2	18	1,2	16	1,3
E.MOTION - B.Braun	-	-	11	0,7	13	1,1
FIRST - Symbios Orthopedie SA	-	-	7	0,5	11	0,9
PROFIX - Smith & Nephew	57	9,5	55	3,7	10	0,8
GEMINI - Link	1	0,2	13	0,9	10	0,8
GSP - TREKKING - Samo	-	-	-	-	10	0,8
AGC - Biomet Merck France	52	8,7	70	4,7	5	0,4
INTERAX - Stryker Howmedica	27	4,5	8	0,5	-	-
DURACON II - Stryker Howmedica	13	2,2	5	0,3	-	-
Other (models with less than 10 cases)	54	9,0	47	3,1	70	5,9
Unknown	4	0,7	8	0,5	1	0,1
Total	**600**	**100,0**	**1.501**	**100,0**	**1.192**	**100,0**

14.4 Prosthesis fixation

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31st December 2012, according to **prosthesis fixation**

Fixation	Primary unicomp.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	6.276	90,7	47.877	90,6	3.215	97,8	57.368	91,0
Uncemented	481	7,0	2.809	5,3	41	1,2	3.331	5,3
Fem. cementless + tib. cemented	156	2,3	1.590	3,0	19	0,6	1.765	2,8
Fem. cem. + tib. cementless	6	0,1	558	1,1	13	0,4	577	0,9
Total*	**6.919**		**52.834**		**3.288**		**63.041**	

* 53 data are missing (0,1%)

Fixation according to year of operation

Years of operation	% Cemented	% Cementless	% cemented tibia	% cemented femur
2001	82,6	8,0	8,7	0,7
2002	79,9	9,0	10,7	0,4
2003	83,5	7,6	8,5	0,4
2004	88,0	7,4	4,0	0,6
2005	89,9	6,2	3,3	0,6
2006	90,8	5,3	3,6	0,4
2007	91,1	4,5	3,0	1,3
2008	91,2	4,2	2,2	2,4
2009	91,5	4,5	1,5	2,5
2010	93,5	4,5	0,9	1,1
2011	94,9	4,1	0,4	0,6
2012	95,1	4,2	0,3	0,4

14.5 Type of insert

Stabilization of liner in bi-tricompartmental knee prostheses.

Years of operation	% Unstabilized	% Posterior stabilized	% Hinged
2001	47,9	50,1	2,0
2002	51,4	46,1	2,5
2003	45,4	52,3	2,2
2004	41,3	57,0	1,7
2005	36,0	62,5	1,5
2006	33,6	64,7	1,7
2007	34,1	63,9	2,0
2008	38,4	59,9	1,7
2009	40,8	57,4	1,8
2010	36,8	60,7	2,5
2011	39,6	58,3	2,1
2012	35,0	62,8	2,2

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	67,9	32,1
2005	66,0	34,0
2006	58,4	41,6
2007	62,2	37,8
2008	60,7	39,3
2009	59,2	40,8
2010	54,8	45,2
2011	55,4	44,6
2012	58,8	41,2

14.6 Bone Cement

Types of cement used (since 1-1-2002)

In **bold** bone cement loaded with antibiotic

Cement	%
Surgical Simplex P – Howmedica	24,4
Antibiotic Simplex – Howmedica	***17,7***
Palacos R - Heraeus Medical	9,9
Palacos R+G - Heraeus Medical	***7,9***
Versabond AB - Smith & Nephew	***3,9***
Osteobond – Zimmer	3,3
Versabond - Smith & Nephew	3,1
Aminofix 1 – Groupe Lepine	***2,5***
Cemex System – Tecres	2,4
Palacos R - Biomet	2,2
Cemex Genta System - Tecres	***1,6***
Cemex – Tecres	1,6
Hi-Fatigue - Zimmer	1,6
Palamed G - Heraeus Medical	***1,6***
Refobacin Revision - Biomet	***1,6***
Refobacin Bone Cement R - Biomet	***1,4***
Hi-Fatigue G - Zimmer	***1,4***
Palamed - Heraeus Medical	1,3
Other bone cement without antibiotic	6,2
Other bone cement loaded with antibiotic	***4,6***
Total	**100,0**

Bone cement loaded with antibiotic is used in 44,1% of cases.

15. Complications occurred during hospitalization

The rate of complications in **primary unicompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2012

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Tibial fracture	6	*0,1*	Hematoma	35	*0,5*	Hyperpyrexia	15	*0,2*
						Anemia	13	*0,2*
Fem. fract.	5	*0,1*	Infection	4	*0,1*	Gastro-intestinal	10	*0,1*
						Cardiac	9	*0,1*
			DVT	4	*0,1*	Embolism	6	*0,1*
Anesthesiol.	1	*0,01*				Genito-urinary	6	*0,1*
			SPE paralysis	1	*0,01*	Dyspnoea	4	*0,1*
						Disorientation	3	*0,04*
Other	6	*0,1*	Other	6	*0,1*	Collapse	2	*0,03*
						Other	18	*0,3*
Total	**18**	***0,3***	**Total**	**50**	***0,7***	**Total**	**86**	***1,2***

The rate of complications in **primary bi-tricompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2012

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Fem. fract.	43	*0,1*	Hematoma	547	*1,0*	Anemizzazione	1454	*2,8*
			DVT	102	*0,2*	Hyperpyrexia	317	*0,6*
Ligament lesion	30	*0,1*	Wound dehiscence	43	*0,1*	Genito-urinary	150	*0,3*
			SPE paralysis	42	*0,1*	Gastro-intestinal	154	*0,3*
Tibial fracture	27	*0,05*	Edema	38	*0,1*	Cardiac	139	*0,3*
Anesthesiol.	24	*0,05*	Bed sores	24	*0,05*	Embolism	75	*0,1*
			Bleeding	21	*0,04*	Respiratory	72	*0,1*
Rupture patellar tendon	23	*0,04*	Infection	19	*0,04*	Disorientation	57	*0,1*
Hemorragia	22	*0,04*	Undescended drainage	16	*0,03*			
						Collapse	44	*0,1*
			Instability of ligaments	12	*0,02*	Infarction	38	*0,1*
Tibial tuberosity fracture	7	*0,01*	Prosthesis disloc.	6	*0,01*	Dyspnoea	37	*0,1*
Other	29	*0,1*	Other	81	*0,2*	Other	231	*0,4*
Total	**205**	***0,4***	**Total**	**951**	***1,8***	**Total**	**2.768**	***5,2***

The rate of complications in **revision surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2012

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Tibial fracture	14	*0,4*	Hematoma	64	*1,6*	Anemia	190	*4,8*
			Wound dehiscence	12	*0,3*	Hyperpyrexia	28	*0,7*
Rupture patellar tendon	13	*0,3*	Infection	10	*0,3*	Cardiac	15	*0,4*
						Gastro-intestinal	14	*0,4*
Fem. fract.	11	*0,3*	Prosthesis disloc.	7	*0,2*	Respiratory	11	*0,3*
						Genito-urinary	10	*0,3*
Anesthesiol.	8	*0,2*	SPE paralysis	6	*0,2*	Disorientation	7	*0,2*
						Allergic reaction	6	*0,2*
Tibial tuberosity fracture	6	*0,2*	Bleeding	6	*0,2*	Reaction to transfusion	5	*0,1*
Ligament lesion	1	*0,03*	Edema	5	*0,1*	Embolism	5	*0,1*
			DVT	2	*0,1*	Collapse	4	*0,1*
						Infarction	1	*0,03*
Other	12	*0,3*	Other	10	*0,3*	Other	20	*0,5*
Total	**65**	***1,6***	**Total**	**122**	***3,1***	**Total**	**316**	***7,9***

15.1 Deaths occurred during hospitalization

Rate of deaths in knee prosthetic surgery carried out on patients hospitalized between July 1st 2000 and December 31st 2012.

Registered deaths occurred during hospitalization.

Years 2000-2012			
Type of operation	**Deaths**	**Number of surgery**	**Percentage**
Primary bi/tricompartmental	48	52.868	0,09
Primary unicompartmental	1	6.933	0,01
Revision	7	3.981	0,18
Prosthesis removal	1	870	0,09

16. Analysis of survival of primary surgery

16.1 Cox multivariate analysis

Bi-tri compartmental

The Cox multivariate analysis identifies any variables that are independent from each other that can influence the event, in our case the removal of at least one prosthesis component. Analysis was performed on following independent variables: gender, age at surgery, pathology and type of insert (fix vs mobile).

All primary bi-tri compartmental knee arthroplasties performed in the region between July 2000 and December 2012 only on patients living in the region, were analyzed.

COX PROPORTIONAL RISK MODEL

Variabiles

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

Number of valid observations 34.563
Non revised: 33.570
Revised: 993

Chi-square: 171,94 *p*= 0,0001

VARIABLE	SIGNIFICANCE (P)
Gender (Males vs females)	**NS** (0,342)
Age (less than 70 yrs vs more than 70 yrs)	**S** (0,001)
Diagnosis (arthrosis vs other)	**NS** (0.365)
Type of insert (Fix vs mobile)	**S** (0,001)

The chi-square test, used to test globally the model applied, was significant, which suggested that, on the whole, the variables inserted in the model influenced the outcome of prosthetic surgery. The effect of each variable was compared to the others when equal.

All variables but gender and diagnosis, significantly influence the outcome of surgery. At this point we tested how it acts, either by reducing or increasing the risk.

A relative risk rate below 1 indicated a reduced risk of prosthesis loosening. Conversely, a relative risk rate above 1 indicated an increased risk of prosthesis loosening.

Age	Relative risk rate	Confidence interval 95%		Significance (p)
Less than 70 yrs (reference:more than 70 yrs)	2,2	1,9	2,4	0,001

Liner	Relative risk rate	Confidence interval 95%		Significance (p)
Mobile (reference: Fix)	1,3	1,1	1,4	0,001

Uni-compartmental

All primary uni compartmental knee arthroplasties performed in the region between July 2000 and December 2012 only on patients living in the region and affected by arthrosis, were analyzed.

Variables in the model are: gender, age at surgery and type of tibial component (all poly vs metal back).

Age	Relative risk rate	Confidence interval 95%		Significance (p)
Less than 70 yrs (reference:more than 70 yrs)	1,6	1,2	2,1	0,001

Other variables do not influence the risk (Gender p=0.,2; Type of tibial component p=0,88)

16.2 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 in the second column the number of primary joint arthroplasty operations performed in the period from July 2000 to December 2012; the third and fourth 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
Primary bicompartmental	28.847	482	369	851
Primary tricompartmental	5.716	110	32	142
Primary unicomp.	4.275	192	111	303
Total revision	1.802	95	62	157

In **39,5**% 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.

16.3 Survival curves according to Kaplan Meier

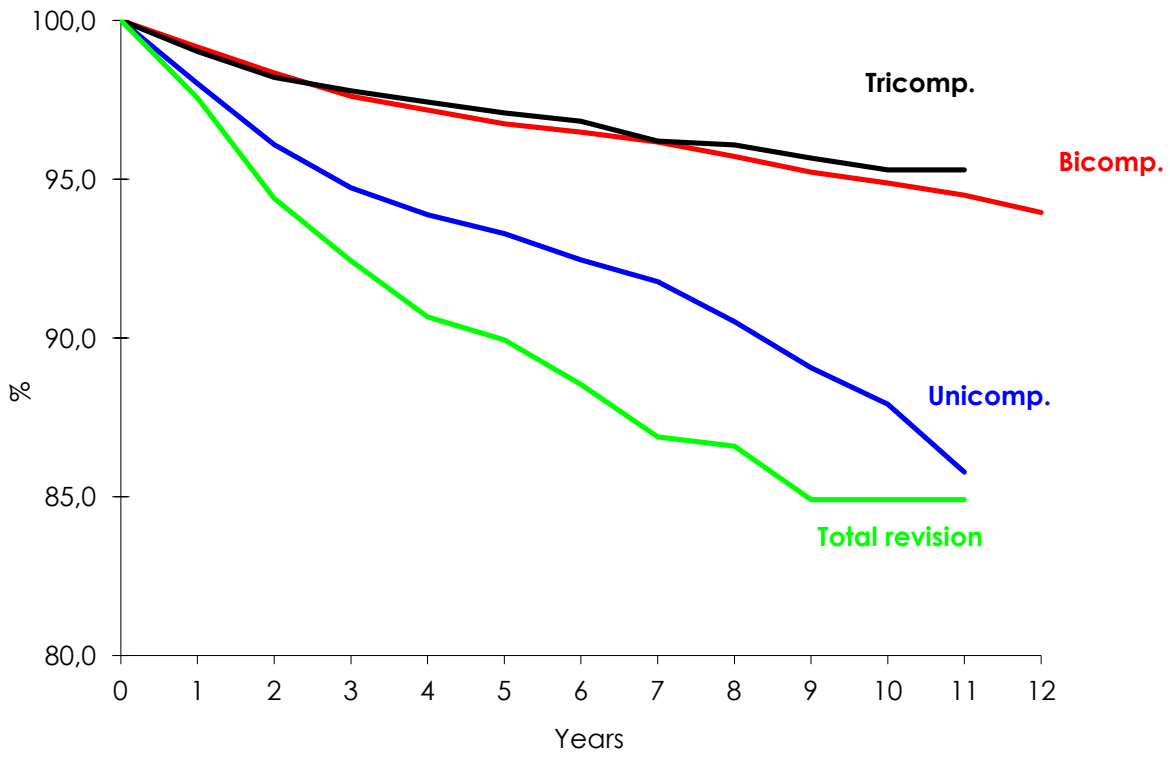
The survival curve calculated by the Kaplan Meier method enables an estimation of the probability that each individual has of maintaining its initial condition (prosthesis in place) over time.
The following paragraphs show the survival curves calculated separately for primary uni, bi/tri compartmental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

16.4 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 operation	N. implants	N. major revisions	N. minor revisions	% revisions	Survival at 11 Yrs (CI)
Primary bicompartmental	28.847	749	102	851/28.847	94,5 (94,0-95,0)
Primary tricompartmental	5.716	120	22	142/5.716	95,3 (94,1-96,5)
Primary unicompartmental	4.275	291	12	303/4.275	85,8 (83,4-88,1)
Total revision	1.802	136	21	157/1.574	84.9 (82,2-87,6)

Survival curve



Survivorship of unicompartmental prostheses is significantly different at 11 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	% distribut. of failure causes
Total aseptic loosening	123/4.275	2,9	40,6
Pain without loosening	48/4.275	1,1	15,8
Tibial aseptic loosening	36/4.275	0,8	11,9
Septic loosening	31/4.275	0,7	10,2
Femoral aseptic loosening	16/4.275	0,4	5,3
Liner wear	14/4.275	0,3	4,6
Breakage of prosthesis	7/4.275	0,2	2,3
Dislocation	5/4.275	0,1	1,7
Bone fracture	4/4.275	0,1	1,3
Instability	2/4.275	0,05	0,7
Unknown	10/4.275	0,2	3,3
Other	7/4.275	0,2	2,3
Total	**303/4.275**	**7,1**	**100,0**

Primary bi-tricompartmental

Cause of revision	Rate	Percentage	% distribut. of failure causes
Total aseptic loosening	311/34.563	0,9	31,3
Septic loosening	255/34.563	0,7	25,7
Pain without loosening	99/34.563	0,3	10,0
Tibial aseptic loosening	93/34.563	0,3	9,4
Dislocation	42/34.563	0,1	4,2
Liner wear	34/34.563	0,1	3,4
Femoral aseptic loosening	31/34.563	0,1	3,1
Instability	24/34.563	0,1	2,4
Stiffness	19/34.563	0,1	1,9
Bone fracture	18/34.563	0,1	1,8
Breakage of prosthesis	8/34.563	0,02	0,8
Unknown	38/34.563	0,1	3,8
Other	21/34.563	0,1	2,1
Total	**993/34.563**	**2,9**	**100,0**

Total revision

Cause of second revision	Rate	Percentage	% distribut. of failure causes
Septic loosening	47/1.802	2,6	29,9
Total aseptic loosening	40/1.802	2,2	25,5
Tibial aseptic loosening	18/1.802	1,0	11,5
Pain without loosening	8/1.802	0,4	5,1
Instability	8/1.802	0,4	5,1
Dislocation	7/1.802	0,4	4,5
Femoral aseptic loosening	6/1.802	0,3	3,8
Liner wear	4/1.802	0,2	2,5
Breakage of prosthesis	3/1.802	0,2	1,9
Trauma	3/1.802	0,2	1,9
Periprosthetic bone fracture	2/1.802	0,1	1,3
Unknown	8/1.802	0,4	5,1
Other	3/1.802	0,2	1,9
Total	**157/1.802**	**8,7**	**100,0**

16.5 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	21.033	563	563/21.033
Mobile	13.504	426	426/13.504

Primary surgery-fixed insert

Cause of revision	Rate	Percentage	% distribut. of failure causes
Septic loosening	162/21.033	0,8	28,8
Total aseptic loosening	158/21.033	0,8	28,1
Pain without loosening	56/21.033	0,3	9,9
Tibial aseptic loosening	53/21.033	0,3	9,4
Liner wear	21/21.033	0,1	3,7
Primary instability	17/21.033	0,1	3,0
Bone fracture	15/21.033	0,1	2,7
Dislocation	15/21.033	0,1	2,7
Femoral aseptic loosening	15/21.033	0,1	2,7
Stiffness	11/21.033	0,1	2,0
Breakage of prosthesis	5/21.033	0,02	0,9
Other	14/21.033	0,1	2,5
Unknown	21/21.033	0,1	3,7
Total	**563/21.033**	**2,7**	**100,00**

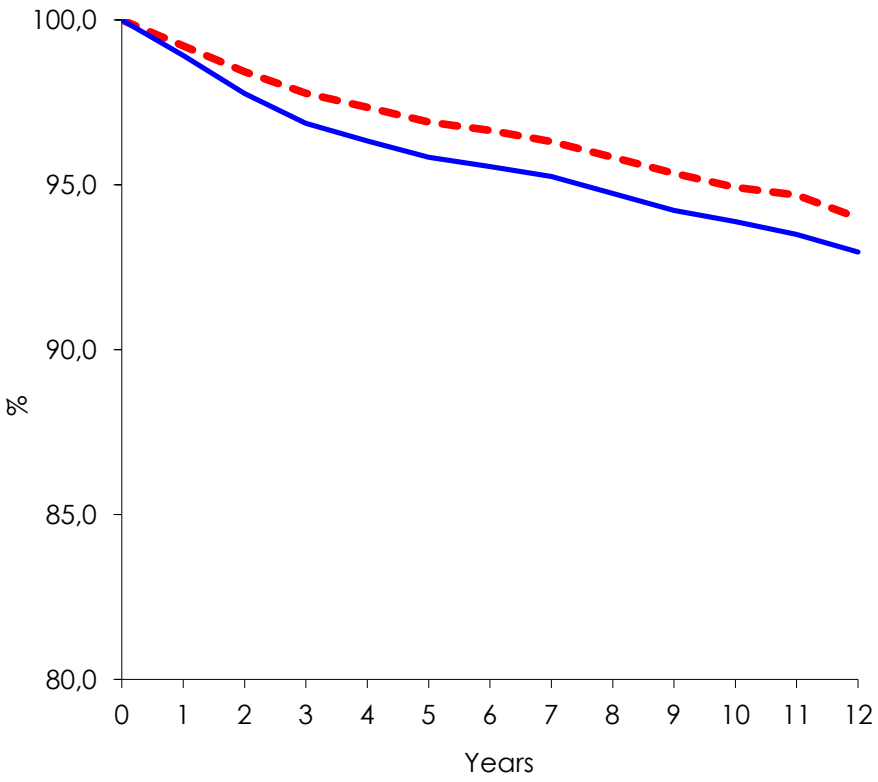
Primary surgery – mobile insert

Cause of revision	Rate	Percentage	% distribut. of failure causes
Total aseptic loosening	150/13.504	1,1	35,2
Septic loosening	93/13.504	0,7	21,8
Pain without loosening	43/13.504	0,3	10,1
Tibial aseptic loosening	39/13.504	0,3	9,2
Dislocation	27/13.504	0,2	6,3
Femoral aseptic loosening	16/13.504	0,1	3,8
Liner wear	13/13.504	0,1	3,1
Stiffness	8/13.504	0,1	1,9
Primary instability	7/13.504	0,1	1,6
Bone fracture	3/13.504	0,02	0,7
Breakage of prosthesis	3/13.504	0,02	0,7
Other	7/13.504	0,1	1,6
Unknown	17/13.504	0,1	4,0
Total	**426/13.504**	**3,2**	**100,0**

16.6 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 273 cases (out 28.847 bicompartmental prostheses recorded in the RIPO).
The mean time lapse between primary bicompartmental arthroplasty and implanting the patella was 1,9 years (CI at 95% 1,7-2,1).
These 273 re-operations were not considered as failures of the bicompartmental prosthesis as in dotted line. For comparison, when resurfacing is considered a failure, the survival is treaced as solid line
Survival at 12 yrs is 93,0% and 94,0% respectively.

11% of the 273 cases that underwent the addition of patella resurfacing, have been successively revised



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

In **bold** all poly

Type	Starting Year	n.	n. failures	% survival at 5	c.i. at 95%	% survival at 10	c.i. at 95%
OXFORD UNICOMPARTIMENTAL PHASE 3 - Biomet Merck	2000	817	85	91,7	89,7 -93,7	85,8	82,4-89,3
GENESIS UNI - Smith & Nephew	2000	603	36	93,5	91,2-95,7	88,6	82,9-94,4
ZIMMER UNI - Zimmer	2005	328	8	97,5	95,5-99,5	-	-
EFDIOS - Citieffe	2000	314	37	92,8	89,7-95,9	83,6	78,2-89,0
MITUS - ENDO-MODEL UNI – ALL POLY - Link	2003	246	19	92,4	88,9-95,9	88,9	82,8-95,1
ALLEGRETTO UNI - Protek-Sulzer	2000	231	17	93,6	90,2-97,0	91,1	87,0-95,2
PRESERVATION UNI – ALL POLY - DePuy	2002	185	16	92,4	88,5-96,4	90,0	85,3-94,7
UC-PLUS SOLUTION - Smith & Nephew	2000	177	7	97,1	94,7-99,6	-	-
HLS - UNI EVOLUTION - ALL POLY - Tornier	2001	144	9	95,3	91,7-99,0	91,0	85,0-97,0
UC-PLUS SOLUTION – ALL POLY - Smith & Nephew	2004	140	8	92,1	86,7-97,6	-	-
UNI SIGMA HP - ***DePuy***	2009	137	2	-	-	-	-
JOURNEY UNI - ALL POLY - Smith & Nephew	2010	131	-	-	-	-	-
GKS - ONE – Permedica	2006	128	3	97,6	94,8-100,0	-	-
OPTETRAK UNI – ALL POLY -Exactech	2005	128	2	99,1	97,3-100,0	-	-
MILLER GALANTE UNI - Zimmer	2001	118	6	96,6	93,3-99,9	92,5	86,2-98,9
Other (models with less than 100 cases)	2000	429	47	86,9	83,1-90,7	81,4	74,9-88,0
Unknown	2000	19	1	-	-	-	-
Total	**2000**	**4.275**	**303**	**93,3**	**92,4-94,1**	**87,9**	**86,2-89,6**

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

Type	Starting Year	N.	n. failures	% survival at 5	c.i. at 95%	% survival at 10	c.i. at 95%
NEXGEN – Zimmer	2001	8.328	181	97,8	97,4-98,1	96,3	95,7-97,0
GENESIS II– Smith&Neph	2000	2.950	49	97,6	96,9-98,3	96,3	94,5-98,2
P.F.C – DePuy	2000	2.917	71	97,3	96,6-98,0	96,0	94,9-97,1
PROFIX– Smith&Neph	2000	2.869	102	96,9	96,2-97,6	95,3	94,3-96,3
VANGUARD - Biomet Merck France	2005	2.141	40	96,8	95,7-97,9	-	-
TC-PLUS - SOLUTION - Smith & Nephew	2002	1.601	31	96,5	95,2-97,9	-	-
SCORPIO – Stryker Howmedica	2002	1.543	55	95,8	94,7-97,0	95,2	93,9-96,5
GEMINI MKII–Link	2002	1.495	29	97,6	96,6-98,5	90,6	79,1-100,0
TRIATHLON – Stryker Howmedica Osteonics	2005	948	15	97,4	96,0-98,7	-	-
LCS – DePuy	2000	786	26	96,7	95,4-98,1	95,8	94,0-97,7
OPTETRACK – Exactech	2000	702	27	95,9	94,3-97,5	93,8	90,9-96,7
GENUS – Adler-Ortho	2008	690	13	97,7	96,4-98,9	-	-
ROTAGLIDE–Corin	2000	656	41	94,0	92,0-96,0	92,1	89,6-94,7
FIRST - Symbios Orthopedie Sa	2006	577	18	94,6	91,6-97,5	-	-
GENIUS TRICCC – Dedienne Santé	2000	575	36	94,5	92,4-96,5	91,0	87,8-94,1
INTERAX – Stryker Howmedica	2000	569	52	94,4	92,5-96,3	88,7	85,6-91,9
T.A.C.K. – Link	2000	529	42	94,1	92,1-96,2	91,8	89,4-94,3
ADVANCE – Wright	2000	521	20	95,9	94,1-97,7	95,5	93,6-97,5
SCORE– Amplitude	2004	437	8	98,3	97,1-99,6	-	-
HLS - NOETOS - Tornier	2002	316	6	98,1	96,4-99,8	-	-
MULTIGEN -Lima	2001	295	17	94,9	92,3-97,5	-	-
AGC – Kirschner Biomet Merck	2000	278	10	97,4	95,4-99,3	95,3	92,0-98,6
GSP - TREKKING - Samo	2005	261	5	97,3	95,0-99,7	-	-
ENDO-MODEL Link	2000	253	11	95,3	92,2-98,4	93,7	90,0-97,4
BALANSYS-Mathys	2005	225	6	96,1	93,0-99,3	-	-
GKS– Permedica	2001	200	5	97,1	94,1-100	95,6	91,5-99,7
DURACON II – Stryker Howmedica	2000	198	8	96,9	94,5-99,4	95,3	92,0-98,6
INNEX - Protek	2002	180	3	95,2	89,0-100	-	-
913 – Wright Crem	2000	156	5	98,7	96,9-100	96,3	93,1-99,5
RO.C.C. – Biomet Merck France	2003	149	15	91,1	86,5-95,7	-	-
JOURNEY- Smith&Neph	2006	147	7	94,2	90,1-98,4	-	-
COLUMBUS-B.Braun	2007	145	3	94,6	87,1-100	-	-
RT-PLUS- Endoplus	2005	110	5	89,6	77,6-100	-	-
Other (modelli con meno di 100 casi)	2000	756	27	95,8	94,1-97,6	93,9	91,4-96,5
Unknown	2000	60	4	96,1	90,8-100	-	-
Total	**2000**	**34.563**	**993**	**96,8**	**96,6-97,0**	**94,9**	**94,5-95,3**

PART THREE: SHOULDER PROSTHESIS

July 2008 – December 2012

17. RIPO capture

17.1 Capture for RIPO

Percentage of R.I.P.O. capture calculated versus Discharge Records (S.D.O.) was **98,7** in 2012. Data are referred to primary total prosthesis (8180), hemiarthroplasty (8181), revision (8197) and prosthesis removal (8001).

17.2 Ratio public/private treatment

Percentage of implants performed in public hospitals.

% of operations performed in public hospitals (AUSL, AOSP, IRCCS)			
Year of surgery	**Primary arthroprosthesis**	**Revision/ removal**	**Hemiarthroplasty**
2008	73,9	100,0	93,0
2009	65,7	93,3	83,6
2010	59,6	81,3	84,6
2011	49,1	66,7	87,1
2012	58,3	69,2	90,8

From database SDO

18. Type of operation

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to **type**

Type of operation	Number of operation	Percentage
Inverse prosthesis	1.268	51,4
Hemiarthroplasty	574	23,3
Resurfacing	213	8,6
Anatomical prosthesis	208	8,4
Revisions	161	6,5
Prosthesis removal	30	1,2
Other	14	0,6
Total	**2.468**	**100,0**

19. Descriptive statistics of patients

19.1 Gender

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to **type of operation** and **gender** of patients.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Inverse prosthesis	274	21,6	994	78,4	1.268
Hemiarthroplasty	167	29,1	407	70,9	574
Resurfacing	103	48,4	110	51,6	213
Anatomical prosthesis	77	37,0	131	63,0	208
Revisions	55	34,2	106	65,8	161
Prosthesis removal	11	36,7	19	63,3	30
Total	**687**	**28,0**	**1.767**	**72,0**	**2.454**

19.2 Age

Mean age of patients, according to gender

	Males		Females	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Inverse prosthesis	71,6	33-87	74,0	49-100
Hemiarthroplasty	61,9	23-91	73,9	41-97
Resurfacing	52,8	17-96	62,0	21-82
Anatomical prosthesis	63,7	47-79	66,7	35-101
Revisions	62,5	34-84	69,7	44-84

19.3 Pathologies

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to **type of operation** and **diagnosis** of patients.

Diagnosis	Total reverse arthroplasty	
	N.	%
Eccentric osteoarthritis	657	51,8
Concentric osteoarthritis	209	16,5
Fracture	202	15,9
Non specified osteoarthritis	75	5.9
Sequelae of fracture	35	2,8
Necrosis	34	2,7
Reumatic arthritis	14	1,1
Joint reccurent dislocation	14	1,1
Post-traumatic arthritis	6	0,5
Pain	3	0,2
Sequelae of septic arthritis	3	0,2
Recurrent dislocation	2	0,2
Unknown	*2*	*0,2*
Other	*12*	*0,9*
Total	**1.268**	**100,0**

Diagnosis	Anatomical prosthesis	
	N.	%
Concentric osteoarthritis	171	82,2
Eccentric osteoarthritis	12	5,8
Reumatic arthritis	7	3,4
Necrosis	6	2,9
Fracture	4	1,9
Non-specified osteoarthritis	3	1,4
Sequelae of fracture	3	1,4
Other	*2*	*1,0*
Total	**208**	**100,0**

Diagnosis	Hemiarthroplasty	
	N.	%
Fracture	357	62,2
Concentric osteoarthritis	65	11,3
Eccentric osteoarthritis	51	8,9
Necrosis	37	6,4
Sequelae of fracture	25	4,4
Dislocation	7	1,2
Reumatic arthritis	5	0,9
Sequelae of septic arthritis	5	0,9
Pathological fracture	4	0,7
Post-traumatic necrosis	4	0,7
Osteomielitis	2	0,3
Post-traumatic arthritis	1	0,2
Unknown	*2*	*0,3*
Other	*9*	*1,6*
Total	**574**	**100,0**

Diagnosis	Resurfacing	
	N.	%
Concentric osteoarthritis	105	49,3
Necrosis	43	20,2
Eccentric osteoarthritis	31	14,6
Non specified osteoarthritis	8	3,8
Sequelae of fracture	7	3,3
Necrosis (idiopathic, steroid-induced, post traumatic)	5	2,3
Dislocation	3	1,4
Reumatic arthritis	3	1,4
Fracture	2	0,9
Post-traumatic arthritis	1	0,5
Sequelae of septic arthritis	1	0,5
Other	*4*	*1,9*
Total	**213**	**100,0**

Number of **shoulder revisions** carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to **diagnosis** and **type of revision.**

Diagnosis	N.	%
Glenoid erosion	30	18,6
Humeral loosening	21	13,0
Two steps revision	20	12,4
Anterior instability	16	9,9
Glenoid loosening	15	9,3
Pain	11	6,8
Superior instability	9	5,6
Dislocation	8	5,0
Cuff lesion	6	3,7
Instability	5	3,1
Septic loosening	4	2,5
Periprosthetic bone fracture	3	1,9
Total aseptic loosening	2	1,2
Eccentric osteoarthritis	1	0,6
Other	*8*	*5,0*
Unknown	*2*	*1,2*
Total	**161**	**100,0**

Type of revision	N.	%
From hemi to reverse	40	24,8
From reverse to reverse	24	14,9
Implant after removal	20	12,4
From anatomic to reverse	15	9,3
From resurfacing to reverse	10	6,2
From hemi to hemi	8	5,0
From reverse to anatomic CTA	7	4,3
From resurfacing to anatomic	6	3,7
From anatomic to anatomic	4	2,5
From resurfacing to resurfacing	4	2,5
From hemi to anatomic	4	2,5
From reverse to anatomic	2	1,2
From resurfacing to hemi	1	0,6
From reverse to hemi	1	0,6
Other	15	9,3
Total	**161**	**100,0**

20. Surgical technique, anesthesia and antithromboembolic prophylaxis

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to **surgical approach.**

Type of operation	Deltoideo-pectoral	Trans-deltoid	Superior lateral
Anatomical prosthesis	202	3	-
Inverse prosthesis	1.119	88	44
Hemiarthroplasty	555	14	-
Resurfacing	202	6	-
Prosthesis removal	28	1	-
Revision	151	6	-
Total*	**2.257**	**118**	**44**

*35 missing data (1,4%)

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to **anesthesia.**

Anesthesia	N.	%
Mixed	984	43,9
General	1.175	52,5
Loco-regional	81	3,6
Total*	**2.240**	**100,0**

*228 missing data (9,2%)

Antithromboembolic prophylaxysis
Eparin is used in 76,0% of primary surgery, no prophylaxis in 11,0%, oral prophylaxis in 1,5% and datum is missing in 11,5%.

20.1 Type of prosthesis

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to **type of prosthesis** and **stem fixation**

Stem fixation	Anatomical prosthesis	%	Inverse prosthesis	%	Hemiarthroplasty	%
Cemented	27	13,0	315	24,8	256	45,0
Cementless	181	87,0	953	75,2	313	55,0
Total*	**208**	**100,0**	**1268**	**100,0**	**569**	**100,0**

*5 missing data

Glenoid was cemented in 38,5% of cases.

20.2 Type of prosthesis

Number of **primary** shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to the **type of prosthesis**.

Model of prosthesis	Inverse prosthesis		Anatomical prosthesis + Hemiarthroplasty	
	N	%	N	%
Delta Xtend - DePuy	519	40,9	42	5,4
SMR Alettato– Lima	329	25,9	258	33,0
Aequalis Rivestito - Tornier	102	8,0	3	0,4
Aequalis Cementato - Tornier	70	5,5	8	1,0
SMR Cementato – Lima	56	4,4	74	9,5
Anatomical Shoulder - Zimmer	39	3,1	45	5,8
Affinis – Mathys	37	2,9	11	1,4
Trabecular Metal Reverse – Zimmer	26	2,1	-	-
Delta CTA - DePuy	21	1,7	-	-
Promos - Plus orthopedics AG	15	1,2	6	0,8
T.E.S.S - Biomet	13	1,0	2	0,3
Comprehensive - Biomet	11	0,9	7	0,9
Equinoxe Primary - Exactech	7	0,6	1	0,1
SMR Revision – Lima	5	0,4	7	0,9
Anatomical Shoulder Fracture - Zimmer	3	0,2	26	3,3
Aequalis Fracture – Tornier	2	0,2	8	1,0
Verso Shoulder System - Biomet	1	0,1	-	-
Aequalis Ascend - Tornier	1	0,1	24	3,1
Bigliani/Flatow - Zimmer	-	-	145	18,5
Anatomica LTO - Lima	-	-	35	4,5
Global FX - DePuy	-	-	33	4,2
Global Advantage - DePuy	-	-	20	2,6
Modular NEER 3 – Smith & Nephew	-	-	8	1,0
M.R.S. - Biompianti	-	-	7	0,9
Other (models < 5 cases)	*10*	*0,8*	*12*	*1,5*
Unknown	*1*	*0,1*	-	-
Total	**1.268**	**100,0**	**782**	**100,0**

Number of **shoulder** resurfacing carried out on patients with admission date between 1st July 2008 and 31st December 2012, according to the **type of prosthesis**.

Model of prosthesis	Resurfacing	
	N	%
T.E.S.S - Biomet	73	34,3
SMR RESURFACING - Lima	40	18,8
ECLIPSE - Arthrex	23	10,8
EPOCA RH - Synthes	21	9,9
COPELAND SHOULDER - Biomet	19	8,9
GLOBAL CAP – DePuy	13	6,1
T.E.S.S. INVERSA - Biomet	5	2,3
AEQUALIS RESURFACING - Tornier	4	1,9
DUROM SHOULDER - Zimmer	4	1,9
PyroTITAN - Ascension Orthopedics	4	1,9
SIDUS - Zimmer	2	0,9
AFFINIS SHORT – mathys	1	0,5
CAPICA - Implantcast	1	0,5
COMPREHENSIVE Versa-Dial - Biomet	1	0,5
HEMICAP - Arthrosurface	1	0,5
VERSO - Biomet	1	0,5
Total	**213**	**100,0**

21. Duration of pre and post-operative hospitalization

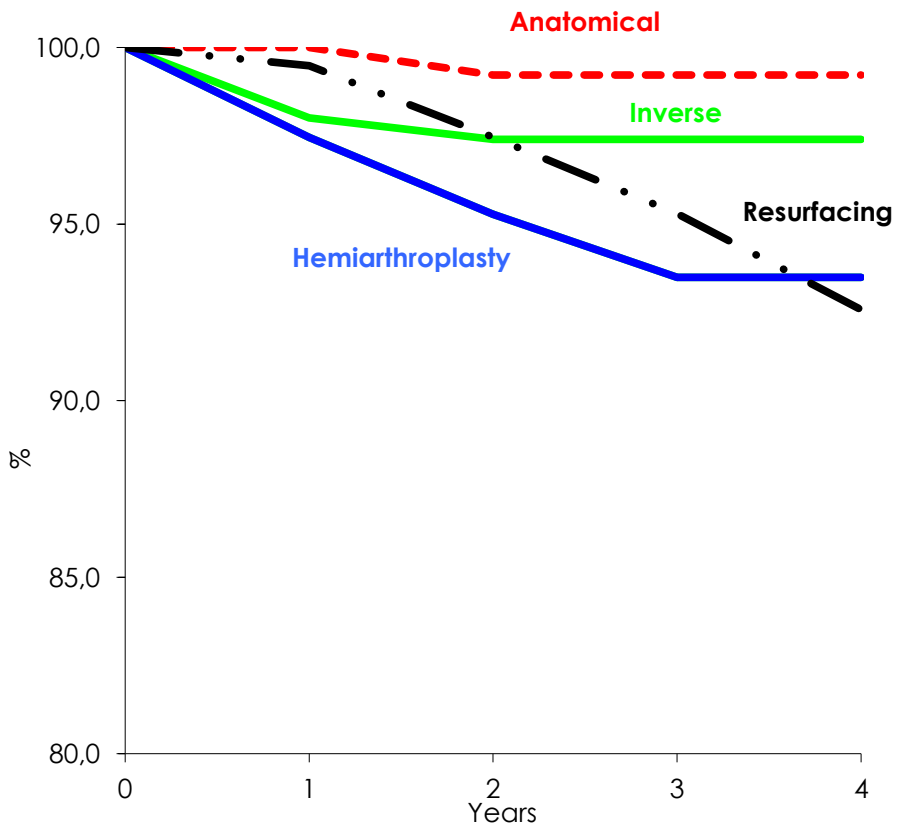
Year 2012			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean post-op. (range)**
Inverse prosthesis	432	1,5 (0-52)	5,9 (0-72)
Hemiarthroplasty	125	3,5 (0-45)	8,0 (2-64)
Resurfacing	40	0,6 (0-2)	5,0 (2-22)
Anatomical prosthesis	58	0,3 (0-2)	3,4 (2-7)
Revisions	47	0,9 (0-6)	6,4 (2-70)

Year 2012			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean post-op. (range)**
Elective	452	0,9 (0-45)	5,5 (0-66)
Emergency	163	4,4 (0-52)	7,7 (2-72)

22. Survival analysis

Analysis was performed on all patients, and not only on the resident in Regione Emilia Romagna, as for all the other survival analyses of present report

Type of operation	Number of impants	Number of revisions	Survial at 4 yrs (C.I. 95%)
Anatomical prosthesis	208	1	99,2 (97,7-100,0)
Inverse prosthesis	1.268	25	97,4 (96,4-98,4)
Hemiarthroplasty	574	25	93,5 (90,9-96,1)
Resurfacing	213	7	92,6 (86,1-99,0)



Difference is not statisically significant (p=0,06 Wilcoxon Test).

Anatomical prosthesis			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Breakage of liner	**1**/208	0,48	100,0
Total	**1/208**	**0,48**	**100,0**
Inverse prosthesis			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Instability	**11**/1.268	0,9	44,0
Glenoid loosening	**6**/1.268	0,5	24,0
Dislocation	**4**/1.268	0,3	16,0
Septic loosening	**2**/1.268	0,2	8,0
Sequelae of fracture	**1**/1.268	0,1	4,0
DIslocation	**1**/1.268	0,1	4,0
Total	**25/1.268**	**2,0**	**100,0**
Hemiarthroplasty			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Septic loosening	**7**/574	1,2	28,0
Pain	**4**/574	0,7	16,0
Glenoid erosion	**4**/574	0,7	16,0
Anterior instability	**3**/574	0,5	12,0
Dislocation	**2**/574	0,3	8,0
Superior instability	**2**/574	0,3	8,0
Homeral component loosening	**1**/574	0,2	4,0
Total aseptic loosening	**1**/574	0,2	4,0
Periprosthetic bone fracture	**1**/574	0,2	4,0
Total	**25/574**	**4,4**	**100,0**
Resurfacing			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Pain	**3**/213	1,4	43,0
Glenoid erosion	**3**/213	1,4	43,0
Superior instability	**1**/213	0,5	14,0
Total	**7/213**	**3,3**	**100,0**