REPORT of R.I.P.O.

Regional Register of Orthopedic Prosthetic Implantology

OVERALL DATA

HIP, KNEE AND SHOULDER ARTHROPLASTY

IN EMILIA-ROMAGNA REGION (ITALY)

1st January 2000 – 31st December 2013

VERSION 1 OF THE 2nd JANUARY 2015

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA

Foreword

This is the 14th 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 2013**.
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 129.000 hip, 73.000 knee and 3.000 shoulder prostheses have been reported from 68 Orthopedic Units in 59 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.
The dissemination of the results of the statistical analysis is carried out through this report that is made available on the web (https://ripo.cineca.it), through scientific publications and through ad hoc reports required by surgeons and health departments. In addition to this, the authorized parties (responsible of Units and Health Management) have access to a system of self-made on-line analysis.

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 region 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.
During 2014, missing data about arthroplasty interventions of past years was requested, in particular for a possible revision. Nevertheless, for this report, not every missing data requested was received. For this, we have an uncertainty about final analysis, moreover the same or lower than other Register of Orthopedic Prosthetic.

As far as concerns the **reliability** of the data given, RIPO handles two types of data: incontrovertible data, 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 Emilia-Romagna region; 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
We have registered data about primary THA, resurfacing, hemiarthroplasty and partial or total revision.
During 2013 primary THA was performed in nearly 6.500 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 yrs for women and 66 yrs for men).
In 2013, as in past years, 100 different types of cup and 125 of stem were used; 21 and 27 of them are 'new', not implanted in previous years. 34% of the stems had a modular neck, slightly decreasing compared to past years.

Uncemented prostheses were 62% in year 2000 and 95% in year 2013, whilst hybrid fixation was 22% and it is now 3%. Cemented prostheses are now only 1%, and they were 15% in year 2000.
Most common articular coupling is ceramic on ceramic, that in 2013 represents 62% of primary surgery (it was 20% in 2000), second most common is ceramic on poly (27%). Metal on poly, that was 41% in 2001, is now reduced to 10%.
During 2013, most common articular coupling in patient until 79 years old is ceramic on ceramic, in patient more than 80 years old is ceramic on poly. Metal on metal articular coupling was almost entirely disused. Diameter of heads implanted during 2013 is major or equal to 32 mm for 90% of cases.

The survival of the hip prostheses is confirmed at very high levels, 91,1% of prostheses implanted in Emilia-Romagna region on resident patients are still in place 14 years after the operation.
Part (75%) of the 2.391 revisions is major revisions, where at least one component interfacing with bone, has been revised. The remaining 25% are minor revisions (liner, head, and modular neck).
Revision carried out outside Emilia-Romagna region was considered apart because causes of failure are not always known.
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.
Partially confirming past years results, multivariate analysis demonstrated that survival is lower for males (1,2 than females) and young patients. Survival is influenced also from diagnosis: is greater for rare pathology and for prosthesis breakage.
At maximum 14 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 from 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 regional mean. In the analysis of single stems or cups, very few have survival slightly lower than the regional mean, barely statistically significant.
It is evident that survival of cups and stems carried out less than 300 cases is lower than survival of cups and stems carried out frequently.
Total revisions are not revised the second time in 85% of cases at 14 yrs.

Survival of resurfacing, at 10 years, is slightly lower than THA (88,5%, statistically significant). This datum is affected by the recall of a particular model of prostheses, the ASR Depuy.
The most frequently implanted resurfacing, on the contrary, shows survival comparable to conventional THA.

Hemiarthroplasty has an optimal survival of the implant (96,2% at 14 years) even if it is burdened by a high rate of patient's deaths due to age and general conditions of the patients. Hemiarthroplasty with acetabular buffer represented a very little number for analysis.

Knee
High percentage of primary knee prostheses is implanted in private structures (65% in 2013 vs 43% in 200).
In 2013, 12% of implanted prostheses are unicompartmental, 69% are bicompartmental with no patella resurfacing and the remaining 19% have patella resurfacing. The number of prostheses with patella are increasing, in particular in public hospital.
In 2013, 96,7% of implants are cemented, in 45% of them cement is antibiotic loaded.
Posterior Stabilization of insert is slightly increasing (61,9% during last year) compared to minimally stabilized. Mobilie insert are decreasing (35,6% in 2013).

Types of implanted prostheses are less numerous and more stable during years compared to hip. Survival of bicompartmental is 94,3% at 12 yrs, survival of tricompartmental is 95,0% and survival of unicompartmental is significantly lower (86,5%). 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 (300 patella resurfacing in 30.000 bicompartmental prostheses).
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. For total implants, septic loosening represents one-third of causes of failure.
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 insert is worse than fixed insert). 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 (5 years and half).
Interesting data are emerging particularly for types of prosthesis and epidemiology of surgery. Reverse prosthesis is the most frequently implanted one (55%). Women are more affected than men, either for fracture and elective surgery.
Mean age at surgery for reverse prostheses is 74 for women and 71,7 for men. Patients are younger in anatomic prostheses (respectively 66 and 63). In hemiarthroplasty women are much older than men (73 vs 61).
Reverse prosthesis is implanted mainly in arthrosis (eccentric osteoarthritis in particular) and in fracture (17%).
Anatomic prosthesis is implanted in concentric arthrosis (82%), while hemiartrhoplasties treat both fractures (61%) and arthrosis.
Fixation is mainly cementless for total and anatomic prosthesis; for hemi the percentage of cemented is 41%.
Survival at 5 yrs is 99,4% for anatomical, 96,9% for reverse and 94,2% for hemi, 95,0% for resurfacing (less implanted the other types of prosthesis).

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 2014.

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Pres. Val D'Arda, Fiorenzuola D'Arda	Dr. Luigi Bisogno	Dr. Stefano Cervi Sig.ra Maria Fava
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Province of Parma

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Ospedale di Mirandola	Dr. Franco Boselli	Sig. Gabriele Palumbo Sig.ra Adriana Cestari
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Ospedale privato "San Pier Damiano"	Dir. San. Dr. Roberto Nonni	Sig.ra Elena Ravagli

Province of Forlì-Cesena

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

Bologna, 1st december 2014

PART ONE: HIP PROSTHESES

January 2000 – December 2013

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 **97,5**% in the year 2013. 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
2013	67,4	99,5	74,9

From SDO database

Number of primary total hip replacements on patients resident in Emilia-Romagna region			
Year of surgery	**Private Hospital in Emilia-Romagna region***	**Public Hospitals in Emilia-Romagna region***	**Hospital outside Emilia-Romagna region****
2000	600	2.707	346
2001	636	2.886	355
2002	608	2.979	330
2003	812	3.075	386
2004	831	3.167	377
2005	907	3.333	440
2006	941	3.455	437
2007	1.058	3.562	412
2008	1.031	3.664	435
2009	1.086	3.854	434
2010	1.032	3.754	488
2011	1.025	3.612	550
2012	1.036	3.642	568
2013	1.067	3.608	697

*From RIPO database
** From SDO database (surgery code 8151;74;75;76;85;86)

Number of primary total hip replacements on patients resident outside Emilia-Romagna region		
Year of surgery	**Private Hospital in Emilia-Romagna region***	**Public Hospitals in Emilia-Romagna region***
2000	341	725
2001	313	753
2002	345	711
2003	395	764
2004	535	826
2005	522	804
2006	563	876
2007	771	863
2008	825	862
2009	866	935
2010	869	941
2011	824	924
2012	987	878
2013	1.124	876

* From RIPO database

2. Types of surgery

Number of hip surgeries carried out on patients with admission date between 1st January 2000 and 31st December 2013, according to **type of surgery**.

Type of surgery	Number of surgeries	Percentage
Primary THA	80.870	62,7
Hemiarthroplasty	31.725	24,6
Total and partial revision*	12.817	9,9
Resurfacing	1.972	1,5
Prosthesis removal	908	0,7
Hemiarthroplasty with buffer°	118	0,1
Other	570	0,4
Total	**128.980**	**100,0**

° acetabular buffer

***** 3.651 total revision, 5.221 cup revisions, 2.392 stem revisions, 1.553 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
2013	261

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	4.373		744	
2001	4.588	4,9	857	15,2
2002	4.643	1,2	870	1,5
2003	5.046	8,7	862	-0,9
2004	5.359	6,2	859	-0,3
2005	5.566	3,9	827	-3,7
2006	5.833	4,8	944	14,1
2007	6.253	7,2	1.018	7,8
2008	6.343	1,4	984	-3,3
2009	6.686	5,4	989	0,5
2010	6.576	-1,6	1.032	4,3
2011	6.386	-2,9	915	-11,3
2012	6.543	2,5	1.003	9,6
2013	6.675	2,0	913	-9,0

3. Descriptive statistics of patients

3.1 Age

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2013, 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	2.520	3,1	5.186	6,4	11.605	14,4	23.251	28,8	29.465	36,4	8.839	10,9	**80.866**
Hemiarthroplasty	20	0,1	58	0,2	184	0,6	990	3,1	7.153	22,5	23.319	73,5	**31.724**
Revision	252	2,0	540	4,2	1.359	10,6	3.182	24,8	5.116	39,9	2.368	18,5	**12.817**
Resurfacing	266	13,5	519	26,3	678	34,4	412	20,9	94	4,8	3	0,2	**1.972**
Prosthesis removal	34	3,7	48	5,3	95	10,5	234	25,8	342	37,7	155	17,1	**908**
Hemiarthroplasty with buffer	-	-	2	1,7	3	2,5	15	12,7	36	30,5	62	52,5	**118**
Other	27	4,7	35	6,1	73	12,8	140	24,6	194	34,0	101	17,7	**570**
Total*	**3.119**	**2,4**	**6.388**	**5,0**	**13.997**	**10,9**	**28.224**	**21,9**	**42.400**	**32,9**	**34.847**	**27,0**	**128.975**

*5 missing data

Percentage of Hemiarthroplasty carried out on patients more than ninety-year-old is 14,7%.

Mean age at surgery

Type of operation	Mean age	Range
Primary THA	66,6	12-101
Hemiarthroplasty	83,3	20-109
Resurfacing	52,0	15-82
Revision	69,8	15-100

Mean age of patients, per type of operation, comparison 2000-2013

	Year 2000		Year 2013	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Primary THA	66,0	16-99	66,7	13-95
Hemiarthroplasty	82,4	35-104	84,7	39-104
Revision	68,6	22-97	70,2	29-98

	Year 2003		Year 2013	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Resurfacing	49,7	18-72	53,1	23-80

Mean age at surgery of patients affected by coxarthrosis according to gender and year of surgery

	THA			
	Year 2000		Year 2013	
Gender	Mean age	Range	Mean age	Range
Males	67,2	34-92	66,3	32-91
Females	68,9	31-93	70,0	20-95

3.2 Gender

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2013, according to **type of operation** and **gender of patient**.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Primary THA	32.099	39,7	48.771	60,3	**80.870**
Hemiarthroplasty	8.003	25,2	23.722	74,8	**31.725**
Revision	4.289	33,5	8.528	66,5	**12.817**
Resurfacing	1.409	71,5	563	28,5	**1.972**
Removal	367	40,4	541	59,6	**908**
Hemiarthroplasty with buffer	25	21,2	93	78,8	**118**
Other	248	43,5	322	56,5	**570**
Total	**46.440**	**36,0**	**82.540**	**64,0**	**128.980**

3.3 Side of surgery

Coxarthrosis more often affects right hip (56,4%). 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	52,9	58,9
Left	47,1	41,1

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

3.4 Diseases treated with total hip arthroplasty

Number of **primary total hip arthroplasty** operations carried out on patients with admission date between 1st January 2000 and 31st December 2013, according to **diagnosis**

Diagnosis in primary arthroplasty	Number	Percentage
Primary arthritis	54.422	67,6
Sequelae of LCA and DCA	8.484	10,5
Femoral neck fracture	7.229	9,0
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	4.734	5,9
Post traumatic arthritis	1.911	2,4
Post traumatic necrosis	1.072	1,3
Rheumatic arthritis	938	1,2
Femoral neck fracture sequelae	689	0,9
Epiphysiolysis sequelae	223	0,3
Perthes disease sequelae	192	0,2
Septic coxitis sequelae	155	0,2
Tumor	121	0,2
Paget disease	80	0,1
TBC coxitis sequelae	56	0,1
Other	259	0,3
Total**	**80.565**	**100,0**

**305 missing data (0,4%)
Prostheses for bone tumor resection are not registered by R.I.P.O.
In 97,6% of hemi diagnosis was femoral neck fracture.

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

Diagnosis in primary arthroplasty	Percentage		
	2000-2004	2005-2009	2010-2013
Primary arthrosis	65,8	67,7	69,0
Sequelae of LCA and DCA	12,8	10,1	8,9
Femoral neck fracture	8,7	9,1	9,1
Idiopathic femoral head necrosis	5,6	6,0	6,1
Post traumatic arthritis	2,5	2,4	2,2
Post traumatic necrosis	1,5	1,3	1,2
Rheumatic arthritis	1,4	1,1	1,0
Other	1,7	2,3	2,5
Total	**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	13,4	37,6	57,6	72,5	75,9	72,7
Sequelae of LCA and DCA	30,4	31,9	20,4	9,3	4,6	2,4
Femoral neck fracture	1,8	2,9	5,7	8,4	11,1	13,3
Idiopathic femoral head necrosis	18,3	11,9	7,3	4,4	4,3	6,0
Post traumatic arthritis	10,2	6,3	3,3	2,0	1,3	1,2
Post traumatic necrosis	8,0	2,6	1,6	0,9	0,7	1,4
Rheumatic arthritis	5,3	2,0	1,4	1,0	0,8	0,6

Femoral neck fracture sequelae	1,5	1,1	0,7	0,5	0,7	2,0
Epiphysiolysis sequelae	3,7	1,1	0,4	0,1	0,0	0,0
Perthes disease sequelae	2,7	0,9	0,3	0,1	0,0	0,0
Septic coxitis sequelae	2,0	0,3	0,3	0,1	0,1	0,0
Tumor	0,2	0,3	0,3	0,2	0,1	0,0
Paget's disease sequelae	0,0	0,0	0,1	0,1	0,1	0,1
TBC coxitis sequelae	0,2	0,2	0,1	0,1	0,0	0,0
Other	2,3	0,8	0,6	0,3	0,1	0,1
Totale	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Diagnosis in primary arthroplasty	Age group						Total
	<40	40-49	50-59	60-69	70-79	≥80	
Primary arthrosis	0,6	3,6	12,2	30,9	40,9	11,8	**100,0**
Sequelae of LCA and DCA	9,0	19,4	27,9	25,4	15,9	2,5	**100,0**
Femoral neck fracture	0,6	2,1	9,1	26,8	45,1	16,3	**100,0**
Idiopathic femoral head necrosis	9,7	13,0	17,8	21,8	26,6	11,1	**100,0**
Post traumatic arthritis	13,4	17,2	20,1	24,2	19,5	5,5	**100,0**
Post traumatic necrosis	18,8	12,4	17,5	19,7	20,1	11,5	**100,0**
Rheumatic arthritis	14,3	11,2	16,7	25,8	26,4	5,5	**100,0**
Femoral neck fracture sequelae	5,4	8,3	12,5	17,6	30,9	25,4	**100,0**
Epiphysiolysis sequelae	41,3	25,1	18,8	9,0	4,9	0,9	**100,0**
Perthes disease sequelae	35,9	25,0	16,1	16,1	4,7	2,1	**100,0**
Septic coxitis sequelae	32,3	11,0	21,9	16,8	15,5	2,6	**100,0**
Tumor	4,1	14,0	24,0	29,8	24,8	3,3	**100,0**
Paget's disease sequelae	0,0	0,0	8,8	27,5	47,5	16,3	**100,0**
TBC coxitis sequelae	8,9	17,9	23,2	35,7	12,5	1,8	**100,0**
Other	22,4	15,8	24,7	23,2	11,2	2,7	**100,0**

Number of **resurfacing** operations carried out on patients with admission date between 1st January 2000 and 31st December 2013, according to **diagnosis**

Diagnosis in resurfacing	Number	Percentage
Primary arthrosis	1.537	78,1
Sequelae of LCA and DCA	176	8,9
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	88	4,5
Post traumatic arthritis	83	4,2
Rheumatic arthritis	26	1,3
Post traumatic necrosis	12	0,6
Epiphysiolysis sequelae	10	0,5
Perthes disease sequelae	10	0,5
Femoral neck fracture sequelae	8	0,4
Septic coxitis sequelae	3	0,2
Paget's disease sequelae	3	0,2
TBC coxitis sequelae	1	0,1
Femoral neck fracture	1	0,1
Other	9	0,5
Total*	**1.967**	**100,0**

*5 missing data (0,3%)

3.5 Causes for revision

Number of revision operations carried out on patients admitted between 1st January 2000 and 31st December 2013 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	3.800	33,1
Total aseptic loosening	2.517	21,9
Stem aseptic loosening	1.472	12,8
Prosthesis dislocation	1.042	9,1
Bone fracture	633	5,5
Prosthesis breakage*	560	4,9
Two steps prosthesis removal	530	4,6
Poly wear	401	3,5
Pain without loosening	184	1,6
Septic loosening	132	1,1
Primary instability	92	0,8
Heterotopic bone	42	0,4
Metallosis	37	0,3
Trauma	27	0,2
Acetabulum fracture	12	0,1
Other	77	0,7
Total°	11.481	100,0

° 133 missing data (1,1%)

***** Failure of 189 modular necks, 126 liners, 94 heads, 72 stems, 65 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	53	45,7
Bone fracture	39	33,6
Metallosis	11	9,5
Pain without loosening	10	8,6
Breakage of prosthesis	3	2,6
Total	**116**	**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	341	33,8
Cotiloiditis	279	27,7
Stem aseptic loosening	247	24,5
Periprosthetic bone fracture	84	8,3
Two steps prosthesis removal	19	1,9
Septic loosening	10	1,0
Breakage of prosthesis	7	0,7
Instability	5	0,5
Poly wear	5	0,5
Heterotopic bone	3	0,3
Other	8	0,8
Total	**1.008**	**100,0**

° 2 missing data (0,2%)

4. Types of prostheses

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

4.1 Cups used in primary surgery

In 155 cases model or cup fixation was not communicated to RIPO.

Cemented cups	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
MULLER Citieffe	10	0,3	40	2,6	59	15,0
PE (Muller Protek) Sulzer	357	11,6	82	5,4	58	14,8
CUPULE AVANTAGE CEMENTED Biomet	2	0,1	46	3,0	41	10,4
ZCA Zimmer	375	12,2	235	15,5	40	10,2
CONTEMPORARY Stryker Howmedica	458	14,9	311	20,5	31	7,9
MULLER Samo	351	11,5	85	5,6	22	5,6
MULLER Lima	117	3,8	120	7,9	12	3,1
MULLER Smith and Nephew	96	3,1	48	3,2	10	2,5
PE Adler-Ortho	-	-	157	10,4	10	2,5
REFLECTION ALL-POLY Smith and Nep.	163	5,3	117	7,7	7	1,8
CCB Mathys	47	1,5	4	0,3	4	1,0
MULLER Groupe Lepine	39	1,3	18	1,2	-	-
LUNA Amplitude	-	-	88	5,8	-	-
MULLER Wright Cremascoli	903	29,5	58	3,8	-	-
Other (< 50 cases)	147	4,8	105	6,9	99	25,2
Total	**3.065**	**100,0**	**1.514**	**100,0**	**393**	**100,0**

Cementless cup	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
FIXA TI-POR Adler-Ortho	-	-	1.946	6,7	7.574	29,4
EP-FIT PLUS Endoplus	24	0,1	2.578	8,9	2.305	9,0
R3 Smith And Nephew	-	-	49	0,2	1.610	6,3
EXCEED ABT Biomet	-	-	367	1,3	1.064	4,1
FIXA Adler-Ortho	16	0,1	6.436	22,1	1.025	4,0
PINNACLE SECTOR II DePuy	69	0,3	622	2,1	1.015	3,9
CONTINUUM Zimmer	-	-	10	0,0	989	3,8
DELTA TT Lima	-	-	147	0,5	668	2,6
DELTA PF Lima	96	0,5	1.042	3,6	634	2,5
ALLOFIT S IT Zimmer	-	-	16	0,1	543	2,1
TRIDENT Stryker Howmedica	459	2,2	1.346	4,6	495	1,9
EXPANSION Mathys	51	0,2	980	3,4	491	1,9
VERSAFITCUP CC Medacta	-	-	392	1,3	468	1,8
SPARKUP Samo	-	-	133	0,5	391	1,5
FITMORE Sulzer	1.320	6,3	1.193	4,1	341	1,3
ABGII Stryker Howmedica	1.313	6,3	1.084	3,7	335	1,3
REFLECTION Smith And Nephew	869	4,2	817	2,8	331	1,3
DELTAMOTION Finsbury	-	-	1	0,0	259	1,0
RECAP RESURFACING Biomet	-	-	638	2,2	256	1,0
MAXERA Zimmer	-	-	-	-	247	1,0
VERSAFITCUP CC TRIO Medacta	-	-	-	-	243	0,9
CUPULE APRIL Symbios	-	-	77	0,3	238	0,9
CUPULE RELOAD AVANTAGE Biomet	-	-	118	0,4	228	0,9
JUMP Permedica	30	0,1	54	0,2	222	0,9
ADAPTIVE WINGS Samo	-	-	-	-	218	0,8

FIN II Bioimpianti	-	-	9	0,0	193	0,7
SELEXYS TH+ Mathys	-	-	-	-	179	0,7
HILOCK LINE Symbios	240	1,1	294	1,0	177	0,7
RM Mathys	2	0,0	5	0,0	170	0,7
ALLOFIT IT Zimmer	-	-	-	-	165	0,6
BS Citieffe	-	-	264	0,9	152	0,6
REGENEREX RINGLOC+ Biomet	-	-	53	0,2	137	0,5
PINNACLE SECTOR II POROCOAT DePuy	-	-	-	-	132	0,5
BETA CUP Link	-	-	147	0,5	128	0,5
POLARCUP Ortho-Id	-	-	136	0,5	120	0,5
TRABECULAR METAL Zimmer	17	0,1	437	1,5	109	0,4
CFP Link	216	1,0	296	1,0	99	0,4
CLS Zimmer	2.481	11,9	800	2,7	92	0,4
MALLORY Biomet	74	0,4	141	0,5	86	0,3
BICON PLUS Endoplus	328	1,6	898	3,1	80	0,3
JUMP COOPER Permedica	37	0,2	201	0,7	79	0,3
BHR Smith And Nephew	33	0,2	94	0,3	75	0,3
CUPULE AVANTAGE 3P Biomet	8	0,0	58	0,2	61	0,2
SELEXYS TH Mathys	-	-	532	1,8	50	0,2
TRILOGY Zimmer	809	3,9	273	0,9	31	0,1
DUOFIT PDT Samo	29	0,1	170	0,6	21	0,1
M2A Biomet	72	0,3	114	0,4	21	0,1
MRS RIVESTIMENTO Lima	-	0,0	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	12	0,0
DUOFIT PSF Samo	1.056	5,1	310	1,1	9	0,0
DUROM HIP RESURFACING Zimmer	10	0,0	311	1,1	9	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	1.150	5,5	154	0,5	-	-
TRABECULAR METAL MONOBLOCK Zimmer	150	0,7	267	0,9	-	-
CUPULE AVANTAGE Biomet	79	0,4	220	0,8	-	-
SPH CONTACT Lima	227	1,1	10	0,0	-	-
ABG Howmedica	221	1,1	-	-	-	-
SPH BLIND Lima	81	0,4	121	0,4	-	-
ELLIPTICAL CUP Stratec	197	0,9	-	-	-	-
EXCEED PC Biomet	87	0,4	98	0,3	-	-
MARBURG Zimmer	171	0,8	3	0,0	-	-
OSTEOLOCK Stryker Howmedica	173	0,8	-	-	-	-
SECUR-FIT Stryker Osteonics	170	0,8	-	-	-	-
ALBI + Wright Cremascoli	159	0,8	-	-	-	-
ELLIPTICAL CUP HEDROCEL Stratec	154	0,7	-	-	-	-
METASUL STAR CUP Protek Sulzer	145	0,7	-	-	-	-
FITEK Protek Sulzer	106	0,5	2	0,0	-	-
Other (< 100 cases)	1.468	7,0	811	2,8	1.083	4,2
Total	**20.888**	**100,0**	**29.110**	**100,0**	**25.745**	**100,0**

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

4.2 Cups used in total revision surgery

In 18 cases model or cup fixation was not communicated to RIPO.

Cemented cups	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
MULLER Protek-Sulzer-Centerpulse-Zimmer	95	24,2	59	29,6	24	26,1
CONTEMPORARY Stryker Howmedica	85	21,6	31	15,6	14	15,2
CUPULE AVANTAGE CEMENTED Biomet	1	0,3	19	9,5	10	10,9
MULLER Samo	40	10,2	21	10,6	8	8,7
ZCA Zimmer	22	5,6	11	5,5	8	8,7
MULLER Lima	33	8,4	13	6,5	6	6,5
Ccb Mathys	19	4,8	-	-	1	1,1
MULLER Wright Cremascoli	53	13,5	5	2,5	-	-
Other (< 10 cases)	45	11,5	40	20,1	21	22,8
Total	**393**	**100,0**	**199**	**100,0**	**92**	**100,0**

Cementless cups	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
FIXA TI-POR Adler-Ortho	-	-	34	3,3	135	16,8
DELTA ONE TT LIMA	-	-	5	0,5	86	10,7
TRABECULAR METAL ZIMMER	2	0,2	98	9,6	69	8,6
CONTINUUM ZIMMER	-	-	1	0,1	54	6,7
DELTA TT LIMA	-	-	12	1,2	50	6,2
HERMES BS REV CITIEFFE	-	-	21	2,1	40	5,0
DELTA REVISION TT LIMA	-	-	1	0,1	40	5,0
REGENEREX RINGLOC+ BIOMET	-	-	10	1,0	31	3,9
OMNIA TI-POR Adler-Ortho	-	-	-	-	24	3,0
TRIDENT Stryker Howmedica	27	2,4	117	11,4	18	2,2
TRABECULAR METAL REVISION ZIMMER	1	0,1	10	1,0	18	2,2
OMNIA Adler-Ortho	-	-	36	3,5	16	2,0
EP-FIT PLUS ENDOPLUS	-	-	22	2,2	16	2,0
TRILOGY Zimmer	79	7,0	49	4,8	13	1,6
DELTA PF LIMA	-	-	35	3,4	8	1,0
BOFOR ENDOPLUS	3	0,3	12	1,2	7	0,9
FIXA Adler-Ortho	-	-	125	12,2	6	0,7
MC MINN LINK	63	5,6	24	2,3	3	0,4
BICON PLUS ENDOPLUS	5	0,4	17	1,7	3	0,4
FITMORE Sulzer	35	3,1	17	1,7	2	0,2
CLS ZIMMER	34	3,0	7	0,7	2	0,2
PINNACLE MULTIHOLE II DePuy	7	0,6	24	2,3	1	0,1
REFLECTION SMITH AND NEPHEW	9	0,8	20	2,0	1	0,1
ABGII Stryker Howmedica	12	1,1	8	0,8	1	0,1
AnCA FIT Cremascoli	282	25,2	18	1,8	-	-
STANDARD CUP Protek Sulzer	128	11,4	4	0,4	-	-
DUOFIT PSF Samo	30	2,7	19	1,9	-	-
LOR ALLOPRO SULZER	42	3,7	6	0,6	-	-
OSTEOLOCK Stryker Howmedica	47	4,2	-	-	-	-
PROCOTYL-E Wright Cremascoli	32	2,9	4	0,4	-	-
TRIDENT ARC2F HOWMEDICA	-	-	36	3,5	-	-
CONICAL SCREW CUP Protek Sulzer	25	2,2	-	-	-	-
SECUR-FIT OSTEONICS	25	2,2	-	-	-	-
PROCOTYL-Z-PIVOT Wright Cremascoli	4	0,4	17	1,7	-	-
Other (< 20 cases)	229	20,4	214	20,9	161	20,0
Total	**1.121**	**100,0**	**1.023**	**100,0**	**805**	**100,0**

4.3 Stems used in primary surgery

In 218 cases model or stem fixation was not communicated to RIPO.

Cemented stem	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
C-STEM AMT DePuy	-	-	19	0,5	173	15,1
BASIS Smith And Nephew	335	4,7	448	11,6	160	14,0
APTA Adler-Ortho	-	-	973	25,2	159	13,9
AB Citieffe	23	0,3	78	2,0	100	8,8
EXETER Stryker Howmedica	641	9,0	565	14,7	95	8,3
CCA Mathys	37	0,5	141	3,7	52	4,6
LC Samo	315	4,4	51	1,3	46	4,0
SL Lima	39	0,5	33	0,9	28	2,5
TAPERLOC CEM Biomet	1	0,0	45	1,2	27	2,4
VERSYS ADVOCATE Zimmer	33	0,5	189	4,9	24	2,1
LUBINUS SP2 Link	225	3,2	66	1,7	13	1,1
MERCURIUS Adler-Ortho	-	-	102	2,6	10	0,9
VERSYS HERITAGE Zimmer	31	0,4	16	0,4	10	0,9
AD Samo	313	4,4	66	1,7	9	0,8
P507 Samo	455	6,4	196	5,1	6	0,5
SPECTRON Smith and Nephew	551	7,7	170	4,4	3	0,3
C STEM DePuy	230	3,2	84	2,2	3	0,3
MULLER AUTOBLOCCANTE Sulzer	43	0,6	11	0,3	3	0,3
DUOFIT CKA Samo	15	0,2	35	0,9	3	0,3
MS 30 Zimmer	175	2,5	9	0,2	2	0,2
ARCAD SO Symbios	-	-	64	1,7	2	0,2
SL STREAKES Hitmedica	40	0,6	8	0,2	2	0,2
ABGII Stryker Howmedica	54	0,8	1	0,0	1	0,1
JVC Wright Cremascoli	669	9,4	59	1,5	-	-
MRL Wright Cremascoli	468	6,6	1	0,0	-	-
DEFINITION Stryker Howmedica	272	3,8	75	1,9	-	-
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	-	-
ABG Stryker Howmedica	230	3,2	-	-	-	-
ULTIMA Johnson e Johnson	197	2,8	-	-	-	-
VERSYS CEMENTED LD Zimmer	123	1,7	10	0,3	-	-
ANCA Wright Cremascoli	89	1,2	-	-	-	-
MBA Groupe Lepine	46	0,6	41	1,1	-	-
DUOFIT CFS Samo	60	0,8	13	0,3	-	-
FULLFIX Mathys	67	0,9	-	-	-	-
PERFECTA RA Wright Cremascoli	51	0,7	9	0,2	-	-
Other (< 50 cases)	366	5,1	260	6,7	211	18,5
Total	**7.132**	**100,0**	**3.855**	**100,0**	**1.142**	**100,0**

Cementless stem	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
APTA Adler-Ortho	10	0,1	4078	15,2	3583	14,3
RECTA Adler-Ortho	6	0,0	2732	10,2	1973	7,9
HYDRA Adler-Ortho	-	-	317	1,2	1701	6,8
TAPERLOC Biomet	158	0,9	1244	4,7	1203	4,8
SL PLUS MIA STEM Smith And Nephew	-	-	5	0,0	1042	4,2
CONUS Centerpulse	2175	13,0	1705	6,4	974	3,9
SL PLUS Endoplus	538	3,2	2677	10,0	962	3,8
CORAIL DePuy	219	1,3	447	1,7	806	3,2
CBC Mathys	104	0,6	1226	4,6	799	3,2
CLS Sulzer	2558	15,2	1110	4,2	675	2,7
Fitmore Zimmer	-	-	95	0,4	645	2,6
ABGII Stryker Howmedica	1230	7,3	1586	5,9	595	2,4
ADR Endoplus	-	-	200	0,7	593	2,4
PROXIPLUS Endoplant	-	-	823	3,1	537	2,1
POLARSTEM Endoplus	-	-	11	0,0	465	1,9
NANOS Endoplant	-	-	170	0,6	398	1,6
ALATA ACUTA S Adler-Ortho	-	-	453	1,7	389	1,6
MINIMAX Medacta	-	-	96	0,4	375	1,5
MODULUS HIP SYSTEM Lima	44	0,3	371	1,4	361	1,4
TRI-LOCK DePuy	-	-	-	-	346	1,4
PARVA Adler-Ortho	-	-	4	0,0	339	1,4
TAPERLOC MICROPLASTY Biomet	-	-	128	0,5	298	1,2
SAM-FIT Lima	-	-	36	0,1	260	1,0
CORAE Adler-Ortho	-	-	-	-	255	1,0
GTS Biomet	-	-	-	-	253	1,0
AMISTEM Medacta	-	-	-	-	231	0,9
SPS MODULAR Symbios	-	-	111	0,4	219	0,9
TWINSYS Mathys	-	-	13	0,0	205	0,8
VERSYS FIBER METAL TAPER Zimmer	594	3,5	434	1,6	198	0,8
PLS Lima	-	-	32	0,1	196	0,8
MULTIFIT Samo	-	-	143	0,5	193	0,8
SYNERGY Smith And Nephew	220	1,3	245	0,9	192	0,8
CFP Link	237	1,4	624	2,3	190	0,8
CLS BREVIUS Zimmer	-	-	-	-	184	0,7
PBF Permedica	72	0,4	166	0,6	178	0,7
S-TAPER Bioimpianti	-	-	10	0,0	174	0,7
DUOFIT RTT Samo	23	0,1	92	0,3	167	0,7
H-MAX S Lima	-	-	7	0,0	167	0,7
C2 Lima	298	1,8	540	2,0	155	0,6
HARMONY Symbios	-	-	64	0,2	152	0,6
H-MAX M Lima	-	-	-	-	152	0,6
SUMMIT DePuy	1	0,0	192	0,7	149	0,6
SMF Smith And Nephew	-	-	-	-	134	0,5
QUADRA-S Medacta	3	0,0	171	0,6	133	0,5
ACCOLADE Osteonics Howmedica	92	0,5	236	0,9	128	0,5
QUADRA-H Medacta	-	-	138	0,5	128	0,5
VITAE Adler-Ortho	-	-	-	-	117	0,5
Z1 Citieffe	-	-	230	0,9	114	0,5
PROFEMUR Z Wright Cremascoli	574	3,4	68	0,3	66	0,3
SL REVISION Sulzer	67	0,4	71	0,3	65	0,3
ALLOCLASSIC SL Zimmer	169	1,0	129	0,5	55	0,2
CONELOCK SHORT Biomet	-	-	248	0,9	52	0,2
ARCAD HA Symbios	5	0,0	203	0,8	40	0,2
MAYO Zimmer	36	0,2	82	0,3	40	0,2
PORO-LOCK II Hit Medica	48	0,3	108	0,4	39	0,2
PPF Biomet	168	1,0	75	0,3	37	0,1
HIPSTAR+ Stryker Howmedica	-	-	192	0,7	30	0,1
DUOFIT RKT Samo	201	1,2	103	0,4	21	0,1

HIPSTAR Stryker Howmedica	124	0,7	193	0,7	20	0,1
S. ROM Johnson e Johnson	79	0,5	86	0,3	11	0,0
ANCA FIT Wright Cremascoli	3819	22,8	678	2,5	6	0,0
SPS Symbios	156	0,9	65	0,2	6	0,0
MBA HAP Groupe Lepine	37	0,2	83	0,3	6	0,0
BHS Smith and Nephew	272	1,6	160	0,6	-	-
ABG Stryker Howmedica	329	2,0	-	-	-	-
EHS Wright Cremascoli	252	1,5	60	0,2	-	-
PROXILOCK FT Stratec	287	1,7	17	0,1	-	-
FIT STEM Lima	69	0,4	227	0,8	-	-
EASY Hitmedica	150	0,9	77	0,3	-	-
STEM Wright Cremascoli	208	1,2	1	0,0	-	-
G3 Citieffe	179	1,1	-	-	-	-
CITATION Stryker Howmedica	112	0,7	-	-	-	-
Other (< 100 cases)	859	5,1	858	3,2	818	3,3
Total	**16.782**	**100,0**	**26.746**	**100,0**	**24.995**	**100,0**

4.4 Stems used in total revision surgery

In 57 cases model or stem fixation was not communicated to RIPO.

Cemented stem	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
APTA Adler-Ortho	-	-	30	18,3	5	6,4
EXETER Stryker Howmedica	39	16,3	35	21,3	5	6,4
LUBINUS SP2 Link	6	2,5	2	1,2	2	2,6
VERSYS REVISION CALCAR Zimmer	8	3,3	10	6,1	2	2,6
ANCA-FIT CLU Wright Cremascoli	10	4,2	-	-	-	-
ANCA Wright Cremascoli	25	10,4	-	-	-	-
AD Samo	26	10,8	3	1,8	-	-
JVC Wright Cremascoli	24	10,0	8	4,9	-	-
Other (< 20 cases)	102	42,5	76	46,3	64	82,1
Total	**240**	**100,0**	**164**	**100,0**	**78**	**100,0**

Cementless stem	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
SL REVISION Sulzer Centerpulse Zimmer	281	22,8	154	14,6	157	19,2
REVISION HIP Lima	6	0,5	41	3,9	136	16,6
ALATA AEQUA REVISION Adler-Ortho	-	-	86	8,1	113	13,8
RESTORATION Stryker Howmedica	11	0,9	192	18,1	69	8,4
ALATA ACUTA S Adler-Ortho	-	-	25	2,4	51	6,2
CONELOCK REVISION Biomet	21	1,7	64	6,0	50	6,1
MODULUS HIP SYSTEM Lima	-	-	17	1,6	26	3,2
MGS Samo	43	3,5	56	5,3	20	2,4
MP RECONSTRUCTION PROSTHESIS Link	33	2,7	17	1,6	13	1,6
APTA Adler-Ortho	-	-	16	1,5	13	1,6
SL PLUS Endoplus	9	0,7	20	1,9	11	1,3
SLR PLUS Endoplus	8	0,6	12	1,1	10	1,2
ZMR REVISION TAPER CONE Zimmer	12	1,0	30	2,8	7	0,9
CLS Sulzer Centerpulse Zimmer	26	2,1	8	0,8	7	0,9
CONUS Sulzer Centerpulse Zimmer	54	4,4	28	2,6	5	0,6
S. ROM Johnson e Johnson	91	7,4	52	4,9	4	0,5
VERSYS FIBER METAL TAPER Zimmer	9	0,7	10	0,9	3	0,4
PROFEMUR R VERS. 4 Wright Cremascoli	351	28,4	58	5,5	2	0,2
C2 Lima	33	2,7	29	2,7	2	0,2
EMPERION Smith And Nephew	-	-	21	2,0	2	0,2
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	118	14,4
Total	**1.235**	**100,0**	**1.058**	**100,0**	**819**	**100,0**

4.5 Number of different types of implant

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

Year of operation	Primary THA	
	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
2013	100	125

In 2013 were implanted 21 different types of cup and 27 stems not used in 2012.

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
2013	37	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.

4.6 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
2013	96,2	3,8

Types of resurfacing implanted between **1st January 2000** and **31st December 2013.**

Type	N.	%
BHR – Smith & Nephew	1.079	54,7
ADEPT – Finsbury	386	19,6
BMHR* – Smith & Nephew	151	7,7
MITCH TRH – Finsbury	87	4,4
ASR – DePuy	74	3,8
RECAP – Biomet	65	3,3
MRS* – Lima	44	2,2
ROMAX – Medacta	33	1,7
ICON – International Orthopaedics	21	1,1
CONSERVE PLUS – Wright	19	1,0
DURON Hip Resurfacing – Zimmer	8	0,4
WAGNER METASUL - Protek	3	0,2
CORMET – Corin	1	0,1
TRIBOFIT – Active Implants	1	0,1
Total	**1.972**	**100,0**

* considered similar to resurfacing

In 2013 were implanted 167 BHR - Smith And Nephew, 78 Adept Matortho, 16 BMHR SMITH AND NEPHEW.

4.7 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	74,7	25,3
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	64,4	35,6
2009	64,3	35,7
2010	60,4	39,6
2011	58,2	41,8
2012	61,0	39,0
2013	65,8	34,2

Types of stems with proximal modularity	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
APTA Adler-Ortho	10	0,2	5.051	47,0	3.742	37,0
RECTA Adler-Ortho	6	0,1	2.733	25,4	1.972	19,5
HYDRA Adler-Ortho	-	-	320	3,0	1.740	17,2
ALATA ACUTA S Adler-Ortho	-	-	454	4,2	389	3,8
MODULUS HIP SYSTEM Lima	44	0,7	371	3,5	361	3,6
PARVA Adler-Ortho	-	-	4	0,0	338	3,3
SAM-FIT Lima	-	-	36	0,3	260	2,6
SPS MODULAR Symbios	-	-	111	1,0	219	2,2
MULTIFIT Samo	-	-	143	1,3	193	1,9
CLS BREVIUS Zimmer	-	-	-	-	184	1,8
H-MAX M Lima	-	-	-	-	152	1,5
VITAE Adler-Ortho	-	-	-	-	117	1,2
SMF Smith And Nephew	-	-	-	-	108	1,1
HARMONY Symbios	-	-	64	0,6	101	1,0
PROFEMUR Z Wright Cremascoli	574	8,8	68	0,6	66	0,7
REVISION HIP Lima	-	-	6	0,1	24	0,2
ALATA AEQUA REVISION Adler-Ortho	-	-	10	0,1	23	0,2
ABGII MODULAR Stryker Howmedica	-	-	48	0,4	14	0,1
S. ROM Johnson e Johnson	79	1,2	86	0,8	11	0,1
MERCURIUS Adler-Ortho	-	-	102	0,9	10	0,1
ANCA FIT Wright Cremascoli	3.820	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	59	0,5	-	-
ANCA-FIT CLU 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	-	-	-	-
MBA Groupe Lepine	46	0,7	41	0,4	-	-

PROFEMUR C Wright Cremascoli	87	1,3	-	-	-	-
STELO MODULARE NDS1 Citieffe	60	0,9	16	0,1	-	-
ALBI PTC Wright Cremascoli	31	0,5	4	0,0	-	-
Other (<30 cases)	84	1,3	84	0,8	71	0,7
Total	**6.489**	**100,0**	**10.739**	**100,0**	**10.108**	**100,0**

4.8 Articular couplings and head diameters

Number of primary total hip arthroplasty operations carried out on patients with admission date between 1st January 2000 and 31st December 2013, according to the **type of operation** and **articular coupling**.

Articular coupling	Primary		Total revision	
	N.	%	N.	%
Cer-cer	33.970	42,2	924	25,4
Met-poly	14.138	17,5	804	22,1
Cer-poly	11.372	14,1	767	21,1
Cer-X linked poly	7.187	8,9	457	12,6
Met-met	6.247	7,8	95	2,6
Met-X linked poly	5.848	7,3	497	13,7
Met-poly undefined*	826	1,0	52	1,4
Cer-poly undefined*	421	0,5	34	0,9
Biolox delta-met	222	0,3	-	-
Cerid-poly	180	0,2	-	-
Surface-treated met- Surface-treated metal	78	0,1	-	-
Oxinium-poly	64	0,1	2	0,1
Met-cer	3	0,0	-	-
Bionium Diamant-poly	2	0,0	1	0,0
Oxinium-cer	2	0,0	-	-
Total^	**80.560**	**100,0**	**3.633**	**100,0**

* missing label did not allow classification of poly
^310 missing data in primary surgery and 18 in total revision.

Double-mobility neck are included in met-pol for 1.119 cases and in cer-pol for 218 cases.

Percentage of total hip arthroplasty interventions between 2001 and 2013, 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	25,6	74,4	0,0
2013	25,8	74,2	0,0

* missing label did not allow classification of poly

Percentage of total hip arthroplasty according **to articular coupling** during the years 2001 - 2013.

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
2013	4,2	6,1	4,8	22,5	62,2	0,2

Percentage of total revision surgeryarthroplasty according **to articular coupling** during the years 2001 - 2013.

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	-
2013	9,3	9,8	3,7	40,5	36.7	-

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

Age class	Elective THA in 2001			
	met-pol	cer-pol	cer-cer	met-met
<40	9,1	21,2	47,0	22,7
40-49	12,8	17,9	45,6	23,7
50-59	23,6	23,6	34,0	18,7
60-69	36,9	31,5	23,8	7,8
70-79	51,9	36,1	10,9	1,1
Over 80	65,6	30,9	3,4	0,0

Age class	Elective THA in 2013			
	met-pol	cer-pol	cer-cer	met-met
<40	2,0	13,8	84,2	0,0
40-49	2,3	14,4	83,3	0,0
50-59	3,0	15,2	81,7	0,1
60-69	5,5	23,0	71,4	0,2
70-79	13,5	32,9	53,3	0,2
Over 80	28,0	45,4	26,0	0,7

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2013, according to **material** and **diameter of the head**

Head material	Diameter of the head (mm)											
	22		26		28		32		36		>=38	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
Biolox Delta	-	-	-	-	2.054	5,0	8.274	53,0	12.967	70,4	2.782	50,6
Allumina	-	-	-	-	17.223	42,3	5.190	33,2	3.452	18,8	-	-
Cr-Co	296	86,3	21	80,8	17.534	43,1	1.861	11,9	1.446	7,9	2.471	44,9
Stainless steel	47	13,7	5	19,2	3.203	7,9	167	1,1	23	0,1	-	-
Oxinium	-	-	-	-	213	0,5	120	0,8	517	2,8	8	0,1
Zirconia	-	-	-	-	290	0,7	4	0,0	2	0,0	-	-
Cerid	-	-	-	-	180	0,4	-	-	-	-	-	-
Revision ceramic	-	-	-	-	2	0,0	3	0,0	3	0,0	159	2,9
Surface-treated metal	-	-	-	-	-	-	-	-	-	-	78	1,4
Total	**343**	**100,0**	**26**	**100,0**	**40.699**	**100,0**	**15.619**	**100,0**	**18.410**	**100,0**	**5.498**	**100,0**

*373 missing data (0,5%)

Year of surgery	Diameter of the head (mm) in THA					
	<=28 cer	<=28 met	32 cer	32 met	>=36 cer	>=36 met
2000	44,0	52,3	1,1	1,4	0,0	1,2
2001	49,3	48,2	0,7	0,4	0,0	1,5
2002	52,1	46,1	0,9	0,1	0,0	0,8
2003	50,9	46,7	0,9	0,1	0,3	1,2
2004	51,1	41,6	3,2	0,6	1,3	2,2
2005	34,1	38,2	16,7	1,6	5,5	4,0
2006	23,3	33,6	19,0	2,0	14,9	7,3
2007	15,9	28,5	20,7	3,9	21,9	9,2
2008	14,4	21,8	20,5	3,7	29,7	9,9
2009	11,6	17,6	21,7	3,1	36,9	9,2
2010	8,6	10,2	24,1	4,7	44,8	7,7
2011	6,5	8,3	28,1	4,9	47,3	5,0
2012	7,0	5,5	29,1	3,8	51,6	3,1
2013	6,2	5,2	30,8	2,8	52,2	2,8

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

4.9 Prosthesis fixation

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2013, according to **type of operation** and **fixation**

Fixation	Primary THA	%	Total revision	%
Cementless	68.292	84,6	2.671	73,4
Hybrid (cemented stem and cementless cup)	7.411	9,2	281	7,7
Cemented	4.424	5,5	193	5,3
Reverse hybrid (cementless stem and cemented cup)	553	0,7	494	13,6
Total*	**80.680**	**100,0**	**3.639**	**100,0**

*190 primary THA and 12 total revision missing data.

Percentage of total hip arthroplasties **according to fixation**, during the years 2000 – 2013

Year of surgery	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	95,1	3,5	0,6
2012	0,6	95,3	3,4	0,7
2013	1,0	95,6	2,9	0,5

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

Age class	Elective primary THA 2000-2013			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0,6	98,1	0,7	0,5
40-49	0,2	98,9	0,6	0,3
50-59	0,5	97,4	1,8	0,3
60-69	1,2	91,6	6,8	0,4
70-79	6,2	79,5	13,6	0,7
≥80	18,6	63,3	16,5	1,6

Percentage of elective total hip arthroplasties according to **fixation and class of 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 elective total hip arthroplasties **according to fixation and class of age** - year 2013

Age class	Elective primary surgery year 2013			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0,0	99,5	0,0	0,5
40-49	0,0	99,1	0,5	0,5
50-59	0,1	99,2	0,6	0,1
60-69	0,0	98,9	0,7	0,4
70-79	0,3	96,5	2,9	0,3
≥80	2,7	86,2	10,0	1,1

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	80,1	7,2	7,7
2012	1,3	88,4	3,1	7,1
2013	1,9	82,8	7,4	7,9

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

Age class	Total revision			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	1,5	92,5	1,5	4,5
40-49	3,9	88,4	2,3	5,4
50-59	1,6	87,0	2,9	8,6
60-69	3,2	77,7	6,1	13,1
70-79	4,6	71,1	8,6	15,7
≥80	13,2	59,2	12,7	14,9

4.10 Bone cement

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

Cement	% in THA	% in Hemi	% in Resurf
Surgical Simplex P - Howmedica	35,0	34,3	22,7
Cemex System - Tecres	11,7	26,4	1,5
Palacos R - Biomet	7,1	1,6	1,4
Antibiotic Simplex - Howmedica	**5,5**	**2,9**	**61,1**
Smartset Hv - Depuy	5,0	7,6	3,5
Amplicem 3 - Amplimedical	5,0	4,1	-
Cmw 3 - Depuy	2,6	1,8	-
Cemex + Cemex System - Tecres	2,2	-	-
Cemex Rx - Tecres	2,1	5,8	0,1
Cemex - Tecres	1,9	2,8	0,3
Amplicem 1 + Amplicem 3 - Amplimedical	1,6	0,004	-
Exolent High - Elmdown	1,5	0,6	-
Cemex Rx + Cemex System - Tecres	1,4	-	-
Cemex System - Tecres + Surgical Simplex P - How	1,3	0,004	-
Sulcem 3 - Centerpulse	1,2	1,1	0,1
Amplicem 1 - Amplimedical + Smartset Hv - Depuy	1,2	-	-
Cemfix 1 - Teknimed	1,1	0,2	-
Palacos R - Heraeus Medical	1,0	1,5	0,2
Versabond - Smith And Nephew	1,0	0,03	3,0
Cemex Genta + Cemex Genta System - Tecres	**0,9**	**0,004**	**-**
Cemfix 3 - Teknimed	0,9	0,05	-
Aminofix 1 - Groupe Lepine	**0,7**	**0,02**	**-**
Cemex Genta - Tecres	**0,6**	**0,4**	**0,1**
Palacos R 40 - Sp Europe	0,6	0,1	-
Smartset Mv - Depuy	0,5	1,0	0,1
Bone Cement R - Biomet	0,5	0,1	1,1
Cemex Genta System - Tecres	**0,5**	**2,0**	**1,6**
Amplicem 1 - Amplimedical	0,4	0,3	0,2
Vacu Mix Plus Cmw 3 - Depuy	0,4	0,9	-
Amplicem 3G - Amplimedical	**0,3**	**-**	**-**
Refobacin Bone Cement R - Biomet	**0,3**	**0,004**	**-**
Cemsys 1 - Mathys	0,3	0,02	-
Palacos R+G - Heraeus Medical	**0,3**	**0,2**	**0,1**
Cmw 1 - Depuy	0,2	0,3	-
Cemex XI - Tecres	0,2	0,6	-
Osteobond - Zimmer	0,2	0,01	1,3
A. Simplex + S. Simplex P - Howmedica	**0,2**	**0,01**	**0,2**
Cemfix 1 + Cemfix 3 - Teknimed	0,2	-	-
Other with antibiotic	**1,2**	**0,7**	**0,2**
Other without antibiotic	1,5	2,6	1,5
Total	**100,0**	**100,0**	**100,0**

5. Types of hemiarthroplasty

5.1 Hemiarthroplasty cup and stem

Monoblock	2000-2004		2005-2009		2010-2013	
	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	2000-2004		2005-2009		2010-2013	
	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	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
C1 - Citieffe	867	8,9	1.772	15,5	2.811	28,6
BI-POLAR DePuy	2	0,0	209	1,8	1.579	16,0
JANUS Bioimpianti	292	3,0	557	4,9	1.294	13,1
SPHERI-LOCK - Hit Medica	2.042	21,0	2.213	19,3	1.235	12,5
UHR Osteonics Stryker Howmedica	444	4,6	1.633	14,3	1.037	10,5
TESTA BIARTICOLARE LOCK Lima	244	2,5	1.100	9,6	639	6,5
CUPOLA NEMAUSUS Transysteme	-	-	238	2,1	624	6,3
CUPOLA BIPOLARE Mathys	404	4,2	233	2,0	74	0,8
TESTA BIPOLARE Samo	100	1,0	3	0,0	71	0,7
BI-POLAR Biomet	143	1,5	231	2,0	69	0,7
CUPOLA BIPOLARE Zimmer	94	1,0	326	2,9	33	0,3
CUPOLA MOBILE Zimmer	360	3,7	500	4,4	21	0,2
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
CUPOLA MOBILE MODULARE- Wright Cremascoli	886	9,1	286	2,5	-	-
ULTIMA MONK DePuy	528	5,4	476	4,2	-	-
CUPOLA SEM - D.M.O.	431	4,4	299	2,6	-	-
TESTA BIARTICOLARE - Lima	608	6,3	4	0,0	-	-
CENTRAX - Stryker Howmedica	525	5,4	12	0,1	-	-
SPHERIC Amplitude	-	-	351	3,1	-	-
MODULAR BIPOLAR - Protek	341	3,5	5	0,0	-	-
RETENTIVE MOBILE CUP - Cedior	292	3,0	-	-	-	-
MODULAR BIPOLAR Zimmer	64	0,7	201	1,8	-	-
BICENTRIC - Stryker Howmedica	233	2,4	3	0,0	-	-
TESTA BIPOLARE -Amplimedical	193	2,0	-	-	-	-
Other (< 100 cases)	171	1,8	167	1,5	330	3,4
Total*	**9.726**	**100,0**	**11.437**	**100,0**	**9.841**	**100,0**

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

In 151 cases model or stem fixation was not communicated to RIPO.

Cemented stem	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
AB Citieffe	665	7,4	1.662	17,7	2.617	37,3
G2 DePuy	46	0,5	670	7,1	757	10,8
APTA Adler-Ortho	-	-	538	5,7	492	7,0
SL Lima	439	4,9	288	3,1	490	7,0
CORAIL DePuy	-	-	-	-	399	5,7
S-TAPER Bioimpianti	-	-	3	0,0	384	5,5
EXETER Stryker Howmedica	204	2,3	347	3,7	367	5,2
SPHERI-SYSTEM II Hitmedica	888	9,8	1.103	11,8	340	4,8
SL STREAKES Hitmedica	276	3,1	890	9,5	339	4,8
SL -Hit Medica	731	8,1	8	0,1	221	3,2
C-STEM AMT DePuy	-	-	10	0,1	133	1,9
DUOFIT CKA Samo	116	1,3	36	0,4	66	0,9
CCA Mathys	400	4,4	214	2,3	28	0,4
STANDARD STRAIGHT Zimmer	525	5,8	232	2,5	22	0,3
LOGICA MIRROR Lima	131	1,5	376	4,0	21	0,3
VERSYS LD/FX- Zimmer	237	2,6	300	3,2	9	0,1
QUADRA-C Medacta	-	-	173	1,8	2	0,0
VERSYS HERITAGE Zimmer	83	0,9	68	0,7	2	0,0
SL Permedica	426	4,7	252	2,7	1	0,0
ORTHO-FIT Zimmer	387	4,3	442	4,7	-	-
SEM II DMO	361	4,0	276	2,9	-	-
RELIANCE HOWMEDICA	305	3,4	318	3,4	-	-
FIN Bioimpianti	229	2,5	295	3,1	-	-
JVC Wright Cremascoli	272	3,0	209	2,2	-	-
ULTIMA LX Johnson And Johnson	315	3,5	-	-	-	-
AHS Wright Cremascoli	303	3,4	9	0,1	-	-
MRL Wright Cremascoli	270	3,0	-	-	-	-
LOGICA Lima	142	1,6	106	1,1	-	-
DEFINITION Stryker Howmedica	68	0,8	168	1,8	-	-
HIP FRACTURE Stryker Howmedica	162	1,8	-	-	-	-
SL Amplimedical	158	1,8	-	-	-	-
ULTIMA STRAIGHT DEPUY	156	1,7	-	-	-	-
ALBI PTC Wright Cremascoli	134	1,5	15	0,2	-	-
Other (< 100 cases)	593	6,6	372	4,0	321	4,6
Total	**9.022**	**100,0**	**9.380**	**100,0**	**7.011**	**100,0**

Cementless stem	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
S-TAPER Bioimpianti	-	-	217	10,5	723	25,8
ACCOLADE Osteonics Stryker Howmedica	282	40,2	833	40,3	648	23,2
LOGICA CS Lima	-	-	52	2,5	208	7,4
KORUS Bioimpianti	-	-	-	-	156	5,6
SL Lima	3	0,4	206	10,0	109	3,9
G2 De Puy	-	-	1	0,0	89	3,2
RECTA Adler-Ortho	-	-	48	2,3	87	3,1
APTA Adler-Ortho	-	-	47	2,3	79	2,8
Z1 Citieffe	-	-	2	0,1	78	2,8
TAPERLOC Biomet	1	0,1	5	0,2	74	2,6
POLARSTEM Endoplus	-	-	-	-	61	2,2
HYDRA Adler-Ortho	-	-	4	0,2	58	2,1
TWINSYS Mathys	-	-	9	0,4	46	1,6

CORAIL De Puy	4	0,6	1	0,0	45	1,6
SPS MODULAR Symbios	-	-	-	-	37	1,3
SUMMIT De Puy	-	-	4	0,2	34	1,2
PORO-LOCK II Hit Medica	-	-	52	2,5	22	0,8
CONUS Centerpulse	5	0,7	12	0,6	19	0,7
C2 Lima	3	0,4	11	0,5	18	0,6
ENDON Tantum	1	0,1	172	8,3	15	0,5
COXAFIT HIP STEM FGL Arge	-	-	11	0,5	13	0,5
SL PLUS Endoplus	1	0,1	15	0,7	8	0,3
ADR Endoplus	-	-	12	0,6	8	0,3
VERSYS FIBER METAL TAPER Zimmer	3	0,4	35	1,7	7	0,3
PROFEMUR Z Wright Cremascoli	3	0,4	13	0,6	7	0,3
SL REVISION Sulzer	7	1,0	17	0,8	6	0,2
PPF Biomet	112	16,0	154	7,5	-	-
HIP FRACTURE - Howmedica	133	19,0	-	-	-	-
H-AC STEM FURLONG Jri	67	9,6	7	0,3	-	-
EURO HIP SYSTEM Wright Cremascoli	17	2,4	23	1,1	-	-
Other (< 20 cases)	59	8,4	102	4,9	143	5,1
Total	**701**	**100,0**	**2.065**	**100,0**	**2.798**	**100,0**

5.2 Other characteristics of hemiarthroplasties

Number of surgeries according to **head type**

Head type	N.	%
Bipolar head to be assembled in the operating theatre	30.084	94,8
Preassembled bipolar head	1.104	3,5
Monoarticular head	425	1,3
Monoblock prosthesis	112	0,4
Total	**31.725**	**100,0**

In 82,2% of hemi, stem was cemented and in 7,8% the stem had a modular neck.

6. Blood transfusion

Percentage of operations performed on patients admitted between 1st January 2003 and 31st December 2013 **according to type of operation and transfusion**

Type of surgery	None	Autologous (recovery)	Autologous (predeposit)	Homologous	Autologous and homologous
Emergency primary	24,8	10,2	-	58,2	6,8
Elective primary	15,3	22,8	34,5	17,1	10,3
Revision	11,0	14,3	15,8	44,3	14,6

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	29,3	3,0	67,2	0,4
Private	9,8	36,7	25,3	28,2
AUSL	36,6	4,8	55,2	3,4
IOR	2,4	0,7	96,9	0,0

Elective THA				
Type of hospital	**None**	**Autologous**	**Homologous**	**Autologous and homologous**
AOSP	22,5	54,6	19,7	3,1
Private	7,0	71,9	5,1	16,0
AUSL	23,0	46,5	19,8	10,7
IOR	8,6	57,0	28,8	5,6

7. Complications occurred during hospitalization

The rate of complications in **primary surgery** carried out on patients hospitalized between January 1st 2000 and December 31st 2013.

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	347	*0,4*	Hematoma	924	*1,1*	Anemia	5.249	*6,5*
Diaphyseal fracture	258	*0,3*	Prosthesis disloc.	318	*0,4*	Hyperpyrexia	597	*0,7*
Greater troch. fracture	172	*0,2*	SPE paralysis	171	*0,2*	Genito-urinary	349	*0,4*
			Deep vein thromb	94	*0,1*	Gastro-intestinal	353	*0,4*
Anaesthesiolog. complications	128	*0,2*	Bleeding	86	*0,1*	Cardiovasc.	210	*0,3*
			Bed sores	86	*0,1*	Embolism	143	*0,2*
Acetabulum fracture	122	*0,2*	Crural paralysis	79	*0,1*	Respiratory	122	*0,2*
Hemorragia	35	*0,04*	Infection	77	*0,1*	Collapse	114	*0,1*
			Secretion	63	*0,1*	Infarction	101	*0,1*
Instability	21	*0,03*				Disorientation	101	*0,1*
						Dyspnoea	61	*0,1*
Other	78	*0,1*	Other	296	*0,4*	Other	520	*0,6*
Total	**1.161**	***1,4***	**Total**	**2.194**	***2,7***	**Total**	**7.920**	***9,8***

The rate of complications in **revision surgery** carried out on patients hospitalized between January 1st 2000 and December 31st 2013.

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Diaphyseal fracture	186	*1,5*	Hematoma	189	*1,5*	Anemia	1.009	*7,9*
Calcar fracture	69	*0,5*	Prosthesis disloc.	114	*0,9*	Hyperpyrexia	78	*0,6*
			SPE paralysis	67	*0,5*	Cardiovasc.	61	*0,5*
Anaesthesiolog. complications	52	*0,4*	Bleeding	46	*0,4*	Gastro-intestinal	54	*0,4*
			Infection	38	*0,3*	Genito-urinary	50	*0,4*
Greater troch. fracture	41	*0,3*	Bed sores	26	*0,2*	Collapse	44	*0,3*
			Deep vein thromb	19	*0,1*	Infarction	26	*0,2*
Acetabulum fracture	22	*0,2*	Crural paralysis	8	*0,1*	Embolism	26	*0,2*
Hemorragia	17	*0,1*				Respiratory	24	*0,2*
Other	21	*0,2*	Other	60	*0,5*	Other	131	*1,0*
Total	**408**	***3,2***	**Total**	**567**	***4,4***	**Total**	**1.503**	***11,7***

The rate of complications in **hemiarthroplasty** carried out on patients hospitalized between January 1st 2000 and December 31st 2013

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	147	*0,5*	Hematoma	305	*1,0*	Anemia	3.583	*11,3*
			Prosthesis disloc.	146	*0,5*	Genito-urinary	292	*0,9*
Anaesthesiolog. complications	122	*0,4*	Bed sores	121	*0,4*	Hyperpyrexia	254	*0,8*
			SPE paralysis	79	*0,2*	Collapse	242	*0,8*
Greater troch. fracture	89	*0,3*	Deep vein thromb	69	*0,2*	Respiratory	221	*0,7*
						Gastro-intestinal	193	*0,6*
Diaphyseal fracture	54	*0,2*	Infection	52	*0,2*	Cardiovasc.	190	*0,6*
Anemia	25	*0,1*	Bleeding	12	*0,04*	Embolism	160	*0,5*
Hemorragia	16	*0,1*				Infarction	106	*0,3*
Acetabulum fracture	4	*0,01*	Crural paralysis	3	*0,01*	Disorientation	78	*0,2*
						Dyspnoea	46	*0,1*
Other	50	*0,2*	Other	60	*0,2*	Other	265	*0,8*
Total	**507**	***1,6***	**Total**	**847**	***2,6***	**Total**	**5.630**	***17,7***

Complications recorded are those that occurred during hospitalization.

7.1 Deaths during hospitalization

Number of deaths in prosthetic surgery on patients hospitalized between January 1st 2000 and December 31st 2013.
The deaths recorded are those that occurred during hospitalization.

Years 2000-2013			
Type of surgery	**Deaths**	**n. of operations**	**Percentage**
Primary THA	198	80.870	0,2
Hemiarthroplasty	1.449	31.725	4,6
Revision	87	12.817	0,7
Resurfacing prostheses	0	1.972	-
Prosthesis removal	21	908	2,3
Hemiarthroplasty with buffer	0	118	-

8. 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 2013			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	6.675	1,4	0-44
Hemiarthropl.	2.435	2,9	0-80
Revision	913	3,5	0-98
Resurfacing	261	1,1	0-8
Prosthesis removal	61	7,5	0-76

9. Analysis of survival of primary surgery

9.1 Cox multivariate analysis

The Cox multivariate analysis identifies any variables that are independent from each other that can influence the event, in our case the removal of at least one prosthesis component. Analysis was performed on three independent variables, sex, age at surgery and pathology.
Other variables that might influence the outcome of surgery, such as the method of fixing the prosthesis, or joint coupling, were not introduced into the analysis because they were not independent (for example, prosthesis fixation depends on the patient's age).
All primary hip arthroplasties performed in the Region between 2000 and 2013 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: 59.859

Non revised: 57.468
Revised: 2.391

Chi-square: 112,9 *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.

9.2 Rate of failure

Prosthesis failure is defined as the revision of even one prosthetic component.

As already mentioned in the introduction of this report the recovery of data of operations not reported to RIPO is in progress. The uncertainty due to 10% of missing reports, over 14 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 2013 **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 14 years.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital	N. of revisions performed in a Hospital outside Emilia-Romagna region
Primary THA	59.859	1.586	740	65
Hemiarthroplasty*	30.639	451	129	9
Total revision	2.234	154	67	6

* hemiartroplasties with acetabular buffer are not considered, 18 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 10 years.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital	N. of revisions performed in a Hospital outside Emilia-Romagna region
Resurfacing	675	42	7	2

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	N° major revisions	N° minor revisions	N° revisions outside region	Revision rate
Primary THA	1.790	536	65	2.391/59.859
Hemiarthroplasty	513	67	9	589/30.639
Resurfacing	49	-	2	51/675
Total revision	176	45	6	227/2.234

9.3 Survival curves according to Kaplan Meier

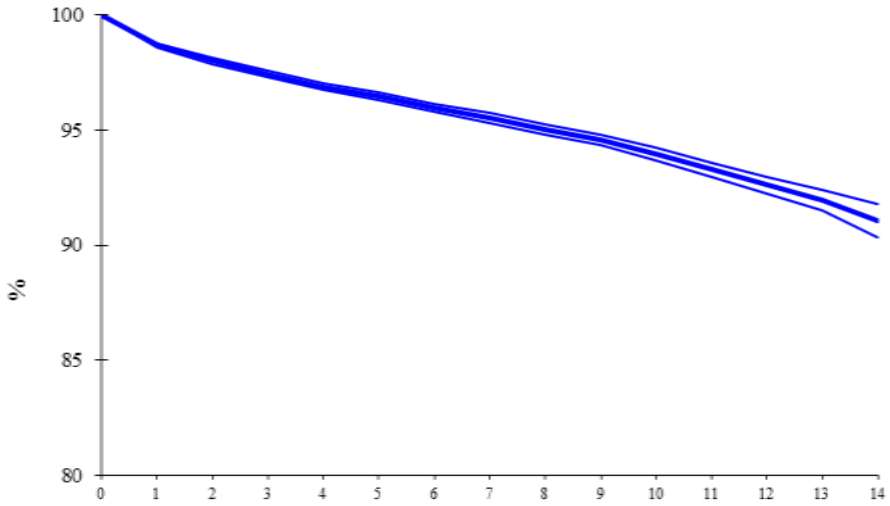
The survival curve calculated by the Kaplan Meier method enables an estimation of the probability that each individual has of maintaining its initial condition (prosthesis in place) over time.
The following paragraphs show the survival curves calculated separately for primary prosthesis, endoprosthesis,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

9.4 Analysis of survival in primary total hip arthroplasty

59.859 primary arthroprostheses are under observation. Of these, 2.391 revisions were carried out.

Number of arthroprostheses	n. revisions	% survival at 14 yrs	Confidence interval 95%
59.859	2.391	91,1	90,4-91,8

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	**421**/59.859	0,7	17,6
within 60 days	*217/59.859*		
over 60 days	*204/59.859*		
Aseptic loosening of the stem	**408**/59.859	0,7	17,1
within 60 days	*15/59.859*		
oltre i 60 days	*393/59.859*		
Aseptic loosening of the cup	**364**/59.859	0,6	15,2
within 60 days	*28/59.859*		
oltre i 60 days	*336/59.859*		
Periprosthetic bone fracture	**277**/59.859	0,5	11,6
within 60 days	*77/59.859*		
oltre i 60 days	*200/59.859*		
Breakage of prosthesis	**259**/59.859	0,4	10,8
Septic loosening	**151**/59.859	0,3	6,3
within 60 days	*19/59.859*		
oltre i 60 days	*132/59.859*		
Global aseptic loosening	**155**/59.859	0,3	6,5
within 60 days	*2/59.859*		
oltre i 60 days	*153/59.859*		
Primary instability	**64**/59.859	0,1	2,7
Pain without loosening	**60**/59.859	0,1	2,5
Poly wear	**37**/59.859	0,1	1,5
Heterotopic bone	**22**/59.859	0,0	0,9
Other	**37**/59.859	0,1	1,5
Unknown	**136**/59.859	0,2	5,7
Total	2.391/59.859	**4,0**	**100,0**

Percentage of causes of revision according to follow-up

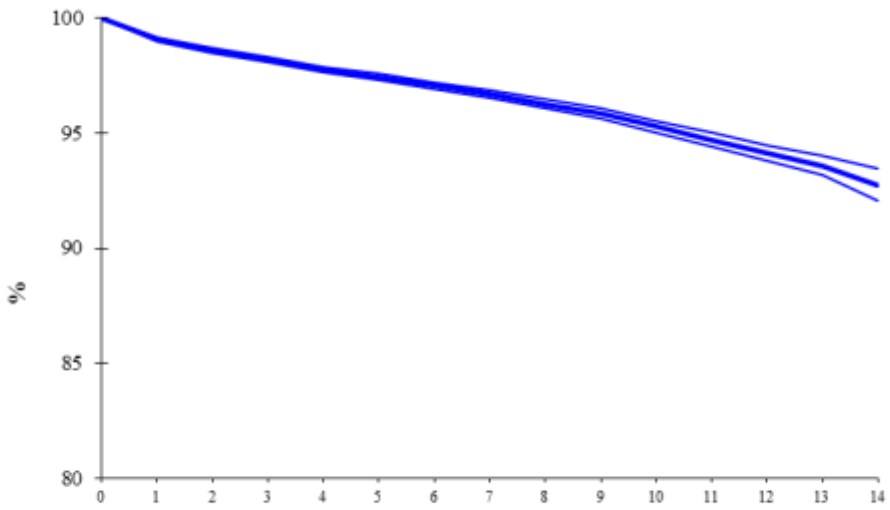
Cause of revision	0-2 Years	3-4 Years	>=5 Years
Prosthesis dislocation	26,7	8,4	7,9
Aseptic loosening of the stem	15,8	20,9	16,9
Periprosthetic bone fracture	11,4	9,5	13,1
Aseptic loosening of the cup	10,4	17,4	21,9
Breakage of prosthesis	7,2	18,3	12,5
Septic loosening	7,7	5,6	4,5
Primary instability	5,1	0,5	0,0
Global aseptic loosening	3,6	7,9	10,5
Pain without loosening	3,1	2,6	1,5
Heterotopic bone	1,5	0,7	0,1
Poly wear	0,5	0,9	3,7
Other	1,6	1,2	1,8
Unknown	5,5	6,3	5,7

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

59.859 primary arthroprostheses are under observation. Of these, 1.790 revisions were carried out to remove cup and/or stem.

Number of arthroprostheses	N. revisions	% survival at 14 yrs	Confidence interval 95%
59.859	1.790	92,8	92,1-93,4

Survival curve



9.6 Analysis of survival according to model of prosthesis

Survival analysis has been calculated either for association of cup and stems and for single component (9.11 and 9.13)
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%
Fixa TI-por (Apta) Adler-Ortho	2007	3.032	43	97,8	97,0-98,6	-	-
AnCA Fit (AnCA Fit) Wright Cremascoli	2000	2.873	173	96,0	95,3-96,7	93,7	92,8-94,7
FIXA (RECTA) Adler-Ortho	2004	2.720	112	96,1	95,3-96,9	-	-
ABGII (ABGII) Stryker Howmedica	2000	1.955	52	98,1	97,4-98,7	96,6	95,5-97,6
EP-FIT PLUS (SL PLUS) ENDOPLUS	2003	1.863	51	96,9	96,1-97,8	94,7	91,6-97,8
FIXA (APTA) Adler-Ortho	2004	1.703	75	96,8	95,9-97,6	-	-
CLS (CLS) Sulzer Centerpulse Zimmer	2000	1.516	76	97,6	96,8-98,4	94,4	93,0-95,7
Fixa TI-por (Hydra) Adler-Ortho	2007	1.473	33	94,7	92,3-97,2	-	-
EXPANSION (CBC) Mathys	2000	1.120	52	94,7	93,2-96,2	93,4	91,5-95,4
FITMORE (CONUS) SulzerCenterpulse Zimmer	2000	1.072	38	97,1	96,0-98,2	95,3	93,5-97,0
Fixa TI-por (RECTA) Adler-Ortho	2007	1.009	26	95,9	93,9-98,0	-	-
EP-FIT PLUS (PROXYPLUS) Smith & Nephew	2004	944	11	98,7	97,9-99,5	-	-
BICON PLUS (SL PLUS) Smith & Nephew	2000	913	54	95,9	94,6-97,2	92,8	90,5-95,2
FITMORE (CLS) SulzerCenterpulse Zimmer	2000	774	28	97,2	96,0-98,4	95,8	94,2-97,4
Exceed ABT (TAPERLOC) Biomet	2006	759	8	98,7	97,9-99,6	-	-
R3 (SL PLUS MIA) Smith & Nephew	2010	696	8	-	-	-	-
REFLECTION (**BASIS**) Smith & Nephew	2001	654	33	96,8	95,3-98,3	92,8	90,1-95,5
CLS (CONUS) SulzerCenterpulse Zimmer	2000	592	39	97,0	95,6-98,4	94,0	91,9-96,1
FIXA (**APTA**) Adler-Ortho	2004	572	18	97,1	95,7-98,5	-	-

TRIDENT (ABGII) Stryker Howmedica	2002	538	29	94,7	92,5-96,9	91,7	88,5-95,0
PINNACLE SECTOR II (CORAIL) DePuy	2002	515	16	96,6	94,9-98,3	95,5	92,7-98,3
TRILOGY (VERSYS FIBER) Zimmer	2000	496	19	96,7	95,1-98,3	95,9	94,1-97,7
DUOFIT PSF (**P507**) Samo	2000	492	17	98,3	97,1-99,5	96,6	94,7-98,4
RECAP RESURFACING (TAPERLOC) Biomet	2005	486	17	96,1	94,3-97,9	-	-
CONTEMPORARY (**EXETER**) Stryker Howmedica	2000	477	21	95,9	94,0-97,8	94,6	92,2-97,0
SELEXYS TH (CBC) MATHYS	2006	434	30	92,4	89,8-95,1	-	-
AnCA Fit (PROFEMUR Z) Wright Cremascoli	2002	420	33	94,2	92,0-96,5	91,4	88,6-94,3
CFP (CFP) Link	2001	403	13	97,6	96,1-99,2	95,6	93,0-98,2
REFLECTION (**SYNERGY**) Smith & Nephew	2000	392	13	97,3	95,4-99,2	94,0	90,5-97,4
Ep-fit (Polarstem) Endoplus	2010	365	3	98,8	97,5-100,0	-	-
Versafitcup CC (Minimax) Medacta	2008	353	9	96,7	94,5-98,9	-	-
DELTA PF (MODULUS HIP SYSTEM) Lima	2003	332	8	97,4	95,6-99,2	97,4	95,6-99,2
MULLER (**JVC**) Wright Cremascoli	2000	326	13	98,4	97,0-99,8	96,0	93,4-98,5
STANDARD CUP (CLS) Sulzer Centerpulse Zimmer	2000	322	12	98,7	97,5-100,0	96,9	94,9-98,9
TRIDENT (**EXETER**) Howmedica	2002	316	2	99,4	98,5-100,0	99,4	98,5-100,0
CLS Zimmer (SL PLUS) Smith & Nephew	2001	311	12	96,9	95,0-98,9	93,8	89,0-98,5
MULLER (**MRL**) Wright Cremascoli	2000	305	16	96,5	94,4-98,6	94,8	92,1-97,5
Altri *(modelli < 300 casi)*	2000	26.336	1178	96,2	95,9-96,4	93,3	92,9-93,7
All models	**2000**	**59.859**	**2391**	**96,5**	**96,3-96,7**	**93,9**	**93,7-94,2**

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 14 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.

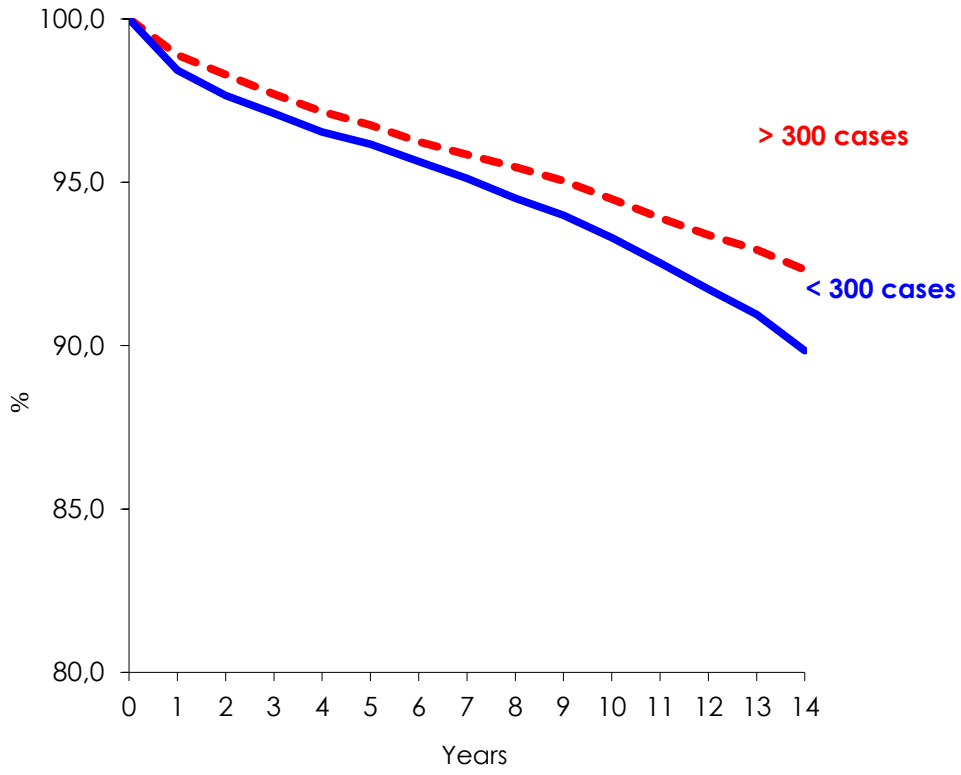
Survival is not adjusted for articular coupling.

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

	Number of implants	n. revisions	% survival at 14 yrs	Confidence interval 95%
Models > 300 cases	33.523	1.213	92,3	91,4-93,2
Models < 300 cases	26.336	1.178	89,8	88,8-90,9

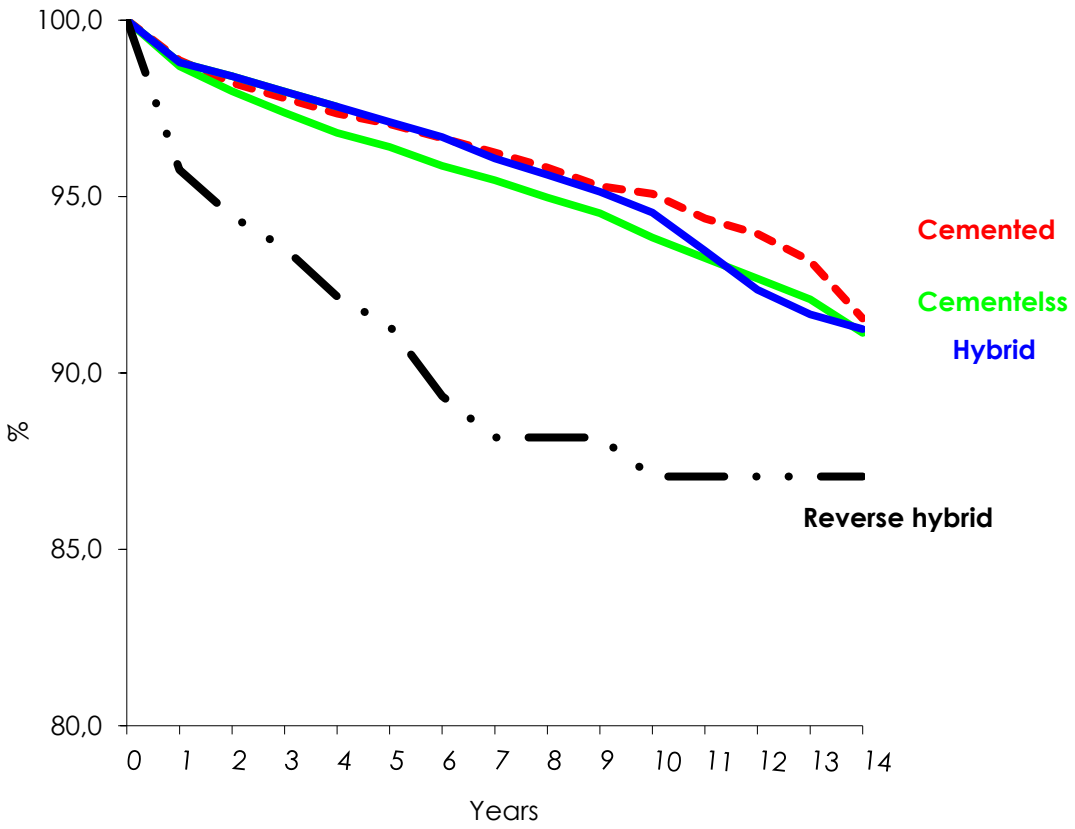
Survival curve

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



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

Fixation	N.	Removals	% survival at 14 yrs	Confidence interval 95%
Cementless	49.249	1.902	91,1	90,3-92,0
Hybrid (cemented stem, cementless cup)	6.009	275	91,2	89,8-92,7
Cemented	3.986	162	91,5	88,9-94,2
Reverse hybrid (cementless stem, cemented cup)	448	39	87,1	82,9-91,4



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

Cemented			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**46**/3.986	1,2	28,4
Global aseptic loosening	**28**/3.986	0,7	17,3
Recurrent prosthesis dislocation	**26**/3.986	0,7	16,0
Aseptic loosening of the stem	**19**/3.986	0,5	11,7
Septic loosening	**17**/3.986	0,4	10,5
Periprosthetic bone fracture	**11**/3.986	0,3	6,8
Primary instability	**4**/3.986	0,1	2,5
Unknown	**9**/3.986	0,2	5,6
Other	**2**/3.986	0,1	1,2
Total	**162/3.986**	**4,1**	**100,0**
Cementless			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**320**/49.249	0,6	16,8
Aseptic loosening of the stem	**297**/49.249	0,6	15,6
Aseptic loosening of the cup	**278**/49.249	0,6	14,6
Breakage of prosthesis	**252**/49.249	0,5	13,2
Periprosthetic bone fracture	**236**/49.249	0,5	12,4
Septic loosening	**112**/49.249	0,2	5,9
Global aseptic loosening	**100**/49.249	0,2	5,3
Pain without loosening	**58**/49.249	0,1	3,0
Primary instability	**58**/49.249	0,1	3,0
Poly wear	**28**/49.249	0,1	1,5
Heterotopic bone	**18**/49.249	0,0	0,9
Unknown	**112**/49.249	0,2	5,9
Other	**33**/49.249	0,1	1,7
Total	**1.902/49.249**	**3,9**	**100,0**
Hybrid			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the stem	**84**/6.009	1,4	30,5
Recurrent prosthesis dislocation	**65**/6.009	1,1	23,6
Periprosthetic bone fracture	**25**/6.009	0,4	9,1
Aseptic loosening of the cup	**24**/6.009	0,4	8,7
Global aseptic loosening	**24**/6.009	0,4	8,7
Septic loosening	**21**/6.009	0,3	7,6
Poly wear	**7**/6.009	0,1	2,5
Breakage of prosthesis	**6**/6.009	0,1	2,2
Heterotopic bone	**3**/6.009	0,0	1,1
Primary instability	**2**/6.009	0,0	0,7
Pain without loosening	**1**/6.009	0,0	0,4
Unknown	**10**/6.009	0,2	3,6
Other	**3**/6.009	0,0	1,1
Total	**275/6.009**	**4,6**	**100,0**

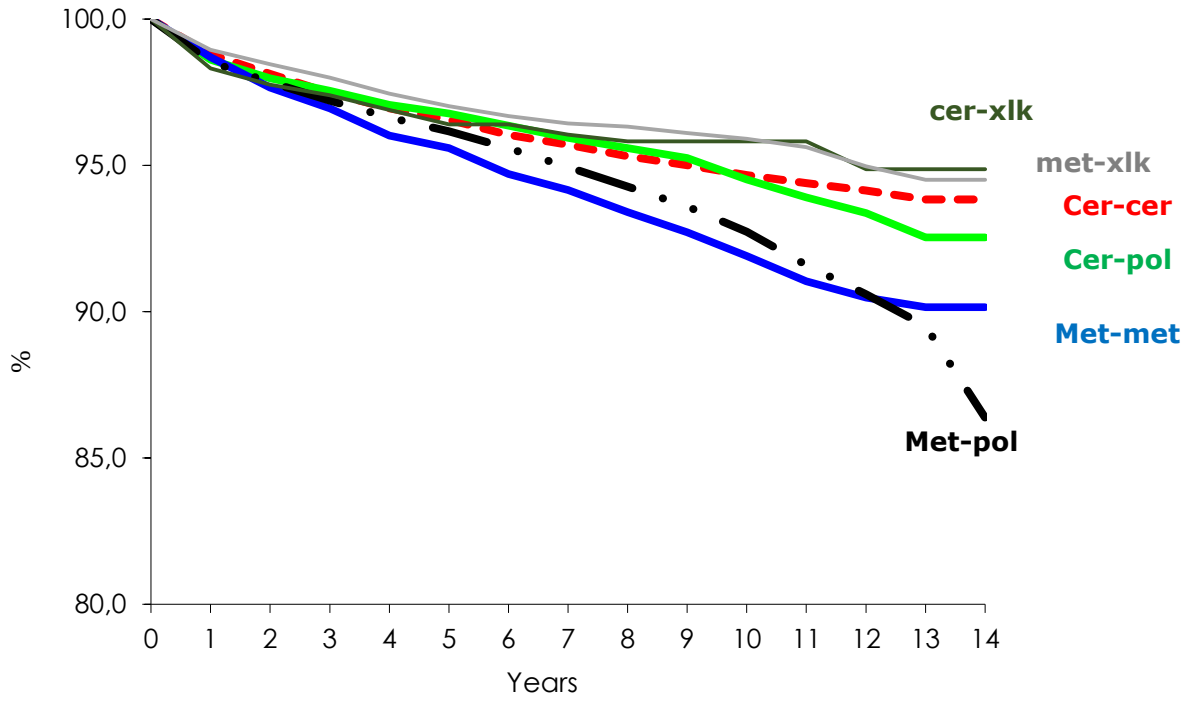
Reverse hybrid			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**14**/448	3,1	35,9
Recurrent prosthesis dislocation	**7**/448	1,6	17,9
Aseptic loosening of the stem	**6**/448	1,3	15,4
Periprosthetic bone fracture	**5**/448	1,1	12,8
Global aseptic loosening	**2**/448	0,4	5,1

Septic loosening	**1**/448	0,2	2,6
Unknown	**4**/448	0,9	10,3
Total	**39/448**	**8,7**	**100,0**

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

Articular coupling	N.	Removals	% survival at 14 yrs	Confidence interval 95%
Ceramic-ceramic	23.283	721	93,8	93,1-94,6
Metal-poly	11.581	637	86,4	83,7-89,1
Ceramic-poly	8.888	398	92,5	91,5-93,5
Ceramic- XLK	4.962	121	94,9	92,8-97,0
Metal-metal	4.637	273	90,2	88,6-91,7
Metal-XLK	4.501	135	94,5	93,1-95,9

Survival curve



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

Prosthesis met-pol			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the stem	**131**/11.581	1,1	20,6
Aseptic loosening of the cup	**126**/11.581	1,1	19,8
Recurrent prosthesis dislocation	**125**/11.581	1,1	19,6
Global aseptic loosening	**63**/11.581	0,5	9,9
Periprosthetic bone fracture	**55**/11.581	0,5	8,6
Septic loosening	**35**/11.581	0,3	5,5
Poly wear	**25**/11.581	0,2	3,9
Pain without loosening	**16**/11.581	0,1	2,5
Primary instability	**9**/11.581	0,1	1,4
Breakage of prosthesis	**9**/11.581	0,1	1,4
Other	**9**/11.581	0,1	1,4
Unknown	**34**/11.581	0,3	5,3
Total	**637/11.581**	**5,5**	**100,0**

Prosthesis met-XLK			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Periprosthetic bone fracture	**39**/4.501	0,9	28,9
Recurrent prosthesis dislocation	**29**/4.501	0,6	21,5
Aseptic loosening of the stem	**15**/4.501	0,3	11,1
Aseptic loosening of the cup	**14**/4.501	0,3	10,4
Global aseptic loosening	**11**/4.501	0,2	8,1
Septic loosening	**10**/4.501	0,2	7,4
Pain without loosening	**4**/4.501	0,1	3,0
Primary instability	**4**/4.501	0,1	3,0
Breakage of prosthesis	**1**/4.501	0,02	0,7
Other	**2**/4.501	0,04	1,5
Unknown	**6**/4.501	0,1	4,4
Total	**135/4.501**	**3,0**	**100,0**

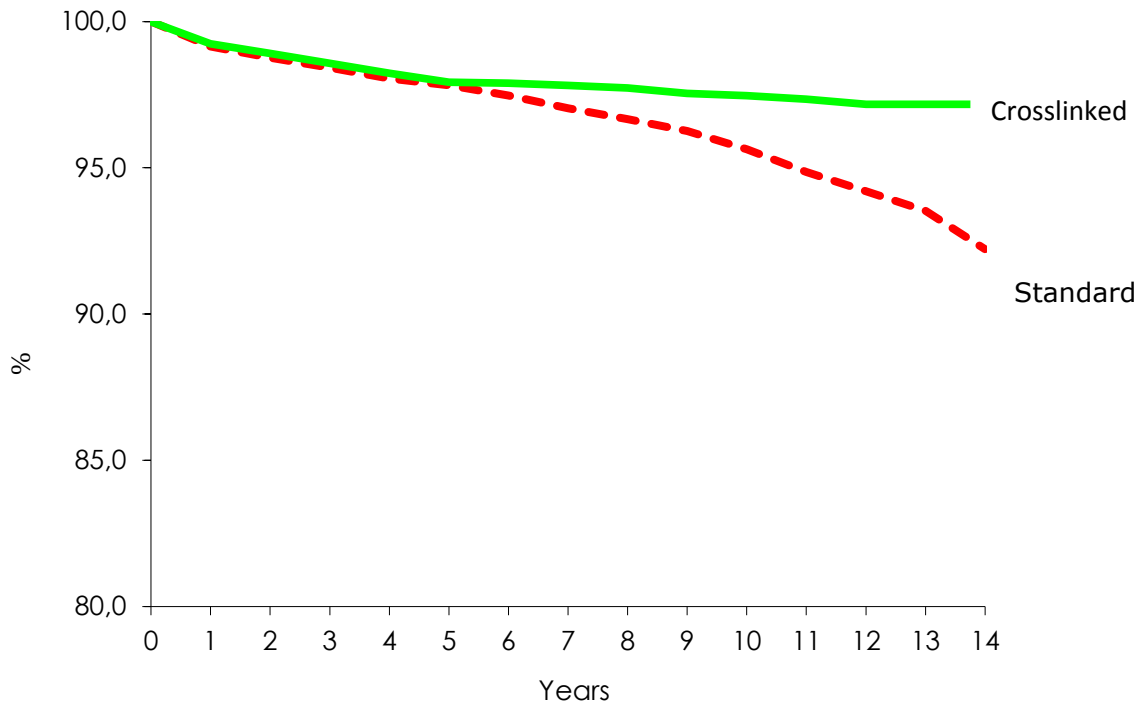
Prosthesis cer-cer			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**118**/23.283	0,5	16,4
Breakage of stem	**115**/23.283	0,5	16,0
Periprosthetic bone fracture	**100**/23.283	0,4	13,9
Aseptic loosening of the stem	**90**/23.283	0,4	12,5
Breakage of insert	**49**/23.283	0,2	6,8
Aseptic loosening of the cup	**47**/23.283	0,2	6,5
Breakage of head	**42**/23.283	0,2	5,8
Septic loosening	**37**/23.283	0,2	5,1
Primary instability	**27**/23.283	0,1	3,7
Pain without loosening	**21**/23.283	0,1	2,9
Global aseptic loosening	**14**/23.283	0,1	1,9
Heterotopic bone	**12**/23.283	0,1	1,7
Poly wear	**2**/23.283	0,01	0,3
Other	**14**/23.283	0,1	1,9
Unknown	**33**/23.283	0,1	4,6
Total	**721/23.283**	**3,1**	**100,0**

Prosthesis cer-pol			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Recurrent prosthesis dislocation	**95**/8.888	1,1	23,9
Aseptic loosening of the stem	**87**/8.888	1,0	21,9
Aseptic loosening of the cup	**58**/8.888	0,7	14,6
Periprosthetic bone fracture	**42**/8.888	0,5	10,6
Septic loosening	**25**/8.888	0,3	6,3
Global aseptic loosening	**24**/8.888	0,3	6,0
Breakage of stem	**12**/8.888	0,1	3,0
Primary instability	**8**/8.888	0,1	2,0
Pain without loosening	**7**/8.888	0,1	1,8
Poly wear	**7**/8.888	0,1	1,8
Heterotopic bone	**4**/8.888	0,05	1,0
Breakage of cup	**4**/8.888	0,05	1,0
Breakage of head	**4**/8.888	0,05	1,0
Other	**3**/8.888	0,03	0,8
Unknown	**18**/8.888	0,2	4,5
Total	**398/8.888**	**4,5**	**100,0**
Prosthesis CER-XLP			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the stem	**23**/4.962	0,5	19,0
Recurrent prosthesis dislocation	**20**/4.962	0,4	16,5
Aseptic loosening of the cup	**18**/4.962	0,4	14,9
Periprosthetic bone fracture	**11**/4.962	0,2	9,1
Primary instability	**11**/4.962	0,2	9,1
Septic loosening	**11**/4.962	0,2	9,1
Pain without loosening	**3**/4.962	0,1	2,5
Breakage of prosthesis	**3**/4.962	0,1	2,5
Global aseptic loosening	**2**/4.962	0,04	1,7
Heterotopic bone	**2**/4.962	0,04	1,7
Poly wear	**2**/4.962	0,04	1,7
Other	**4**/4.962	0,1	3,3
Unknown	**11**/4.962	0,2	9,1
Total	**121/4962**	**2,4**	**100,0**
Prosthesis met-met			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**71**/4.637	1,5	26,0
Aseptic loosening of the stem	**43**/4.637	0,9	15,8
Septic loosening	**28**/4.637	0,6	10,3
Global aseptic loosening	**27**/4.637	0,6	9,9
Recurrent prosthesis dislocation	**23**/4.637	0,5	8,4
Breakage of prosthesis	**19**/4.637	0,4	7,0
Periprosthetic bone fracture	**16**/4.637	0,3	5,9
Pain without loosening	**8**/4.637	0,2	2,9
Primary instability	**4**/4.637	0,1	1,5
Heterotopic bone	**2**/4.637	0,04	0,7
Other	**7**/4.637	0,2	2,6
Unknown	**25**/4.637	0,5	9,2
Total	**273/4.637**	**5,9**	**100,0**

9.9 Analysis of survival in primary total hip arthroplasty according to types of polyethylene

Polyethylene	N.	n. revisions	% survival 14 yrs	c.i at 95%
Standard	20654	700	92,2	90,9-93,5
Cross linked	9463	150	97,2	96,5-97,8

Survival curve



Difference is statistically significant (p=0,017, Wilcoxon test).

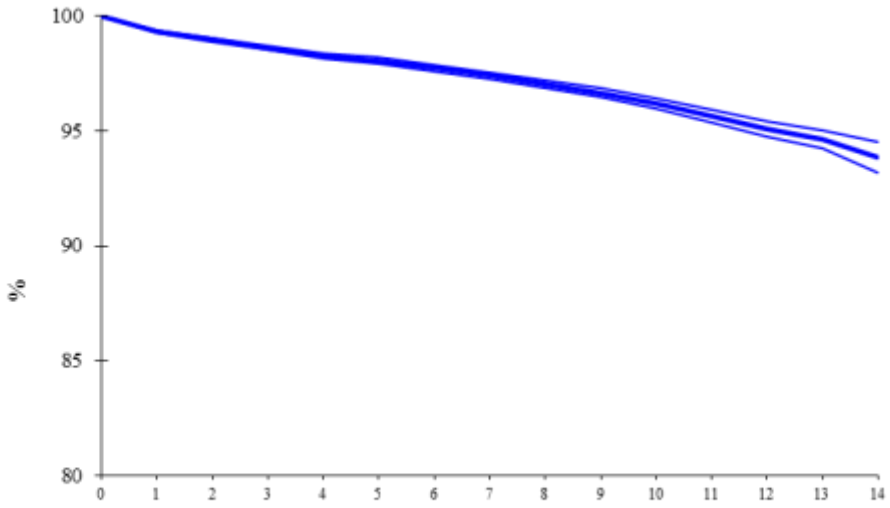
9.10 Analysis of the survivorship of the acetabular cup

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%
59.859	1.433*	93,8	93,2-94,5

*328 revision of liner only

Survival curve



9.11 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%
FIXATi por – Adler-Ortho	2007	6.530	43	99,0	98,6-99,4	-	-
FIXA Adler-Ortho	2004	5.595	84	98,8	98,5-99,1	-	-
AnCA FIT Wright Cremascoli	2000	4.934	133	98,5	98,1-98,8	97,2	96,7-97,7
EP-FIT Plus – Smith & Nephew	2003	3.870	27	99,2	98,9-99,5	97,7	95,4-100,0
CLS Sulzer, Centerpulse,Zimmer	2000	3.007	124	98,3	97,8-98,7	95,5	94,6-96,3
ABGII Stryker Howmedica	2000	2.271	35	98,8	98,4-99,3	98,2	97,6-98,9
FITMORE Sulzer	2000	2.147	55	98,1	97,5-98,7	96,7	95,7-97,6
REFLECTION	2000	1.519	50	98,5	97,8-99,1	94,7	93,1-

Smith & Nephew							96,3
TRIDENT Stryker Howmedica	2002	1.410	23	98,2	97,5-99,0	98,0	97,2-98,9
EXPANSION Mathys	2003	1.353	43	97,0	95,9-98,0	89,4	81,4-97,4
DELTA PF – Lima	2003	1.316	15	98,5	97,7-99,3	98,5	97,7-99,3
EXCEED ABT Biomet	2006	1.217	7	99,3	98,8-99,8	-	-
R3 SMITH AND NEPHEW	2009	1.213	5			-	-
BICON PLUS Smith & Nephew	2000	1.192	61	96,7	95,7-97,8	93,0	90,9-95,2
Pinnacle Sector II – DePuy	2002	1.075	16	98,1	97,1-99,1	97,5	95,9-99,1
DUOFIT PSF Samo	2000	985	36	97,7	96,7-98,6	96,2	94,8-97,5
MULLER Wright Cremascoli	2000	884	27	98,6	97,8-99,4	97,0	95,8-98,3
STANDARD CUP PROTEK Sulzer	2000	864	37	98,3	97,5-99,2	96,6	95,3-97,8
TRILOGY Zimmer	2000	847	19	98,3	97,5-99,2	97,5	96,4-98,6
DELTA TT – Lima	2007	731	6	99,0	98,3-99,8	-	-
CONTEMPORARY Stryker Howmedica	2000	703	25	96,8	95,4-98,2	95,4	93,4-97,4
RECAP RESURFACING - Biomet	2005	687	20	97,0	95,6-98,4	-	-
VERSAFITCUP CC Medacta	2005	641	17	96,8	95,2-98,3	-	-
ZCA Zimmer	2000	621	14	98,6	97,6-99,6	97,7	96,3-99,1
HILOCK LINE Symbios	2000	573	34	95,7	93,9-97,6	91,5	88,6-94,5
Continuum – Zimmer	2009	540	1	-	-	-	-
SELEXYS TH - Mathys	2006	520	19	95,6	93,7-97,6	-	-
CFP Link	2000	452	13	97,7	96,2-99,1	96,8	95,0-98,5
PE (Muller Protek) Sulzer	2000	446	22	96,5	94,7-98,3	93,9	91,3-96,5
MULLER Samo	2000	368	17	95,3	93,0-97,6	94,3	91,6-97,0
ALLOFIT S IT - Zimmer	2009	347	4	-	-	-	-
Other (with less than 300 cases each))*	2000	10.803	329	97,6	97,2-97,9	95,4	94,8-95,9
ALL MODELS	**2000**	**59.859***	**1.433**	**98,1**	**97,9-98,2**	**96,2**	**96,0-96,4**

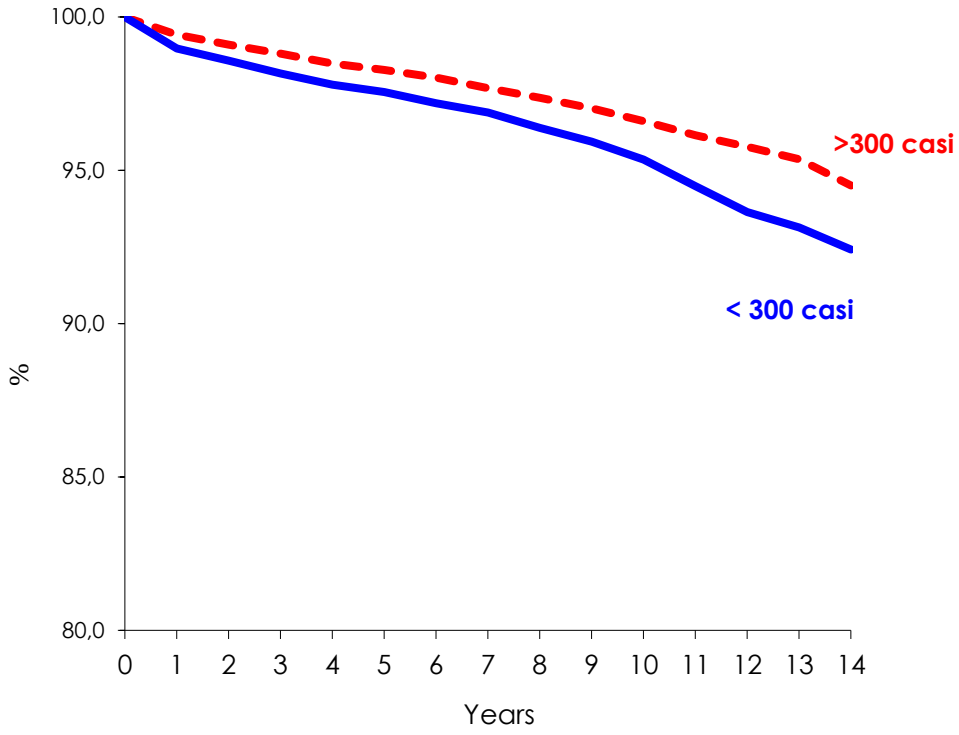
*197 missing data

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 14 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 14 yrs	Confidence interval 95%
Models >300 cases	48.858	1.031	94,5	93,8-95,3
Models <300 cases	10.803	329	92,4	91,0-93,8

Survival curve



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

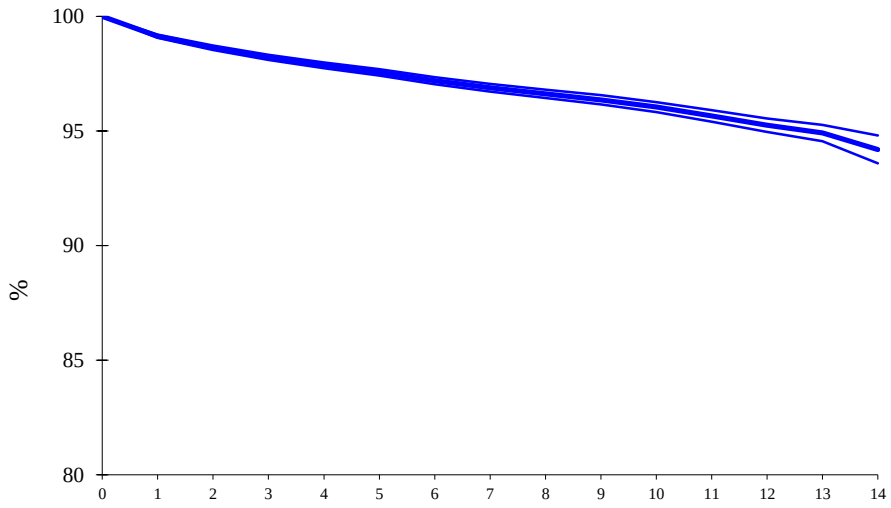
9.12 Survival analysis of the femoral component

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 14 yrs	Confidence interval 95%
59.859	1.608	94,2	93,6-94,8

*318 revision of modular neck/proximal component only

Survival curve



9.13 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	4.787	111	97,5	97,0-98,0	-	-
RECTA Adler-Ortho	2004	3.819	132	96,3	95,6-97,0	-	-
SL PLUS Smith & Nephew	2000	3.675	95	97,6	97,0-98,1	96,0	94,9-97,2
CLS Sulzer Centerpulse Zimmer	2000	3.422	85	98,3	97,8-98,7	97,0	96,4-97,7
CONUS Sulzer Centerpulse Zimmer	2000	3.147	58	98,4	98,0-98,9	97,8	97,2-98,4
AnCA FIT Wright Cremascoli	2000	3.146	150	96,3	95,6-97,0	95,1	94,3-95,8
ABGII Stryker Howmedic	2000	2.780	69	98,0	97,5-98,6	96,7	95,9-97,6
TAPERLOC Biomet	2002	2.110	30	98,2	97,5-98,8	98,2	97,5-98,8
CBC Mathys	2000	1.945	55	96,8	95,9-97,7	96,3	95,3-97,4
Hydra Adler-Ortho	2007	1.713	37	96,0	94,4-97,5	-	-
EXETER Stryker Howmedic	2000	1.167	14	99,0	98,5-99,6	98,5	97,7-99,3
PROXIPLUS ENDOPLANT	2005	1.001	10	98,9	98,1-99,6	-	-
APTA Cem Adler-Ortho	2004	947	27	97,1	96,0-98,2	-	-
CORAIL De Puy	2000	912	13	98,2	97,2-99,2	98,2	97,2-99,2
VERSYS FIBER METAL TAPER Zimmer	2000	883	15	98,7	97,9-99,5	-	-
SL PLUS MIA Smith & Nephew	2009	874	7		-	-	-
CFP Link	2000	869	9	99,3	98,7-99,9	97,8	96,0-99,6
BASIS Smith & Nephew	2001	762	24	98,2	97,2-99,3	95,0	92,9-97,1
JVC Wright Cremascoli	2000	694	27	97,9	96,8-99,0	96,4	94,9-97,9
Modulus Hip System Lima	2001	688	13	97,8	96,6-99,0	97,8	96,6-99,0
SPECTRON Smith & Nephew	2000	675	29	98,5	97,5-99,5	94,9	92,8-96,9
P507 Samo	2000	586	14	99,3	98,6-100,0	97,4	95,9-99,0
PROFEMUR Z Wright Cremascoli	2002	523	23	96,5	94,9-98,2	94,8	92,7-97,0
Alata acuta S Adler-Ortho	2005	469	20	95,0	92,7-97,2	-	-
MRL Wright Cremascoli	2000	452	16	97,6	96,2-99,1	96,5	94,6-98,3
ABG riv -Stryker Howme.	2000	447	15	99,3	98,5-100,0	98,2	96,9-99,5
SYNERGY Smith & Nephew	2000	445	3	99,8	99,3-100,0	98,8	97,3-100,0
ADR Endoplus	2007	436	5	98,4	97,0-99,8	-	-
POLARSTEM Endoplus	2007	433	2	-	-	-	-
Minimax Medacta	2007	372	6	97,9	96,2-99,6	-	-

FITMORE Zimmer	2008	367	3	-	-	-	-
NANOS Endoplant Gmbh	2005	333	4	98,3	96,5-100,0	-	-
VERSYS CEMENTED Zimmer	2000	319	8	99,0	97,9-100,0	98,6	97,2-100,0
TAPERLOC MICROPLASTY Biomet	2008	319	2	99,3	98,4-100,0	-	-
AD Samo	2000	310	12	96,2	93,9-98,5	95,1	92,3-97,8
Other (with less than 300 cases each))*	2000	13.826	396	97,4	97,1-97,7	95,5	95,0-96,0
ALL MODELS	**2000**	**59.859**	**1.608**	**97,6**	**97,4-97,7**	**96,0**	**95,8-96,3**

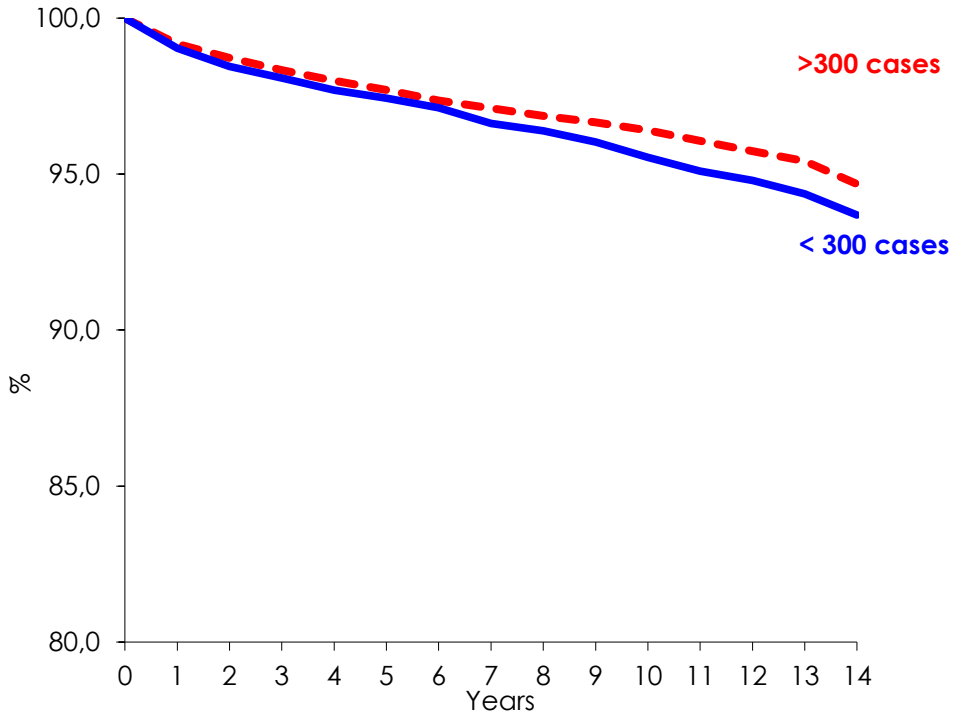
*254 missing data

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 14 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 14 yrs	Confidence interval 95%
Models >300 cases	45.773	1.140	94,7	94,0-95,4
Models <300 cases	13.826	396	93,7	92,5-94,9

Survival curve



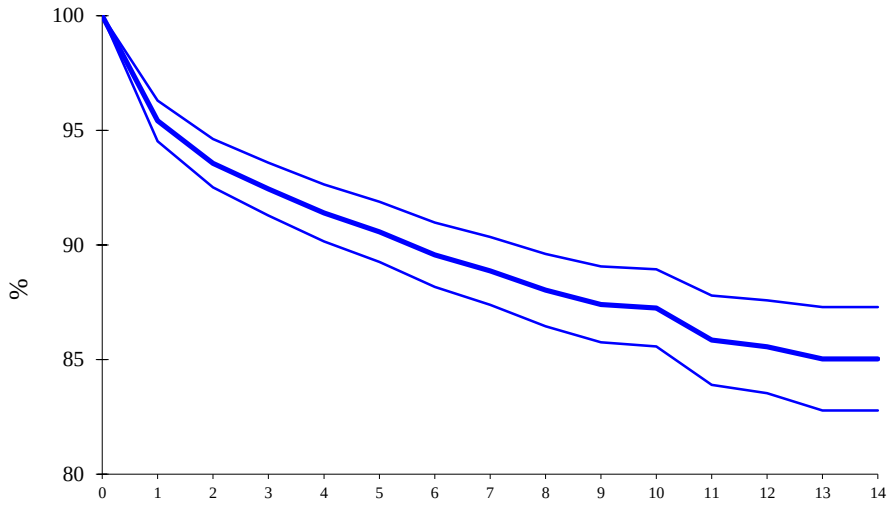
Curves are not significantly different (p=0,207, Wilcoxon test)

9.14 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 14 yrs	Confidence interval 95%
2.234	227	85,0	82,8-87,3

Survival curve



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

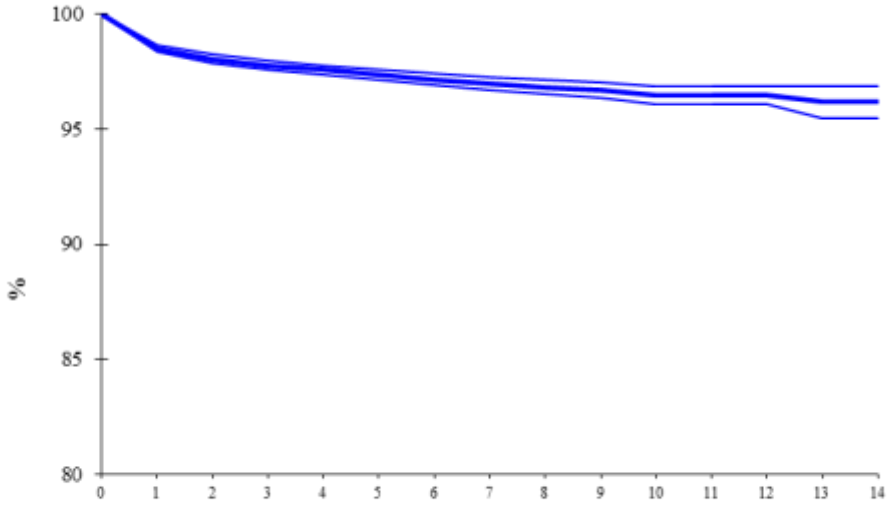
Cause of revision	Rate	%	% distribution of failure causes
Recurrent prosthesis dislocation	**51**/2.234	2,3	22,5
Aseptic loosening of the cup	**45**/2.234	2,0	19,8
Aseptic loosening of the stem	**32**/2.234	1,4	14,1
Septic loosening	**30**/2.234	1,3	13,2
Global aseptic loosening	**20**/2.234	0,9	8,8
Periprosthetic bone fracture	**14**/2.234	0,6	6,2
Breakage of prosthesis	**4**/2.234	0,2	1,8
Primary instability	**3**/2.234	0,1	1,3
Pain without loosening	**3**/2.234	0,1	1,3
Other	**8**/2.234	0,4	3,5
Unknown	**17**/2.234	0,8	7,5
Total	**227/2.234**	**10,2**	**100,0**

9.15 Survival analysis of hemiarthroplasty

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

N. of hemiarthroplasty	N. revisions	% survival at 14 yrs	Confidence interval 95%
30.639	589	96,2	95,5-96,9

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.

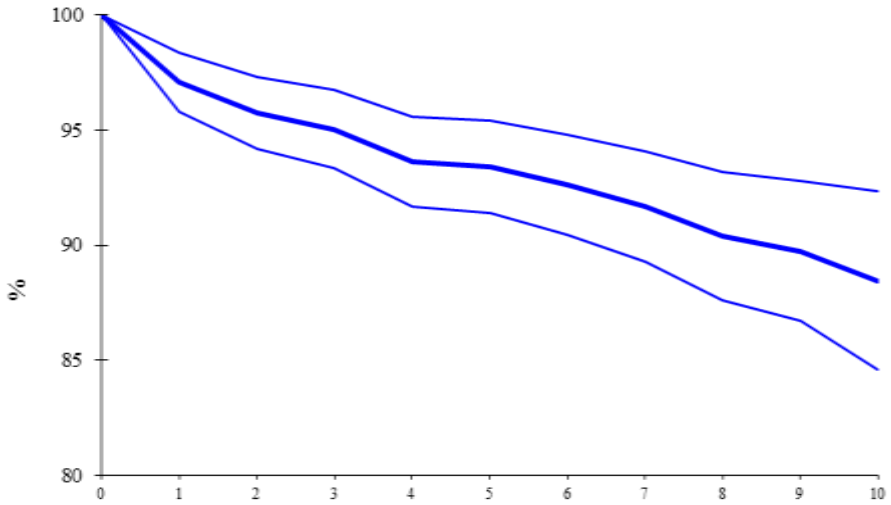
Cause of revision	Rate	%	% distribution of failure causes
Dislocation	**272**/30.639	0,9	46,2
Aseptic loosening of the stem	**93**/30.639	0,3	15,8
Cotyloiditis	**89**/30.639	0,3	15,1
Periprosthetic bone fracture	**52**/30.639	0,2	8,8
Septic loosening	**43**/30.639	0,1	7,3
Unknown	**22**/30.639	0,1	3,7
Primary instability	**10**/30.639	0,01	1,7
Other	**8**/30.639	0,01	1,4
Total	**589/30.639**	**1,9**	**100,0**

9.16 Survival analysis of resurfacing

Analysis was performed only on patients resident in Emilia-Romagna region.
The number of implants for which survival is calculated is obviously lower (10 years) than the amount present in the database (14 years).

N. of resurfacing	Removal	% survival at 10 yrs	Confidence interval 95%
675	51	88,5	84,6-92,4

Survival curve



Type of prosthesis	First implant	N.	Rev. (in all period)	% survival at 5 yrs	Confidence interval 95%
BHR – Smith & Nephew	2001	342	14	96,7	94,7-98,7
ADEPT – Finsbury	2005	104	2	98,0	95,2-100,0
ASR – DePuy	2004	63	16	80,6	70,8-90,5
BMHR – Smith & Nephew	2007	61	2	98,3	95,1-100,0
MRS – Lima	2005	42	9	81,0	69,1-92,8
Other (< 40 cases)	2003	63	8	90,3	82,9-97,7
Total	**2001**	**675**	**51**	**93,4**	**91,4-95,4**

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

Cause of revision	Rate	%	% distribution of failure causes
Aseptic loosening	**18**/675	2,7	35,3
Periprosthetic bone fracture	**15**/675	2,2	29,4
Pain without loosening	**7**/675	1,0	13,7
Metal sensitization	**5**/675	0,7	9,8
Breakage of prosthesis	**2**/675	0,3	3,9
Septic loosening	**1**/675	0,1	2,0
Unknown	**3/675**	0,4	5,9
Total	**51/675**	**7,6**	**100,0**

PART TWO: KNEE PROSTHESIS

July 2000 – December 2013

10. RIPO capture

10.1 Percentage of capture

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), according to Agency was **98,6**% for year 2013. Data are referred to primary knee prosthesis (8154), revision (8155;80;81;82;83;84) and prosthesis removal (8006).

10.2 Ratio public/private treatment

Percentage of primary arthroprostheses 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
2013	34,7	38,5

From database SDO

Percentage of primary total knee arthroprostheses and revision performed in public and private hospitals, in year 2013

Type of operation	Public	Private
	%	%
Primary bicompartmental	54,4	67,0
Primary tricompartmental	27,4	11,9
Primary unicompartmental	8,8	12,0
Revision	6,4	6,9
Prosthesis removal	1,8	1,1
Implant of patella	1,1	1,1
Total	**100,0**	**100,0**

11. Type of operation

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

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2013, according to **type**

Type of operation	Number	Percentage
Primary bicompartmental	48.402	66,1
Primary tricompartmental	10.116	13,8
Primary unicompartmental	7.708	10,5
Revision^	4.454	6,1
Prosthesis removal	986	1,3
Implant of patella	573	0,8
Other prostheses*	330	0,5
Other operations°	639	0,9
Total	**73.208**	**100,0**

*49 Hemicap – Arthrosurface, 29 Hemicap patello_femoral – Arthrosurface, 52 Avon-Patello-Femoral Joint Stryker, 106 other patella-femoral, 53 Unicompartimental Plus + patella
°242 spacer exchange, 69 stiff knee loosenings, 78 debridments, 5 dislocation reductions
^380 liner, 8 femoral component, 1 tibial component, 88 femoral component and liner, 252 tibial component and liner, 3.696 total, 29 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	78,6	8,7
2004	12,9	75,7	11,3
2005	12,4	75,6	12,0
2006	10,8	69,9	19,2
2007	11,6	69,3	19,2
2008	11,5	72,2	16,3
2009	12,9	72,3	14,7
2010	12,5	71,5	16,0
2011	9,7	73,4	16,8
2012	10,5	72,3	17,2
2013	12,1	69,1	18,8

12. Descriptive statistics of patients with knee prosthesis

12.1 Age

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2013, 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	212	0,4	737	1,3	4.187	7,2	17.858	30,5	29.017	49,6	6.507	11,1	**58.518**
Unicomp	21	0,3	234	3,0	1.457	18,9	3.226	41,9	2.337	30,3	433	5,6	**7.708**
Revision	20	0,4	111	2,5	412	9,3	1370	30,8	2002	44,9	539	12,1	**4.454**
Prosthesis removal	9	0,9	30	3,0	110	11,2	335	34,0	400	40,6	102	10,3	**986**
Patella only	5	0,9	17	3,0	40	7,0	170	29,7	282	49,2	59	10,3	**573**
Total*	**267**	**0,4**	**1.129**	**1,6**	**6.206**	**8,6**	**22.959**	**31,8**	**34.038**	**47,1**	**59**	**10,6**	**72.239**

* 6 missing cases casi (0,009%)

Mean age at surgery, according to type of operation - years 2000-2013

Type of operation	Mean age	Range
Primary bi/tricompartmental	70,6	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 2001-2013

Type of operation	Year 2001		Year 2013	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental°	71,2	23-92	70,2	26-92
Primary unicompartmental*	68,9	45-87	65,6	38-90
Revision^	71,8	26-87	69,4	32-89

° 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 2000-2013 - 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)

12.2 Gender

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2013, according to **type of operation** and **gender** of patients

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Bi/tricompartmental	16.373	28,0	42.145	72,0	58.518
Unicompartmental	2.519	32,7	5.189	67,3	7.708
Revision	1.159	26,0	3.295	74,0	4.454
Prosthesis removal	368	37,3	618	62,7	986
Patella only	141	24,6	432	75,4	573
Total	**20.560**	**28,5**	**51.679**	**71,5**	**72.239**

12.3 Side of surgery

There is a prevalence of operations performed on the right side (55,0%) in comparison with the left side (45,0%). The percentage was calculated on patients affected by primary arthritis, on first side operated.

Percentage

Side	Males	Females
Right	51,5	56,5
Left	48,5	43,5

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

12.4 Bilateral arthroplasty

In the period of registry observation (14 years), 10.069 patients underwent bilateral operations.
8.597 (85,4%) chose to undergo the second operation at the same hospital from where the first one was performed.
469 (4,7%) chose to undergo the second operation at a different hospital from where the first one was performed to follow the surgeon.
1.003 (10,0%) 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 54,1% of cases.

12.5 Diseases treated with unicompartmental knee prosthesis

Number of primary unicompartmental knee prosthesis operations carried out on patients with admission date between 1st July 2000 and 31st December 2013, according to **diagnosis**

Diagnosis in unicomp. knee prosthesis	Number	Percentage
Primary arthritis	6.606	85,9
Necrosis of the condyle	398	5,2
Deformity	419	5,4
Post-traumatic arthritis	86	1,1
Post-traumatic necrosis	64	0,8
Idiopathic necrosis	33	0,4

Sequelae of fracture	40	0,5
Rheumatic arthritis	16	0,2
Sequelae of osteotomy	11	0,1
Other	17	0,2
Total*	**7.690**	**100,0**

*18 missing data (0,2%)

12.6 Diseases treated with bi-tricompartmental knee prosthesis

Number of primary bi-tricompartmental knee prosthesis operations carried out on patients with admission date between 1st July 2000 and 31st December 2013, according to **diagnosis**.

Diagnosis in bi/tricompartmental knee prosth.	Number	Percentage
Primary arthritis	50.394	86,4
Deformity	4.229	7,2
Post-traumatic arthritis	970	1,7
Rheumatic arthritis	892	1,5
Sequelae of fracture	755	1,3
Necrosis of the condyle	347	0,6
Sequelae of osteotomy	341	0,6
Post-traumatic necrosis	83	0,1
Sequelae of septic arthritis	72	0,1
Sequelae of poliomyelitis	46	0,1
Idiopathic necrosis	38	0,1
Tumor	14	0,01
Other	158	0,3
Total*	**58.339**	**100,0**

*179 missing data (0,3%)

12.7 Causes of revision and removal

Number of **revision operations** carried out on patients admitted between 1st July 2000 and 31st December 2013, 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	1.845	43,3
Prosthesis removal	820	19,3
Aseptic loosening of tibial component	394	9,3
Pain without loosening	389	9,1
Insert wear	204	4,8
Aseptic loosening of femoral component	132	3,1
Septic loosening	128	3,0
Prosthesis dislocation	103	2,4
Instability	79	1,9
Periprosthetic bone fracture	59	1,4
Stiffness	49	1,2
Breakage of prosthesis	55	1,3
Other	154	3,6
Total*	**4.257**	**100,0**

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

Number of **prosthesis removal** carried out on patients admitted between 1st July 2000 and 31st December 2013, 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	883	91,0
Total aseptic loosening	55	5,7
Prosthesis dislocation	5	0,5
Aseptic loosening of tibial component	6	0,6
Pain without loosening	5	0,5
Periprosthetic bone fracture	6	0,6
Other	10	1,0
Total*	**970**	**100,0**

*16 missing data (1,6%)

13. Types of knee prosthesis

13.1 Unicompartmental prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2013, primary unicompartmental surgery.

All poly tibial components in **bold**

TYPE OF PROSTHESIS	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
ZIMMER UNI - Zimmer	-	-	300	9,1	479	16,6
GENESIS UNI - Smith & Nephew	131	8,6	492	15,0	395	13,7
UNI SIGMA HP - De Puy Johnson & Johnson	-	-	11	0,3	386	13,4
JOURNEY UNI - All Poly - Smith & Nephew	***-***	***-***	***-***	***-***	***240***	***8,3***
OXFORD UNICOMPARTMENTAL PHASE 3 - Biomet Merck	428	27,9	692	21,0	231	8,0
GENESIS UNI - ALL POLY - Smith & Nephew	***16***	***1,0***	***84***	***2,6***	***194***	***6,7***
JOURNEY UNI - Smith & Nephew	-	-	-	-	183	6,3
GKS - ONE - ALL POLY - Permedica	***-***	***-***	***108***	***3,3***	***149***	***5,2***
BALANSYS - UNI - Mathys	-	-	63	1,9	85	2,9
MITUS - ENDO-MODEL UNI - ALL POLY - Link	***76***	***5,0***	***245***	***7,5***	***81***	***2,8***
UNI SIGMA HP - ALL POLY - De Puy Johnson & Johnson	***-***	***-***	***-***	***-***	***81***	***2,8***
UC-PLUS SOLUTION - ALL POLY - Endoplus	***3***	***0,2***	***79***	***2,4***	***62***	***2,1***
ALLEGRETTO UNI - Protek-Sulzer	***204***	***13,3***	***49***	***1,5***	***62***	***2,1***
EFDIOS - Citieffe	254	16,6	171	5,2	52	1,8
OPTETRAK - UNI - ALL POLY - Exactech	***-***	***-***	***126***	***3,8***	***45***	***1,6***
GENUS UNI - Adler	-	-	-	-	31	1,1
TRIATHLON - PKR - HOWMEDICA Osteonics	-	-	3	0,1	22	0,8
PRESERVATION UNI - ALL POLY - Depuy	***125***	***8,2***	***228***	***6,9***	***21***	***0,7***
GKS - ONE - CUSTOM MADE - Permedica	***-***	***-***	***5***	***0,2***	***19***	***0,7***
GKS - ONE - Permedica	-	-	-	-	14	0,5

PRESERVATION UNI - Depuy	-	-	14	0,4	13	0,5
ACS UNI - Implantcast	-	-	-	-	11	0,4
UC-PLUS SOLUTION - Endoplus	45	2,9	194	5,9	3	0,1
HLS - UNI EVOLUTION - ALL POLY - Tornier	***53***	***3,5***	***100***	***3,0***	***1***	***-***
MILLER GALANTE UNI - Zimmer	103	6,7	75	2,3	1	-
MAIOR - Finceramica	-	-	154	4,7	-	-
EIUS UNI - ALL POLY - STRYKER Howmedica	***5***	***0,3***	***54***	***1,6***	***-***	***-***
OPTETRAK - ARTHROFOCUS - Exactech	***-***	***-***	***10***	***0,3***	***-***	***-***
PFC - UNI - De Puy Johnson & Johnson	41	2,7	-	-	-	-
UNICIA - VECTEUR ORTHOPEDIC - Stratec	27	1,8	-	-	-	-
Other (models with less than 10 cases)	20	1,3	17	0,5	24	0,8
Unknown	1	0,1	14	0,4	3	0,1
Total	**1.532**	**100,0**	**3.288**	**100,0**	**2.888**	**100,0**

13.2 Bi-tricompartmental knee prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2013, primary bi/tricompartmental surgery.

TYPE OF PROSTHESIS	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
NEXGEN – Zimmer	3.024	27,1	5.940	24,3	3.894	17,0
P.F.C – DePuy	904	8,1	1.894	7,8	2.985	13,0
VANGUARD – Biomet Merck France	-	-	1.579	6,5	2.939	12,8
GENESIS - Smith & Nephew	212	1,9	1.783	7,3	2.484	10,8
TC-PLUS - SOLUTION - Smith & Nephew	13	0,1	1.066	4,4	1.428	6,2
GEMINI - Link	151	1,4	991	4,1	1.062	4,6
TRIATHLON – Stryker Howmedica Osteonics	-	-	401	1,6	1.035	4,5
GENUS – Adler-Ortho	-	-	328	1,3	950	4,1
FIRST - Symbios Orthopedie SA	-	-	345	1,4	618	2,7
GSP - TREKKING - Samo	-	-	246	1,0	582	2,5
SCORPIO – Stryker Howmedica	526	4,7	1.534	6,3	565	2,5
BALANSYS - Mathys	-	-	173	0,7	542	2,4
G.K.S. – Permedica	106	0,9	252	1,0	530	2,3
PROFIX – Smith & Nephew	1.854	16,6	2.823	11,6	409	1,8
INNEX - Protek Sulzer	12	0,1	34	0,1	292	1,3
OPTETRACK – Exactech	289	2,6	661	2,7	265	1,2
ADVANCE - Wright	292	2,6	384	1,6	251	1,1
LEGION - Smith & Nephew	-	-	8	0,0	238	1,0
APEX - Omnilife Science	-	-	-	-	179	0,8
PERSONA - Zimmer	-	-	-	-	168	0,7
ROTAGLIDE – Corin Medical	296	2,7	362	1,5	167	0,7
LCS – DePuy	417	3,7	354	1,4	161	0,7
COLUMBUS - B.Braun	-	-	192	0,8	148	0,6
ATTUNE – DePuy	-	-	-	-	132	0,6
RT-PLUS - Smith & Nephew	3	0,0	75	0,3	122	0,5
GENIUS TRICCC - Dedienne Sante	295	2,6	246	1,0	105	0,5
JOURNEY – Smith & Nephew	-	-	170	0,7	99	0,4
HLS – Tornier	137	1,2	164	0,7	85	0,4
ENDO-MODEL - Link	149	1,3	123	0,5	83	0,4

E.MOTION - B.Braun	-	-	130	0,5	51	0,2
ACS - Implantcast	-	-	-	-	40	0,2
MULTIGEN - Lima	20	0,2	393	1,6	26	0,1
AGC - Biomet Merck France	58	0,5	527	2,2	6	0,0
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	-	-
CINETIQUE - Medacta	17	0,2	83	0,3	-	-
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)	149	1,3	182	0,7	284	1,2
Unknown	10	0,1	29	0,1	9	0,0
Total	**11.162**	**100,0**	**24.422**	**100,0**	**22.934**	**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).

13.3 Revision prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2013, in total revision surgery.

TYPE OF PROSTHESIS	2000-2004		2005-2009		2010-2013	
	N.	%	N.	%	N.	%
NEXGEN - Zimmer	163	27,2	453	30,2	380	23,8
LEGION - Smith & Nephew	-	-	49	3,3	203	12,7
SIGMA RP - TC3 - DePuy	-	-	61	4,1	145	9,1
ENDO-MODEL - Link	112	18,7	101	6,7	127	8,0
RT-PLUS - Smith & Nephew	5	0,8	117	7,8	122	7,6
PFC - DePuy	59	9,8	115	7,7	103	6,5
GENESIS - Smith & Nephew	2	0,3	66	4,4	85	5,3
GKS - Permedica	13	2,2	44	2,9	61	3,8
VANGUARD - Biomet	-	-	39	2,6	56	3,5
TRIATHLON - Howmedica Osteonics	-	-	8	0,5	27	1,7
DURATION MRH - Osteonics	12	2,0	73	4,9	26	1,6
SCORPIO - Osteonics	2	0,3	61	4,1	24	1,5
OPTETRAK - Exactech	13	2,2	53	3,5	24	1,5
LPS - DePuy	-	-	-	-	21	1,3
GSP - TREKKING - Samo	-	-	-	-	19	1,2
S-ROM NRH - Johnson & Johnson	10	1,7	19	1,3	18	1,1
BALANSYS - Mathys	-	-	4	0,3	18	1,1
TC-PLUS -SOLUTION - Smith & Nephew	1	0,2	18	1,2	16	1,0
ACS - Implantcast	-	-	1	0,1	15	0,9
GEMINI - Link	1	0,2	13	0,9	13	0,8
E.MOTION - B.Braun	-	-	11	0,7	13	0,8
FIRST - Symbios Orthopedie SA	-	-	7	0,5	12	0,8
PROFIX - Smith & Nephew	57	9,5	55	3,7	10	0,6
MUTARS - Implantcast	1	0,2	3	0,2	6	0,4

AGC - Biomet Merck France	52	8,7	70	4,7	5	0,3
ADVANCE - Wright	7	1,2	6	0,4	3	0,2
LCS – DePuy	2	0,3	7	0,5	2	0,1
GENIUS TRICCC - Dedienne Sante	9	1,5	1	0,1	2	0,1
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)	35	5,8	25	1,7	39	2,4
Unknown	3	0,5	8	0,5	1	0,1
Total	**599**	**100,0**	**1.501**	**100,0**	**1.596**	**100,0**

13.4 Prosthesis fixation

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31st December 2013, according to **prosthesis fixation**

Fixation	Primary unicomp.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	7.042	91,5	53.338	91,2	3.619	98,0	63.999	91,6
Cementless	490	6,4	2.980	5,1	41	1,1	3.511	5,0
Fem. cementless + tib. cemented	157	2,0	1.597	2,7	19	0,5	1.773	2,5
Fem. cem. + tib. cementless	9	0,1	568	1,0	13	0,4	590	0,8
Total*	7.698		58.483		3.692		69.873	

*49 missing data (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	0,7
2012	95,1	4,2	0,3	0,4
2013	96,7	3,0	0,1	0,2

13.5 Type of insert

Stabilization of insert in bi-tricompartmental knee prostheses.

Years of operation	% Mininally stabilized	% 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	39,7	58,6	1,7
2009	46,2	52,0	1,8
2010	42,3	55,2	2,5
2011	45,6	52,3	2,1
2012	39,4	58,4	2,1
2013	35,1	61,9	2,9

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

Years of operation	% fixed insert	% mobile insert
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	58,5	41,5
2007	62,2	37,8
2008	60,6	39,4
2009	59,2	40,8
2010	54,8	45,2
2011	55,4	44,6
2012	58,9	41,1
2013	64,4	35,6

13.6 Bone Cement

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

In **bold** bone cement loaded with antibiotic

Cement	%
Surgical Simplex P – Howmedica	23,3
Antibiotic Simplex – Howmedica	**17,2**
Palacos R - Heraeus Medical	10,4
Palacos R+G - Heraeus Medical	**8,4**
Versabond AB - Smith & Nephew	**3,5**
Osteobond – Zimmer	3,1
Versabond - Smith & Nephew	**3,0**
Hi-Fatigue G - Zimmer	**2,5**
Aminofix 1 – Groupe Lepine	**2,4**
Cemex System – Tecres	2,3
Hi-Fatigue - Zimmer	2,0
Palacos R - Biomet	1,9
Cemex Genta System - Tecres	**1,7**
Palamed G - Heraeus Medical	**1,6**
Refobacin Revision - Biomet	**1,5**
Refobacin Bone Cement R - Biomet	**1,4**
Palamed - Heraeus Medical	1,4
Cemex – Tecres	1,4
Other bone cement without antibiotic	6,1
Other bone cement loaded with antibiotic	**4,9**
Total	**100,0**

Bone cement loaded with antibiotic is used in 45,1% of cases.

14. Complications occurred during hospitalization

The rate of complications in **primary unicompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2013

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Tibial fracture	6	*0,1*	Hematoma	37	*0,5*	Anemia	18	*0,2*
						Hyperpyrexia	17	*0,2*
Fem. fract.	6	*0,1*	Infection	4	*0,1*	Gastro-intestinal	12	*0,2*
Tibial tuberosity fracture	1	*0,01*				Cardiac	10	*0,1*
Ligament lesion	1	*0,01*	DVT	4	*0,1*	Genito-urinary	7	*0,1*
						Embolism	6	*0,1*
Anesthesiol.	1	*0,01*	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	20	*0,3*
Total	**21**	***0,3***	**Total**	**52**	***0,7***	**Total**	**99**	***1,3***

The rate of complications in **primary bi-tricompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2013

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Fem. fract.	48	*0,1*	Hematoma	585	*1,0*	Anemia	1738	*3,0*
			DVT	105	*0,2*	Hyperpyrexia	337	*0,6*
Ligament lesion	33	*0,1*	Wound dehiscence	52	*0,1*	Genito-urinary	166	*0,3*
			SPE paralysis	45	*0,1*	Gastro-intestinal	178	*0,3*
Tibial fracture	29	*0,05*	Edema	43	*0,1*	Cardiac	157	*0,3*
Anesthesiol.	26	*0,04*	Bed sores	28	*0,05*	Embolism	83	*0,1*
			Bleeding	23	*0,04*	Respiratory	86	*0,1*
Rupture patellar tendon	24	*0,04*	Infection	23	*0,04*	Disorientation	59	*0,1*
Hemorragia	23	*0,04*	Undescended drainage	17	*0,03*			
						Collapse	45	*0,1*
Hemorragia	10	*0,02*	Instability of ligaments	12	*0,02*	Infarction	41	*0,1*
Tibial tuberosity fracture	7	*0,01*	Prosthesis disloc.	6	*0,01*	Dyspnoea	41	*0,1*
Other	21	*0,04*	Other	89	*0,2*	Other	257	*0,4*
Total	**221**	***0,4***	**Total**	**1.028**	***1,8***	**Total**	**3.188**	***5,4***

The rate of complications in **revision surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2013

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	*%*		**N.**	*%*		**N.**	*%*
Tibial fracture	16	*0,4*	Hematoma	68	*1,5*	Anemia	219	*4,9*
			Wound dehiscence	16	*0,4*	Hyperpyrexia	29	*0,7*
Rupture patellar tendon	16	*0,4*	Infection	11	*0,2*	Cardiac	17	*0,4*
						Gastro-intestinal	17	*0,4*
Fem. fract.	12	*0,3*	Prosthesis disloc.	7	*0,2*	Respiratory	15	*0,3*
						Genito-urinary	10	*0,2*
Anesthesiol.	8	*0,2*	SPE paralysis	6	*0,1*	Disorientation	7	*0,2*
						Allergic reaction	6	*0,1*
Tibial tuberosity fracture	6	*0,1*	Bleeding	6	*0,1*	Reaction to transfusion	6	*0,1*
Ligament lesion	1	*0,02*	Edema	5	*0,1*	Embolism	5	*0,1*
			DVT	2	*0,04*	Collapse	4	*0,1*
						Infarction	1	*0,02*
Other	13	*0,3*	Other	13	*0,3*	Other	17	*0,4*
Total	**72**	***1,6***	**Total**	**134**	***3,0***	**Total**	**353**	***7,9***

14.1 Deaths occurred during hospitalization

Rate of deaths in knee prosthetic surgery carried out on patients hospitalized between July 1st 2000 and December 31st 2013.

Registered deaths occurred during hospitalization.

Years 2000-2013			
Type of operation	**Deaths**	**Number of surgery**	**Percentage**
Primary bi/tricompartmental	52	58.518	0,09
Primary unicompartmental	1	7.708	0,01
Revision	7	4.454	0,16
Prosthesis removal	2	986	0,2

15. Analysis of survival of primary surgery

15.1 Cox multivariate analysis

Bi-tri compartmental

The Cox multivariate analysis identifies any variables that are independent from each other that can influence the event, in our case the removal of at least one prosthesis component. Analysis was performed on 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 2013 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 38.069
Non revised: 36.946
Revised: 1.123

Chi-square: 114,80 *p*= 0,0001

VARIABLE	SIGNIFICANCE (P)
Gender (Males vs females)	**NS** (0,342)
Age (less than 60 yrs vs more than 60 yrs)	**S** (0,001)
Diagnosis (arthrosis vs other)	**NS** (0,365)
Type of insert (Mobile vs fix)	**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 60 yrs (reference:more than 60 yrs)	2,2	1,8	2,5	0,001

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

Unicompartmental

All primary unicompartmental knee arthroplasties performed in the Region between July 2000 and December 2013 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 60 yrs (reference:more than 60 yrs)	1,5	1,2	2,0	0,001

Other variables do not influence the risk (Gender p=0,124; Type of tibial component p=0,545)

15.2 Rate of failure

As already written in hip section, the recovery of data of operations not reported to RIPO is in progress. The uncertainty due to the failure to report about 10% of operations performed in the Region, may lead to an underestimation of the revision rate that is not quantifiable at the moment.
The following table shows in the second column the number of primary joint arthroplasty operations performed in the period from July 2000 to December 2013; 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	31.517	530	426	956
Primary tricompartmental	6.552	123	44	167
Primary unicomp.	4.652	207	132	339
Total revision	2.017	126	83	209

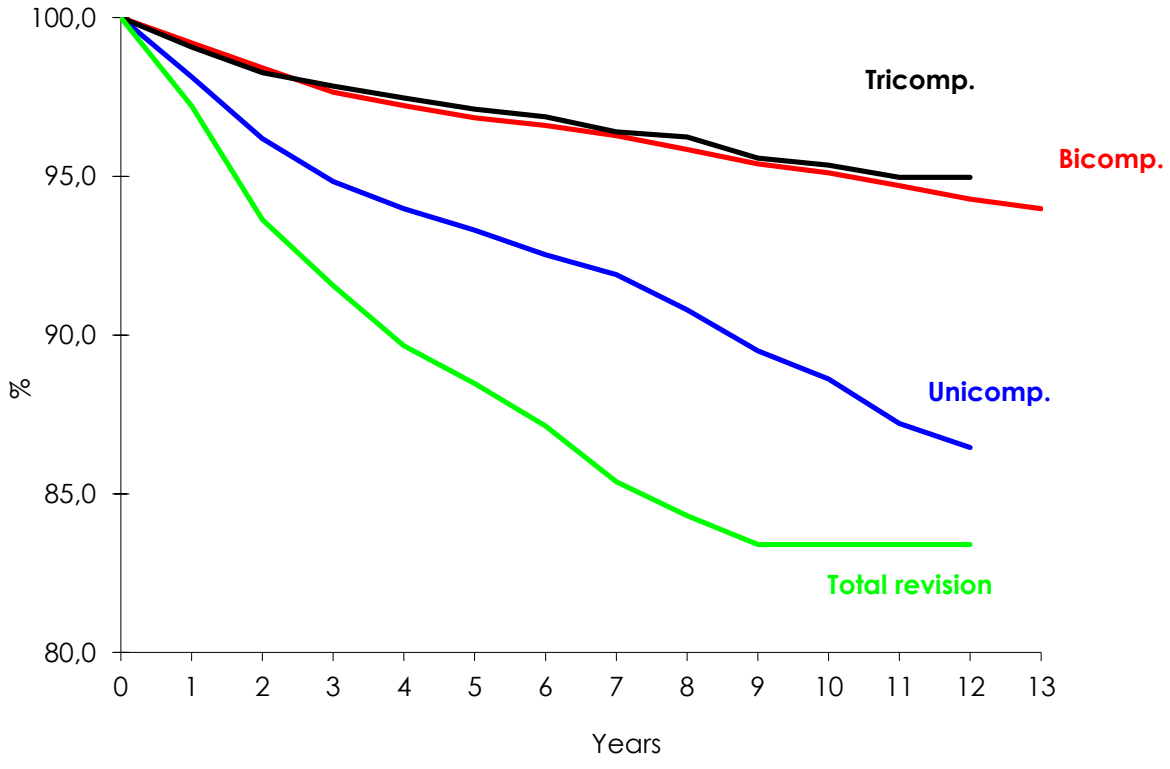
In **41%** of the primary total prostheses that are replaced, the patient undergoes revision surgery in a different hospital from the one where the primary operation was performed.

15.3 Analysis of survival in primary uni and bi/tricompartmental knee prosthesis

Analysis has been separately performed for uni, bi, tricompartmental 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 insert and/or patella are revised.

Type of operation	N. implants	N. major revisions	N. minor revisions	% revisions	Survival at 12 Yrs (CI 95%)
Primary bicompartmental	31.517	853	103	956/31.517	94,3 (93,8-94,8)
Primary tricompartmental	6.552	139	28	167/6.552	95,0 (93,7-96,2)
Primary unicompartmental	4.652	327	12	339/4.652	86,5 (84,5-88,4)
Total revision	2.017	184	25	209/2.017	83,4 (81,0-85,9)

Survival curve



Survivorship of unicompartmental prostheses is significantly different at 12 years follow-up from bi and tricompartimental 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 unicompartmental

Cause of revision	Rate	Percentage	% distribut. of failure causes
Total aseptic loosening	142/4.652	3,1	41,9
Pain without loosening	58/4.652	1,2	17,1
Tibial aseptic loosening	42/4.652	0,9	12,4
Septic loosening	33/4.652	0,7	9,7
Femoral aseptic loosening	16/4.652	0,3	4,7
Insert wear	14/4.652	0,3	4,1
Breakage of prosthesis	7/4.652	0,2	2,1
Dislocation	5/4.652	0,1	1,5
Bone fracture	4/4.652	0,1	1,2
Instability	2/4.652	0,0	0,6
Unknown	9/4.652	0,2	2,7
Other	7/4.652	0,2	2,1
Total	**339/4.652**	**7,3**	**100,0**

Primary bi-tricompartmental

Cause of revision	Rate	Percentage	% distribut. of failure causes
Total aseptic loosening	311/38.069	0,9	32,0
Septic loosening	255/38.069	0,7	25,2
Pain without loosening	99/38.069	0,3	10,2
Tibial aseptic loosening	93/38.069	0,3	9,3
Dislocation	42/38.069	0,1	3,9
Insert wear	34/38.069	0,1	3,6
Femoral aseptic loosening	31/38.069	0,1	3,0
Instability	24/38.069	0,1	2,1
Stiffness	19/38.069	0,05	1,7
Bone fracture	18/38.069	0,05	1,6
Breakage of prosthesis	8/38.069	0,03	1,0
Unknown	38/38.069	0,1	3,7
Other	21/38.069	0,1	2,8
Total	**1.123/38.069**	**2,9**	**100,0**

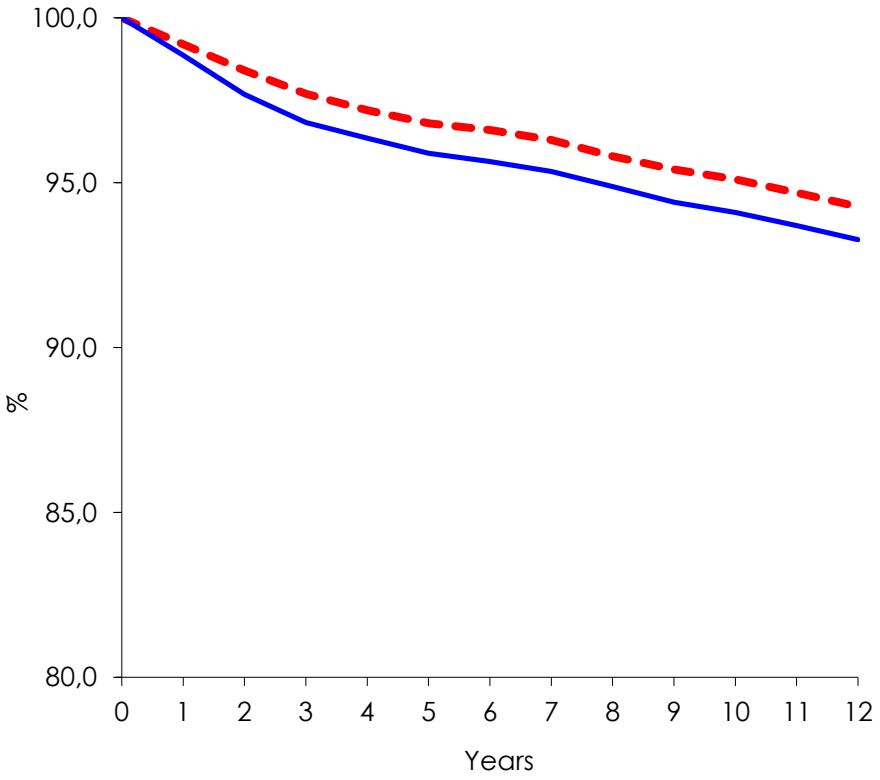
Total revision

Cause of second revision	Rate	Percentage	% distribut. of failure causes
Septic loosening	69/2.017	3,4	33,0
Total aseptic loosening	55/2.017	2,7	26,3
Tibial aseptic loosening	20/2.017	1,0	9,6
Unknown	13/2.017	0,6	6,2
Pain without loosening	12/2.017	0,6	5,7
Dislocation	8/2.017	0,4	3,8
Instability	5/2.017	0,2	2,4
Femoral aseptic loosening	5/2.017	0,2	2,4
Stiffness	5/2.017	0,2	2,4
Insert wear	4/2.017	0,2	1,9

Other	4/2.017	0,2	1,9
Breakage of prosthesis	3/2.017	0,1	1,4
Trauma	3/2.017	0,1	1,4
Periprosthetic bone fracture	3/2.017	0,1	1,4
Total	**209/2.017**	**10,4**	**100,0**

15.4 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 297 cases (out 31.517 bicompartmental prostheses recorded in the RIPO).
The mean time lapse between primary bicompartmental arthroplasty and implanting the patella was 1,9 years (I.C. at 95% 1,6-1,9).
These 297 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 13 yrs is 93,0% and 94,0% respectively.
13% of the 297 cases that underwent the addition of patella resurfacing, have been successively revised.



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

In **bold** Monoblock Prosthesis

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	835	90	91,7	89,8-93,7	87,0	84,2-89,9
GENESIS UNI - Smith & Nephew	2000	625	39	94,0	92,0-96,0	89,8	85,4-94,3
ZIMMER UNI - Zimmer	2005	416	14	95,5	93,0-98,1	-	-
EFDIOS - Citieffe	2000	314	39	92,5	89,4-95,5	83,8	78,7-89,0
MITUS - ENDO-MODEL UNI – ALL POLY - Link	2003	260	21	92,8	89,5-96,1	88,3	82,9-93,7
ALLEGRETTO UNI - Protek-Sulzer	2000	243	22	92,4	88,7-96,0	88,7	84,2-93,2
PRESERVATION UNI – ALL POLY - DePuy	2002	185	16	92,7	88,8-96,5	90,4	85,9-94,9
UC-PLUS SOLUTION - Smith & Nephew	2000	177	7	98,3	96,3-100	-	-
HLS - UNI EVOLUTION - ALL POLY - Tornier	2001	144	9	95,5	92,1-99,0	92,0	86,8-97,2
UC-PLUS SOLUTION – ALL POLY - Smith & Nephew	2004	140	11	90,8	85,5-96,0	-	-
UNI SIGMA HP - ***DePuy***	2009	211	3	-	-	-	-
JOURNEY UNI - ALL POLY - Smith & Nephew	2010	169	2	-	-	-	-
GKS - ONE – Permedica	2006	152	4	97,2	94,4-99,9	-	-
OPTETRAK UNI – ALL POLY -Exactech	2005	128	3	99,2	97,7-100	-	-
MILLER GALANTE UNI - Zimmer	2001	118	6	96,6	93,3-99,9	94,2	89,6-98,8
Other (models with less than 100 cases)	2000	518	53	87,8	84,4-91,2	81,2	74,9-87,5
Unknown	2000	18	-	-	-	-	-
Total	**2000**	**4.652**	**339**	**93,3**	**92,5-94,1**	**88,6**	**87,2-90,0**

15.6 Analysis of the survival of bi-tricompartmental 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%
ADVANCE Medial Pivot - Wright	2000	542	20	96,1	94,4-97,8	95,8	93,9-97,6
FIRST - Symbios Orthopedie	2006	626	20	95,6	93,4-97,8	-	-
GEMINI MK II – Link	2002	1.706	37	97,6	96,7-98,4	93,0	88,1-97,9
GENESIS II - C R - Smith & Nephew	2001	852	24	96,7	95,2-98,1	94,8	92,1-97,4
GENESIS II - MOBILE BEARING - Smith & Nephew	2001	358	7	97,8	96,2-99,4	-	-
GENESIS II - PS HIGH FLEXION - Smith & Nephew	2004	1.784	20	98,2	97,3-99,0	-	-
GENIUS TRICCC - Dedienne Sante	2000	585	37	94,8	92,9-96,7	91,0	88,0-94,1
GENUS PE - Adler-Ortho	2008	760	18	97,1	95,7-98,4	-	-
LCS - COMPLETE - RP - De Puy Johnson & Johnson	2004	300	11	95,8	93,2-98,5	-	-
LCS - UNIVERSAL - RP - De Puy Johnson & Johnson	2000	481	15	97,2	95,8-98,7	97,0	95,5-98,6
NEXGEN - CR FLEX FISSO - Zimmer	2004	933	20	96,9	95,4-98,3	96,2	94,3-98,1
NEXGEN - LPS - FLEX FISSO - Zimmer	2002	4.436	66	98,2	97,8-98,7	-	-
NEXGEN - LPS - FLEX MOBILE - Zimmer	2002	746	25	96,6	95,2-98,1	94,3	91,5-97,1
NEXGEN - LPS - Zimmer	2000	1.990	70	97,5	96,8-98,2	96,4	95,5-97,2
OPTETRAK - RBK - HI-FLEX - Exactech	2006	398	12	96,5	94,6-98,5	-	-
PFC - CVD - De Puy J.&J.	2000	309	5	98,1	96,4-99,8	98,1	96,4-99,8
PFC - PS - De Puy J.&J.	2000	408	16	96,5	94,4-98,6	93,6	90,4-96,8
PFC - RP - CVD - De Puy Johnson & Johnson	2001	503	9	98,2	96,8-99,6	-	-
PFC - RP - PS - De Puy Johnson & Johnson	2000	1.626	37	97,4	96,5-98,3	96,5	95,2-97,8
PFC - SIGMA RPF - De Puy Johnson & Johnson	2005	433	11	96,7	94,7-98,7	-	-
PROFIX - CONFORMING - Smith & Nephew	2000	1.997	72	97,0	96,2-97,8	95,7	94,7-96,8
PROFIX - P S - Smith & Nep.	2002	581	16	97,5	96,2-98,8	-	-
ROTAGLIDE - Corin Medical	2000	610	46	93,6	91,6-95,7	91,1	88,4-93,8
SCORE - Amplitude	2004	437	8	98,4	97,2-99,6	97,5	95,3-99,6
SCORPIO - NRG - CR - Howmedica Osteonics	2007	396	8	97,2	95,2-99,2	-	-
SCORPIO - NRG - PS – Howmedica Osteonics	2004	530	17	97,0	95,4-98,6	-	-
T.A.C.K. - Link	2000	529	47	94,1	92,1-96,2	91,6	89,2-94,1
TC-PLUS - SB SOLUTION - Endoplus	2002	1.676	28	97,5	96,4-98,5	-	-
TRIATHLON - CR - Howmedica Osteonics	2005	792	9	97,5	95,4-99,6	-	-
VANGUARD - CR-LIPPED - Biomet Orthopedics	2006	608	15	97,0	95,5-98,5	-	-
VANGUARD - PS - Biomet Orthopedics	2005	1.803	28	97,4	96,4-98,4	-	-
Other (< 300 cases)	2000	8.182	346	96,0	95,5-96,4	93,5	92,7-94,3
Unknown	2000	152	3	-	-	-	-
Total	**2000**	**38.069**	**1.123**	**96,9**	**96,7-97,1**	**95,1**	**94,8-95,5**

PART THREE: SHOULDER PROSTHESIS

July 2008 – December 2013

16. RIPO capture

16.1 Capture for RIPO

Percentage of R.I.P.O. capture calculated versus Discharge Records (S.D.O.) was **97,1** in 2013. Data are referred to primary total prosthesis (8180), hemiarthroplasty (8181), revision (8197) and prosthesis removal (8001).

16.2 Ratio public/private treatment

Percentage of implants performed in public hospitals.

% of operations performed in public hospitals (AUSL, AOSP, IRCCS)			
Year of surgery	**Primary arthroprosthesis**	**Revision/ removal**	**Hemiarthroplasty**
2008	73,9	100,0	93,0
2009	65,7	93,3	83,6
2010	59,6	81,3	84,6
2011	49,1	66,7	87,1
2012	58,3	69,2	90,8
2013	59,8	72,0	93,2

From database SDO

17. Type of operation

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2013, according to **type**

Type of operation	Number of operation	Percentage
Inverse prosthesis	1.697	55,0
Hemiarthroplasty	650	21,1
Resurfacing	229	7,4
Anatomical prosthesis	253	8,2
Revisions	205	6,6
Prosthesis removal	38	1,2
Other	14	0,5
Total	3.086	100,0

18. Descriptive statistics of patients

18.1 Gender

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2013, according to **type of operation** and **gender** of patients.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Inverse prosthesis	356	21,0	1341	79,0	1697
Hemiarthroplasty	183	28,2	467	71,8	650
Resurfacing	112	48,9	117	51,1	229
Anatomical prosthesis	94	37,2	159	62,8	253
Revisions	69	33,7	136	66,3	205
Prosthesis removal	12	31,6	26	68,4	38
Total	**822**	**26,8**	**2243**	**73,2**	**3065**

18.2 Age

Mean age of patients, according to gender and type of operation

	Males		Females	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Inverse prosthesis	71,7	33-87	74,1	33-100
Hemiarthroplasty	61,3	23-91	73,4	23-97
Resurfacing	52,1	17-96	62,7	21-82
Anatomical prosthesis	62,9	45-79	66,0	35-101
Revisions	62,9	34-84	66,0	44-84

18.3 Pathologies

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2013, according to **type of operation** and **diagnosis** of patients.

Diagnosis	**Total reverse arthroplasty**	
	N.	**%**
Eccentric osteoarthritis	877	51,7
Concentric osteoarthritis	258	15,2
Fracture	285	16,8
Non specified osteoarthritis	50	2,9
Cuff arthropathy	50	2,9
Sequelae of fracture	42	2,5
Necrosis	45	2,7
Reumatic arthritis	16	0,9
Joint reccurent dislocation	16	0,9
Post-traumatic arthritis	6	0,4
Pain	3	0,2
Sequelae of septic arthritis	3	0,2
Recurrent dislocation	3	0,2
Unknown	*15*	0,9
Other	*28*	1,6
Total	**1697**	**100,0**

Diagnosis	**Total reverse arthroplasty**	
	N.	**%**
Concentric osteoarthritis	207	81,8
Eccentric osteoarthritis	13	5,1
Reumatic arthritis	7	2,8
Necrosis	10	4,0
Fracture	4	1,6
Reumatic arthritis	3	1,2
Sequelae of fracture	3	1,2
Other	6	2,4
Total	**253**	**100,0**

Diagnosis	**Hemiarthroplasty**	
	N.	**%**
Fracture	398	61,2
Concentric osteoarthritis	68	10,5

Eccentric osteoarthritis	60	9,2
Necrosis	46	7,1
Sequelae of fracture	28	4,3
Dislocation	7	1,1
Reumatic arthritis	6	0,9
Sequelae of septic arthritis	5	0,8
Pathological fracture	4	0,6
Post-traumatic necrosis	4	0,6
Osteomielitis	2	0,3
Post-traumatic arthritis	2	0,3
Unknown	5	0,8
Other	15	2,3
Total	650	100,0

Diagnosis	Resurfacing	
	N.	%
Concentric osteoarthritis	113	49,3
Necrosis	43	18,8
Eccentric osteoarthritis	34	14,8
Non specified osteoarthritis	8	3,5
Sequelae of fracture	7	3,1
Necrosis (idiopathic, steroid-induced, post traumatic)	5	2,2
Dislocation	3	1,3
Reumatic arthritis	3	1,3
Fracture	2	0,9
Post-traumatic arthritis	1	0,4
Sequelae of septic arthritis	1	0,4
Other	9	3,9
Total	**229**	**100,0**

Number of **shoulder revisions** carried out on patients with admission date between 1st July 2008 and 31st December 2013, according to **diagnosis** and **type of revision.**

Diagnosis	N.	%
Glenoid erosion	45	22,0
Humeral loosening	25	12,2
Two steps revision	25	12,2
Anterior instability	23	11,2
Glenoid loosening	19	9,3
Pain	15	7,3
Superior instability	10	4,9
Dislocation	9	4,4
Cuff lesion	7	3,4
Instability	4	2,0
Septic loosening	4	2,0
Periprosthetic bone fracture	5	2,4
Total aseptic loosening	2	1,0
Other	8	3,9
Unknown	4	2,0
Total	**205**	**100,0**

Type of revision	N.	%
From hemi to reverse	48	23,4
From reverse to reverse	35	17,1
Implant after removal	25	12,2
From anatomic to reverse	18	8,8
From resurfacing to reverse	12	5,9
From hemi to hemi	9	4,4
From reverse to anatomic CTA	8	3,9
From hemi to anatomic	7	3,4
From resurfacing to anatomic	6	2,9
From resurfacing to resurfacing	4	2,0
From anatomic to anatomic	4	2,0
From resurfacing to hemi	3	1,5
From reverse to anatomic	3	1,5
From reverse to hemi	1	0,5
Other	22	10,7
Total	**205**	**100,0**

19. Surgical technique, anesthesia and antithromboembolic prophylaxis

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2013, according to **surgical approach.**

Type of operation	Deltoideo-pectoral	Trans-deltoid	Superior lateral
Anatomical prosthesis	246	4	-
Inverse prosthesis	1473	133	45
Hemiarthroplasty	621	17	-
Resurfacing	214	7	
Prosthesis removal	34	1	
Revision	184	10	-
Total	**2772**	**172**	**45**

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2013, according to **anesthesia.**

Anesthesia	N.	%
Mixed	1242	44,1
General	1482	52,6
Loco-regional	94	3,3
Total*	**2.818**	**100.0**

*268 missing data (9,5%)

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. Type of prosthesis

20.1 Prosthesis fixation

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2013, according to **stem fixation** and **type of operation**

Stem fixation	Anatomical prosthesis	%	Inverse prosthesis	%	Hemiarthroplasty	%
Cemented	33	13,0	428	25,2	267	41,5
Cementless	220	87,0	1269	74,8	377	58,5
Total*	**253**	**100,0**	**1697**	**100,0**	**646**	**100,0**

*6 missing data
Glenoid was cemented in 40,5% 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 2013, according to the **type of prosthesis**.

Model of prosthesis	Inverse prosthesis		Anatomical prosthesis + Hemiarthroplasty	
	N	%	N	%
Delta - DePuy	697	41,1	46	5,1
SMR – Lima	538	31,7	418	46,3
Aequalis - Tornier	226	13,3	54	6,0
Trabecular Metal Reverse – Zimmer	67	3,9	0	0,0
Affinis – Mathys	54	3,2	11	1,2
Anatomical Shoulder - Zimmer	34	2,0	75	8,3
Comprehensive - Biomet	22	1,3	3	0,3
Promos - Plus orthopedics AG	15	0,9	6	0,7
Agilon - Implantcast	11	0,6	0	0,0
T.E.S.S - Biomet	10	0,6	1	0,1
Equinoxe Primary - Exactech	9	0,5	2	0,2
Ascend - Tornier	0	0,0	10	1,1
Anatomica LTO - Lima	0	0,0	36	4,0
Global - DePuy	0	0,0	60	6,6
Bigliani/Flatow - Zimmer	0	0,0	152	16,8
Other (models < 10 cases)	13	0,8	29	3,2
Unknown	1	0,1	0	0,0
Total	**1697**	**100,0**	**903**	**100,0**

Number of shoulder **resurfacing** carried out on patients with admission date between 1st July 2008 and 31st December 2013, according to the **type of prosthesis**.

Model of prosthesis	Resurfacing	
	N	%
T.E.S.S - Biomet	81	35,0
SMR RESURFACING - Lima	45	19,7
ECLIPSE - Arthrex	24	10,5
EPOCA RH - Synthes	21	9,2
COPELAND SHOULDER - Biomet	19	8,3
GLOBAL CAP – DePuy	13	5,7
AEQUALIS RESURFACING - Tornier	4	1,7
DUROM SHOULDER - Zimmer	4	1,7
PyroTITAN - Ascension Orthopedics	4	1,7
SIDUS - Zimmer	3	1,3
AFFINIS SHORT – mathys	4	1,7
CAPICA - Implantcast	1	0,4
COMPREHENSIVE Versa-Dial - Biomet	1	0,4
HEMICAP - Arthrosurface	1	0,4
Bigliani/Flatow - Zimmer	3	1,3
VERSO - Biomet	1	0,4
Total	**229**	**100.0**

21. Complications occurred during hospitalization

The rate of complications in shoulder operations carried out on patients hospitalized between July 1st 2000 and December 31st 2013.
In the period of registry observation, concerning **intra-operative** complications were observed 25 fracture, 18 muscular lesion, 3 vascular lesion and 1 ligament lesion; about **local post-operative** complications were observed 25 hematoma, 7 edema, 4 anterior dislocation, 1 posterior dislocation, 1 superior dislocation, 1 dysesthesia in C7 and 10 wound dehiscence; about **general post-operative** complications were observed 6 thrombosis, 1 pneumonia, 1 renal infection, 82 anemia and 2 hypertension crisis.
They were observed also 3 deaths in hemiarthroplasty and 3 deaths in inverse prosthesis according to fracture diagnosis.

22. Duration of pre and post-operative hospitalization

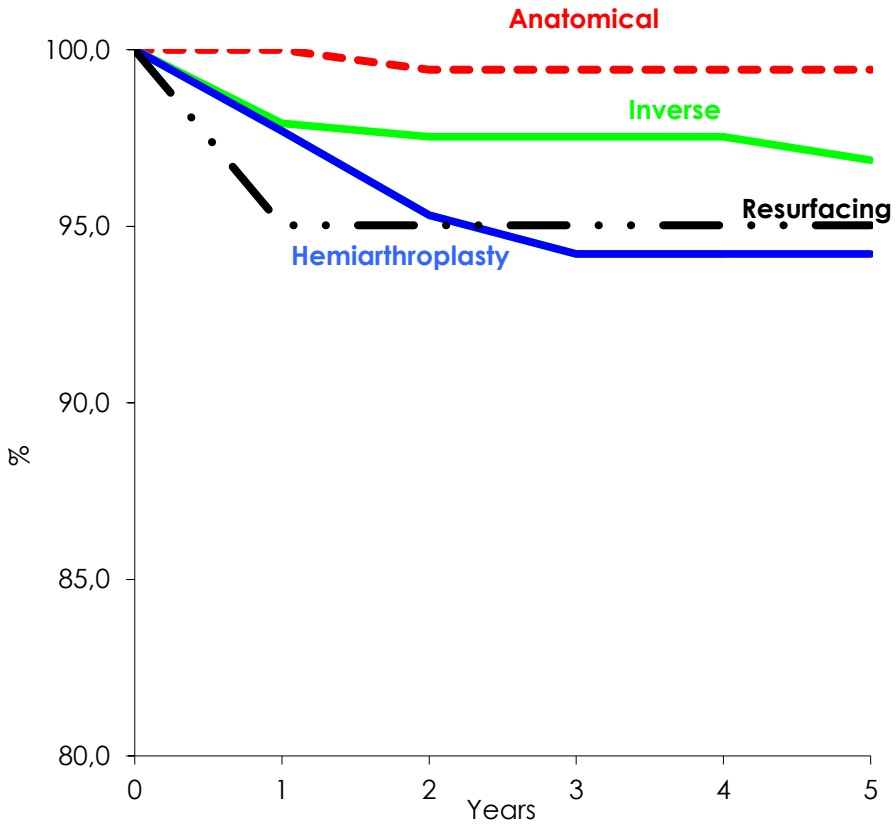
Year 2013			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean post-op. (range)**
Inverse prosthesis	411	1,2 (0-24)	5,5 (0-105)
Hemiarthroplasty	81	2,7 (0-30)	5,2 (2-24)
Resurfacing	14	1,1 (0-5)	3,6 (2-8)
Anatomical prosthesis	44	0,1 (0-1)	3,2 (3-5)
Revisions	44	1,5 (0-15)	4,5 (2-18)

Year 2013			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean post-op. (range)**
Elective	480	0,8 (0-30)	4,9 (0-105)
Emergency	123	3,3 (0-16)	6,3 (2-52)

23. Survival analysis

Analysis was performed on all patients, and not only on the resident in Emilia-Romagna region.

Type of operation	Number of impants	Number of revisions	Survial at 5 yrs (C.I. 95%)
Anatomical prosthesis	253	1	99,4 (98,3-100,0)
Inverse prosthesis	1697	36	96,9 (95,4-98,4)
Hemiarthroplasty	650	30	94,2 (92,2-96,3)
Resurfacing	229	11	95,0 (92,2-97,9)



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

Anatomical prosthesis			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Breakage of liner	1/253	0,39	100,0
Total	**1/253**	**0,39**	**100,0**
Inverse prosthesis			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Instability	**12**/1.697	0,7	33,3
Glenoid loosening	**10**/1.697	0,6	27,8
Dislocation	**6**/1.697	0,4	16,7
Septic loosening	**4**/1.697	0,2	11,1
Sequelae of fracture	**1**/1.697	0,1	2,8
Pain	**1**/1.697	0,1	2,8
Unknown	**2**/1.697	0,1	5,6
Total	**36/1.697**	**2,1**	**100,0**
Hemiarthroplasty			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Septic loosening	**7**/650	1,1	23,3
Pain	**6**/650	0,9	20,0
Glenoid erosion	**6**/650	0,9	20,0
Anterior instability	**3**/650	0,5	10,0
Dislocation	**2**/650	0,3	6,7
Superior instability	**2**/650	0,3	6,7
Homeral component loosening	**1**/650	0,2	3,3
Total aseptic loosening	**1**/650	0,2	3,3
Periprosthetic bone fracture	**2**/650	0,3	6,7
Total	**30/650**	**4,6**	**100,0**
Resurfacing			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Pain	**4**/229	1,7	36,4
Glenoid erosion	**6**/229	2,6	54,5
Superior instability	**1**/229	0,4	9,1
Total	**11/229**	**4,8**	**100,0**