REPORT of R.I.P.O.

Regional Register of Orthopaedic Prosthetic Implantology

OVERALL DATA

HIP, KNEE AND SHOULDER ARTHROPLASTY

IN EMILIA-ROMAGNA REGION (ITALY)

1st January 2000 – 31st December 2014

VERSION 1 OF THE 21st DECEMBER 2015

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA

Foreword

This is the 15th report, elaborated by the Register of Orthopaedic 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 2014**.
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 Reverse arthroplasty, resurfacing, revision and removal operations.

Altogether data of approx. 140.000 hip, 80.000 knee and 3.800 shoulder prostheses have been reported from 68 Orthopaedic Units in 59 Hospitals, either public or private.

As in the past, data from the orthopaedic 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 actively cooperated 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.

Objectives 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 orthopaedic 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 Orthopaedic Commission about those implants that show an abnormal failure rate;
- to answer to questions coming from the Regional Orthopaedic 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, for hip and knee implants, 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.

It is not always possible to known reasons for revision if they are carried out outside the region.

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 Orthopaedic 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 2014 primary THA was performed in nearly 7.000 patients to treat pathologies well known, following a distribution percentage unchanged over the years. Mean age at surgery is stable (70 yrs for women and 66 yrs for men).
In 2014, as in past years, 97 different types of cup and 125 of stem were used; 21 and 25 of them are 'new', not implanted in previous years. 29% of the stems had a modular neck, slightly decreasing compared to past years.
Uncemented prostheses were 62% in year 2000 and 95% in year 2014, whilst hybrid fixation was 21% 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. Starting with this report the distinction between pure ceramic (alumina or zirconia) and ceramic composite was introduced.

The survival of the hip prostheses is confirmed at very high levels, 90,2% of prostheses implanted in Emilia-Romagna region on resident patients are still in place 15 years after the operation.
Part (73%) of the 2.817 revisions is major revisions, where at least one component interfacing with bone, has been revised. The remaining 27% 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, lower than the result of other international registries 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 if implant was done to treat rare pathology and for femoral fracture.
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.

Only two types of primary hip prosthesis carried out more than 300 in 14 years of activity of the register have a survival significantly lower than the regional mean at 5 years .
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 84,4% of cases at 15 yrs.

Survival of resurfacing, at 11 years, is slightly lower than THA (87,4%, 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 (95,7% at 15 yrs) even if the data is greatly influenced 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 (two-thirds in 2014 vs 43% in 2000).

In 2014, 10,8% of implanted prostheses are unicompartmental, 68,2% are bicompartmental with no patella resurfacing and the remaining 21% have patella resurfacing. The number of prostheses with patella are increasing, in particular in public hospital.

In 2014, 97,3% of implants are cemented, in 45% of them cement is antibiotic loaded.
Posterior Stabilization of insert is slightly increasing (61,6% during last year) compared to minimally stabilized. Mobile insert are decreasing (26,6% in 2014, same as in 2001).

Types of implanted prostheses are less numerous and more stable during years compared to hip. Survival of bicompartmental is 93,6% at 13 yrs, survival of tricompartmental is 95,0% and survival of unicompartmental is significantly lower (83,8%). In these analyses patella resurfacing after primary TKA is not considered as a failure.

As requested by the Board, bicompartmental TKA survival has been calculated also considering patella resurfacing as a failure (350 patella resurfacing in 34.000 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 (the expectancy of prosthesis survival is lower for patient less than 60 yrs) and by type of insert (mobile insert is worse than fixed insert). In unicompartmental implants, only age of the patient influence negatively survival, while type of tibial component seems to be irrelevant (monoblock vs metal-back).

Some models of prosthetic have 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 (58%). Women are more affected than men, either for fracture and elective surgery.
Mean age at surgery for reverse prostheses is 74 for women and 71,8 for men. Patients are younger in anatomic prostheses (respectively 65,6 and 61,5). 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 (18%).
Anatomic prosthesis is implanted in concentric arthrosis (81%), while hemiarthroplasties treat both fractures (63% of implants) and arthrosis.
Fixation is mainly cementless for reverse and anatomic prosthesis.
Survival at 6 yrs is 98,7% for anatomical, 97% for reverse, 93% for hemi and 90,5% for resurfacing (less implanted the other types of prosthesis).

Units participating in RIPO, Head of Orthopaedic Surgery Department or Health Manager in the case of Private Hospitals and RIPO representatives inside the unit are listed in the Table below.

The data is updated to November 2015.

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AZIENDA USL PIACENZA	**Head of Orthopaedic Surgery Department or Health Manager**	**RIPO Representative**
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Pres. Val Tidone, Castel San Giovanni	Dr. Giuseppe Leddi	Dr. Claudio Gheduzzi Sig.ra Raffaella Sorsi
Pres. Val D'Arda, Fiorenzuola D'Arda	Dr. Luigi Bisogno	Dr. Stefano Cervi Sig.ra Maria Fava
Ospedale privato 'Casa di cura Piacenza'	Dir. San. Dr. Sergio Freschi	Sig.ra Brunetta Nazzari

Province of Parma

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Ospedale Borgo Val di Taro	Dr. Aldo Guardoli	Dr. Aldo Guardoli
Ospedale privato casa di cura "Città di Parma"	Dir. San. Dr. Tiziano Cocchi	Sig.ra Rosa Concari
Ospedale privato "Hospital Piccole Figlie"	Dir. San. Dr. Giorgio Bordin	Sig.ra Paola Casalini

Province of Reggio-Emilia

AZIENDA USL REGGIO EMILIA		
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Ospedale di Montecchio Emilia	Dr. Norberto Negri	Dr. Antonio Palmieri
Ospedale di Scandiano	Dr. Antonello Salsi	Dr. Orlando Mantovani
Ospedale di Castelnovo Monti	Dr. Giuseppe Sciaboni	Dr. Giuseppe Sciaboni
Ospedale privato "Salus Hospital"	Dir. San. Dr. Giovanni Baldi	Dr. Rodolfo Rocchi Dr. Ivo Tartaglia
Ospedale privato "Villa Verde"	Dir. San. Dr. Sergio Roti	Dott. Uluhogian Sevag Dott. Vezzosi Cesarino Dr. Sergio Roti

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Ospedale di Carpi	Dr. Eugenio Rossi Urtoler	Sig.ra Miriana Dardi Dr. Eugenio Rossi Urtoler
Ospedale di Mirandola	Dr. Franco Boselli	Sig. Gabriele Palumbo Sig.ra Adriana Cestari
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Ospedale di Vignola	Dr. Gilberto Masetti	Dr. Mauro Tisi

Ospedale di Pavullo	Dr. Luca Fontana	Dr. Gianluca Bonanno Dr. Angelo Rizza
Ospedale privato "Hesperia Hospital"	Dir. San. Dr. Stefano Reggiani	Dr. ssa Michelina Guerra
Ospedale privato casa di cura "Prof. Fogliani"	Dir. San. Dr. Angelo Rosi	Dr. Angelo Rosi

Province of Bologna

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Ospedale di Vergato	Dr. Giovanni Serra	Dr. Massimo Corlianò
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Ospedale privato "Villa Erbosa"	Dir. San. Dr. Gianfranco Finzi	Sig.ra Sladjana Karavdic Sig.ra Stefania Volpe
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Ospedale privato "San Francesco"	Dir. San. Dr. Domenico Basilio Poddie	Sig.ra Joanna Gorniak
Ospedale privato "Maria Cecilia Hospital"	Dir. San. Dr.ssa Silvia Rapuano	Dr.ssa Silvia Rapuano
Ospedale privato "San Pier Damiano"	Dir. San. Dr. Roberto Nonni	Sig.ra Elena Ravagli
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Technological partner for computer management of the database is CINECA of Bologna.

Bologna, 1st december 2015

PART ONE: HIP PROSTHESES

January 2000 – December 2014

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 **97,1**% in the year 2014. 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
2014	66,8	99,3	77,0

From SDO database

2. Types of surgery

Number of hip surgeries carried out on patients with admission date between 1st January 2000 and 31st December 2014, according to **type of surgery**.

Type of surgery	Number of surgeries	Percentage
Primary THA	87.993	63,0
Hemiarthroplasty	34.094	24,4
Total and partial revision*	13.680	9,8
Resurfacing	2.195	1,6
Prosthesis removal	990	0,7
Hemiarthroplasty with buffer°	118	0,1
Other**	595	0,4
Total	**139.665**	**100,0**

° acetabular buffer
*3.816 total revision, 5.581 cup revisions, 2.570 stem revisions, 1.713 revisions of other components.
178 reduction of dislocation, 128 debridement, 75 spacer exchange, 15 hematoma drainage, 33 ***heterotopic* ossification removal

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	**180**
2006	**218**
2007	**200**
2008	**162**
2009	**166**
2010	**122**
2011	**138**
2012	**294**
2013	**261**
2014	**220**

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	4.375		744	
2001	4.591	4,9	857	**15,2**
2002	4.643	1,1	870	**1,5**
2003	5.049	8,7	863	**-0,8**
2004	5.360	6,2	860	**-0,3**
2005	5.568	3,9	827	**-3,8**
2006	5.834	4,8	945	**14,3**
2007	6.255	7,2	1.019	**7,8**
2008	6.343	1,4	985	**-3,3**
2009	6.687	5,4	991	**0,6**
2010	6.576	-1,7	1.032	**4,1**
2011	6.391	-2,8	914	**-11,4**
2012	6.547	2,4	1.008	**10,3**
2013	6.694	2,2	918	**-8,9**
2014	7.080	5,8	847	**-7,7**

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 2014, 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	2.693	3,1	5.638	6,4	12.670	14,4	25.290	28,7	31.973	36,3	9.725	11,1	**87.989**
Hemiarthroplasty	20	0,1	61	0,2	189	0,6	1.040	3,1	7.557	22,2	25.226	74,0	**34.093**
Revision	267	2,0	579	4,2	1.447	10,6	3.372	24,6	5.442	39,8	2.573	18,8	**13.680**
Resurfacing	285	13,0	583	26,6	768	35,0	457	20,8	99	4,5	3	0,1	**2.195**
Prosthesis removal	35	3,5	50	5,1	105	10,6	258	26,1	366	37,0	176	17,8	**990**
Hemiarthroplasty with buffer	-	-	2	1,7	3	2,5	15	12,7	36	30,5	62	52,5	**118**
Other	27	4,5	35	5,9	76	12,8	153	25,7	198	33,3	106	17,8	**595**
Total*	**3.327**	**2,4**	**6.948**	**5,0**	**15.258**	**10,9**	**30.585**	**21,9**	**45.671**	**32,7**	**37.871**	**27,1**	**139.660**

*5 missing data

Percentage of Hemiarthroplasty carried out on patients older than ninety is 15%.

Mean age at surgery

Type of operation	Mean age	Range
Primary THA	66,7	12-101
Hemiarthroplasty	83,4	20-109
Resurfacing	52,0	15-82
Revision	69,9	15-100

Mean age of patients, per type of operation, comparison 2000-2014

	Year 2000		Year 2014	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Primary THA	66,0	16-99	67,0	13-96
Hemiarthroplasty	82,4	35-104	84,8	46-104
Revision	68,6	22-97	70,7	24-94

	Year 2000		Year 2014	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Resurfacing	49,7	18-72	52,1	25-74

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

	THA			
	Year 2000		Year 2014	
Gender	Mean age	Range	Mean age	Range
Males	67,2	34-92	66,5	27-92
Females	68,9	31-93	70,2	18-94

3.2 Gender

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2014, according to **type of operation** and **gender of patient**

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Primary THA	35.175	40,0	52.818	60,0	87.993
Hemiarthroplasty	8.617	25,3	25.477	74,7	34.094
Revision	4.634	33,9	9.046	66,1	13.680
Resurfacing	1.596	72,7	599	27,3	2.195
Removal	403	40,7	587	59,3	990
Hemiarthroplasty with buffer	25	21,2	93	78,8	118
Other	262	44,0	333	56,0	595
Total	**50.712**	**36,3**	**88.953**	**63,7**	**139.665**

3.3 Side of surgery

Coxarthrosis more often affects right hip (58,7%). The percentage has been calculated on patients affected by primary coxarthrosis, on first side operated. The difference is more accentuated for females.
Percentage of operations carried out on the right or left side, considered by gender

Side	Males	Females
Right	53,3	62,7
Left	46,7	37,3

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

3.4 Bilateral prosthesis

Between 1st January 2000 and 31st December 2014, 7156 patients underwent bilateral operations for primary arthrosis.
In bilateral operations, it was observed that the first hip to be treated was the right one in 53,9%

5.976 (83,5%) chose to undergo the second operation at the same hospital from where the first one was performed;
334 (4,7%) chose to undergo the second operation at a different hospital from where the first one was performed to follow the surgeon;
846 (11,8%) chose to undergo the second operation at a different hospital from where the first one was performed.

3.5 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 2014, according to **diagnosis**

Diagnosis in primary arthroplasty	Number	Percentage
Primary arthritis	59.466	67,8
Sequelae of LCA and DCA	9.026	10,3
Femoral neck fracture	7.915	9,0
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	5.143	5,9
Post traumatic arthritis	2.045	2,3
Post traumatic necrosis	1.111	1,3
Rheumatic arthritis	993	1,1
Femoral neck fracture sequelae	776	0,9
Epiphysiolysis sequelae	244	0,3
Perthes disease sequelae	218	0,2
Septic coxitis sequelae	166	0,2
Tumour	132	0,2
Paget disease	83	0,1
TBC coxitis sequelae	58	0,1
Other	283	0,3
Total**	**87.659**	**100,0**

**334 missing data (0,4%)

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

In 96,6% of hemi diagnosis was femoral neck fracture.

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

Diagnosis in primary arthroplasty	Percentage		
	2000-2004	2005-2009	2010-2014
Primary arthrosis	65,7	67,7	69,5
Sequelae of LCA and DCA	12,8	10,1	8,6
Femoral neck fracture	8,7	9,1	9,3
Idiopathic femoral head necrosis	5,6	6,0	6,0
Post traumatic arthritis	2,5	2,4	2,1
Post traumatic necrosis	1,5	1,3	1,1
Rheumatic arthritis	1,4	1,1	0,9
Other	1,8	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 arthritis	14,3	38,5	58,1	72,7	75,9	73,1
Sequelae of LCA and DCA	29,6	31,0	19,9	9,1	4,5	2,3
Femoral neck fracture	1,7	3,0	5,8	8,4	11,2	13,1
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	18,5	11,9	7,3	4,5	4,2	6,0
Post traumatic arthritis	10,4	6,3	3,3	1,9	1,3	1,2
Post traumatic necrosis	7,6	2,5	1,6	0,9	0,7	1,3
Rheumatic arthritis	5,3	2,0	1,3	1,0	0,8	0,6
Femoral neck fracture sequelae	1,5	1,2	0,8	0,5	0,8	2,0
Epiphysiolysis sequelae	3,6	1,1	0,4	0,1	0,0	0,0
Perthes disease sequelae	2,9	0,9	0,3	0,1	0,0	0,1
Septic coxitis sequelae	0,1	0,0	0,0	0,0	0,0	0,0
Tumor	0,0	0,0	0,0	0,0	0,0	0,0
Paget disease	0,0	0,0	0,0	0,0	0,0	0,0
TBC coxitis sequelae	0,0	0,0	0,0	0,0	0,0	0,0
Other	4,5	1,6	1,2	0,8	0,6	0,3
Total	**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 arthritis	0,6	3,6	12,3	30,8	40,8	11,9	**100,0**
Sequelae of LCA and DCA	8,8	19,3	27,9	25,5	16,0	2,5	**100,0**
Femoral neck fracture	0,6	2,1	9,2	26,9	45,2	16,0	**100,0**
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	9,7	13,0	17,9	21,9	26,2	11,3	**100,0**
Post traumatic arthritis	13,6	17,2	20,5	23,5	19,5	5,7	**100,0**
Post traumatic necrosis	18,5	12,6	17,8	19,7	20,1	11,3	**100,0**
Rheumatic arthritis	14,3	11,5	17,0	25,4	26,2	5,6	**100,0**
Femoral neck fracture sequelae	5,0	8,5	12,4	16,7	32,0	25,4	**100,0**
Epiphysiolysis sequelae	40,2	25,8	18,9	9,4	4,9	0,8	**100,0**
Perthes disease sequelae	35,2	24,3	16,1	16,1	6,0	2,3	**100,0**
Septic coxitis sequelae	30,7	10,2	22,9	18,1	15,7	2,4	**100,0**
Tumor	5,3	12,9	22,7	31,9	24,2	3,0	**100,0**
Paget disease	0,0	0,0	8,4	27,7	48,2	15,7	**100,0**
TBC coxitis sequelae	8,6	17,2	25,9	34,5	12,1	1,7	**100,0**
Other	21,7	15,3	25,6	22,8	11,4	3,2	**100,0**

Number of **resurfacing** operations carried out on patients with admission date between 1st January 2000 and 31st December 2014, according to **diagnosis**

Diagnosis in resurfacing	Number	Percentage
Primary arthritis	1.737	79,3
Sequelae of LCA and DCA	187	8,5
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	91	4,2
Post traumatic arthritis	87	4,0
Rheumatic arthritis	29	1,3
Post traumatic necrosis	12	0,6
Epiphysiolysis sequelae	11	0,5
Perthes disease sequelae	10	0,5
Femoral neck fracture sequelae	7	0,3
Septic coxitis sequelae	3	0,1
Paget disease	3	0,1
Femoral neck fracture	1	0,05
TBC coxitis sequelae	1	0,05
Other	11	0,5
Total*	**2.190**	**100,0**

* 5 missing data (0,2%)

3.6 Causes for revision

Number of revision operations carried out on patients admitted between 1st January 2000 and 31st December 2014 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	4.011	32,5
Total aseptic loosening	2.598	21,1
Stem aseptic loosening	1.572	12,7
Prosthesis dislocation	1.113	9,0
Bone fracture	713	5,8
Prosthesis breakage*	615	5,0
Two steps prosthesis removal	570	4,6
Poly wear	456	3,7
Pain without loosening	204	1,7
Septic loosening	139	1,1
Primary instability	107	0,9
Metallosis	56	0,5
Heterotopic bone	49	0,4
Trauma	29	0,2
Other	100	0,8
Total°	**12.332**	**100,0**

° 148 missing data (1,2%)

***** Failure of 209 modular necks, 138 liners, 102 heads, 77 stems, 73 cups. 16 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	58	45,0
Bone fracture	45	34,9
Metallosis	12	9,3
Pain without loosening	11	8,5
Breakage of prosthesis	3	2,3
Total	**129**	**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	362	34,0
Cotiloiditis	296	27,8
Stem aseptic loosening	254	23,9
Periprosthetic bone fracture	93	8,7
Two steps prosthesis removal	19	1,8
Septic loosening	10	0,9
Breakage of prosthesis	7	0,7
Instability	7	0,7
Poly wear	5	0,5
Heterotopic bone	3	0,3
Other	8	0,8
Total*	**1.064**	**100,0**

*7 data missing (0,7%)

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 172 cases model or cup fixation was not communicated to RIPO.

Cemented cups	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
PE (Muller Protek) Sulzer	357	11,6	82	5,4	67	13,9
MULLER Citieffe	10	0,3	40	2,6	62	12,9
CUPULE AVANTAGE CEMENTED Biomet	2	0,1	46	3,0	46	9,6
ZCA Zimmer	375	12,2	235	15,5	45	9,4
CONTEMPORARY Stryker Howmedica	458	14,9	311	20,5	41	8,5
MULLER Samo	351	11,5	85	5,6	23	4,8
MULLER Lima	117	3,8	120	7,9	16	3,3
MULLER Smith and Nephew	96	3,1	48	3,2	12	2,5
PE Adler-Ortho	-	-	157	10,4	10	2,1
REFLECTION ALL-POLY Smith and Nep.	163	5,3	117	7,7	7	1,5
CCB Mathys	47	1,5	4	0,3	4	0,8
LUNA Amplitude	-	-	88	5,8	-	-
MULLER Wright Cremascoli	903	29,5	58	3,8	-	-
MULLER Groupe Lepine	39	1,3	18	1,2	-	-
Other (< 50 cases)	147	4,8	105	6,9	148	30,8
Total	**3.065**	**100,0**	**1.514**	**100,0**	**481**	**100,0**

Cementless cup	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
FIXA TI-POR Adler-Ortho	-	-	1.946	6,7	9.857	30,1
EP-FIT PLUS Endoplus	24	0,1	2.578	8,9	2.696	8,2
R3 Smith And Nephew	-	-	49	0,2	2.212	6,8
PINNACLE SECTOR II POROCOAT DePuy	69	0,3	622	2,1	1.516	4,6
EXCEED ABT Biomet	-	-	367	1,3	1.486	4,5
CONTINUUM Zimmer	-	-	10	0,0	1.246	3,8
FIXA Adler-Ortho	16	0,1	6.438	22,1	1.034	3,2
DELTA TT Lima	-	-	147	0,5	917	2,8
DELTA PF Lima	96	0,5	1.042	3,6	751	2,3
ALLOFIT S IT Zimmer	-	-	16	0,1	682	2,1
TRIDENT Stryker **Howmedica**	459	2,2	1.346	4,6	645	2,0
EXPANSION Mathys	51	0,2	981	3,4	550	1,7
VERSAFITCUP CC TRIO Medacta	-	-	-	-	500	1,5
VERSAFITCUP CC Medacta	-	-	392	1,3	472	1,4
SPARKUP Samo	-	-	133	0,5	448	1,4
REFLECTION Smith And Nephew	857	4,1	814	2,8	405	1,2
FITMORE Sulzer	1.301	6,2	1.193	4,1	390	1,2
DELTAMOTION Finsbury	-	-	1	0,0	370	1,1
JUMP Permedica	30	0,1	54	0,2	365	1,1
ABGII Stryker Howmedica	1.314	6,3	1.085	3,7	354	1,1
MAXERA Zimmer	-	-	-	-	336	1,0
ADAPTIVE WINGS Samo	-	-	-	-	324	1,0
CUPULE APRIL Symbios	-	-	77	0,3	305	0,9
CUPULE RELOAD AVANTAGE Biomet	-	-	118	0,4	286	0,9
RECAP RESURFACING Biomet	-	-	638	2,2	256	0,8
RM Mathys	2	0,0	5	0,0	235	0,7
FIN II Bioimpianti	-	-	9	0,0	224	0,7
ALLOFIT IT Zimmer	-	-	-	-	209	0,6
BS Citieffe	-	-	264	0,9	187	0,6

HILOCK LINE Symbios	240	1,1	294	1,0	182	0,6
SELEXYS TH+ Mathys	-	-	-	-	179	0,5
CFP Link	216	1,0	296	1,0	164	0,5
BETA CUP Link	-	-	147	0,5	151	0,5
REGENEREX RINGLOC+ Biomet	-	-	53	0,2	147	0,4
POLARCUP Ortho-Id	-	-	136	0,5	141	0,4
TRABECULAR METAL Zimmer	17	0,1	437	1,5	139	0,4
SELEXYS PC Mathys	-	-	-	-	129	0,4
MALLORY Biomet	74	0,4	141	0,5	121	0,4
PINNACLE SECTOR GRIPTION DePuy	-	-	-	-	107	0,3
AGILIS TI-POR Adler-Ortho	-	-	-	-	104	0,3
BICON PLUS Endoplus	329	1,6	898	3,1	94	0,3
CLS Zimmer	2.482	11,9	800	2,7	92	0,3
PINNACLE BANTAM POROCOAT DePuy	-	-	44	0,2	92	0,3
JUMP COOPER Permedica	37	0,2	201	0,7	91	0,3
VERSAFITCUP DM Medacta	-	-	17	0,1	85	0,3
BHR Smith And Nephew	33	0,2	94	0,3	75	0,2
CUPULE AVANTAGE 3P Biomet	8	0,0	58	0,2	75	0,2
SELEXYS TH Mathys	-	-	532	1,8	50	0,2
TRILOGY Zimmer	809	3,9	273	0,9	32	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	-	-	161	0,6	20	0,1
ALLOFIT Zimmer	92	0,4	149	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	0,0
PROCOTYL-L Wright Cremascoli	-	-	141	0,5	12	0,0
DUROM HIP RESURFACING Zimmer	10	0,0	311	1,1	9	0,0
DUOFIT PSF Samo	1.056	5,1	311	1,1	9	0,0
MOBILIS I Othesio	-	-	107	0,4	7	0,0
MBA Groupe Lepine	103	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	-	-
TRABECULAR METAL MONOBLOCK Zimmer	150	0,7	267	0,9	-	-
CUPULE AVANTAGE Biomet	79	0,4	220	0,8	-	-
STANDARD CUP Protek Sulzer	1.151	5,5	154	0,5	-	-
SPH BLIND Lima	81	0,4	121	0,4	-	-
EXCEED PC Biomet	87	0,4	98	0,3	-	-
SPH CONTACT Lima	227	1,1	10	0,0	-	-
MARBURG Zimmer	171	0,8	3	0,0	-	-
FITEK Protek Sulzer	125	0,6	2	0,0	-	-
ABG Howmedica	221	1,1	-	-	-	-
ELLIPTICAL CUP Stratec	197	0,9	-	-	-	-
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	-	-	-	-
Other (< 100 cases)	1.482	7,1	753	2,6	1.081	3,3
Total	**20.895**	**100,0**	**29.116**	**100,0**	**32.750**	**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 17 cases model or cup fixation was not communicated to RIPO.

Cemented cups	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
MULLER Protek-Sulzer-Centerpulse-Zimmer	95	24,1	59	29,5	25	23,8
CONTEMPORARY Stryker Howmedica	85	21,6	31	15,5	15	14,3
CUPULE AVANTAGE CEMENTED Biomet	1	0,3	19	9,5	10	9,5
MULLER Samo	40	10,2	21	10,5	9	8,6
ZCA Zimmer	22	5,6	11	5,5	9	8,6
MULLER Lima	34	8,6	13	6,5	7	6,7
REFLECTION ALL-POLY Smith and Nephew	5	1,3	3	1,5	2	1,9
CCB Mathys	19	4,8	-	-	1	1,0
MULLER Wright Cremascoli	53	13,5	5	2,5	-	-
Other (< 10 cases)	40	10,2	38	19,0	27	25,7
Total	**394**	**100,0**	**200**	**100,0**	**105**	**100,0**

Cementless cups	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
FIXA TI-POR Adler-Ortho	-	-	34	3,3	165	17,3
DELTA ONE TT Lima	-	-	5	0,5	102	10,7
TRABECULAR METAL Zimmer	2	0,2	98	9,6	78	8,2
CONTINUUM Zimmer	-	-	1	0,1	66	6,9
DELTA TT Lima	-	-	12	1,2	62	6,5
HERMES BS REV Citieffe	-	-	21	2,1	47	4,9
DELTA REVISION TT Lima	-	-	1	0,1	42	4,4
OMNIA TI-POR Adler-Ortho	-	-	-	-	33	3,5
REGENEREX RINGLOC+ Biomet	-	-	10	1,0	31	3,2
PINNACLE MULTIHOLE GRIPTION DePuy	-	-	-	-	26	2,7
TRIDENT Stryker Howmedica	27	2,4	117	11,4	23	2,4
TRABECULAR METAL REVISION Zimmer	1	0,1	10	1,0	19	2,0
OMNIA Adler-Ortho	-	-	36	3,5	16	1,7
EP-FIT PLUS Endoplus	-	-	22	2,2	16	1,7
TRILOGY Zimmer	79	7,0	49	4,8	14	1,5
DELTA PF Lima	-	-	36	3,5	8	0,8
BOFOR Endoplus	3	0,3	12	1,2	7	0,7
FIXA Adler-Ortho	-	-	125	12,2	6	0,6
MC MINN Link	63	5,6	24	2,3	3	0,3
BICON PLUS Endoplus	5	0,4	17	1,7	3	0,3
PINNACLE MULTIHOLE II DePuy	7	0,6	24	2,3	2	0,2
FITMORE Sulzer	25	2,2	17	1,7	2	0,2
CLS Zimmer	34	3,0	7	0,7	2	0,2
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
TRIDENT ARC2F Stryker Howmedica	-	-	36	3,5	-	-
DUOFIT PSF Samo	30	2,7	18	1,8	-	-
AnCA FIT Cremascoli	282	25,2	18	1,8	-	-
PROCOTYL-Z-PIVOT Wright Cremascoli	4	0,4	17	1,7	-	-
LOR ALLOPRO Protek Sulzer	42	3,7	6	0,6	-	-
PROCOTYL-E Wright Cremascoli	32	2,9	4	0,4	-	-
STANDARD CUP Protek Sulzer	128	11,4	4	0,4	-	-
OSTEOLOCK Stryker Howmedica	47	4,2	-	-	-	-
CONICAL SCREW CUP Protek Sulzer	25	2,2	-	-	-	-
SECUR-FIT Osteonics Howmedica	25	2,2	-	-	-	-
Other (< 20 cases)	239	21,3	214	20,9	181	18,9
Total	**1.121**	**100,0**	**1.023**	**100,0**	**956**	**100,0**

4.3 Stems used in primary surgery

In 230 cases model or stem fixation was not communicated to RIPO.

Cemented stem	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
C-STEM AMT DePuy	-	-	19	0,5	210	14,7
BASIS Smith And Nephew	336	4,7	449	11,6	187	13,1
APTA Adler-Ortho	-	-	973	25,2	184	12,9
EXETER Stryker Howmedica	641	9,0	565	14,6	134	9,4
AB Citieffe	23	0,3	78	2,0	116	8,1
CCA Mathys	37	0,5	142	3,7	58	4,1
HYDRA Adler-Ortho	-	-	3	0,1	49	3,4
LC Samo	315	4,4	51	1,3	46	3,2
TAPERLOC CEM Biomet	1	0,0	45	1,2	33	2,3
SL Lima	39	0,5	33	0,9	31	2,2
VERSYS ADVOCATE Zimmer	33	0,5	189	4,9	26	1,8
LUBINUS SP2 Link	226	3,2	66	1,7	17	1,2
VERSYS HERITAGE Zimmer	31	0,4	16	0,4	11	0,8
MERCURIUS Adler-Ortho	-	-	102	2,6	10	0,7
AD Samo	313	4,4	66	1,7	9	0,6
P507 Samo	455	6,4	196	5,1	6	0,4
SPECTRON Smith and Nephew	552	7,7	170	4,4	5	0,3
DUOFIT CKA Samo	15	0,2	35	0,9	4	0,3
MULLER AUTOBLOCCANTE Sulzer	43	0,6	11	0,3	3	0,2
ARCAD SO Symbios	-	-	64	1,7	2	0,1
MS 30 Zimmer	175	2,5	9	0,2	2	0,1
SL STREAKES Hitmedica	40	0,6	8	0,2	2	0,1
C STEM DePuy	230	3,2	84	2,2	-	-
DEFINITION Stryker Howmedica	272	3,8	75	1,9	-	-
JVC Wright Cremascoli	669	9,4	59	1,5	-	-
MBA Groupe Lepine	46	0,6	41	1,1	-	-
DUOFIT CFS Samo	60	0,8	14	0,4	-	-
ANCA-FIT CLU Wright Cremascoli	303	4,2	11	0,3	-	-
VERSYS CEMENTED LD Zimmer	123	1,7	10	0,3	-	-
PERFECTA RA Wright Cremascoli	51	0,7	9	0,2	-	-
AHS Wright Cremascoli	302	4,2	4	0,1	-	-
VERSYS CEMENTED Zimmer	333	4,7	2	0,1	-	-
MRL Wright Cremascoli	468	6,6	1	0,0	-	-
ABGII Stryker Howmedica	53	0,7	1	0,0	-	-
ABG Stryker Howmedica	231	3,2	-	-	-	-
ULTIMA Johnson e Johnson	197	2,8	-	-	-	-
ANCA Wright Cremascoli	89	1,2	-	-	-	-
FULLFIX Mathys	67	0,9	-	-	-	-
Other (< 50 cases)	365	5,1	257	6,7	285	19,9
Total	**7.134**	**100,0**	**3.858**	**100,0**	**1.430**	**100,0**

Cementless stem	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
APTA Adler-Ortho	10	0,1	4.079	15,2	4.324	**13,6**
RECTA Adler-Ortho	6	0,0	2.732	10,2	2.280	**7,2**
HYDRA Adler-Ortho	-	-	317	1,2	2.176	**6,8**
TAPERLOC Biomet	158	0,9	1.244	4,7	1.469	**4,6**
SL PLUS MIA STEM Smith And Nephew	-	-	5	0,0	1.339	**4,2**
CONUS Centerpulse	2.175	13,0	1.705	6,4	1.197	**3,8**
SL PLUS Endoplus	539	3,2	2.677	10,0	1.072	**3,4**
CORAIL DePuy	219	1,3	447	1,7	1.065	**3,3**
CBC Mathys	104	0,6	1.227	4,6	912	**2,9**
CORAE Adler-Ortho	-	-	-	-	861	**2,7**
CLS Sulzer	2.559	15,2	1.110	4,1	838	**2,6**
Fitmore Zimmer	-	-	95	0,4	830	**2,6**
ADR Endoplus	-	-	200	0,7	735	**2,3**
POLARSTEM Endoplus	-	-	11	0,0	678	**2,1**
ABGII Stryker Howmedica	1.231	7,3	1.587	5,9	661	**2,1**
PROXIPLUS Endoplant	-	-	823	3,1	616	**1,9**
TRI-LOCK DePuy	-	-	-	-	570	**1,8**
MINIMAX Medacta	-	-	96	0,4	478	**1,5**
ALATA ACUTA S Adler-Ortho	-	-	454	1,7	470	**1,5**
NANOS Endoplant	-	-	170	0,6	470	**1,5**
MODULUS HIP SYSTEM Lima	44	0,3	373	1,4	435	**1,4**
AMISTEM Medacta	-	-	-	-	382	**1,2**
PARVA Adler-Ortho	-	-	4	0,0	367	**1,2**
TAPERLOC MICROPLASTY Biomet	-	-	128	0,5	353	**1,1**
SAM-FIT Lima	-	-	36	0,1	330	**1,0**
GTS Biomet	-	-	-	-	305	**1,0**
H-MAX S Lima	-	-	7	0,0	285	**0,9**
SYNERGY Smith And Nephew	220	1,3	245	0,9	258	**0,8**
TWINSYS Mathys	-	-	13	0,0	257	**0,8**
PLS Lima	-	-	32	0,1	226	**0,7**
SMF Smith And Nephew	-	-	-	-	222	**0,7**
SPS MODULAR Symbios	-	-	111	0,4	221	**0,7**
CLS BREVIUS Zimmer	-	-	-	-	220	**0,7**
MULTIFIT Samo	-	-	143	0,5	219	**0,7**
CFP Link	238	1,4	624	2,3	212	**0,7**
SUMMIT DePuy	1	0,0	192	0,7	212	**0,7**
HARMONY Symbios	-	-	64	0,2	212	**0,7**
VERSYS FIBER METAL TAPER Zimmer	595	3,5	434	1,6	207	**0,7**
DUOFIT RTT Samo	23	0,1	92	0,3	198	**0,6**
S-TAPER Bioimpianti	-	-	10	0,0	195	**0,6**
PBF Permedica	72	0,4	166	0,6	190	**0,6**
C2 Lima	299	1,8	540	2,0	188	**0,6**
H-MAX M Lima	-	0,0	-	-	185	**0,6**
QUADRA-S Medacta	3	0,0	171	0,6	173	**0,5**
TAPERLOC COMPLETE Biomet	-	-	-	-	171	**0,5**
ACCOLADE Osteonics Howmedica	92	0,5	236	0,9	159	**0,5**
Z1 Citieffe	-	-	230	0,9	142	**0,4**
MISTRAL Samo	-	-	-	-	131	**0,4**
QUADRA-H Medacta	-	-	138	0,5	129	**0,4**
VITAE Adler-Ortho	-	-	-	-	128	**0,4**
RECTA-FIX Adler-Ortho	-	-	-	-	122	**0,4**
SL REVISION Sulzer	67	0,4	71	0,3	75	**0,2**
PROFEMUR Z Wright Cremascoli	574	3,4	68	0,3	70	**0,2**
ALLOCLASSIC SL Zimmer	169	1,0	129	0,5	62	**0,2**
CONELOCK SHORT Biomet	-	-	248	0,9	52	**0,2**
PPF Biomet	168	1,0	75	0,3	48	**0,2**
MAYO Zimmer	36	0,2	82	0,3	45	**0,1**
ARCAD HA Symbios	5	0,0	203	0,8	42	**0,1**
PORO-LOCK II Hit Medica	48	0,3	108	0,4	39	**0,1**

DUOFIT RKT Samo	201	1,2	103	0,4	34	**0,1**
HIPSTAR+ Stryker Howmedica	-	-	193	0,7	30	**0,1**
HIPSTAR Stryker Howmedica	124	0,7	192	0,7	20	**0,1**
S. ROM Johnson e Johnson	79	0,5	86	0,3	14	**0,0**
FIT STEM Lima	68	0,4	227	0,8	13	**0,0**
ANCA FIT Wright Cremascoli	3.819	22,7	678	2,5	6	**0,0**
MBA HAP Groupe Lepine	38	0,2	83	0,3	6	**0,0**
SPS Symbios	156	0,9	65	0,2	6	**0,0**
BHS Smith and Nephew	272	1,6	160	0,6	-	**-**
EASY Hitmedica	150	0,9	77	0,3	-	**-**
EHS Wright Cremascoli	252	1,5	60	0,2	-	**-**
PROXILOCK FT Stratec	287	1,7	17	0,1	-	**-**
STEM Wright Cremascoli	208	1,2	1	0,0	-	**-**
ABG Stryker Howmedica	328	2,0	-	-	-	**-**
G3 Citieffe	179	1,1	-	-	-	**-**
CITATION Stryker Howmedica	112	0,7	-	-	-	**-**
Other (< 100 cases)	859	5,1	856	3,2	1158	**3,6**
Total	**16.787**	**100,0**	**26.750**	**100,0**	**31.795**	**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		2010-2014	
	N.	%	N.	%	N.	%
EXETER Stryker Howmedica	39	16,2	35	21,5	6	7,0
APTA Adler-Ortho	-	-	30	18,4	5	5,8
VERSYS REVISION CALCAR Zimmer	8	3,3	10	6,1	2	2,3
JVC Wright Cremascoli	24	10,0	8	4,9	-	-
AD Samo	26	10,8	3	1,8	-	-
ANCA Wright Cremascoli	25	10,4	-	-	-	-
Other (< 20 cases)	119	49,4	77	47,2	73	84,9
Total	**241**	**100,0**	**163**	**100,0**	**86**	**100,0**

Cementless stem	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
SL REVISION Sulzer Centerpulse Zimmer	281	22,8	154	14,5	182	18,6
REVISION HIP Lima	6	0,5	41	3,9	155	15,9
ALATA AEQUA REVISION Adler-Ortho	-	-	86	8,1	137	14,0
RESTORATION Stryker Howmedica	11	0,9	192	18,1	86	8,8
ALATA ACUTA S Adler-Ortho	-	-	25	2,4	60	6,1
CONELOCK REVISION Biomet	21	1,7	64	6,0	52	5,3
MODULUS HIP SYSTEM Lima	-	-	17	1,6	35	3,6
RECLAIM DePuy	-	-	-	-	26	2,7
MGS Samo	43	3,5	56	5,3	23	2,4
ADR Endoplus	-	-	2	0,2	20	2,0
MP RECONSTRUCTION PROSTHESIS Link	33	2,7	17	1,6	14	1,4
APTA Adler-Ortho	-	-	16	1,5	14	1,4
SL PLUS Endoplus	9	0,7	20	1,9	11	1,1
SLR PLUS Endoplus	8	0,6	12	1,1	10	1,0
ZMR REVISION TAPER CONE Zimmer	12	1,0	30	2,8	9	0,9
CONUS Sulzer Centerpulse Zimmer	54	4,4	28	2,6	7	0,7
CLS Sulzer Centerpulse Zimmer	26	2,1	9	0,8	7	0,7
S. ROM Johnson e Johnson	91	7,4	52	4,9	4	0,4
PROFEMUR R VERS. 4 Wright Cremascoli	350	28,4	58	5,5	3	0,3
VERSYS FIBER METAL TAPER Zimmer	9	0,7	10	0,9	3	0,3

C2 Lima	33	2,7	29	2,7	2	0,2
EMPERION Smith And Nephew	-	-	21	2,0	2	0,2
ANCA FIT Wright Cremascoli	55	4,5	4	0,4	-	-
CBK REVISION STEM Mathys	18	1,5	2	0,2	-	-
RESTORATION T3 Stryker Howmedica	74	6,0	-	-	-	-
ZMR REVISION TAPER Zimmer	30	2,4	-	-	-	-
Other (< 20 cases)	69	5,6	115	10,8	114	11,7
Total	**1.233**	**100,0**	**1.060**	**100,0**	**976**	**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
2014	97	125

In 2014 were implanted 21 different types of cup and 25 stems not used in 2013.

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
2014	39	36

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
2014	97,0	3,0

Types of resurfacing implanted between **1st January 2000** and **31st December 2014.**

Type	N.	%
BHR – Smith & Nephew	1276	58,1
ADEPT – Finsbury	393	17,9
BMHR* – Smith & Nephew	166	7,6
MITCH TRH – Finsbury	87	4,0
ASR – DePuy	77	3,5
RECAP – Biomet	65	3,0
MRS* – Lima	44	2,0
ROMAX – Medacta	33	1,5
ICON – International Orthopaedics	21	1,0
CONSERVE PLUS – Wright	19	0,9
DURON Hip Resurfacing – Zimmer	8	0,3
WAGNER METASUL – Protek	3	0,1
TRIBOFIT – Active Implants	1	0,05
ACCIS – Implantcast	1	0,05
CORMET – Corin	1	0,05
Total	**2.195**	**100,0**

* considered similar to resurfacing

In 2014 were implanted 197 BHR - Smith And Nephew, 7 Adept Matortho, 15 BMHR SMITH AND NEPHEW and 1 Accis Implantcast.

4.7 Modular neck

33,4% of stems implanted in primary surgery have modular neck.

In the following table percentage of standard and modular neck in primary surgery are presented.

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
2014	71,3	28,7

In the following table Types of stems with proximal modularity more present in database.

Types of stems with proximal modularity	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
APTA Adler-Ortho	10	0,2	5052	47,0	4508	37,1
RECTA Adler-Ortho	6	0,1	2733	25,4	2280	18,8
HYDRA Adler-Ortho	-	-	320	3,0	2225	18,3
ALATA ACUTA S Adler-Ortho	-	-	455	4,2	471	3,9
MODULUS HIP SYSTEM Lima	44	0,7	373	3,5	434	3,6
PARVA Adler-Ortho	-	-	4	0,0	366	3,0
SAM-FIT Lima	-	-	36	0,3	330	2,7
SPS MODULAR Symbios	-	-	111	1,0	221	1,8
CLS BREVIUS Zimmer	-	-	-	-	220	1,8
MULTIFIT Samo	-	-	143	1,3	219	1,8
H-MAX M Lima	-	-	-	-	185	1,5
VITAE Adler-Ortho	-	-	-	-	128	1,1
HARMONY Symbios	-	-	64	0,6	123	1,0
SMF Smith And Nephew	-	-	-	-	113	0,9
PROFEMUR Z Wright Cremascoli	574	8,8	68	0,6	67	0,6
PULCHRA Adler-Ortho	-	-	-	-	52	0,4
REVISION HIP Lima	-	-	6	0,1	34	0,3
ALATA AEQUA REVISION Adler-Ortho	-	-	10	0,1	29	0,2
ABGII MODULAR Stryker Howmedica	-	-	48	0,4	14	0,1
S. ROM Johnson e Johnson	79	1,2	86	0,8	14	0,1
MERCURIUS Adler-Ortho	-	-	102	0,9	10	0,1
ANCA FIT Wright Cremascoli	3820	58,9	678	6,3	6	0,0
MBA HAP Groupe Lepine	38	0,6	83	0,8	6	0,0
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		0,0	-	-
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	99	0,8
Total	**6490**	**100,0**	**10743**	**100,0**	**12155**	**100,0**

ANCA -Fit stem was implanted with short necks in 65% of cases and with long necks in 35%
The straight neck is used in 38.4 % of surgery , the anti - retroverted with 8 or 15 ° in 34.1 % correction, and the varus - valgus in 24.7%.
APTA stem , the most used in the region, was implanted with neutral necks in 63.5% of cases and with various degree of correction necks in the remaining 36.5 %.

4.8 Articular couplings and head diameters

'Ceramic' definition includes 'homogeneous materials ' (alumina or zirconia) or composite materials (alumina + zirconia).

Number of primary total hip arthroplasty operations carried out on patients with admission date between 1st January 2000 and 31st December 2014, according to the **type of operation** and **articular coupling**. **Double-mobility neck are excluded.**

Articular coupling	Primary		Total revision	
	N.	%	N.	%
Composite ceramic - Composite ceramic	22.826	26,8	496	13,8
Met - UHMWPE	12.503	14,7	726	20,1
Alumina - alumina	11.013	12,9	327	9,1
Alumina - UHMWPE	9.675	11,4	656	18,2
Met - XLPE	6.387	7,5	511	14,2
Composite ceramic - XLPE	5.359	6,3	326	9,0
met-met	5.170	6,1	86	2,4
Alumina - Composite ceramic	1.801	2,1	58	1,6
Alumina - XLPE	1.796	2,1	126	3,5
Composite ceramic - UHMWPE	1.335	1,6	66	1,8
Composite ceramic - Alumina	1.265	1,5	16	0,4
Met - UHMWPE+met	1.086	1,3	10	0,3
Composite ceramic - XLPE+vitamin E	942	1,1	42	1,2
Oxinium - XLPE	909	1,1	16	0,4
Metal-Undefined PE*	826	1,0	52	1,4
Alumina - UHMWPE+Alumina	790	0,9	13	0,4
Ceramic - Undefined PE *	421	0,5	34	0,9
Composite ceramic - metal	222	0,3		0,0
Zirconia - UHMWPE	216	0,3	19	0,5
Cerid - UHMWPE	179	0,2		0,0
Oxinium - UHMWPE	137	0,2	12	0,3
Zirconia-XLPE	99	0,1		0,0
Surface-treated metal - Surface-treated metal	78	0,1	1	0,0
Met - XLPE+vitamin E	35	0,0	7	0,2
Other (< 20 cases)	49	0,1	3	0,1
Total^	**85119**	**100,0**	**3603**	**100,0**

* missing label did not allow classification of poly
^219 missing data in primary surgery and 12 in total revision.

Percentage of total hip arthroplasty interventions between 2001 and 2014, according to the **type of polyethylene** used.

Year of surgery	Primary surgery		
	Standard poly	Crosslinked poly	Undefined poly
2001	76,5	18,3	5,2
2002	82,0	15,7	2,3
2003	81,3	17,3	1,4
2004	77,9	21,5	0,6
2005	74,9	24,0	1,1
2006	75,3	24,5	0,2
2007	71,6	28,2	0,2
2008	64,6	35,3	0,1
2009	52,5	47,5	-
2010	41,6	58,4	-
2011	35,7	64,3	-
2012	25,0	75,0	-
2013	22,6	77,4	-
2014	19,5	80,5	-

missing label did not allow classification of poly

The following table shows percentage of Primary surgery with Ceramic o Composite ceramic **liner**

Year of surgery	Primary surgery	
	Ceramic liner	Composite ceramic liner
2001	100,0	-
2002	100,0	-
2003	100,0	-
2004	99,1	0,9
2005	96,9	3,1
2006	90,5	9,5
2007	85,4	14,6
2008	67,4	32,6
2009	22,2	77,8
2010	14,9	85,1
2011	7,0	93,0
2012	3,4	96,6
2013	0,8	99,2
2014	1,1	98,9

The following table shows percentage of Primary surgery with Ceramic o Composite ceramic **head**

Year of surgery	Primary surgery	
	Ceramic head	Composite ceramic head
2001	100,0	-
2002	100,0	-
2003	100,0	-
2004	100,0	-
2005	99,8	0,2
2006	99,2	0,8
2007	96,4	3,6
2008	88,6	11,4
2009	46,0	54,0
2010	27,3	72,7
2011	10,3	89,7
2012	5,3	94,7
2013	4,3	95,7
2014	4,4	95,6

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2014, 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.	%
Composite ceramic	-	-	-	-	2.398	5,8	10.519	57,9	15.549	72,8	3.408	54,8
Alumina	1	0,3	-	-	17.306	41,7	5.230	28,8	3.494	16,4	-	-
Cr-Co	342	86,8	22	78,6	17.820	43,0	2.041	11,2	1.614	7,6	2.474	39,8
Stainless steel	50	12,7	5	17,9	3.254	7,8	172	0,9	26	0,1	-	-
OXINIUM	-	-	-	-	233	0,6	171	0,9	657	3,1	8	0,1
Zirconia	1	0,3	1	3,6	291	0,7	20	0,1	18	0,1	-	-
Cerid	-	-	-	-	180	0,4	-	-	-	-	-	-
Revision ceramic	-	-	-	-	3	0,01	6	0,03	4	0,02	249	4,0
Surface-treated metal	-	-	-	-	-	-	-	-	-	-	78	1,3
Total	**394**	**100,0**	**28**	**100,0**	**41.485**	**100,0**	**18.159**	**100,0**	**21.362**	**100,0**	**6.217**	**100,0**

*348 missing data (0,4%)

Year of surgery	Diameter of the head (mm) in THA								
	<=28 cer	<=28 met	<=28 Other	32 cer	32 met	32 Other	>=36 cer	>=36 met	>=36 Other
2000	45,6	49,7	1,2	1,1	1,3	0,0	0,0	1,1	0,0
2001	49,9	46,6	1,1	0,7	0,3	0,0	0,0	1,4	0,0
2002	51,6	45,8	0,8	0,9	0,1	0,0	0,0	0,8	0,0
2003	50,4	46,4	0,7	0,9	0,1	0,0	0,3	1,2	0,0
2004	50,6	41,4	0,8	3,2	0,6	0,0	1,3	2,2	0,0
2005	33,8	38,1	0,5	16,5	1,6	0,0	5,5	3,9	0,0
2006	23,1	33,5	0,5	18,8	2,0	0,1	14,7	7,2	0,0
2007	15,7	28,2	0,9	20,5	3,8	0,1	21,7	9,1	0,0
2008	14,3	21,7	0,4	20,4	3,7	0,1	29,6	9,9	0,0
2009	11,5	17,6	0,1	21,6	3,1	0,0	36,7	9,2	0,1
2010	8,5	10,0	0,1	23,8	4,6	0,2	44,3	7,7	0,9
2011	6,3	8,0	0,2	27,1	4,8	0,5	45,6	4,8	2,8
2012	6,8	5,4	0,0	28,1	3,7	0,3	49,9	3,0	2,7
2013	6,0	5,1	0,1	29,7	2,8	0,6	50,3	2,7	2,9
2014	6,1	5,4	0,3	32,7	2,6	0,7	47,7	2,5	2,0

Heads made of cobalt-based alloy and stainless steel are marked with the initials "met"; heads made of Cerid and Oxinium are included in "other"

4.9 Prosthesis fixation

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2014, according to **type of operation** and **fixation**

Fixation	Primary THA	%	Total revision	%
Cementless	75.017	85,5	2.814	74,0
Hybrid (cemented stem and cementless cup)	7.647	8,7	289	7,6
Cemented	4.477	5,1	194	5,1
Reverse hybrid (cementless stem and cemented cup)	587	0,7	507	13,3
Total*	**87.728**	**100,0**	**3.804**	**100,0**

*265 primary THA and 12 total revision missing data.

Percentage of total hip arthroplasties **according to fixation**, during the years 2000 – 2014

Year of surgery	Primary surgery			
	Cemented	Cementless	Hybrid	Reverse hybrid
2000	14,6	61,9	21,3	2,2
2001	13,8	66,3	17,9	2,0
2002	11,8	70,9	15,3	2,0
2003	10,8	73,1	14,5	1,6
2004	8,5	77,9	12,2	1,4
2005	7,0	80,0	11,5	1,5
2006	6,1	82,7	10,2	1,0
2007	4,3	86,5	8,1	1,1
2008	2,5	89,9	6,6	1,0
2009	2,0	91,1	5,8	1,1
2010	1,2	93,7	4,2	0,9
2011	0,9	94,6	3,6	0,9
2012	0,7	95,1	3,3	0,9
2013	1,1	95,1	3,1	0,7
2014	0,7	95,3	3,3	0,7

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

Age class	Elective primary THA 2000-2014			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0,6	98,3	0,7	0,4
40-49	0,2	98,9	0,6	0,3
50-59	0,4	97,6	1,7	0,3
60-69	1,2	92,1	6,4	0,3
70-79	5,8	80,7	12,8	0,7
≥80	17,2	65,2	15,9	1,7

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	0,8
40-49	0,4	96,1	3,1	0,4
50-59	1,5	88,6	9,5	0,4
60-69	5,7	70,4	23,2	0,7
70-79	21,4	46,6	30,6	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 2014

Age class	Elective primary surgery year 2014			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	0,0	100,0	0,0	0,0
40-49	0,2	99,3	0,2	0,3
50-59	0,1	99,6	0,3	0,0
60-69	0,1	99,0	0,8	0,1
70-79	0,3	96,0	3,2	0,5
≥80	2,8	84,8	10,6	1,8

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	18,7
2001	7,9	64,0	8,5	19,6
2002	6,0	66,0	7,3	20,7
2003	7,2	69,3	6,9	16,6
2004	7,1	68,8	7,9	16,2
2005	7,5	68,0	8,3	16,2
2006	6,2	72,9	9,9	11,0
2007	4,0	73,8	9,5	12,7
2008	3,1	78,2	8,4	10,3
2009	1,8	82,4	6,8	9,0
2010	1,7	84,0	5,9	8,4
2011	5,0	80,1	7,2	7,7
2012	1,3	88,5	3,1	7,1
2013	1,9	82,3	7,9	7,9
2014	0,6	88,1	4,4	6,9

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

Age class	Total revision			
	Cemented	Cementless	Hybrid	Reverse hybrid
<40	1,4	93,0	1,4	4,2
40-49	3,6	88,3	2,2	5,9
50-59	1,5	87,2	2,7	8,6
60-69	3,1	78,3	5,9	12,7
70-79	4,5	71,7	8,5	15,3
≥80	12,8	59,7	12,9	14,6

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	35,4	36,2	30,2
Cemex System - Tecres	12,0	25,4	1,3
Antibiotic Simplex - Howmedica	**6,0**	**3,0**	**55,0**
Palacos R - Biomet	5,7	1,3	1,2
Smartset Hv - Depuy	5,8	8,5	3,1
Amplicem 3 - Amplimedical	3,6	3,4	-
Cemex Rx - Tecres	2,3	5,2	0,1
Cemex + Cemex System - Tecres	2,0	-	-
Cemex - Tecres	1,9	1,6	0,2
Exolent High - Elmdown	1,6	0,6	-
Cemex Rx + Cemex System - Tecres	1,5	-	-
Cmw 3 - Depuy	1,4	1,0	-
Amplicem 1 + Amplicem 3 - Amplimedical	1,4	0,004	-
Cemex System - Tecres + Surgical Simplex P - How	1,4	0,004	-
Amplicem 1 - Amplimedical + Smartset Hv - Depuy	1,3	-	-
Palacos R - Heraeus Medical	1,3	2,0	0,2
Cemfix 1 - Teknimed	1,2	0,2	-
Versabond - Smith And Nephew	1,1	0,03	2,7
Cemex Genta + Cemex Genta System - Tecres	**1,0**	**0,004**	**-**
Sulcem 3 - Centerpulse	1,0	1,0	0,1
Cemfix 3 - Teknimed	0,8	0,05	-
Aminofix 1 - Groupe Lepine	**0,8**	**0,02**	**-**
Smartset Mv - Depuy	0,7	2,1	0,1
Cemex Genta - Tecres	**0,7**	**0,4**	**0,1**
Palacos R 40 - Sp Europe	0,6	0,1	-
Bone Cement R - Biomet	0,6	0,1	1,0
Cemex Genta System - Tecres	**0,5**	**2,2**	**1,4**
Palacos R+G - Heraeus Medical	**0,4**	**0,4**	**0,1**
Refobacin Bone Cement R - Biomet	**0,4**	**0,004**	**-**
Amplicem 1 - Amplimedical	0,4	0,03	0,2
Cemsys 1 - Mathys	0,4	0,03	-
Vacu Mix Plus Cmw 3 - Depuy	0,4	0,9	-
Amplicem 3G - Amplimedical	**0,3**	**-**	**-**
A. Simplex + S. Simplex P - Howmedica	**0,3**	**0,01**	**0,2**
Cemex Xl - Tecres	0,2	0,6	-
Osteobond - Zimmer	0,2	0,01	1,1
Palamed G - Heraeus Medical	**0,2**	**0,1**	**0,1**
Hi-Fatigue - Zimmer	0,2	0,02	0,7
Versabond AB - Smith And Nephew	**0,2**	**0,01**	**-**
Other without antibiotic	1,7	2,8	0,7
Other with antibiotic	**1,1**	**0,7**	**0,2**
Total	**100,0**	**100,0**	**100,0**

Antibiotic-loaded cement was chosen in 11,8% of THA, in 6,8% of hemi and in 57,0% of resurf.
Surgical Simplex P – Howmedica in 2013-2014 was chosen in 42,8% of THA and in 40,6% of hemi.

5. Types of hemiarthroplasty

5.1 Hemiarthroplasty cup and stem

Monoblock	2000-2004		2005-2009		2010-2014	
	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		2010-2014	
	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		2010-2014	
	N.	%	N.	%	N.	%
C1 - Citieffe	867	8,9	1772	15,5	3501	28,7
JANUS Bioimpianti	292	3,0	557	4,9	1970	16,2
BI-POLAR DePuy	2	0,0	209	1,8	1805	14,8
SPHERI-LOCK - Hit Medica	2042	21,0	2214	19,3	1511	12,4
UHR Osteonics Stryker Howmedica	444	4,6	1633	14,3	1169	9,6
TESTA BIARTICOLARE LOCK Lima	244	2,5	1101	9,6	748	6,1
CUPOLA NEMAUSUS Transysteme	-	-	240	2,1	651	5,3
CUPOLA MOBILE MODULARE- Wright Cremascoli	886	9,1	305	2,7	233	1,9
BI-POLAR Biomet	143	1,5	231	2,0	122	1,0
TESTA BIPOLARE SMITH AND NEPHEW		0,0	2	0,0	110	0,9
CUPOLA BIPOLARE Mathys	404	4,2	233	2,0	77	0,6
TESTA BIPOLARE Samo	100	1,0	3	0,0	72	0,6
CUPOLA BIPOLARE Zimmer	94	1,0	326	2,8	34	0,3
CUPOLA MOBILE Zimmer	360	3,7	666	5,8	21	0,2
CORON Tantum	1	0,0	174	1,5	15	0,1
CUPOLA MOBILE Medacta		0,0	185	1,6	6	0,0
CUPOLA MOBILE BIARTICOLARE - Permedica	461	4,7	259	2,3	3	0,0
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	-	-	352	3,1	-	-
MODULAR BIPOLAR - Protek	341	3,5	5	0,0	-	-
RETENTIVE MOBILE CUP - Cedior	292	3,0	-	-	-	-
MODULAR BIPOLAR Zimmer	62	0,6	35	0,3	-	-
BICENTRIC - Stryker Howmedica	233	2,4	3	0,0	-	-
TESTA BIPOLARE -Amplimedical	193	2,0	-	-	-	-
Other (< 100 cases)	173	1,8	146	1,3	143	1,2
Total*	**9726**	**100,0**	**11442**	**100,0**	**12191**	**100,0**

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

In 185 cases model or stem fixation was not communicated to RIPO.

Cemented stem	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
AB Citieffe	665	7,4	1.662	17,7	3.269	37,4
G2 DePuy	53	0,6	693	7,4	760	8,7
SL STREAKES Hitmedica	276	3,1	890	9,5	653	7,5
SL Lima	439	4,9	288	3,1	650	7,4
CORAIL DePuy	-	-	-	-	577	6,6
APTA Adler-Ortho	-	-	541	5,8	493	5,6
EXETER Stryker Howmedica	204	2,3	347	3,7	461	5,3
S-TAPER Bioimpianti	-	-	3	0,0	430	4,9
SPHERI-SYSTEM II Hitmedica	888	9,8	1.103	11,8	396	4,5
PROFEMUR GLADIATOR Wright Cremascoli	-	-	-	-	230	2,6
KORUS Bioimpianti	-	-	-	-	191	2,2
C-STEM AMT DePuy	-	-	10	0,1	161	1,8
VERSYS ADVOCATE Zimmer	-	-	15	0,2	105	1,2
DUOFIT CKA Samo	116	1,3	36	0,4	67	0,8
MERCURIUS Adler-Ortho	-	-	42	0,4	58	0,7
CCA Mathys	400	4,4	214	2,3	31	0,4
LOGICA MIRROR Lima	131	1,5	377	4,0	27	0,3
STANDARD STRAIGHT Zimmer	525	5,8	232	2,5	22	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	-	-
RELIANCE HOWMEDICA	305	3,4	318	3,4	-	-
FIN Bioimpianti	229	2,5	295	3,1	-	-
SEM II DMO	361	4,0	276	2,9	-	-
JVC Wright Cremascoli	272	3,0	209	2,2	-	-
DEFINITION Stryker Howmedica	68	0,8	168	1,8	-	-
LOGICA Lima	142	1,6	106	1,1	-	-
ALBI PTC Wright Cremascoli	134	1,5	15	0,2	-	-
AHS Wright Cremascoli	303	3,4	9	0,1	-	-
SL -Hit Medica	731	8,1	8	0,1	-	-
ULTIMA LX Johnson And Johnson	315	3,5	-	-	-	-
MRL Wright Cremascoli	270	3,0	-	-	-	-
HIP FRACTURE Stryker Howmedica	162	1,7	-	-	-	-
SL Amplimedical	158	1,7	-	-	-	-
ULTIMA STRAIGHT DePuy	156	1,7	-	-	-	-
Other (< 100 cases)	586	6,5	292	3,1	147	1,7
Total	**9.022**	**100,0**	**9.384**	**100,0**	**8.742**	**100,0**

Cementless stem	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
S-TAPER Bioimpianti	-	-	217	10,5	873	25,9
ACCOLADE Osteonics Stryker Howmedica	282	40,2	833	40,3	688	20,4
KORUS Bioimpianti	-	-	-	-	437	13,0
LOGICA CS Lima	-	-	52	2,5	269	8,0
SL Lima	3	0,4	206	10,0	117	3,5
TAPERLOC Biomet	1	0,1	5	0,2	109	3,2
Z1 Citieffe	-	-	2	0,1	95	2,8

G2 De Puy	-	-	1	0,0	91	2,7
RECTA Adler-Ortho	-	-	48	2,3	90	2,7
APTA Adler-Ortho	-	-	47	2,3	82	2,4
HYDRA Adler-Ortho	-	-	4	0,2	67	2,0
POLARSTEM Endoplus	-	-	-	-	67	2,0
CORAIL De Puy	4	0,6	1	0,0	52	1,5
TWINSYS Mathys	-	-	9	0,4	46	1,4
SUMMIT De Puy	-	-	4	0,2	38	1,1
SPS MODULAR Symbios	-	-	-	-	37	1,1
CORAE Adler-Ortho	-	-	-	-	32	1,0
CONUS Centerpulse	5	0,7	12	0,6	23	0,7
PORO-LOCK II Hit Medica	-	-	52	2,5	22	0,7
C2 Lima	3	0,4	11	0,5	18	0,5
ENDON Tantum	1	0,1	172	8,3	15	0,5
COXAFIT HIP STEM FGL Arge	-	-	11	0,5	13	0,4
ADR Endoplus	-	-	12	0,6	11	0,3
SL PLUS Endoplus	1	0,1	15	0,7	9	0,3
VERSYS FIBER METAL TAPER Zimmer	3	0,4	35	1,7	7	0,2
SL REVISION Sulzer	7	1,0	17	0,8	7	0,2
PROFEMUR Z Wright Cremascoli	3	0,4	13	0,6	7	0,2
PPF Biomet	112	16,0	154	7,5	-	-
EURO HIP SYSTEM Wright Cremascoli	17	2,4	24	1,2	-	-
H-AC STEM FURLONG Jri	67	9,6	7	0,3	-	-
HIP FRACTURE - Howmedica	133	19,0	-	-	-	-
Other (< 20 cases)	59	8,4	101	4,9	44	1,3
Total	**701**	**100,0**	**2.065**	**100,0**	**3.366**	**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	32.455	95,2
Preassembled bipolar head	1.102	3,2
Monoarticular head	425	1,3
Monoblock prosthesis	112	0,3
Total	**34.094**	**100,0**

In 83,3% of hemi, stem was cemented and in 7,2% the stem had a modular neck.
In year 2014 1,1% of hemi has ceramic heads.

6. Blood transfusion

Percentage of operations performed on patients admitted between 1st January 2003 and 31st December 2014 **according to type of operation and transfusion**

Type of surgery	None	Autologous (recovery)	Autologous (predeposit)	Homologous	Autologous and homologous
Emergency primary	26,3	9,7	-	57,6	6,4
Elective primary	16,9	23,4	32,4	17,4	9,9
Revision	11,7	14,5	15,0	44,8	14,0

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

Emergency primary THA and hemiarthroplasty				
Struttura	**None**	**Autologous (recovery)**	**Homologous**	**Autologous and homologous**
AOSP	30,2	2,9	66,5	0,4
Private	10,5	37,2	25,0	27,3
AUSL	37,1	4,6	55,1	3,2
IOR	2,5	0,7	96,8	0,0

Elective THA				
Struttura	**None**	**Autologous**	**Homologous**	**Autologous and homologous**
AOSP	24,5	52,1	20,5	2,9
Private	8,2	71,7	5,0	15,1
AUSL	24,2	45,0	20,4	10,4
IOR	12,1	54,0	28,7	5,2

7. Complications occurred during hospitalization

RIPO registers all kind of complications occurred during hospitalization. In the following tables only intra-operative and post-operative local complications are presented.

The rate of complications in **primary surgery** carried out on patients hospitalized between January 1st 2000 and December 31st 2014.

Complications observed during hospitalization					
Intra-operative			**Post-operative local**		
	N.	**%**		**N.**	**%**
Calcar fracture	372	*0,4*	Deep vein thromb	98	*0,1*
Diaphysis fracture	277	*0,3*			
Greater troch. fracture	192	*0,2*			
Acetabulum fracture	136	*0,2*	Early infection	78	*0,1*
Anaesthesiolog. complications	131	*0,1*			
Hemorragia	36	*0,04*			
Instability	21	*0,02*			
Other	90	*0,1*			
Total	**1.255**	***1,4***	**Total**	**176**	***0,2***

The rate of complications in **revision surgery** carried out on patients hospitalized between January 1st 2000 and December 31st 2014.

Complications observed during hospitalization					
Intra-operative			**Post-operative local**		
	N.	**%**		**N.**	**%**
Diaphysis fracture	197	*1,4*	Early infection	42	*0,3*
Calcar fracture	69	*0,5*			
Anaesthesiolog. complications	54	*0,4*			
Greater troch. fracture	45	*0,3*	Deep vein thromb	19	*0,1*
Acetabulum fracture	23	*0,2*			
Hemorragia	18	*0,1*			
Other	26	*0,2*			
Total	**432**	***3,2***	**Total**	**61**	***0,4***

The rate of complications in **hemiarthroplasty** carried out on patients hospitalized between January 1st 2000 and December 31st 2014.

Complications observed during hospitalization					
Intra-operative			**Post-operative local**		
	N.	**%**		**N.**	**%**
Calcar fracture	154	*0,5*	Deep vein thromb	69	*0,2*
Anaesthesiolog. complications	126	*0,4*			
Greater troch. fracture	95	*0,3*			
Diaphysis fracture	61	*0,2*	Early infection	53	*0,2*
Anaemia	25	*0,1*			
Hemorragia	16	*0,0*			
Acetabulum fracture	4	*0,0*			
Other	42	*0,1*			
Total	**523**	***1,5***	**Total**	**122**	***0,4***

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 2014.
The deaths recorded are those that occurred during hospitalization.

Years 2000-2014			
Type of surgery	**Deaths**	**n. of operations**	**Percentage**
Primary THA	207	87.993	0,2
Hemiarthroplasty	1.534	34.094	4,5
Revision	96	13.680	0,7
Resurfacing prostheses	0	2.195	-
Prosthesis removal	22	990	2,2
Hemiarthroplasty with buffer	0	118	-

Through merging with other data-base the number of deaths occurred **within 90 days** from the date of intervention. Only patients living in Emilia Romagna are considered. Following table includes deaths of previous table.

Deaths occurred within 90 days after Hemiarthroplasty			
Year of surgery	**Deaths**	**n. of operations**	**Percentage**
2000	240	1684	14,3
2001	277	2062	13,4
2002	226	1868	12,1
2003	262	1969	13,3
2004	274	2147	12,8
2005	293	2221	13,2
2006	279	2298	12,1
2007	268	2069	13,0
2008	334	2379	14,0
2009	318	2402	13,2
2010	345	2420	14,3
2011	369	2410	15,3
2012	303	2375	12,8
2013	300	2368	12,7
Total	**4.088**	**30.672**	**13,3**

2014 Regional Mortality database was not available at time of report writing.

8. Duration of pre-operative hospitalization

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

Year 2000			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	3.310	2,4	0-49
Hemiarthroplasty	1.684	3,5	0-44
Revision	483	3,9	0-52
Prosthesis removal	19	5,2	1-20
Year 2014			
Type of operation	**N.**	**Mean pre-op.**	**Range**
Primary THA	5.019	1,4	0-76
Hemiarthroplasty	2.270	2,5	0-68
Revision	562	3,2	0-50
Resurfacing	37	1,1	0-4
Prosthesis removal	36	5,7	0-55

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 2014 were analysed.
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: 64.916
Non revised: 57.468
Revised: 2.817

Chi-square: 153,9 *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.

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 analyse 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, ankyloses, and metastasis

Patients of the group 'Other pathologies' had a 1,9-fold greater risk of failure. In this heterogeneous group, sequelae of congenital and infantile septic coxitis, although the low numerosity, represent the higher risk pathology. Also patients treated due to femoral neck fracture and sequelae, the risk of loosening had a 1,3-fold greater risk of than in patients treated for coxarthrosis.
Conversely, in patients treated by arthroplasty due to necrosis, or to correct sequelae of congenital and childhood 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 2014 **on resident in Emilia-Romagna region**, the second, 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.

Maximum follow-up is 15 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 an Hospital outside Emilia-Romagna region
Primary THA	64.916	1.805	888	124
Hemiarthroplasty*	32.941	509	143	16
Total revision	2.436	177	73	7

* hemiarthroplasties with acetabular buffer are not considered, 19 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 11 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 an Hospital outside Emilia-Romagna region
Resurfacing	715	46	12	6

In Primary THA, **35,9%** of Revisions was performed in a different hospital, in Hemiarthroplasty **23,8%** and in total revision **31,1%.**

As for other registries, 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° of unclassified revisions ^	Revision rate
Primary THA	2.063	630	124	2.817/64.916
Hemiarthroplasty*	551	101	16	668/32.941
Resurfacing	58	-	6	64/715
Total revision	202	48	7	257/2.436

*Minor revision included revision of head, while implant of acetabular component is considered major revision.
^Revisions not classify because performed outside region.

9.3 Survival curves according to Kaplan Meier

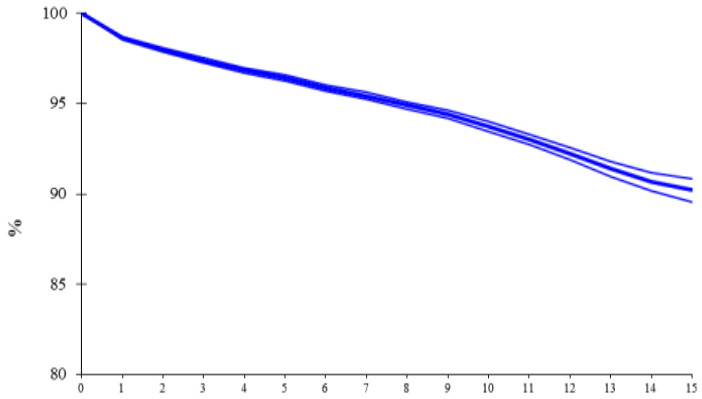
The survival curve calculated by the Kaplan Meier method enables an estimation of the probability that each individual has of maintaining its initial condition (prosthesis in place) over time.
The following paragraphs show the survival curves calculated separately for primary prosthesis, endoprosthesis,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

9.4 Analysis of survival in primary total hip arthroplasty

64.916 primary arthroprostheses are under observation. Of these, 2.817 revisions were carried out.

Number of arthroprostheses	n. revisions	% survival at 15 yrs	Confidence interval 95%
64.916	2.817	90,2	89,6-90,9

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	**458**/64.916	0,7	16,3
within 60 days	*234/64.916*		
over 60 days	*224/64.916*		
Aseptic loosening of the stem	**454**/64.916	0,7	16,1
within 60 days	*15/64.916*		
over 60 days	*439/64.916*		
Aseptic loosening of the cup	**428**/64.916	0,7	15,2
within 60 days	*31/64.916*		
over 60 days	*397/64.916*		
Periprosthetic bone fracture	**322**/64.916	0,5	11,4
within 60 days	*83/64.916*		
over 60 days	*239/64.916*		
Breakage of prosthesis	**294**/64.916	0,5	10,4
Global aseptic loosening	**171**/64.916	0,3	6,1
within 60 days	*2/64.916*		
over 60 days	*169/64.916*		
Septic loosening	**170**/64.916	0,3	6,0
within 60 days	*19/64.916*		
over 60 days	*151/64.916*		
Pain without loosening	**71**/64.916	0,1	2,5
Primary instability	**64**/64.916	0,1	2,3
Poly wear	**54**/64.916	0,1	1,9
Heterotopic bone	**27**/64.916	0,04	1,0
Other	**61**/64.916	0,1	2,2
Unknown*	**243**/64.916	0,4	8,6
Total	2.817/64.916	**4,3**	**100,0**

*124 unknown because performed outside region

Percentage of causes of revision according to follow-up

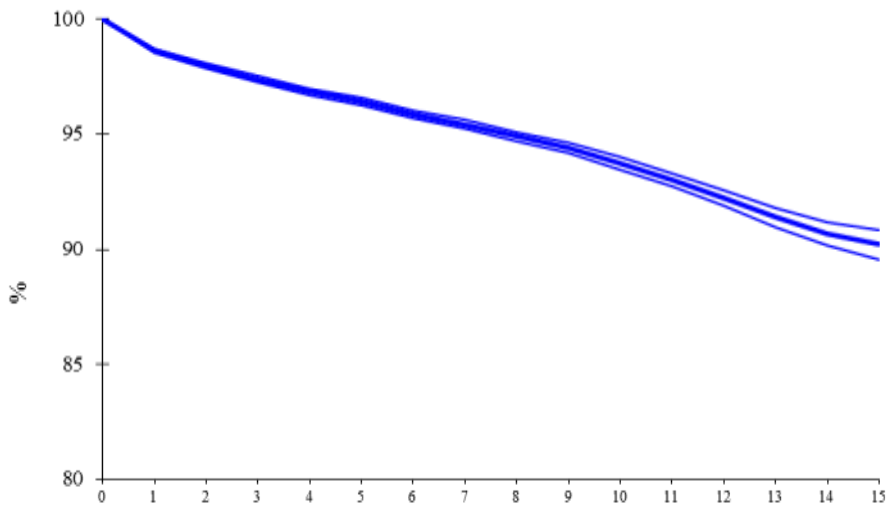
Cause of revision	0-2 Years	3-4 Years	>=5 Years
Prosthesis dislocation	26,0	7,9	6,7
Aseptic loosening of the stem	15,0	21,4	15,1
Periprosthetic bone fracture	11,3	9,4	12,7
Aseptic loosening of the cup	10,3	17,1	21,1
Septic loosening	7,7	5,6	3,9
Breakage of prosthesis	6,9	17,4	12,0
Primary instability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

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

64.916 primary arthroprostheses are under observation. Of these, 2.063 revisions were carried out to remove cup and/or stem.

Number of arthroprostheses	N. revisions	% survival at 15 yrs	Confidence interval 95%
64.916	2.063	90,2	89,6-90,9

Survival curve



9.6 Analysis of survival according to model of prosthesis

Survival analysis has been calculated either for association of cup and stems.
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 cup and stem 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	3519	57	97,9	97,3-98,5	-	-
AnCA Fit (AnCA Fit) Wright Cremascoli	2000	2873	199	95,9	95,2-96,7	93,4	92,4-94,3
FIXA (RECTA) Adler-Ortho	2004	2725	123	96,2	95,5-97	94,2	93,1-95,3
ABGII (ABGII) Stryker Howmedica	2000	1759	62	98	97,3-98,7	96,1	95-97,1
EP-FIT PLUS (SL PLUS) ENDOPLUS	2003	1911	61	96,7	95,8-97,6	94,9	93-96,8
FIXA (APTA) Adler-Ortho	2004	1704	81	96,7	95,8-97,6	94,0	92,3-95,7
CLS (CLS) Sulzer Centerpulse Zimmer	2000	1517	82	97,6	96,8-98,4	94,4	93,1-95,7
Fixa TI-por (Hydra) Adler-Ortho	2007	1814	42	95,2	93,3-97	-	-
EXPANSION (CBC) Mathys	2000	1171	61	94,5	93-95,9	93,2	91,5-95
FITMORE (CONUS) SulzerCenterpulse Zimmer	2000	1111	45	97,1	96,1-98,2	94,9	93,2-96,6
Fixa TI-por (RECTA) Adler-Ortho	2007	1209	37	95,8	94,2-97,4	-	-
EP-FIT PLUS (PROXYPLUS) Smith & Nephew	2004	1003	14	98,4	97,6-99,3	-	-
BICON PLUS (SL PLUS) Smith & Nephew	2000	915	59	95,8	94,5-97,1	92,8	90,6-94,9
FITMORE (CLS) SulzerCenterpulse Zimmer	2000	766	29	97,2	96-98,4	95,7	94,1-97,2
Exceed ABT (TAPERLOC) Biomet	2006	897	12	98,5	97,6-99,3	-	-
R3 (SL PLUS MIA) Smith & Nephew	2010	928	12	98,3	97,4-99,3	-	-
REFLECTION (**BASIS**) Smith & Nephew	2001	677	40	96,6	95,1-98,1	91,9	89,1-94,7
CLS (CONUS) SulzerCenterpulse Zimmer	2000	592	43	97	95,6-98,4	93,9	91,8-96
FIXA (**APTA**) Adler-Ortho	2004	572	18	97,1	95,7-98,5	96,6	95,1-98,2
TRIDENT (ABGII) Stryker Howmedica	2002	389	29	94,6	92,3-96,9	91,5	88,4-94,6
PINNACLE SECTOR II (CORAIL) DePuy	2002	604	25	95,8	94,1-97,6	92,6	89-96,2

TRILOGY (VERSYS FIBER)Zimmer	2000	496	21	96,7	95,1-98,3	96	94,2-97,8
DUOFIT PSF (**P507**) Samo	2000	492	19	98,1	96,8-99,3	96,5	94,7-98,3
RECAP RESURFACING (TAPERLOC) Biomet	2005	486	21	95,9	94,1-97,7	-	-
CONTEMPORARY (**EXETER**)Stryker Howmedica	2000	485	22	96	94,1-97,9	94,2	91,6-96,8
SELEXYS TH (CBC) MATHYS	2006	435	35	91,9	89,3-94,6	-	-
AnCA Fit (PROFEMUR Z) Wright Cremascoli	2002	420	34	94,2	92-96,5	91,8	89,2-94,5
CFP (CFP) Link	2001	406	14	97,7	96,2-99,2	95,7	93,5-98
REFLECTION (**SYNERGY**) Smith & Nephew	2000	418	15	97,4	95,6-99,2	93,7	90,2-97,2
Ep-fit (Polarstem) Endoplus	2010	464	6	98,6	97,4-99,7	-	-
Versafitcup CC (Minimax) Medacta	2008	354	10	97	95,1-98,8	-	-
DELTA PF (MODULUS HIP SYSTEM) Lima	2003	352	9	97,5	95,8-99,2	96,9	94,7-99
MULLER (**JVC**) Wright Cremascoli	2000	326	13	98,4	97-99,8	96,1	93,6-98,5
STANDARD CUP (CLS) Sulzer Centerpulse Zimmer	2000	322	13	98,7	97,5-100	96,9	94,9-98,9
TRIDENT (**EXETER**) Howmedica	2002	342	2	99,4	98,5-100	99,4	98,5-100
CLS Zimmer (SL PLUS) Smith & Nephew	2001	311	13	97	95-98,9	94,8	91,3-98,3
MULLER (**MRL**) Wright Cremascoli	2000	305	17	96,5	94,3-98,6	94,8	92,1-97,5
CUPULE RELOAD AVANTAGE (TAPERLOC) Biomet	2008	312	8	96,5	94,1-98,9	-	-
Fixa TI-por (CORAE) Adler-Ortho	2010	642	3	98,8	97,2-100	-	-
PINNACLE SECTOR II (SUMMIT) DePuy	2005	309	4	97,9	95,8-100	-	-
Unknown	2000	317	64	87,5	83,5-91,6	-	-
Other (< 300 cases)	2000	28315	1343	96,1	95,9-96,4	93,2	92,8-93,6
All models	2000	64.916	2.817	96,4	96,3-96,6	93,7	93,5-94,0

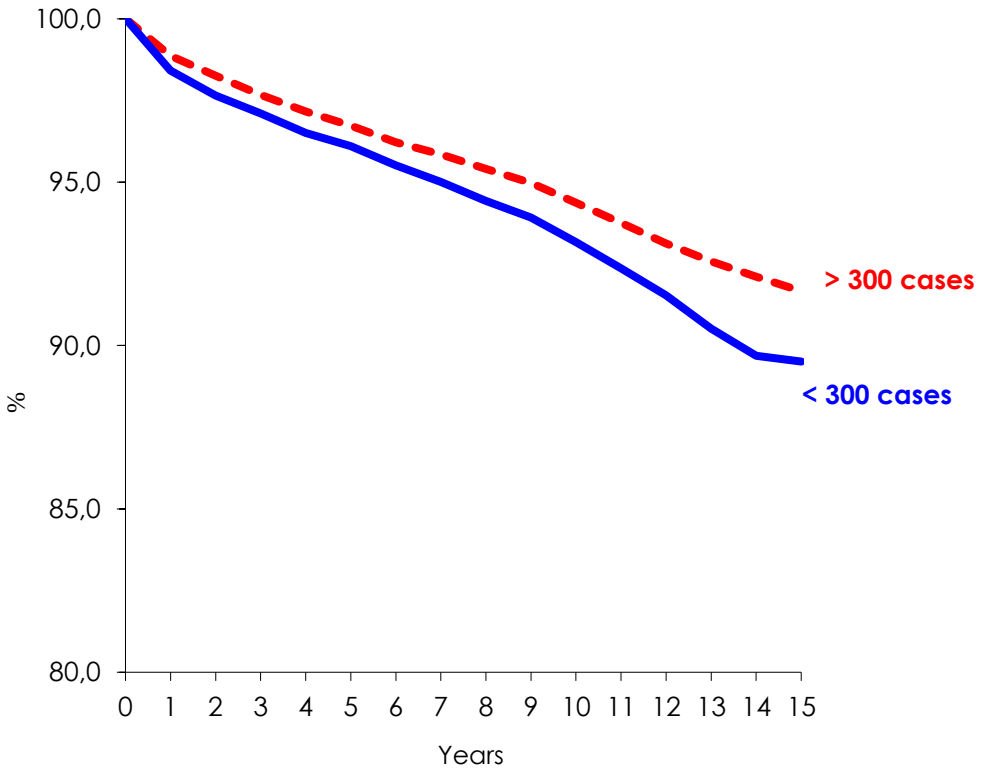
The marked dispersion of prosthesis types and the wide variability of the combinations between acetabulum and stems enable the comparison of only some types of prosthesis.
To provide, anyway, an indication of the survival of the prosthesis types less represented in data banks, they were grouped together 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 15 yrs	Confidence interval 95%
Models > 300 cases	36.332	1.410	91,7	90,8-92,5
Models < 300 cases	28.315	1.343	89,5	88,7-90,3

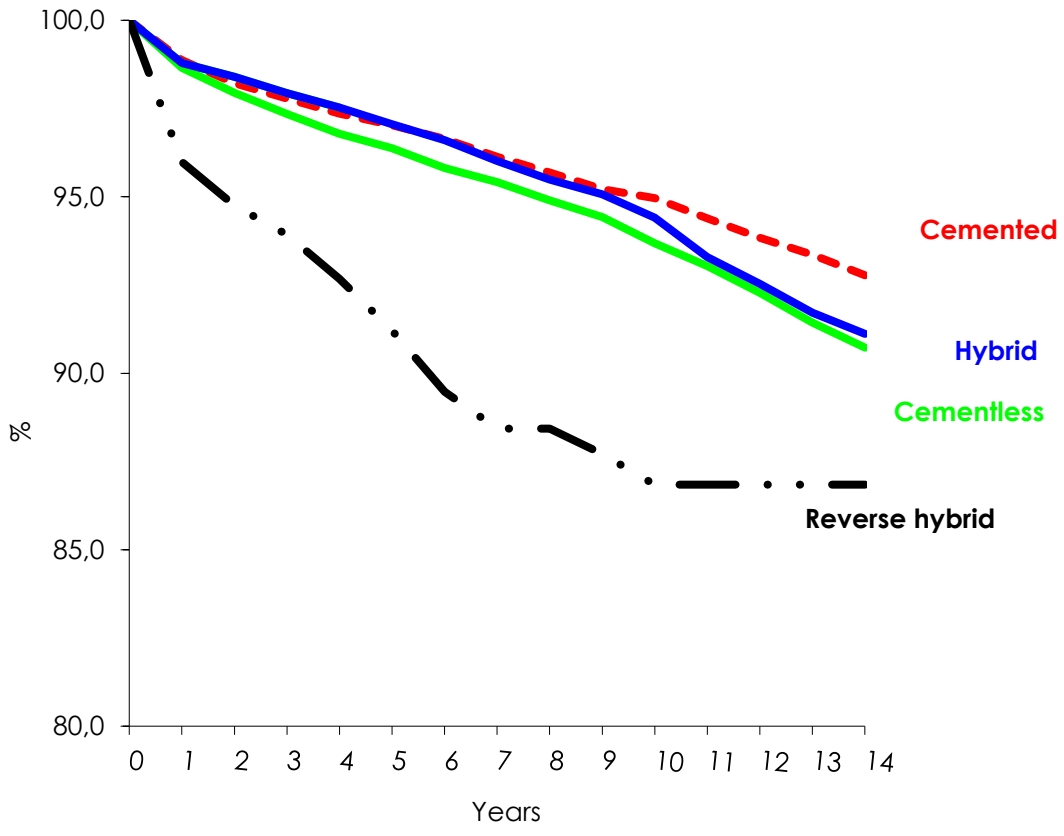
Survival curve



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 15 yrs	Confidence interval 95%
Cementless	54.052	2.249	90,2	89,3-91,0
Hybrid (cemented stem, cementless cup)	6.194	305	91,1	89,9-92,3
Cemented	4.025	171	92.8	91.4-94.2
Reverse hybrid (cementless stem, cemented cup)	476	42	86,8	82,7-91,0



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

Cemented			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**49**/4.025	1,2	28,7
Global aseptic loosening	**30**/4.025	0,7	17,6
Recurrent prosthesis dislocation	**26**/4.025	0,6	15,2
Aseptic loosening of the stem	**19**/4.025	0,5	11,1
Septic loosening	**18**/4.025	0,4	10,5
Periprosthetic bone fracture	**11**/4.025	0,3	6,4
Primary instability	**4**/4.025	0,1	2,3
Breakage of prosthesis	**1**/4.025	0,02	0,6
Poly wear	**1**/4.025	0,02	0,6
Other	**1**/4.025	0,02	0,6
Unknown *(5 performed outside region)*	**11**/4.025	0,3	6,4
Total	**171/4.025**	**4,2**	**100,0**
Cementless			
Recurrent prosthesis dislocation	**343**/54.052	0,6	15,2
Aseptic loosening of the stem	**333**/54.052	0,6	14,8
Aseptic loosening of the cup	**327**/54.052	0,6	14,5
Breakage of prosthesis	**287**/54.052	0,5	12,8
Periprosthetic bone fracture	**276**/54.052	0,5	12,3
Septic loosening	**128**/54.052	0,2	5,7
Global aseptic loosening	**107**/54.052	0,2	4,8
Pain without loosening	**69**/54.052	0,1	3,1
Primary instability	**57**/54.052	0,1	2,5
Poly wear	**39**/54.052	0,1	1,7
Heterotopic bone	**23**/54.052	0,04	1,0
Other	**55**/54.052	0,1	2,4
Unknown *(107 performed outside region)*	**205**/54.052	0,4	9,2
Total	**2.249/54.052**	**4,2**	**100,0**
Hybrid			
Aseptic loosening of the stem	**88**/6.194	1,4	28,8
Recurrent prosthesis dislocation	**70**/6.194	1,1	22,9
Global aseptic loosening	**28**/6.194	0,5	9,2
Periprosthetic bone fracture	**27**/6.194	0,4	8,9
Aseptic loosening of the cup	**26**/6.194	0,4	8,5
Septic loosening	**21**/6.194	0,3	6,9
Poly wear	**10**/6.194	0,2	3,3
Breakage of prosthesis	**6**/6.194	0,1	2,0
Heterotopic bone	**3**/6.194	0,05	1,0
Primary instability	**2**/6.194	0,03	0,7
Pain without loosening	**1**/6.194	0,02	0,3
Other	**5**/6.194	0,1	1,6
Unknown *(7 performed outside region)*	**18**/6.194	0,3	5,9
Total	**305/6.194**	**4,9**	**100,0**
Reverse hybrid			
Aseptic loosening of the cup	**15**/476	3,2	35,7
Recurrent prosthesis dislocation	**8**/476	1,7	19,0
Aseptic loosening of the stem	**7**/476	1,5	16,7
Periprosthetic bone fracture	**5**/476	1,1	11,9
Global aseptic loosening	**2**/476	0,4	4,8
Septic loosening	**1**/476	0,2	2,4
Unknown *(performed outside region)*	**4**/476	0,8	9,5
Total	**42/476**	**8,8**	**100,0**

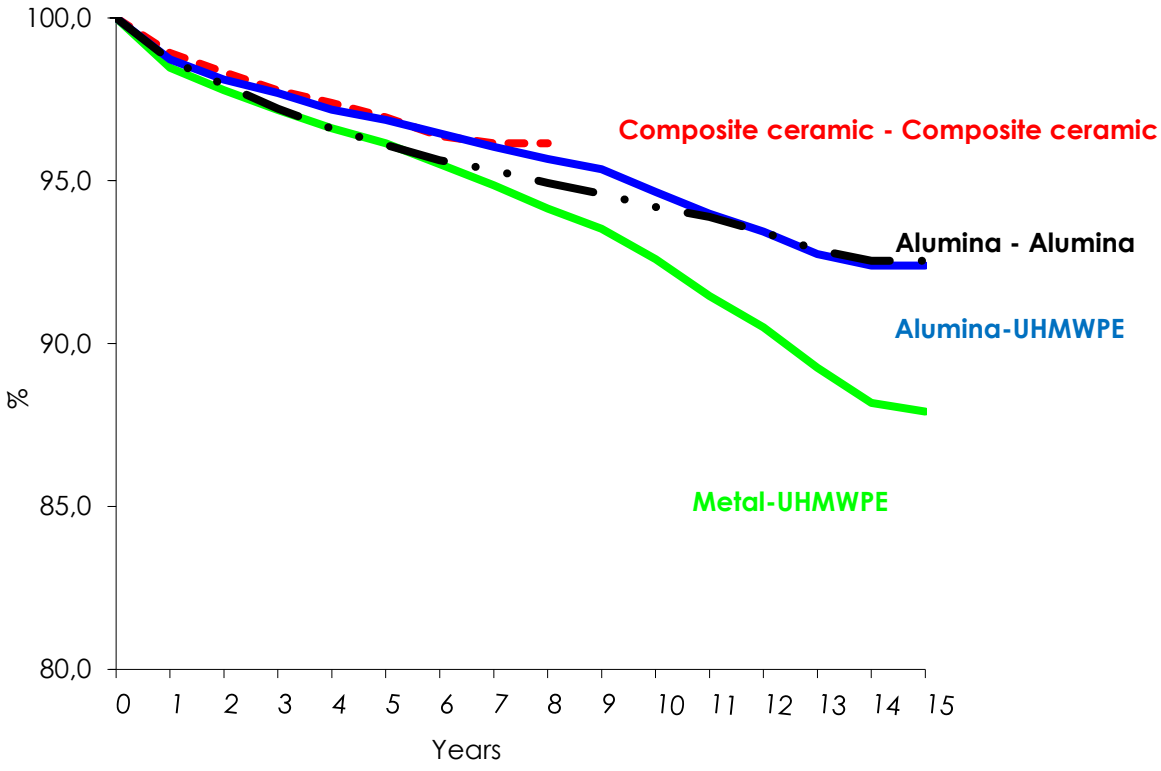
9.8 Analysis of survival in primary total hip arthroplasty according to coupling

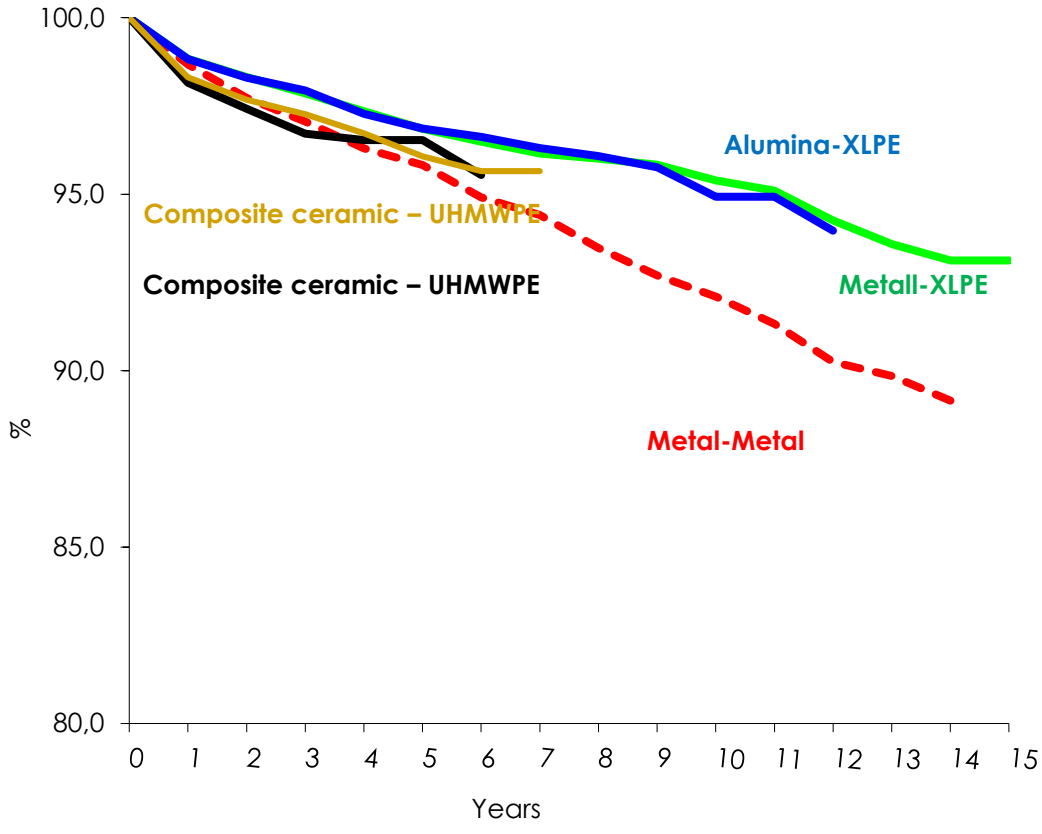
The following table shows survival of prosthesis according to coupling, Only couplings implanted more than 900 are presented. Double-mobility cups are excluded.

The survival curve are shown in two separate figures, to have better graphics.

Articular coupling	From years	N.	Removals	% survival at 5 yrs	Confidence interval 95%	% survival at 10 yrs	Confidence interval 95%
Composite ceramic - Composite ceramic	2006	16.036	339	96,9	96,6-97,3	-	-
Metal-UHMWPE	2000	11.065	725	96,1	95,8-96,5	92,6	92,0-93,2
Ceramic- UHMWPE	2000	8.050	407	96,9	96,5-97,3	94,7	94,1-95,2
Alumina-Alumina	2000	7.539	408	96,1	95,7-96,5	94,2	93,6-94,8
Metal-XLPE	2000	4.947	172	96,8	96,3-97,4	95,4	94,6-96,2
Composite ceramic - XLPE	2006	3.952	92	96,1	95,1-97,0	-	-
Metal-metal	2000	3.640	247	95,8	95,2-96,5	92,1	91,0-93,2
Ceramic- XLPE	2000	1.214	44	96,9	95,8-97,9	94,9	93,1-96,7
Composite ceramic - UHMWPE	2007	972	32	96,5	95,3-97,8	-	-

Survival curve





Difference is statistically significant (p=0,010, Wilcoxon test).

METAL-METAL			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**62**/3.640	1,7	25,1
Aseptic loosening of the stem	**30**/3.640	0,8	12,1
Global aseptic loosening	**24**/3.640	0,7	9,7
Prosthesis dislocation	**22**/3.640	0,6	8,9
Septic loosening	**21**/3.640	0,6	8,5
Breakage of prosthesis (12 stems and 6 cups)	**18**/3.640	0,5	7,3
Periprosthetic bone fracture	**13**/3.640	0,4	5,3
Pain without loosening	**9**/3.640	0,2	3,6
Primary instability	**4**/3.640	0,1	1,6
Heterotopic bone	**2**/3.640	0,1	0,8
Other	**14**/3.640	0,4	5,7
Unknown *(22 performed outside region)*	**28**/3.640	0,8	11,3
Total	**247/3.640**	**6,8**	**100,0**
Metal- UHMWPE			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the cup	**159**/11.065	1,4	21,9
Aseptic loosening of the stem	**142**/11.065	1,3	19,6
Prosthesis dislocation	**136**/11.065	1,2	18,8
Global aseptic loosening	**68**/11.065	0,6	9,4
Periprosthetic bone fracture	**55**/11.065	0,5	7,6
Septic loosening	**36**/11.065	0,3	5,0
Poly wear	**35**/11.065	0,3	4,8
Pain without loosening	**13**/11.065	0,1	1,8
Breakage of prosthesis (6 stems, 2 cups and 1 insert)	**9**/11.065	0,1	1,2
Primary instability	**8**/11.065	0,1	1,1
Heterotopic bone	**1**/11.065	0,01	0,1
Other	**9**/11.065	0,1	1,2
Unknown *(25 performed outside region)*	**54**/11.065	0,5	7,4
Total	**725/11.065**	**6,6**	**100,0**
Metal - XLPE			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Periprosthetic bone fracture	**53**/4.947	1,1	30,8
Prosthesis dislocation	**32**/4.947	0,6	18,6
Aseptic loosening of the stem	**19**/4.947	0,4	11,0
Aseptic loosening of the cup	**17**/4.947	0,3	9,9
Global aseptic loosening	**13**/4.947	0,3	7,6
Septic loosening	**10**/4.947	0,2	5,8
Primary instability	**7**/4.947	0,1	4,1
Pain without loosening	**5**/4.947	0,1	2,9
Heterotopic bone	**1**/4.947	0,02	0,6
Breakage of stem	**1**/4.947	0,02	0,6
Poly wear	**1**/4.947	0,02	0,6
Other	**3**/4.947	0,1	1,7
Unknown *(5 performed outside region)*	**10**/4.947	0,2	5,8
Total	**172/4.947**	**3,5**	**100,0**

Alumina-Alumina			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Breakage of prosthesis *(55 stems, 36 inserts and 39 heads)*	**130**/7.539	1,7	31,9
Periprosthetic bone fracture	**62**/7.539	0,8	15,2
Prosthesis dislocation	**52**/7.539	0,7	12,7
Aseptic loosening of the stem	**44**/7.539	0,6	10,8
Aseptic loosening of the cup	**29**/7.539	0,4	7,1
Septic loosening	**13**/7.539	0,2	3,2
Global aseptic loosening	**10**/7.539	0,1	2,5
Pain without loosening	**9**/7.539	0,1	2,2
Primary instability	**5**/7.539	0,1	1,2
Heterotopic bone	**5**/7.539	0,1	1,2
Poly wear	**2**/7.539	0,03	0,5
Other	**10**/7.539	0,1	2,5
Unknown *(21 performed outside region)*	**37**/7.539	0,5	9,1
Total	**408/7539**	**5,4**	**100,0**
Alumina- UHMWPE			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the stem	**84**/8.050	1,0	20,6
Prosthesis dislocation	**80**/8.050	1,0	19,7
Aseptic loosening of the cup	**61**/8.050	0,8	15,0
Periprosthetic bone fracture	**47**/8.050	0,6	11,5
Global aseptic loosening	**28**/8.050	0,3	6,9
Septic loosening	**24**/8.050	0,3	5,9
Breakage of prosthesis *(11 stems, 4 cups e 4 heads)*	**19**/8.050	0,2	4,7
Poly wear	**12**/8.050	0,1	2,9
Pain without loosening	**7**/8.050	0,1	1,7
Primary instability	**6**/8.050	0,1	1,5
Heterotopic bone	**4**/8.050	0,05	1,0
Other	**4**/8.050	0,05	1,0
Unknown *(15 performed outside region)*	**31**/8.050	0,4	7,6
Total	**407/8.050**	**5,1**	**100,0**
Alumina- XLPE			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Aseptic loosening of the stem	**11**/1.214	0,9	25,0
Aseptic loosening of the cup	**8**/1.214	0,7	18,2
Periprosthetic bone fracture	**4**/1.214	0,3	9,1
Septic loosening	**4**/1.214	0,3	9,1
Primary instability	**3**/1.214	0,2	6,8
Prosthesis dislocation	**2**/1.214	0,2	4,5
Global aseptic loosening	**2**/1.214	0,2	4,5
Pain without loosening	**1**/1.214	0,1	2,3
Breakage of stem	**1**/1.214	0,1	2,3
Poly wear	**1**/1.214	0,1	2,3
Unknown *(3 performed outside region)*	**7**/1.214	0,6	15,9
Total	**44/1.214**	**3,6**	**100,0**
Composite ceramic -Composite ceramic			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Breakage of prosthesis (65 stems, 8 inserts and 1head)	**74**/16.036	0,5	21,8

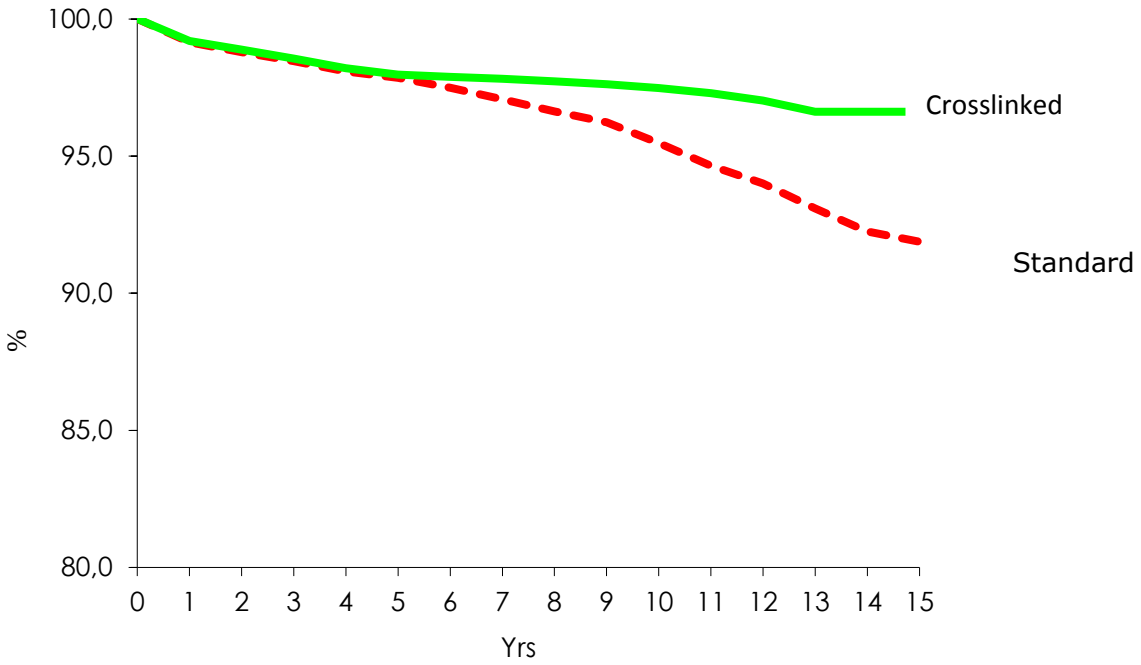
Aseptic loosening of the stem	**56**/16.036	0,3	16,5
Prosthesis dislocation	**50**/16.036	0,3	14,7
Periprosthetic bone fracture	**37**/16.036	0,2	10,9
Septic loosening	**23**/16.036	0,1	6,8
Aseptic loosening of the cup	**22**/16.036	0,1	6,5
Primary instability	**19**/16.036	0,1	5,6
Pain without loosening	**13**/16.036	0,1	3,8
Heterotopic bone	**10**/16.036	0,1	2,9
Global aseptic loosening	**2**/16.036	0,01	0,6
Other	**8**/16.036	0,05	2,4
Unknown ***(14 performed outside region)***	**25**/16.036	0,2	7,4
Total	**339/16.036**	**2,1**	**100,0**
Composite ceramic - UHMWPE			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Prosthesis dislocation	**13**/972	1,3	40,6
Aseptic loosening of the stem	**6**/972	0,6	18,8
Breakage of prosthesis (2 stems)	**3**/972	0,3	9,4
Pain without loosening	**2**/972	0,2	6,3
Global aseptic loosening	**2**/972	0,2	6,3
Septic loosening	**2**/972	0,2	6,3
Periprosthetic bone fracture	**1**/972	0,1	3,1
Primary instability	**1**/972	0,1	3,1
Aseptic loosening of the cup	**1**/972	0,1	3,1
Unknown	**1**/972	0,1	3,1
Total	**32/972**	**3,3**	**100,0**
Composite ceramic - XLPE			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Prosthesis dislocation	**20**/3.952	0,5	21,7
Aseptic loosening of the cup	**13**/3.952	0,3	14,1
Aseptic loosening of the stem	**13**/3.952	0,3	14,1
Periprosthetic bone fracture	**7**/3.952	0,2	7,6
Primary instability	**6**/3.952	0,2	6,5
Septic loosening	**5**/3.952	0,1	5,4
Global aseptic loosening	**4**/3.952	0,1	4,3
Breakage of prosthesis (2 stems and 2 cups)	**4**/3.952	0,1	4,3
Pain without loosening	**1**/3.952	0,03	1,1
Other	**5**/3.952	0,1	5,4
Unknown ***(5 performed outside region)***	**14**/3.952	0,4	15,2
Total	**92/3.952**	**2,3**	**100,0**

9.9 Analysis of survival in primary total hip arthroplasty according to insert

Standard poly (UHMWPE) and cross -linked poly inserts independently from the articular coupling are considered in the following analysis Monoblock polyethylene cups are excluded.

Polyethylene	N.	Removals	% survival at 15 yrs	Confidence interval 95%
Standard	17.891	698	91,9	91,0-92,8
Cross linked	10.112	166	96,6	95,8-97,5

Survival curve



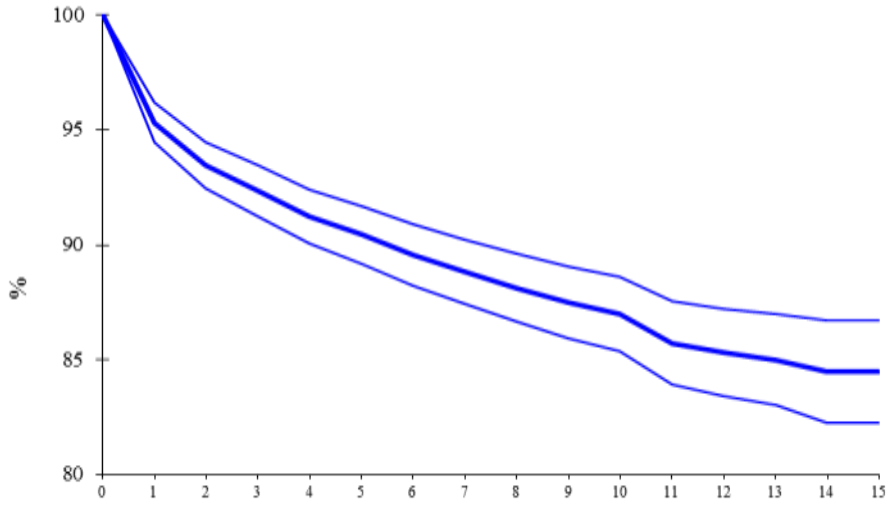
Difference is statistically significant (p=0,012, Wilcoxon test).
Influence of head diameter is not considered in this analysis because heads >=36 are not used with standard poly liners.

9.10 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 revision	Second revision	% survival at 14 yrs	Confidence interval 95%
2.436	257	84,4	82,1-86,7

Survival curve



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

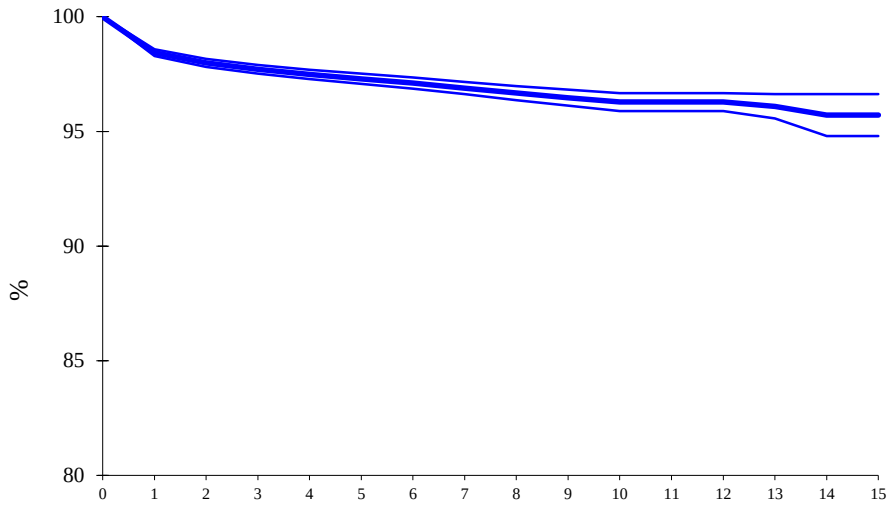
Cause of second revision	Rate	%	% distribution of failure causes
Recurrent prosthesis dislocation	**57**/2.436	2,3	22,2
Aseptic loosening of the cup	**51**/2.436	2,1	19,8
Aseptic loosening of the stem	**37**/2.436	1,5	14,4
Septic loosening	**37**/2.436	1,5	14,4
Global aseptic loosening	**20**/2.436	0,8	7,8
Periprosthetic bone fracture	**15**/2.436	0,6	5,8
Primary instability	**6**/2.436	0,2	2,3
Breakage of prosthesis	**4**/2.436	0,2	1,6
Pain without loosening	**3**/2.436	0,1	1,2
Poly wear	**2**/2.436	0,1	0,8
Other	**3**/2.436	0,1	1,2
Unknown *(7 performed outside region)*	**22**/2.436	0,9	8,5
Total	**257/2.436**	**10,6**	**100,0**

9.11 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 15 yrs	Confidence interval 95%
32.941	668	95,7	94,8-96,6

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.

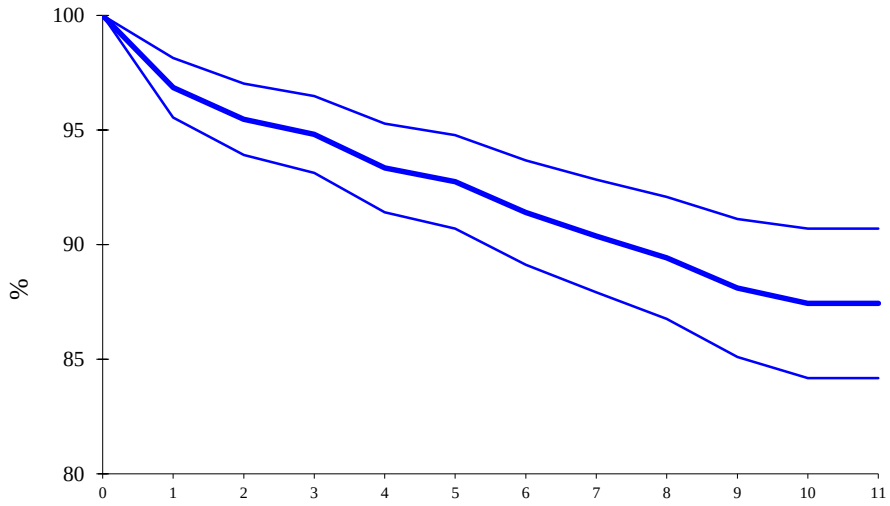
Cause of revision	Rate	%	% distribution of failure causes
Dislocation	**297**/32.941	0,9	44,5
Cotyloiditis	**100**/32.941	0,3	15,0
Aseptic loosening of the stem	**96**/32.941	0,3	14,4
Periprosthetic bone fracture	**63**/32.941	0,2	9,4
Septic loosening	**50**/32.941	0,2	7,5
Primary instability	**15**/32.941	0,05	2,2
Other	**11**/32.941	0,03	1,6
Unknown *(16 performed outside region)*	**36**/32.941	0,1	5,4
Total	**668/32.941**	**2,0**	**100,0**

9.12 Survival analysis of resurfacing

Analysis was performed only on patients resident in Emilia-Romagna region. This reduced the number of observed subjects.
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 11 yrs	Confidence interval 95%
715	64	87,4	84,2-90,7

Survival curve



Type of prosthesis	From years	N.	Rev. (in all period)	% survival at 5 yrs	Confidence interval 95%	% survival at 10 yrs	Confidence interval 95%
BHR – Smith & Nephew	2001	377	18	96,0	93,8-98,1	93,8	90,8-96,8
ADEPT – Finsbury	2005	105	3	97,1	93,8-100,0	-	-
ASR – DePuy	2004	65	20	80,0	70,2-89,7	-	-
BMHR – Smith & Nephew	2007	62	3	98,4	95,2-100,0	-	-
MRS – Lima	2005	42	10	81,0	69,1-92,8	-	-
Other (< 400 cases)	2003	64	10	87,3	79,1-95,5	-	-
Total	**2001**	**715**	**64**	**92,7**	**90,7-94,8**	**87,4**	**84,2-90,7**

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	**19**/715	2,7	29,7
Periprosthetic bone fracture	**18**/715	2,5	28,1
Pain without loosening	**8**/715	1,1	12,5
Metal sensitization	**6**/715	0,8	9,4
Breakage of prosthesis	**2**/715	0,3	3,1
Septic loosening	**2**/715	0,3	3,1
Unknown *(6 performed outside region)*	**9**/715	1,3	14,1
Total	64/715	**9,0**	**100,0**

PART TWO: KNEE PROSTHESIS

July 2000 – December 2014

10. RIPO capture

10.1 Percentage of capture

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), according to Agency was **98,5**% for year 2014. 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
2014	34,1	37,5

From database SDO

During 2014 percentage of primary THA performed in public hospitals is 66,8%.

Percentage of primary total knee arthroprostheses and revision performed in public and private hospitals, in year 2014

Type of operation	Public	Private
	%	%
Primary bicompartmental	54,6	66,0
Primary tricompartmental	29,8	14,1
Primary unicompartmental	7,2	11,1
Revision	5,8	6,8
Prosthesis removal	1,6	1,2
Implant of patella	1,0	0,8
Total	**100,0**	**100,0**

From database RIPO

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	52.933	65,7
Primary tricompartmental	11.511	14,3
Primary unicompartmental	8.429	10,4
Revision^	4.929	6,1
Prosthesis removal	1.094	1,4
Implant of patella	637	0,8
Other prostheses*	355	0,4
Other operations°	709	0,9
Total	**80.597**	**100,0**

*49 Hemicap – Arthrosurface, 29 Hemicap patello_femoral – Arthrosurface, 53 Avon-Patello-Femoral Joint Stryker, 54 Gender-Patello-Femoral Joint System Zimmer, 40 Journey-PFJ-Patellofemoral Smith&Nephew, 32 other patella-femoral, 53 Unicompartimental Plus + patella
°281 spacer exchange, 71 stiff knee loosening, 90 debridement's, 5 dislocation reductions
^429 liner, 9 femoral component, 2 tibial component, 99 femoral component and liner, 278 tibial component and liner, 4079 total, 33 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	8,6
2004	12,9	75,7	11,4
2005	12,4	75,6	12,0
2006	10,8	69,9	19,3
2007	11,6	69,3	19,1
2008	11,5	72,2	16,3
2009	13,0	72,3	14,7
2010	12,5	71,5	16,0
2011	9,8	73,4	16,8
2012	10,5	72,3	17,2
2013	12,1	69,1	18,8
2014	10,8	68,2	21,0

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 2014, 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	232	0,4	826	1,3	4.690	7,3	19.750	30,6	31.784	49,3	7.156	11,1	64.438
Unicomp	22	0,3	277	3,3	1.603	19,0	3.501	41,5	2.547	30,2	477	5,7	8.427
Revision	20	0,4	119	2,4	481	9,8	1.525	30,9	2.201	44,7	583	11,8	4.929
Prosthesis removal	12	1,1	33	3,0	126	11,5	366	33,5	443	40,5	114	10,4	1.094
Patella only	6	0,9	17	2,7	43	6,7	184	28,9	319	50,1	68	10,7	637
Total*	**292**	**0,4**	**1.272**	**1,6**	**6.943**	**8,7**	**25.326**	**31,8**	**37.294**	**46,9**	**8.398**	**10,6**	**79.525**

*8 missing data (0,009%)

Mean age at surgery, according to type of operation - years 2000-2014

Type of operation	Mean age	Range
Primary bi/tricompartmental	70,6	13–96
Primary unicompartmental	66,0	24-92
Revision	69,7	18-92
Total	**70,0**	**13-96**

Mean age at surgery, according to type of operation - years 2001-2014

Type of operation	Year 2001		Year 2014	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental°	71,2	23-92	70,2	24-90
Primary unicompartmental*	68,9	45-87	65,3	30-92
Revision^	71,8	26-87	68,7	41-91

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

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	67,1	24-89	65,3	30-92

*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 2014, according to **type of operation** and **gender** of patients

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Bi/tricompartmental	18.263	28,3	46.181	71,7	64.444
Unicompartmental	2.790	33,1	5.639	66,9	8.429
Revision	1.288	26,1	3.641	73,9	4.929
Prosthesis removal	408	37,3	686	62,7	1.094
Patella only	158	24,8	479	75,2	637
Total	**22.907**	**28,8**	**56.626**	**71,2**	**79.533**

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 of operation carried out on each of two sides, according to gender

Side	Males	Females
Right	51,4	56,5
Left	48,6	43,5

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

12.4 Bilateral arthroplasty

In the period of registry observation (15 years), 11.401 patients underwent bilateral operations.
9.685 (85,0%) chose to undergo the second operation at the same hospital from where the first one was performed.
550 (4,8%) chose to undergo the second operation at a different hospital from where the first one was performed to follow the surgeon.
1.166 (10,2%) chose to undergo the second operation at a different hospital from where the first one was performed.
In bilateral operations, it was observed that the first knee to be treated was the right one in 53,9% of cases.

12.5 Diseases treated with unicompartmental knee prosthesis

90% of unicompartmental knee prosthesis recording in RIPO are implanted in medial condyle.

Number of primary unicompartmental knee prosthesis operations carried out on patients with admission date between 1st July 2000 and 31st December 2014, according to **diagnosis**

Diagnosis in unicomp. knee prosthesis	Number	Percentage
Primary arthritis	7.190	85,5
Deformity	507	6,0
Necrosis of the condyle	430	5,1
Post-traumatic arthritis	87	1,0
Post-traumatic necrosis	68	0,8
Sequelae of fracture	47	0,6
Idiopathic necrosis	34	0,4
Rheumatic arthritis	16	0,2
Sequelae of osteotomy	11	0,1
Other	18	0,2
Total*	**8.408**	**100,0**

*21 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 2014, according to **diagnosis**.

Diagnosis in bi/tricompartmental knee prosth.	Number	Percentage
Primary arthritis	55.260	86,0
Deformity	4.918	7,7
Post-traumatic arthritis	1.049	1,6
Rheumatic arthritis	962	1,5
Sequelae of fracture	822	1,3
Necrosis of the condyle	390	0,6
Sequelae of osteotomy	364	0,6
Post-traumatic necrosis	90	0,1
Sequelae of septic arthritis	72	0,1
Sequelae of poliomyelitis	52	0,1
Idiopathic necrosis	40	0,1
Chondrocalcinosis	25	0,04
Tumor	16	0,02
Paget disease	14	0,02
Other	168	0,3
Total*	**64.242**	**100,0**

* 202 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 2014, 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	2.028	41,6
Two steps prosthesis removal	904	18,5
Pain without loosening	456	9,3
Aseptic loosening of tibial component	439	9,0
Insert wear	211	4,3
Aseptic loosening of femoral component	139	2,8
Septic loosening	133	2,7
Prosthesis dislocation	108	2,2
Instability	85	1,7
Periprosthetic bone fracture	75	1,5
Stiffness	52	1,1
Breakage of prosthesis	33	0,7
Other	217	4,4
Total*	**4.880**	**100,0**

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

Number of **prosthesis removal** carried out on patients admitted between 1st July 2000 and 31st December 2014, 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	963	89,3
Total aseptic loosening	64	5,9
Aseptic loosening of tibial component	8	0,7
Periprosthetic bone fracture	7	0,7
Pain without loosening	6	0,6
Prosthesis dislocation	5	0,5
Other	25	2,3
Total*	**1.078**	**100,0**

*16 missing data (1,5%)

13. Types of knee prosthesis

13.1 Unicompartmental prosthesis

Prostheses used in patients admitted between 1st July 2000 and 31st December 2014, primary unicompartmental surgery.

All poly tibial components in **bold**

Type of Prosthesis	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
ZIMMER UNI - Zimmer	-	-	300	9,1	631	17,5
UNI SIGMA HP - De Puy Johnson & Johnson	-	-	11	0,3	543	15,1
GENESIS UNI - Smith & Nephew	131	8,5	493	15,0	478	13,3
JOURNEY UNI - All Poly - Smith & Nephew	-	-	-	-	260	7,2
OXFORD UNICOMPARTMENTAL PHASE 3 - Biomet Merck	428	27,9	692	21,0	259	7,2
JOURNEY UNI - Smith & Nephew	-	-	-	-	254	7,0
GKS - ONE - ALL POLY - Permedica	-	-	108	3,3	220	6,1
GENESIS UNI - ALL POLY - Smith & Nephew	16	1,0	84	2,6	198	5,5
UNI SIGMA HP - ALL POLY - De Puy Johnson & Johnson	-	-	-	-	109	3,0
MITUS - ENDO-MODEL UNI - ALL POLY - Link	76	5,0	246	7,5	94	2,6
BALANSYS - UNI - Mathys	-	-	57	1,7	90	2,5
ALLEGRETTO UNI - Protek-Sulzer	204	13,3	49	1,5	75	2,1
UC-PLUS SOLUTION - ALL POLY - Endoplus	3	0,2	79	2,4	62	1,7
EFDIOS - Citieffe	254	16,6	171	5,2	52	1,4
OPTETRAK - UNI - ALL POLY - Exactech	-	-	126	3,8	45	1,2
GENUS UNI - Adler	-	-	-	-	37	1,0
TRIATHLON - PKR - HOWMEDICA Osteonics	-	-	4	0,1	28	0,8
PRESERVATION UNI - ALL POLY - Depuy	125	8,2	228	6,9	21	0,6
GKS - ONE - CUSTOM MADE - Permedica	-	-	5	0,2	19	0,5
GKS - ONE - Permedica	-	-	-	-	19	0,5
IBALANCE UNI - Arthrex	-	-	-	-	16	0,4
ACS UNI - Implantcast	-	-	-	-	14	0,4
PRESERVATION UNI - Depuy	-	-	14	0,4	13	0,4
GENUS UNI - ALL POLY - Adler Ortho	-	-	-	-	11	0,3
RESTORIS MCK UNI - Mako	-	-	-	-	10	0,3
UC-PLUS SOLUTION - Endoplus	45	2,9	194	5,9	3	0,1
HLS - UNI EVOLUTION - ALL POLY - Tornier	53	3,5	100	3,1	3	0,1
MILLER GALANTE UNI - Zimmer	103	6,7	75	2,3	1	0,03
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 (<10 cases)	20	1,3	20	0,6	38	1,1
Unknown	1	0,1	17	0,5	3	0,1
Total	**1.532**	**100,0**	**3.291**	**100,0**	**3.606**	**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		2010-2014	
	N.	%	N.	%	N.	%
NEXGEN – Zimmer	3.024	27,1	5.942	24,3	4.737	16,4
VANGUARD – Biomet Merck France	-	-	1.579	6,5	3.594	12,5
P.F.C – DePuy	904	8,1	1.894	7,8	3.446	11,9
GENESIS - Smith & Nephew	212	1,9	1.783	7,3	3.099	10,7
TC-PLUS - SOLUTION - Smith & Nephew	13	0,1	1.066	4,4	1.644	5,7
GEMINI - Link	151	1,4	991	4,1	1.334	4,6
TRIATHLON – Stryker Howmedica Osteonics	-	-	401	1,6	1.286	4,5
GENUS – Adler-Ortho	-	-	328	1,3	1.109	3,8
GSP - TREKKING - Samo	-	-	246	1,0	765	2,7
LEGION - Smith & Nephew	-	-	8	0,03	702	2,4
ATTUNE – DePuy	-	-	-	-	665	2,3
FIRST - Symbios Orthopedie SA	-	-	345	1,4	645	2,2
BALANSYS - Mathys	-	-	173	0,7	635	2,2
SCORPIO – Stryker Howmedica	526	4,7	1.534	6,3	607	2,1
G.K.S. – Permedica	106	0,9	252	1,0	604	2,1
PROFIX – Smith & Nephew	1.846	16,5	2.818	11,5	436	1,5
PERSONA - Zimmer	-	-	-	-	396	1,4
INNEX - Protek Sulzer	12	0,1	34	0,1	389	1,3
OPTETRACK – Exactech	289	2,6	662	2,7	377	1,3
ADVANCE - Wright	292	2,6	384	1,6	298	1,0
APEX - Omnilife Science	-	-	-	-	236	0,8
ACS - Implantcast	-	-	-	-	216	0,7
COLUMBUS - B.Braun	-	-	192	0,8	191	0,7
ROTAGLIDE – Corin Medical	296	2,7	362	1,5	180	0,6
LCS – DePuy	417	3,7	354	1,4	162	0,6
JOURNEY – Smith & Nephew	-	-	170	0,7	144	0,5
RT-PLUS - Smith & Nephew	3	0,03	75	0,3	140	0,5
GENIUS TRICCC - Dedienne Sante	295	2,6	246	1,0	115	0,4
GMK - Medacta	-	-	3	0,01	115	0,4
ENDO-MODEL - Link	149	1,3	123	0,5	102	0,4
HLS – Tornier	137	1,2	164	0,7	87	0,3
SIGMA RP - TC3 - DePuy	-	-	34	0,1	66	0,2
E.MOTION - B.Braun	-	-	130	0,5	51	0,2
MULTIGEN - Lima	20	0,2	393	1,6	32	0,1
AGC - Biomet Merck France	58	0,5	527	2,2	6	0,02
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 (<10 cases)	149	1,3	145	0,6	233	0,8
Unknown	19	0,2	34	0,1	12	0,04
Total	**11.163**	**100,0**	**24.425**	**100,0**	**28.856**	**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 2014, in total revision surgery.

Type of Prosthesis	2000-2004		2005-2009		2010-2014	
	N.	%	N.	%	N.	%
NEXGEN - Zimmer	163	27,2	455	30,3	473	23,9
LEGION - Smith & Nephew	-	-	49	3,3	277	14,0
SIGMA RP - TC3 - DePuy	-	-	61	4,4	188	9,5
ENDO-MODEL - Link	112	18,7	101	6,7	150	7,6
RT-PLUS - Smith & Nephew	5	0,8	117	7,8	130	6,6
PFC - DePuy	59	9,8	115	7,7	125	6,3
GENESIS - Smith & Nephew	2	0,3	66	4,4	103	5,2
GKS - Permedica	13	2,2	44	2,9	70	3,5
VANGUARD - Biomet	-	-	39	2,6	64	3,2
TRIATHLON - Howmedica Osteonics	-	-	8	0,5	42	2,1
DURATION MRH - Osteonics	12	2,0	72	4,8	33	1,7
GSP - TREKKING - Samo	-	-	-	-	29	1,5
ACS - Implantcast	-	-	1	0,1	28	1,4
OPTETRAK - Exactech	13	2,2	53	3,5	27	1,4
SCORPIO - Osteonics	2	0,3	62	4,1	26	1,3
LPS - DePuy	-	-	-	-	23	1,2
BALANSYS - Mathys	-	-	4	0,3	21	1,1
S-ROM NRH - Johnson & Johnson	10	1,7	19	1,3	18	0,9
TC-PLUS -SOLUTION - Smith & Nephew	1	0,2	18	1,2	18	0,9
GEMINI - Link	1	0,2	13	0,9	18	0,9
FIRST - Symbios Orthopedie SA	-	-	7	0,5	14	0,7
E.MOTION - B.Braun	-	-	11	0,7	13	0,7
PROFIX - Smith & Nephew	57	9,5	55	3,6	10	0,5
MUTARS - Implantcast	1	0,2	3	0,2	8	0,4
AGC - Biomet Merck France	52	8,7	70	4,6	5	0,3
ADVANCE - Wright	7	1,2	6	0,4	3	0,1
GENIUS TRICCC - Dedienne Sante	9	1,5	1	0,1	2	0,1
LCS – DePuy	2	0,3	7	0,5	2	0,1
INTERAX - Stryker Howmedica	27	4,5	8	0,5	-	-
DURACON II - Stryker Howmedica	13	2,2	5	0,3	-	-
Other (<10 cases)	35	5,8	25	1,7	56	2,8
Unknown	3	0,5	8	0,5	1	0,1
Total	**599**	**100,0**	**1.503**	**100,0**	**1.977**	**100,0**

13.4 Prosthesis fixation

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31st December 2014, according to **prosthesis fixation**

Fixation	Primary unicomp.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	7.754	92,1	59.100	91,8	4.001	98,2	70.855	92,1
Cementless	494	5,9	3.132	4,9	41	1,0	3.667	4,8
Fem. cementless + tib. cemented	158	1,9	1.602	2,5	19	0,5	1.779	2,3
Fem. cem. + tib. cementless	10	0,1	574	0,9	13	0,3	597	0,8
Total*	8.416		64.408		4.074		76.898	

*54 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	0,3
2007	91,1	4,5	3,0	1,4
2008	91,2	4,2	2,2	2,4
2009	91,5	4,5	1,5	2,5
2010	93,5	4,5	0,9	1,1
2011	94,9	4,1	0,4	0,6
2012	95,1	4,2	0,3	0,4
2013	96,7	3,0	0,1	0,2
2014	97,3	2,5	0,1	0,1

13.5 Type of insert

Stabilization of insert in bi-tricompartmental knee prostheses according to year of operation.

Years of operation	% Minimally stabilized	% Posterior stabilized	% Hinged
2001	47,9	50,1	2,0
2002	51,9	45,6	2,5
2003	46,4	51,4	2,2
2004	44,7	53,6	1,7
2005	40,4	58,1	1,5
2006	37,5	60,8	1,7
2007	37,5	60,5	2,0
2008	43,2	55,1	1,7
2009	51,2	47,0	1,8
2010	46,9	50,6	2,5
2011	49,0	49,0	2,0
2012	44,4	53,5	2,1
2013	40,9	56,2	2,9
2014	35,2	61,6	3,2

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	58,4	41,6
2007	62,2	37,8
2008	60,6	39,4
2009	59,2	40,8
2010	54,8	45,2
2011	55,3	44,7
2012	58,9	41,1
2013	64,5	35,5
2014	73,4	26,6

13.6 Bone Cement

Types of cement used (since 1-1-2002)
In **bold** bone cement loaded with antibiotic.

Cement	%
Surgical Simplex P – Howmedica	22,1
Antibiotic Simplex – Howmedica	**16,5**
Palacos R - Heraeus Medical	10,9
Palacos R+G - Heraeus Medical	**8,4**
Hi-Fatigue G - Zimmer	**3,6**
Versabond AB - Smith & Nephew	**3,2**
Osteobond – Zimmer	3,0
Versabond - Smith & Nephew	3,0
Hi-Fatigue - Zimmer	2,4
Aminofix 1 – Groupe Lepine	**2,3**
Cemex System – Tecres	2,2
Palacos R - Biomet	1,7
Cemex Genta System - Tecres	**1,7**
Palamed G - Heraeus Medical	**1,6**
Palamed - Heraeus Medical	1,6
Refobacin Bone Cement R - Biomet	**1,5**
Refobacin Revision - Biomet	**1,4**
Cemex – Tecres	1,3
Smartset GHV – DePuy	**1,0**
Other bone cement without antibiotic	6,3
Other bone cement loaded with antibiotic	**4,3**
Total	**100,0**

Bone cement loaded with antibiotic is used in 45,5% of cases.

14. Complications occurred during hospitalization

RIPO registers all kind of complications occurred during hospitalization. In the following tables only intra-operative and post-operative local complications are presented.

The rate of complications in **primary unicompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2014

Complications occurred during hospitalization					
Intra-operative			**Local post-operative**		
	N.	**%**		**N.**	**%**
Tibial fracture	7	*0,1*	Infection	4	*0,05*
Femoral fracture	7	*0,1*			
Tibial tuberosity fracture	1	*0,01*			
Ligament lesion	1	*0,01*	Deep venous thrombosis	4	*0,05*
Anaesthesiologic	1	*0,01*			
Other	6	*0,1*			
Total	**23**	***0,3***	**Total**	**8**	***0,1***

The rate of complications in **primary bi-tricompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2014

Complications occurred during hospitalization					
Intra-operative			**Local post-operative**		
	N.	**%**		**N.**	**%**
Femoral fracture	53	0,1	Deep venous thrombosis	113	*0,2*
Ligament lesion	34	0,1			
Tibial fracture	32	0,05			
Rupture patellar tendon	27	0,04			
Anaesthesiologic	27	0,04			
Hemorragia	24	0,04	Infection	25	*0,04*
Vascular lesion	10	0,02			
Tibial tuberosity fracture	7	0,01			
Other	25	0,04			
Total	**239**	***0,4***	**Total**	**138**	***0,2***

The rate of complications in **revision surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2014

Complications occurred during hospitalization					
Intra-operative			**Local post-operative**		
	N.	**%**		**N.**	**%**
Tibial fracture	19	0,4	Infection	13	*0,3*
Rupture patellar tendon	16	0,3			
Femoral fracture	16	0,3			
Anaesthesiologic	8	0,2			
Tibial tuberosity fracture	7	0,1	Deep venous thrombosis	2	*0,04*
Ligament lesion	1	0,02			
Other	13	0,3			
Total	**80**	***1,6***	**Total**	**15**	***0,3***

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 2014.

Registered deaths occurred during hospitalization.

Years 2000-2014			
Type of operation	**Deaths**	**Number of surgery**	**Percentage**
Primary bi/tricompartmental	59	64.444	0,09
Primary unicompartmental	1	8.429	0,01
Revision	8	4.929	0,16
Prosthesis removal	2	1.094	0,18

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).

Mobile insert includes all kind of mobility (sliding, rotating).
All primary bi-tri compartmental knee arthroplasties performed in the Region between July 2000 and December 2014 only on patients living in the Region, were analysed.

COX PROPORTIONAL RISK MODEL

Variables

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

Number of valid observations 41.848
Non revised: 40.474
Revised: 1.374

Chi-square: 141,069 *p*= 0,0001

VARIABLE	SIGNIFICANCE (P)
Gender (Males vs females)	**NS** (0,078)
Age (less than 60 yrs vs more than 60 yrs)	**S** (0,001)
Diagnosis (arthrosis vs other)	**NS** (0,245)
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.

The rate of relative risk was expressed with respect to the risk rate presented by the patients more than 60 yrs.

The following table shows that patients of the group 'less than 60 yrs' had a greater risk of failure than patients of the group 'more than 60 yrs' compared to the others variables when equal.

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

The rate of relative risk was expressed with respect to the risk rate presented by the patients with poly fix insert.

The following table shows that patients of the group 'mobile insert' had a greater risk of failure than patients of the group 'fix insert' compared to the others variables when equal.

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 2014 only on patients living in the Region and affected by arthrosis, were analysed.

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

The rate of relative risk was expressed with respect to the risk rate presented by the patients more than 60 yrs.

The following table shows that patients of the group 'less than 60 yrs' had a greater risk of failure than patients of the group 'more than 60 yrs' compared to the others variables when equal.

Age	Relative risk rate	Confidence interval 95%		Significance (p)
Less than 60 yrs (reference: more than 60 yrs)	1,6	1,3	2,0	0,001

Other variables do not influence the risk (Gender p=0,108; Type of tibial component p=0,353)

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.

By comparison with other data banks (S.D.O. hospital discharge data)it was determined the number of Revision, also they not communicated to RIPO.
Revisions include:

- revisions performed in the same hospital;
- revisions performed in a different hospital;
- revisions performed outside Emilia-Romagna region

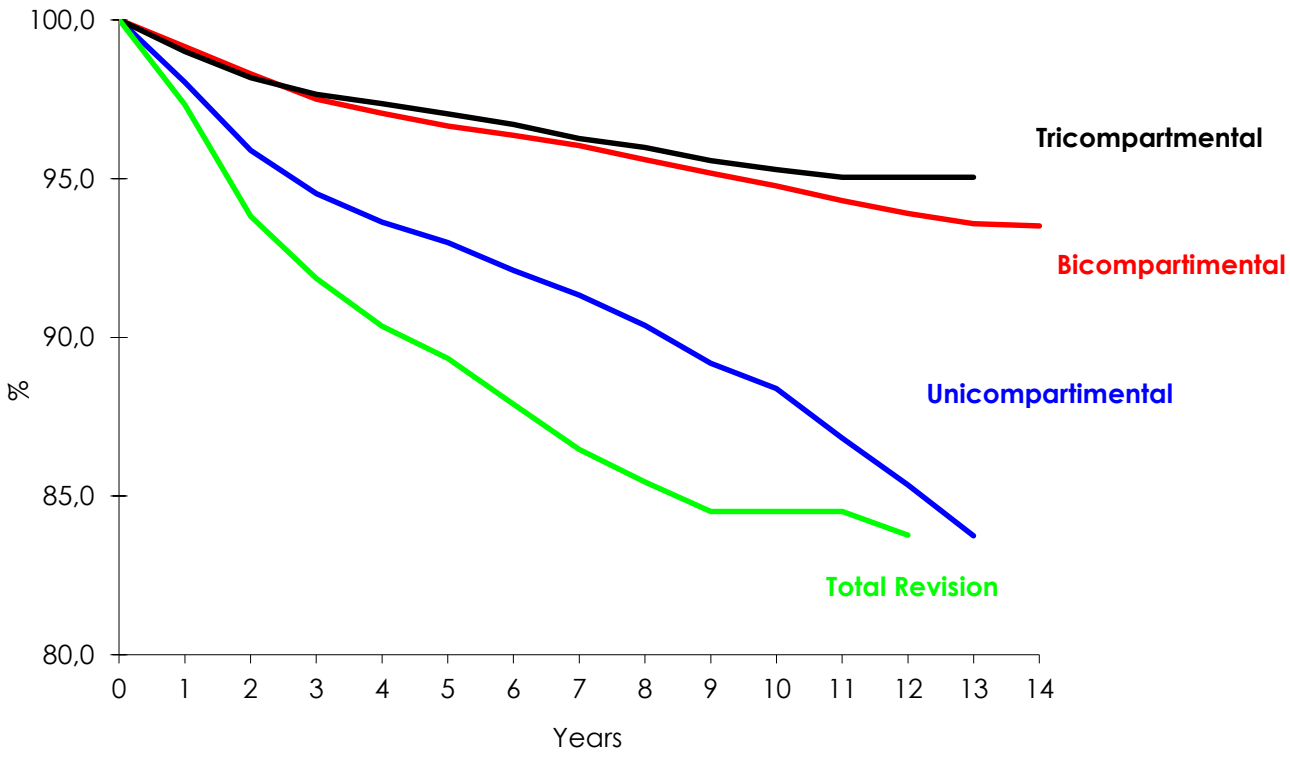
Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital	N. of revisions performed outside Emilia-Romagna region	N. total revisions
Primary bicompartmental	34.334	617	500	51	1.168
Primary tricompartmental	7.514	144	55	7	206
Primary unicompartmental	5.031	239	154	16	409
Total revision	2.208	136	84	4	224

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	N. of revisions performed outside Emilia-Romagna region	% revisions	Survival at 13 Yrs (CI 95%)
Primary bicompartmental	34.334	1.006	111	51	1.168/34.334	93,6 (93,0-94,1)
Primary tricompartmental	7.514	167	32	7	206/7.514	95,0 (94,1-96,0)
Primary unicompartmental	5.031	382	11	16	409/5.031	83,8 (81,4-86,1)
Total revision	2.208	193	31	4	224/2.208	82,4 (78,7-86,1)

Survival curve



Survivorship of unicompartmental prostheses is significantly different at 13 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	**163**/5.031	3,2	39,8
Pain without loosening	**74**/5.031	1,5	18,1
Tibial aseptic loosening	**49**/5.031	1,0	12,0
Septic loosening	**32**/5.031	0,6	7,8
Femoral aseptic loosening	**17**/5.031	0,3	4,2
Insert wear	**13**/5.031	0,3	3,2
Breakage of prosthesis	**9**/5.031	0,2	2,2
Dislocation	**6**/5.031	0,1	1,5
Bone fracture	**4**/5.031	0,1	1,0
Instability	**2**/5.031	0,04	0,5
Other	**8**/5.031	0,2	1,9
Unknown *(16 performed outside region)*	**32**/5.031	0,6	7,8
Total	**409/5.031**	**8,1**	**100,0**

Primary bi-tricompartmental

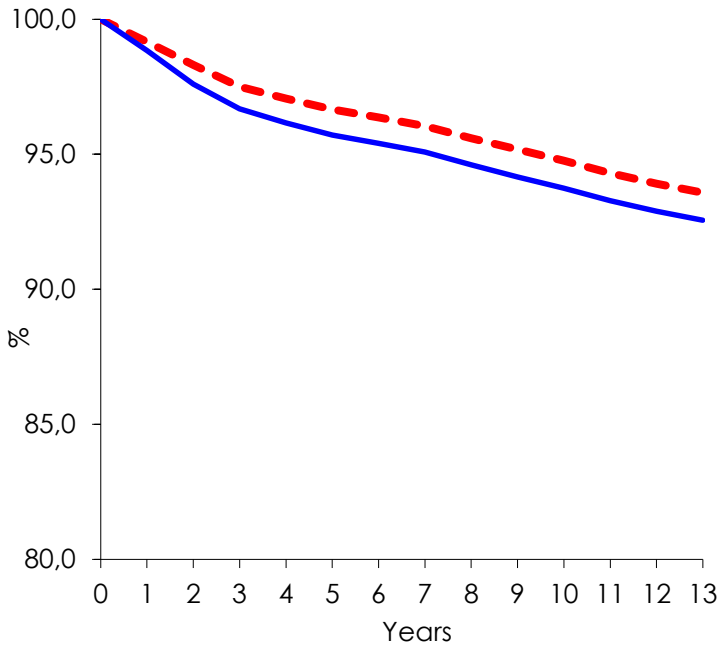
Cause of revision	Rate	Percentage	% distribut. of failure causes
Total aseptic loosening	**427**/41.848	1,0	31,1
Septic loosening	**311**/41.848	0,7	22,6
Pain without loosening	**135**/41.848	0,3	9,8
Tibial aseptic loosening	**120**/41.848	0,3	8,7
Dislocation	**48**/41.848	0,1	3,5
Insert wear	**44**/41.848	0,1	3,2
Femoral aseptic loosening	**35**/41.848	0,1	2,6
Instability	**27**/41.848	0,1	2,0
Bone fracture	**25**/41.848	0,1	1,8
Stiffness	**21**/41.848	0,1	1,5
Breakage of prosthesis	**12**/41.848	0,03	0,9
Other	**36**/41.848	0,1	2,6
Unknown *(58 performed outside region)*	**133**/41.848	0,3	9,7
Total	**1.374/41.848**	**3,3**	**100,0**

Total revision

Cause of second revision	Rate	Percentage	% distribut. of failure causes
Septic loosening	**74**/2.208	3,4	33,0
Total aseptic loosening	**60**/2.208	2,7	26,8
Tibial aseptic loosening	**24**/2.208	1,1	10,7
Pain without loosening	**11**/2.208	0,5	4,9
Dislocation	**10**/2.208	0,5	4,5
Femoral aseptic loosening	**6**/2.208	0,3	2,7
Instability	**5**/2.208	0,2	2,2
Stiffness	**5**/2.208	0,2	2,2
Insert wear	**5**/2.208	0,2	2,2
Periprosthetic bone fracture	**3**/2.208	0,1	1,4
Breakage of prosthesis	**3**/2.208	0,1	1,4
Trauma	**2**/2.208	0,1	0,9
Other	**5**/2.208	0,2	2,2
Unknown *(4 performed outside region)*	**11**/2.208	0,5	4,9
Total	**224/2208**	**10,1**	**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 362 cases (out 34.334 bicompartmental prostheses recorded in the RIPO).
The mean time lapse between primary bicompartmental arthroplasty and implanting the patella was 2,0 years (I.C. at 95% 1,8-2,2).
These 362 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 traced as solid line.
Survival at 13 yrs is 92,1% and 93,5% respectively.
14% of the 362 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	From years	n.	n. failures	% survival at 5	c.i. at 95%	% survival at 10	c.i. at 95%
OXFORD UNICOMPARTIMENTAL PHASE 3 - Biomet Merck	2000	851	106	91,2	89,3-93,2	86,7	84,1-89,4
GENESIS UNI - Smith & Nephew	2000	649	43	94,1	92,2-96,0	90,1	86,4-93,8
ZIMMER UNI - Zimmer	2005	514	18	95,4	93,1-97,6	-	-
EFDIOS - Citieffe	2000	314	43	92,7	89,7-95,6	83,5	78,5-88,5
MITUS - ENDO-MODEL UNI – ALL POLY - Link	2003	270	25	91,5	88,0-95,0	88,1	83,4-92,8
ALLEGRETTO UNI - Protek-Sulzer	2000	250	25	92,3	88,7-95,8	88,8	84,4-93,2
PRESERVATION UNI – ALL POLY - DePuy	2002	185	20	92,2	88,3-96,1	87,6	82,3-92,9
UC-PLUS SOLUTION - Smith & Nephew	2000	177	9	97,1	94,7-99,6	95,0	91,6-98,4
HLS - UNI EVOLUTION - ALL POLY - Tornier	2001	144	10	95,6	92,2-99,0	91,7	86,6-96,7
UC-PLUS SOLUTION – ALL POLY - Smith & Nephew	2004	140	13	90,3	85,3-95,3	-	-
UNI SIGMA HP - ***DePuy***	2009	300	6	96,6	93,7-99,4	-	-
JOURNEY UNI - ALL POLY - Smith & Nephew	2010	185	5	-	-	-	-
JOURNEY UNI - Smith & Nephew	2012	103	2	-	-	-	-
GKS - ONE – ALL POLY Permedica	2006	185	7	96,0	92,7-99,2	-	-
OPTETRAK UNI – ALL POLY -Exactech	2005	128	4	96,0	92,6-99,5	-	-
MILLER GALANTE UNI - Zimmer	2001	118	9	92,7	89,7-95,6	83,5	78,5-88,5
Other (<100 cases)	2000	502	63	87,5	84,3-90,7	80,5	74,9-86,0
Unknown	2000	16	1	-	-	-	
Total	**2000**	**5031**	**409**	**93,0**	**92,2-93,8**	**88,4**	**87,2-89,6**

15.6 Analysis of the survival of bi-tricompartmental prosthesis according to the most widely used commercial type in Emilia-Romagna

Type	From years	n.	n. failures	% survival at 5	c.i. at 95%	% survival at 10	c.i. at 95%
ADVANCE Medial Pivot - Wright	2000	561	20	96,3	94,6-97,9	96,0	94,2-97,7
ATTUNE - PS FIXED – De Puy J&J	2012	308	2	-	-	-	-
FIRST - Symbios Orthopedie	2006	648	26	95,2	93,3-97,1		-
GEMINI MK II – Link	2002	1865	44	97,5	96,7-98,3	94,9	92,7-97,1
GENESIS II - C R - Smith & Nephew	2001	924	28	96,4	95-97,8	95,6	93,7-97,4
GENESIS II - MOBILE BEARING - Smith & Nephew	2001	358	9	97,3	95,6-99,1	-	-
GENESIS II - PS HIGH FLEXION - Smith & Nephew	2004	2137	24	98,4	97,7-99,1	-	-
GENIUS TRICCC - Dedienne Sante	2000	589	42	94,4	92,5-96,4	90,6	87,7-93,5
GENUS PE - Adler-Ortho	2008	842	21	97,0	95,7-98,3	-	-
INNEX - MOBILE BEARING - UCOR - Protek Sulzer	2002	315	7	96,6	94,0-99,2	-	-
LCS - COMPLETE - RP - De Puy J&J	2004	300	12	95,9	93,5-98,3	-	-
LCS - UNIVERSAL - RP - De Puy Johnson & Johnson	2000	481	17	96,8	95,3-98,4	96,6	95-98,2
LEGION - PS XLPE HIGH FLEXION - Smith & Nephew	2011	349	4	-	-	-	-
NEXGEN - CR FLEX FISSO - Zimmer	2004	1076	23	97,3	96,1-98,5	95,2	92,1-98,3
NEXGEN - LPS - FLEX FISSO - Zimmer	2002	4797	80	98,2	97,8-98,6	97,6	97-98,2
NEXGEN - LPS - FLEX MOBILE - Zimmer	2002	790	27	96,6	95,3-98	95,1	93,1-97,1
NEXGEN - LPS - Zimmer	2000	1991	80	97,4	96,6-98,1	95,9	94,9-96,8
OPTETRAK - RBK - HI-FLEX - Exactech	2006	399	12	96,8	95-98,6		-
PFC - CVD - De Puy J.&J.	2000	323	6	97,8	96-99,6	97,8	96-99,6
PFC - PS - De Puy J.&J.	2000	521	19	96,3	94,4-98,3	93,6	90,5-96,6
PFC - RP - CVD - De Puy J & J	2001	526	16	96,6	94,8-98,4	-	-
PFC - RP - PS - De Puy J & J	2000	1724	50	97,1	96,2-98	96,0	94,7-97,2
PFC - SIGMA RPF - De Puy Johnson & Johnson	2005	440	15	96,4	94,5-98,3	-	-
PROFIX - CONFORMING - Smith & Nephew	2000	2011	82	96,8	96,0-97,6	95,3	94,3-96,4
PROFIX - P S - Smith & Nep.	2002	581	18	97,3	96,0-98,7	96,6	95,1-98,2
ROTAGLIDE - Corin Medical	2000	621	50	93,2	91,2-95,3	91,2	88,7-93,7
SCORE - Amplitude	2004	437	10	98,1	96,8-99,4	97,3	95,6-99
SCORPIO - NRG - CR - Howmedica Osteonics	2007	430	11	96,3	94,1-98,6		-
SCORPIO - NRG - PS – Howmedica Osteonics	2004	535	21	96,4	94,8-98,1	94,6	92,1-97,1
T.A.C.K. - Link	2000	529	54	93,6	91,4-95,7	90,7	88,1-93,3
TC-PLUS - SB SOLUTION - Endoplus	2002	1837	35	97,7	96,8-98,5	-	-
TRIATHLON - CR - Howmedica Osteonics	2005	902	13	97,9	96,6-99,3	94,7	89,7-99,8
VANGUARD - CR-LIPPED - Biomet Orthopedics	2006	641	22	96,3	94,8-97,9	-	-
VANGUARD - PS - Biomet Orthopedics	2005	2081	36	97,6	96,7-98,4	-	-
Unknown	2000	217	18	95,5	92,6-98,4	90,6	85,8-95,3
Other (<300 cases)	2000	8762	420	95,5	95,0-96,0	92,9	92,1-93,6

Total	**2000**	**41848**	**1374**	**96.7**	**96.5-96.9**	**94.8**	**94.5-95.2**

PART THREE: SHOULDER PROSTHESIS

July 2008 – December 2014

16. RIPO capture

16.1 Capture for RIPO

Percentage of R.I.P.O. capture calculated versus Discharge Records (S.D.O.) was **96,2** in 2014. 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**	**Hemiarthroplasty**
2008	73,9	93,0
2009	65,7	83,6
2010	59,6	84,6
2011	49,1	87,1
2012	58,3	90,8
2013	59,8	93,2
2014	54,5	85,6

From database SDO

17. Type of operation

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2014, according to **type**

Type of operation	Number of operation	Percentage
Reverse prosthesis	2.226	58,1
Hemiarthroplasty	730	19,1
Resurfacing	233	6,1
Anatomical prosthesis	320	8,3
Revisions	245	6,4
Prosthesis removal	48	1,2
Other	29	0,8
Total	**3.831**	**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 2014, according to **type of operation** and **gender** of patients

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Reverse prosthesis	480	21,6	1746	78,4	2.226
Hemiarthroplasty	210	28,8	520	71,2	730
Resurfacing	114	48,9	119	51,1	233
Anatomical prosthesis	128	40,0	192	60,0	320
Revisions	88	35,9	157	64,1	245
Prosthesis removal	21	43,8	27	56,3	48
Total	**1041**	**27,4**	**2761**	**72,6**	**3.802**

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**
Reverse prosthesis	71,8	33-88	74,0	33-100
Hemiarthroplasty	61,0	21-91	73,4	36-97
Resurfacing	51,6	17-80	62,4	21-85
Anatomical prosthesis	61,5	33-79	65,6	30-100
Revisions	63,1	26-84	69,3	43-86

18.3 Pathologies

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2014, according to **type of operation** and **diagnosis** of patients.

Diagnosis	Total reverse arthroplasty	
	N.	%
Eccentric osteoarthritis	1174	52,7
Fracture	400	18,0
Concentric osteoarthritis	329	14,8
Cuff arthropathy	67	3,0
Sequelae of fracture	56	2,5
Necrosis	55	2,5
Non specified osteoarthritis	49	2,2
Inveterate dislocation	21	1,0
Rheumatic arthritis	18	0,8
Post-traumatic arthritis	7	0,3
Recurrent dislocation	4	0,2
Pain	3	0,1
Sequelae of septic arthritis	3	0,1
Other	*40*	1,8
Total	**2226**	**100.0**

Diagnosis	Total anatomical prosthesis	
	N.	%
Concentric osteoarthritis	259	80,9
Necrosis	19	5,9
Eccentric osteoarthritis	15	4,6
Sequelae of fracture	7	2,2
Rheumatic arthritis	7	2,2
Non specified osteoarthritis	4	1,3
Fracture	4	1,3
Other	4	1,3
Unknown	1	0,3
Total	**320**	**100,0**

Diagnosis	Hemiarthroplasty	
	N.	%
Fracture	462	63,3
Concentric osteoarthritis	75	10,3
Eccentric osteoarthritis	65	8,9
Necrosis	51	7,0
Sequelae of fracture	32	4,4
Dislocation	11	1,5
Rheumatic arthritis	6	0,8
Post-traumatic necrosis	6	0,8
Sequelae of septic arthritis	5	0,7
Sequelae of Osteomyelitis	3	0,4
Post-traumatic arthritis	3	0,4
Pathological fracture	2	0,3
Unknown	4	0,5
Other	5	0,7
Total	**730**	**100,0**

Diagnosis	Resurfacing	
	N.	%
Concentric osteoarthritis	115	49,4
Necrosis	46	19,7
Eccentric osteoarthritis	34	14,6
Arthritis	8	3,4
Sequelae of fracture	7	3,0
Necrosis (idiopathic, steroid-induced, post traumatic)	5	2,2
Fracture	5	2,2
Dislocation	3	1,3
Rheumatic arthritis	3	1,3
Post-traumatic arthritis	1	0,4
Sequelae of septic arthritis	1	0,4
Other	5	2,1
Total	**233**	**100,0**

Number of **shoulder revisions** carried out on patients with admission date between 1st July 2008 and 31st December 2014, according to **diagnosis** and **type of revision.**

Diagnosis	N.	%
Glenoid erosion	57	23,3
Humeral loosening	34	13,9
Two steps revision	31	12,6
Anterior instability	24	9,8
Glenoid loosening	22	9,0
Pain	17	6,9
Superior instability	10	4,1
Dislocation	9	3,7
Cuff lesion	7	2,9
Instability	7	2,9
Periprosthetic bone fracture	5	2,0
Total aseptic loosening	5	2,0
Septic loosening	4	1,6
Other	10	4,1
Unknown	3	1,2
Total	**245**	**100,0**

Type of revision	N.	%
From hemi to reverse	56	22,9
From reverse to reverse	40	16,3
Implant after removal	31	12,7
From anatomic to reverse	23	9,4
From resurfacing to reverse	17	6,9
From hemi to anatomic	13	5,3
From reverse to anatomic CTA	12	4,9
From hemi to hemi	9	3,7
From resurfacing to anatomic	6	2,5
From resurfacing to resurfacing	4	1,6
From resurfacing to hemi	3	1,2
From reverse to anatomic	3	1,2
From anatomic to anatomic	3	1,2
From reverse to hemi	2	0,8
Other	23	9,4
Total	**245**	**100,0**

19. Surgical technique, anaesthesia and antithromboembolic prophylaxis

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2014, according to **surgical approach.**

Type of operation	Deltoid-pectoral	Trans-deltoid	Superior lateral	Other
Anatomical prosthesis	316	4	-	-
Reverse prosthesis	1911	206	45	31
Hemiarthroplasty	698	20	-	5
Resurfacing	220	7	1	-
Prosthesis removal	45	1	-	-
Revision	231	10	-	-
Total*	**3421**	**248**	**46**	**36**

*51 missing data (1.3%)

Number of shoulder operations carried out on patients with admission date between 1st July 2008 and 31st December 2014, according to **anaesthesia.**

Anaesthesia	N.	%
Mixed	1.575	44,9
General	1.820	51,9
Loco-regional	115	3,3
Total*	**3.510**	**100,0**

*292 missing data (7,7%)

Antithromboembolic prophylaxis
Heparin is used in 79% of primary surgery, oral prophylaxis in 4% and no prophylaxis in 17%,.

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 2014, according to **stem fixation** and **type of operation**

Stem fixation	Anatomical prosthesis	%	Reverse prosthesis	%	Hemiarthroplasty	%
Cemented	33	10,3	520	23,4	285	39,0
Cementless	287	89,7	1.706	76,6	445	61,0
Total	**320**	**100,0**	**2.226**	**100,0**	**730**	**100,0**

Glenoid was cemented in 44% 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 2014, according to the **type of prosthesis**.

Model of prosthesis	Reverse prosthesis		Anatomical prosthesis + Hemiarthroplasty	
	N	%	N	%
Delta - DePuy	939	42,2	47	4,5
SMR – Lima	692	31,1	503	47,9
Aequalis - Tornier	271	12,2	105	10,0
Trabecular Metal Reverse – Zimmer	97	4,4	-	-
Affinis – Mathys	68	3,1	18	1,7
Anatomical Shoulder - Zimmer	34	1,5	75	7,1
Comprehensive - Biomet	34	1,5	4	0,4
Duocentric – Aston Medical	18	0,8	-	-
Equinoxe Primary - Exactech	18	0,8	2	0,2
Promos - Plus orthopedics AG	16	0,7	6	0,6
Agilon - Implantcast	13	0,6	1	0,1
T.E.S.S - Biomet	10	0,4	1	0,1
Bigliani/Flatow - Zimmer	-	-	158	15,0
Global - DePuy	-	-	65	6,2
Randelli – LTO - Lima	-	-	36	3,4
Other (models < 10 cases)	14	0,6	27	2,6
Unknown	2	0,1	2	0,2
Total	**2.226**	**100,0**	**1.050**	**100,0**

Number of shoulder **resurfacing** carried out on patients with admission date between 1st July 2008 and 31st December 2014, according to the **type of prosthesis**.

Model of prosthesis	Resurfacing	
	N	%
T.E.S.S - Biomet	81	34,8
SMR - Lima	48	20,6
ECLIPSE - Arthrex	26	11,2
EPOCA RH - Synthes	21	9,0
COPELAND - Biomet	19	8,2
GLOBAL CAP – DePuy	13	5,6
AFFINIS – Mathys	5	2,1
SIDUS - Zimmer	4	1,7
DUROM SHOULDER - Zimmer	4	1,7
AEQUALIS RESURFACING - Tornier	4	1,7
Bigliani/Flatow - Zimmer	3	1,3
COMPREHENSIVE Versa-Dial - Biomet	2	0,9
VERSO - Biomet	1	0,4
CAPICA - Implantcast	1	0,4
HEMICAP - Arthrosurface	1	0,4
Total	**233**	**100,0**

21 Complications occurred during hospitalization

RIPO registers all kind of complications occurred during hospitalization. In the following tables only intra-operative and post-operative local complications are presented.

The rate of complications in **primary shoulder operations (total reverse prosthesis and total anatomical prosthesis)** carried out on patients hospitalized between July 1st 2000 and December 31st 2014.

Complications occurred during hospitalization					
Intra-operative			**Post-operative local**		
	N.	**%**		**N.**	**%**
Muscular lesion	20	0,8	Dislocation	6	*0,2*
Tendon lesion	1	0,0			
Vascular lesion	1	0,0			
Fracture	20	0,8	Early Infection	4	*0,2*
Other	4	0,2			
Total	**46**	***1,8***	**Total**	**10**	***0,4***

The rate of complications in **primary Hemiarthroplasty** carried out on patients hospitalized between July 1st 2000 and December 31st 2014.

Complications occurred during hospitalization					
Intra-operative			**Post-operative local**		
	N.	**%**		**N.**	**%**
Muscular lesion	5	0,7	Early Infection	2	*0,3*
Tendon lesion	1	0,1			
Vascular lesion	1	0,1			
Fracture	7	1,0	Dislocation	-	-
Other	2	0,3			
Total	**16**	**2,2**	**Total**	**2**	***0,3***

They were observed also 3 deaths in hemiarthroplasty and 3 deaths in reverse prosthesis according to fracture diagnosis.

22. Duration of pre and post-operative hospitalization

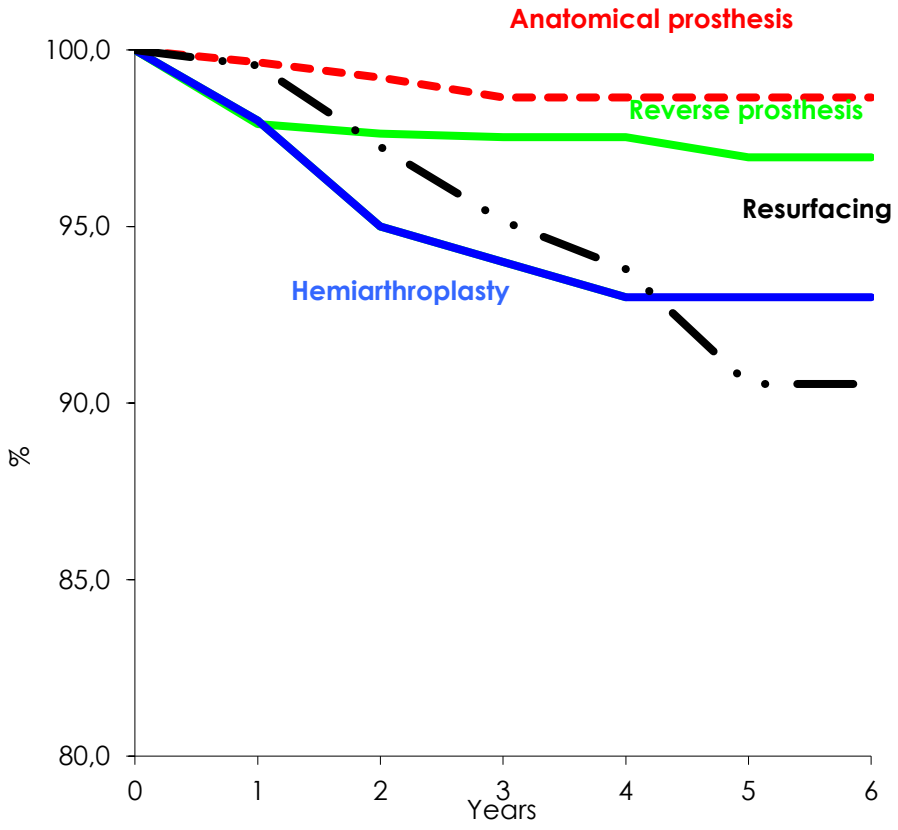
Year 2014			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean post-op. (range)**
Reverse prosthesis	523	1,4 (0-31)	4,8 (1-36)
Hemiarthroplasty	84	2,5 (0-19)	7,2 (1-72)
Resurfacing	9	0,7 (0-1)	3,3 (2-6)
Anatomical prosthesis	68	0,2 (0-1)	3,4 (2-8)
Revisions	37	0,5 (0-2)	4,1 (2-11)

Year 2014			
Type of operation	**N.**	**Mean pre-op. (range)**	**Mean post-op. (range)**
Elective	517	0,8 (0-31)	4,5 (1-22)
Emergency	167	3,5 (0-25)	6,4 (1-72)

23. Survival analysis

Survival curve is used to estimate the probability that each patient to remain in the initial condition (unrevised prosthesis). Following figure shows curves according to Type of operation.
Analysis was performed on all patients, and not only on the resident in Emilia-Romagna region.

Type of operation	Number of implants	Number of revisions	Survival at 6 yrs (C.I. 95%)
Anatomical prosthesis	320	3	98.7 (97.1-100)
Reverse prosthesis	2.226	48	97.0 (95.9-98.0)
Hemiarthroplasty	730	39	93.0 (91.0-95.0)
Resurfacing	233	15	90.5 (85.6-95.5)



Difference is not statistically significant (p=0,02 Wilcoxon Test).

Anatomical prosthesis			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Breakage of liner	1/320	0,3	33,3
Glenoid erosion	1/320	0,3	33,3
Posterior instability	1/320	0,3	33,3
Total	**3/320**	**0,9**	**100,0**
Reverse prosthesis			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Instability	15/2226	0,7	31,3
Glenoid loosening	10/2226	0,4	20,8
Septic loosening	9/2226	0,4	18,8
Dislocation	5/2226	0,2	10,4
Humeral **component loosening**	2/2226	0,1	4,2
Sequelae of fracture	1/2226	0,0	2,1
Other	3/2226	0,1	6,2
Unknown	3/2226	0,1	6,2
Total	**48/2.226**	**2,2**	**100,0**
Hemiarthroplasty			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Septic loosening	9/730	1,2	23,1
Glenoid erosion	8/730	1,1	20,5
Instability	6/730	0,8	15,4
Pain	4/730	0,5	10,3
Dislocation	2/730	0,3	5,1
Cuff arthropathy	2/730	0,3	5,1
Periprosthetic bone fracture	2/730	0,3	5,1
Total aseptic loosening	1/730	0,1	2,6
Other	2/730	0,3	5,1
Unknown	3/730	0,4	7,7
Total	**39/730**	**5,3**	**100,0**
Resurfacing			
Cause of revision	**Rate**	**%**	**% distribut. of failure causes**
Glenoid erosion	8/233	3,4	53,3
Pain	4/233	1,7	26,6
Septic loosening	1/233	0,4	6,7
Instability	1/233	0,4	6,7
Unknown	1/233	0,4	6,7
Total	**15/233**	**6,4**	**100,0**