REPORT of R.I.P.O.

Register of orthopedic prosthetic implantology

OVERALL DATA
HIP AND KNEE ARTHROPLASTY
IN EMILIA-ROMAGNA Region

2000-2007

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA

Foreword

This is the eighth report, elaborated by the Register of Orthopedic Prosthetic Implantology (RIPO), it presents the most significant results of the descriptive statistical analyses performed on operations of hip and knee arthroplasty carried out in Emilia-Romagna, between 1st January 2000 and 31st December 2007.
Starting from today this document accompanies the brief elaborations that authorized subjects may make alone by entering the Register site (https://ripo.cineca.it). Aim of this report is the presentation of the overall regional data of total hip prostheses, hemiartroplasty, resurfacing and revision, as well as uni and bicompartimental total knee and revisions.
Altogether data of 66.500 hip and 30.000 knee prostheses are reported from 75 Orthopedic Units in 59 Hospitals either public and private.
As in the past, data from the orthopedic wards was provided on paper forms. Registry staff transferred the data via internet to the databank run by CINECA (Interuniversity Consortium of North-eastern Italy) which was responsible for computer management and security aspects of the data. Statistical analysis was performed by Registry statistics staff.
The RIPO representatives of each surgical unit have cooperated actively in fulfilling the aims by providing clarification and integration of the data transferred, when necessary.

Objective of the Register

The Register has some fundamental objectives:

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

Methodological notes

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 Forms; in the last year the Register has 'captured' 94% of hip operations and 93.5% of knee operations. Submission to RIPO of the information about missing operations was prompted in May 2008, but not all of the information has been collected. For 2007 the data of about 600 hip prosthesis and 400 knee prosthesis operations are still missing from RIPO.
That, theoretically, introduces uncertainty in the conclusions, a doubt that, however, is the same that burdens all the other main joint prosthesis registers, that have comparable support to that of RIPO.
As far as concerns the **reliability** of the data given, RIPO handles two types of data: incontrovertible data, either that RIPO checks by comparison with other data banks (labels of the components implanted, demographic data of the patients, dates of admission, any date of death), and not verifiable data such as disease that led to replacement or revision or the complications that arose during hospitalization. Reliability is checked by sampling the data, by asking for

confirmation of some information. The percentage of responses obtained was unfortunately very low and this does not enable definitive conclusions to be drawn.
The identification of the type of prosthesis implanted is reported in detail: the manufacturer's name is reported as it appears on the label, even if the trade mark varies slightly.
The commercial reference of the product and its batch are also recorded. To facilitate the interpretation of the present report the prosthesis types have been identified with the name of the firm mostly responsible for marketing them and the name commonly used by orthopedic surgeons.
The data collected so far have an eight-year maximum follow-up; it is therefore possible to perform evaluations of prosthesis survivorship.

Explanatory guide for the survival analysis

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

The survival curves are preceded by the **multivariate analysis** performed according to the Cox method.
This analysis enables us to check what, if any, independent variables among them may influence the event, in our case the removal of at least one prosthetic component.
The concept of case-mix comes from this. When a comparison is performed, for example the comparison of different prosthetic models, it is opportune to point out the complexity of the series treated with the prosthesis types under comparison. In the report both complete hip and knee prostheses and single components (acetabulum and stems) were compared, if there was a sufficient number of implants (at least 300 cases). The comparison tables show the number of implants and survival rate at 3 and 7 years. Because it is well-known that some of the patient's characteristics such as age at the time of surgery and the disease that led to the replacement may influence the survival of the prosthesis, said comparison tables show a case-mix rate, that enables a more correct comparison of the effectiveness of the prosthesis to be performed, thus assessing in short the complexity of the series (as obtained from the relative risk calculations performed on all the patients of the Emilia-Romagna region).

Summary of the main results presented

The number of hip and knee replacement operations is continuously increasing. In 2007 an increase of 7.1% was observed for total hip replacement and 9.6% for knee replacement compared to the previous year.
Hip

Resurfacing arthroplasty decreased in 2007, for the first time since their introduction. In 2007, 3.3% of hip replacement operations were performed by resurfacing arthroplasty, compared to 3.7% of the previous year.
With regards to traditional arthroplasty, in 2007 cementless components were used in 88% of primary operations. In the remaining cases hybrid prostheses were used in 8% and totally cemented prostheses in 3%. In 2000, the rates were respectively 60%, 23% and 16%.
The most widely used joint coupling is ceramic-ceramic which in 2007 was used in 43% of the primary implants (it was 18% in 2000) followed by metal-polyethylene with 29%, (it was 46%).
According to age it can be observed that cer-cer is used far more than met-pol in patients up to 59 years old, from 60 to 69 the use is balanced, after 70 years old the preference goes to met-pol, with a substantial inversion of the ratio.
The use of cross-linked polyethylene was, in 2007, 26% of all components in polyethylene.
The survival of the hip prostheses is confirmed at very high levels. Over 96% of prostheses implanted in Region Emilia-Romagna are still in place 8 years after the operation.
The revision of the hip prostheses is not, at a maximum follow-up of 8 years, significantly different with respect to the type of fixation or joint coupling. The two variables, however, cannot to be introduced in the multivariate analysis performed according to Cox, because they are not independent from each other and dependent on the other variables of the model, such as age. In other words the survival curves for fixation and joint coupling are plotted without being able ‘to adjust' any bias.
Conversely, the multivariate analysis showed, in support of what was already observed in previous years, that the result of the operation is significantly influenced by the disease that leads to the replacement. The patients at greater risk of failure are those treated surgically due to fracture, sequelae of fracture, rheumatic arthritis or rare diseases.
Precisely for that reason, the comparison among prosthesis types was performed highlighting the complexity of the series on which the individual types were implanted, borrowing the concept of *case-mix.*
As a result no prosthesis type, implanted in a sufficiently high number of cases, has a significantly worse survival than the regional mean. Conversely, it should be underlined that the less often implanted prostheses, taken on the whole, have a significantly lower survival rate than that of more common prostheses. Studies are in progress for the assessment of individual specific cases.

Knee
Besides the marked increase in operations in recent years and the progressive reduction of the mean age of the first operation, for knee replacement the role played by private centers in this operation is noteworthy. In 2007 about 60% of primary operations were performed at private centers operating within the National Health Service. In 2000 it was 40%.
The choices of the types of prostheses have changed less than those observed for the hip, thus supporting the choice of total cement and a substantial balance between non-stabilization and posterior stabilization; slightly on the increase the preference for models with mobile bearing.
The range of prosthetic models used is narrower and more constant over time. The survival of bi- and tri-compartmental prostheses (total without and with patella replacement) is extremely high, respectively 97% and 95% at 7 years. That of unicompartmental prostheses is significantly lower (92%), as repeatedly highlighted also by other registers.
The Cox multivariate analysis shows that the survival of knee prostheses, besides being influenced by the fact of being uni- or bicompartmental, is negatively influenced by the patient's age (the younger the patient is the less the prosthesis is expected to survive) and the type of prosthesis (the mobile bearing is worse than the fixed one). Studies are in progress on this specific subject.
Furthermore, some models have a slightly lower survival than average. Further investigation into these models is also in progress.
Another critical aspect of bicompartmental knee prostheses is septic loosening. The revision rate due to infection is still high. Currently, the use of antibiotic-loaded cement is uninfluential compared to traditional cement.

Units supporting RIPO, Head of Orthopedic Surgery Department or Health Manager in the case of Private Nursing homes and RIPO representatives inside the unit are listed in the Table below.
The data are updated to June 2008, to be lined up with the contents of the present report.

Provincia di Bologna

	Head of Orthopedic Surgery Department or Health Manager	**RIPO Representative**
AZIENDA ULS BOLOGNA		
Ospedale Maggiore	Dr. Stefano Boriani	Dr.ssa Stefania Paderni Dr.ssa Silvia Terzi
Ospedale di Bentivoglio	Dr. Luigi Prosperi	Dr. Paolo Borelli Dr. Cataldo Lippo
Ospedale di Vergato	Dr. Giovanni Serra	Dr. Massimo Corlianò
Casa di cura Villa Regina	Dir. San. Dr. Sandro Uva	Dr. Mirka Cocconcelli
Casa di cura Villa Erbosa	Dir. San. Dr. Piero Fiorentini	Dr. Enzo Zanini
Casa di cura Villa Nigrisoli	Dir. San. Dr. Sandro Uva	Dr. Mirka Cocconcelli
Casa di cura Villa Torri	Dir. San. Dr. Gianluigi Gardini	Sig.ra Maria Bucca
Casa di cura Villa Laura	Dir. San. Dr. Giancarlo Caroli	Dr. Francesco Noia Dr. Michele Perozzi
Casa di cura Prof. Nobili	Dir. San. Dr. Margherita Gallina	Dr. Enzo Zanini
Casa di cura Villa Chiara	Dir. San. Dr. Corrado Ballarini	Dr. Corrado Ballarini

Az. Osp-Univ S. Orsola-Malpighi	Dr. Massimo Laus	Dr. Luigi Brizio Dr. Franco A. Zappoli

Istituti Ortopedici Rizzoli	Dr. Mauro Girolami Prof. Sandro Giannini Prof. Armando Giunti Prof. Maurilio Marcacci Dr. Ermanno Martucci Prof. Mario Mercuri Dr. Aldo Toni	

AZIENDA ULS IMOLA		
Ospedale Civile di Imola	Dr. Guglielmo Vicenzi	Dr. Marco Scardoni Dr. Michele Macchiagodena

Provincia di Ferrara

AZIENDA ULS FERRARA		
Ospedale di Cento	Dr. Luigi Specchia	Dr. Raffaele Rossi Dr. Luigi Specchia
Ospedale di Argenta	Dr. Pier Giorgio Vasina	Dr. Roberto Rossi Dr. PierGiorgio Vasina
Ospedale del Delta	Dr. Riccardo Faccini	Dr. Giorgio Massini

Az Osp-Univ Sant Anna Ferrara	Prof. Leo Massari	Dr. Roberto Biscione Prof. Leo Massari

Provincia di Forlì-Cesena

AZIENDA USL FORLI'		
Ospedale di Forlì	Dr. Francesco Lijoi	Dr. Maurizio Barchetti Dr. Stefano Nardi
Casa di Cura Villa Igea	Dir. San. Dr. Giuliana Vandi	Sig.ra Debora Bertaccini
Casa di cura Villa Serena	Dir. San. Dr. Giovanni Gardini	Dr. Lorena Sangiorgi

AZIENDA USL CESENA		
Ospedale di Cesena	Dr. Mauro Monesi	Dr. Franco Calista Dr. Francesco Fanton
Casa di cura Malatesta Novello	Dir. San. Dr. Gianluca Bersani	Dr. Adolfo Mantero Dr. Maria Gabriella Pignati Dr. Alessandro Romani
Casa di cura S. Lorenzino	Dir. San. Dr. Raffaele Bisulli	Dr. Paolo Pardini

Provincia di Modena

AZIENDA USL MODENA		
Ospedale S. Agostino-Estense	Dr. Antonio Vaccari	Dr. Pier Bruno Squarzina
Ospedale di Carpi	Dr. Eugenio Rossi Urtoler	Dr. Silvano Franchini
Ospedale di Mirandola	Dr. Franco Boselli	Sig. Gabriele Palumbo
Ospedale di Castelfranco Emilia	Dr. Gilberto Masetti	Dr. Giancarlo Cocchi
Ospedale di Sassuolo	Dr. Mario Longo Dr. Luigi Adriano Pederzini	Dr. Alessandro Tambella Dr. Mauro Prandini
Ospedale di Vignola	Dr. Gilberto Masetti	Dr. Mauro Tisi
Ospedale di Pavullo	Dr. Mario Argazzi	Dr. Mauro Lineti
Casa di cura Hesperia Hospital	Dir. San. Dr. Stefano Reggiani	Dr. Michelina Guerra
Casa di cura Prof. Fogliani	Dir. San. Dr. Angelo Rosi	Dr. Angelo Rosi

Az. Osp-Univ Policlinico Modena	Prof. Luigi Celli	Dr. Anselmo Campagna

Provincia di Parma

AZIENDA USL PARMA		
Ospedale Civile Fidenza	Prof. Enrico Vaienti	Sig.ra Claudia Zoppi
Ospedale Borgo Val di Taro	Dr. Aldo Guardoli	Dr. Aldo Guardoli
Casa di cura Città di Parma	Dir. San. Dr. Felice De Cristofaro	Sig.ra Rosa Concari

Azienda Osp-Univ di Parma	Prof. Pietro Marenghi Prof. Giovanni Soncini Prof. Francesco Ceccarelli	Dr. Paolo Perini Dr. Francesco Zaniboni Dr. Filippo Calderazzi

Provincia di Piacenza

AZIENDA USL PIACENZA		
	Prof. Carlo Fioruzzi	Prof. Carlo Fioruzzi
Ospedale di Piacenza		Dr. Giuseppe Guidoni
	Dr. Michael Memminger	Dr. Michael Memminger
Pres. Val Tidone, Castel San Giovanni	Dr. Giuseppe Leddi	Dr. Claudio Gheduzzi
Pres. Val D'Arda, Fiorenzuola D'Arda	Prof. Carlo Fioruzzi	Dr. Stefano Cervi

Provincia di Ravenna

AZIENDA USL RAVENNA		
Ospedale di Ravenna	Dr. Alberto Belluati	Dr. Alessandro Campagna
Ospedale di Lugo	Dr. Gabriele Zanotti	Dr. Andrea Martini
Ospedale di Faenza	Dr. Maurizio Fontana	Dr. Paolo Frontali Dr.ssa Milena Sirri
Casa di cura Domus Nova	Dir. San. Dr. Gian Battista Roversi	Dr.Giuseppe Coppola
Casa di cura S. Francesco	Dir. San. Dr. Nunzio D'Agnelli	Sig.ra Joanna Gorniak Sig. Irinel Longu
Casa di cura V. Maria Cecilia	Dir. San. Dr. Folco Galeati	Dr. Silvia Rapuano
Casa di cura S. Pier Damiano	Dir. San. Dr. Roberto Nonni	Dr. Maurizio Bergami Sig.ra Elena Ravagli

Provincia di Reggio-Emilia

AZIENDA USL REGGIO EMILIA		
Ospedale di Guastalla	Dr. Enrico Magnani	Dr. Enrico Magnani
Ospedale di Montecchio Emilia	Dr. Norberto Negri	Dr. Antonio Carbognani
Ospedale di Scandiano	Dr. Roberto Fiocchi	Dr. Roberto Fiocchi
Ospedale di Castelnovo Monti	Dr. Paolo Carretti	Dr. Giuseppe Sciaboni
Casa di cura Villa Salus	Dir. San. Dott.ssa Rosanna Carbognani	Dr. Sevag Uluhogian
Casa di cura Villa Verde	Dir. San. Dott.ssa Alessandra Pradelli	Dr. Cesario Vezzosi

Az Osp Arcisp Santa Maria Nuova	Dr. Ettore Sabetta	Dr.Valentina Montemaggiori

Provincia di Rimini

AZIENDA USL RIMINI		
Ospedale di Rimini	Dr. Giannicola Lucidi	Dr. Giannicola Lucidi
Ospedale di Riccione	Dr. Luigi D'Elia	Dr. Luigi D'Elia
Casa di cura Sol et Salus	Dir. San. Dr. Pier Paolo Balli	Dr. Ettore La Bruna Sig.ra Sirte Sgarbi
Casa di cura Villa Maria	Dir. San. Dr. Rosaria Stefania D'Urso	Dr. Sandro Vasini

Board

On November 9th 2006 the Regional Technical-Scientific Commission for the area of orthopedic healthcare set up by the Emilia Romagna Region Council met for the first time by resolution 1066 of July 31st 2006 and ruling 2620 of the Manager of the Regional
Health agency.
The Commission, that will stay in office for three years to provide technical-scientific support for the development of the activities of clinical government on a departmental, commercial, and large area scale, is thus composed:

Dr. Paolo Adravanti,

Dr. Stefano Boriani,

Dr. Giuseppe Caroli,

Prof. Luigi Celli,

Dr. Carlo Fioruzzi,

Prof. Aldo Guardoli,

Dr. Francesco Lijoi,

Dr. Stefano Liverani,

Prof. Maurilio Marcacci,

Prof. Pietro Marenghi,

Prof. Leo Massari,

Dr. Luigi Pederzini,

Dr.ssa Kyriakoula Petropulaos,

Dr. Giuseppe Porcellini,

Dr. Luigi Prosperi,

Dr. Alessandro Romani,

Dr. Ettore Sabetta,

Dr. Luca Sircana,

Dr. Aldo Toni,

Dr. Antonio Vaccari,

Dr. Gabriele Zanotti,

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

Bologna, 2nd July 2008

PART ONE: HIP PROSTHESIS

January 2000 – December 2007

1. RIPO capture

1.1 Capture for RIPO per hospital in years 2000-2007

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.),was 93,8% in 2007 according to Agency.
Data are referred to primary hip prosthesis (8151), hemiarthroplasty (8152), revision (8153) and prosthesis removal (8005)

1.2 Ratio public/private treatment

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

% of operations performed in public hospitals (AUSL, AOSP, IRCCS)			
Year of surgery	**Primary arthroprosthesis**	**Hemiarthroplasty**	**Revision**
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

From database SDO

2. Quality of data

The quality of the data supplied to RIPO is much better than that of past years,
The use of self-adhesive labels describing the prostheses enables unequivocal identification of the implant and the registration of the production batch. In 2000 only 70% of the data supplied to RIPO was of satisfactory quality, in 2007 this percentage was much higher, 98%.

3. Type of operation

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2007, according to **type**

Type of operation	Number of operation	Percentage
Primary THA	41256	62.1
Total and partial revision*	6895	10.4
Hemiarthroplasty	16784	25.2
Resurfacing	823	1.2
Prosthesis removal	410	0.6
Other**	327	0.5
Total	**66.495**	**100.0**

***** 2276 total revisions, 2829 cup revision, 1123 stem revision, 539 head revision. 18 liner revision and 110 total or partial revision of hemiarthroplasty

****** Including 139 luxation reductions, 69 debridements, 15 hematoma drains, 17 ossification removals and 8 biopsies

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

Year of operation	N.	Percentage of THA
2000	-	-
2001	6	0.1
2002	34	0.7
2003	76	1.5
2004	112	2.1
2005	178	3.1
2006	218	3.7
2007	198	3.3

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

	Primary THA		Revision (total + partial)	
	N.	**Increase %**	**N.**	Increase %
2000	4287	-	720	-
2001	4562	+6.4	850	+18.1
2002	4630	+1.5	866	+1.9
2003	5029	+8.6	855	-1.3
2004	5347	+6.3	852	-0.4
2005	5546	+3.7	821	-3.6
2006	5749	+3.7	933	+13.6
2007	6106	+6.2	998	+7.0

4. Descriptive statistics of patients

4.1 Age

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2007, according to **type of operation** and **age group** of patients at the time of surgery.

	<40		40-49		50-59		60-69		70-79		≥80		
	N.	**%**	**N.**	**%**	**N.**	**%**	**N.**	**%**	**N.**	**%**	**N.**	**%**	
Primary THA	1277	3.1	2604	6.3	5869	14.2	12242	29.7	15052	36.5	4211	10.2	**41255**
Resurfacing	127	15.4	216	26.2	292	35.5	156	19.0	32	3.9	-	-	**823**
Hemiarthroplasty	17	0.1	36	0.2	110	0.7	613	3.7	4313	25.7	11693	69.6	**16782**
Revision	130	1.9	252	3.7	690	10.0	1861	27.0	2845	41.3	1117	16.1	**6895**
Prosthesis removal	10	2.4	19	4.6	38	9.3	108	26.3	175	42.8	60	14.6	**410**
Other	14	4.3	15	4.6	43	13.1	83	25.4	107	32.7	65	19.9	**327**
Total*	**1575**	**2.4**	**3142**	**4.7**	**7042**	**10.6**	**15063**	**22.7**	**22524**	**33.9**	**17146**	**25.7**	**66492**

***** 3 data are missing

Mean age of patients at surgery.

Type of operation	Mean age	Range
Primary THA	67.0	14-101
Hemiarthroplasty i	83.1	23-109
Resurfacing	51.7	16-80
Revision	70.1	23-99
Total	**71.2**	**14-109**

Mean age of patients suffering from coxarthrosis at surgery

	Year of operation 2000		Year of operation 2007	
Type of operation	**Mean age**	**Range**	**Mean age**	**Range**
Primary THA	66.5	16-100	67.2	15-95
Hemiarthroplasty	82.9	32-104	83.5	29-103
Resurfacing	/	/	52.8	21-78
Revision	69.1	23-98	70.3	26-99
Total	**71.0**	**16-104**	**70.8**	**15-103**

Mean age of patients suffering from coxarthrosis at surgery, by gender

	Primary THA			
	Year of operation 2000		Year of operation 2007	
Gender	**Mean age**	**Range**	**Mean age**	**Range**
Male	67.4	33-92	67.3	21-87
Female	68.9	31-91	70.0	26-91

4.2 Gender
Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2007, according to **type of operation** and **gender** of patient.

	Male		**Female**		**Total**
	N.	**%**	**N.**	**%**	**N.**
Primary THA	15733	38.1	25523	61.9	**41256**
Hemiarthroplasty	4014	23.9	12770	76.1	**16784**
Revision	2101	30.5	4794	69.5	**6895**
Prosthesis removal	141	34.4	269	65.6	**410**
Resurfacing	537	65.2	286	34.8	**823**
Other	120	36.7	207	63.3	**327**
Total*	**22646**	**34.1**	**43849**	**65.9**	**66495**

4.3 Side of surgery
Coxarthrosis more often affects right hip (59.3%). The percentage has been calculated on patients wearing only one implant.

Percentage of operation according to side and sex

	Male	Female
Right Side	53.7	63.3
Left Side	46.3	36.7

Difference is significantly different (Chi square $p<0.001$)

4.4 Bilateral arthroplasty
In the period of registry observation 2402 patients underwent bilateral operations.
2175 patients (90.5%) chose to undergo the second operation at the same hospital where the first one was performed.
70 patients (2,9%)chose to undergo the second operation at a different hospital
157 patients (6,6%) of this group of patients 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 hip to be treated was the right one in 54,6% of cases

4.5 Diseases treated with total hip arthroplasty and hemiarthroplasty
Number of primary total hip arthroplasty operations carried out on patients with admission date between 1st January 2000 and 31st December 2007, according to **diagnosis**.

Diagnosis in primary arthroplasty	Number	Percentage
Primary arthritis	27377	66.6
Sequelae of LCA and DCA	4911	12.0
Femoral neck fracture	3583	8.7
Femoral head necrosis (idiopathic, due to dialysis, due tosteroids)	2313	5.6
Post traumatic arthritis	994	2.4
Post traumatic necrosis	587	1.4
Rheumatic arthritis	532	1.3
Femoral neck fracture sequelae	228	0.6
Epiphysiolysis sequelae	106	0.3
Perthes disease sequelae	89	0.2
Septic coxitis sequelae	65	0.2
Tumor	58	0.1
Paget's disease sequelae	47	0.1
TBC coxitis sequelae	34	0.1
Other	151	0.4
Total*	**41075**	**100.0**

* 181 data missing (0,4%)

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

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

	Percentage			
	2000-2002	**2003-2005**	**2006**	**2007**
Primary arthrosis	65.1	67.7	67.3	67.3
Sequelae of LCA and DCA	14.0	12.3	11.3	10.6
Femoral neck fracture	9.1	8.3	8.7	8.6
Femoral head necrosis idiopathic	5.1	5.3	6.1	5.9
Post traumatic arthritis	2.5	2.4	2.0	2.7
Post traumatic necrosis	1.5	1.3	1.4	1.4
Rheumatic arthritis	1.5	1.2	0.9	1.1
Other	1.2	1.5	2.3	2.4

Number of resurfacing operations carried out on patients with admission date between 1st January 2000 and 31st December 2007, according to **diagnosis**.

Diagnosis in resurfacing	**Number**	**Percentage**
Primary arthrosis	575	70.2
Sequelae of LCA and DCA	111	13.6
Femoral head necrosis idiopathic	41	5.0
Post traumatic arthritis	45	5.5
Rheumatic arthritis	15	1.8
Perthes disease sequelae	5	0.6
Femoral neck fracture sequelae	6	0.8
Post traumatic necrosis	8	1.0
Epiphysiolysis sequelae	6	0.8
Septic coxitis sequelae	2	0.2
Spondilytis	2	0.2
Paget's disease sequelae	1	0.1
Polymyelitis sequelae	1	0.1
Fem neck fracture	1	0.1
Total*	**819**	**100.0**

*4 data are missing (0,4%)

4.6 Causes for revision

Number of revision operations carried out on patients admitted between 1st January 2000 and 31 December 2007 according to **diagnosis**.
In italics the cause of hemiarthroplasty revision
In the Table all revisions performed in the Region, without taking care of site and date of primary implant are reported. No indication of follow-up time is in theses data.

Diagnosis in revision	Number	Percentage
Cup aseptic loosening	2134	31.2
Total aseptic loosening	1754	25.7
Stem aseptic loosening	741	10.9
Prosthesis luxation	506	7.4
Prosthesis removal	243	3.6
Bone fracture*	237	3.5
Hemiarthroplasty stem loosening	192	2.8
Hemiarthroplasty luxation	158	2.3
Prosthesis breakage**	167	2.5
Poly wear	161	2.4
Cotiloiditis	143	2.1
Septic loosening	100	1.5
Pain without loosening	80	1.2
Loosening of resurfacing	31	0.5
Bone fracture in hemiarthroplasty	30	0.4
Primary instability	31	0.5
Other (ossification, trauma..)	105	1.5
Total **	**6813**	**100.0**

* 23 cup, 33 stem, 45 head, 47 liner, 9 modular neck.In 10 cases unspecified
** **82** data are missing, equal to 1.2% of the series of revision operations

5. Types of prosthesis

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

5.1 Cups used in primary arthroplasty

	2000-2005		2006		2007	
	N.	%	N.	%	N.	%
CONTEMPORARY Stryker Howmedica	530	15.2	79	20.6	64	21.2
PE Adler	7	0.2	78	20.4	48	15.9
ZCA Zimmer	431	12.3	51	13.3	43	14.3
MULLER Smith & Nephew	316	9.0	48	12.5	41	13.6
MULLER Lima	133	3.8	36	9.4	34	11.3
MULLER Sulzer-Centerpulse-Zimmer	383	11.0	13	3.4	16	5.3
MULLER Samo	387	11.1	14	3.7	15	5.0
LUNA Amplitude	55	1.6	25	6.5	6	2.0
MULLER Wright Cremascoli	943	27.0	6	1.6	2	0.7
MULLER Groupe Lepine	49	1.4	5	1.3	2	0.7
CCB Mathys	48	1.4	2	0.5	-	-
Others (with less than 50 each)	211	6.0	26	6.8	30	10.0
Total	**3493**	**100.0**	**383**	**100.0**	**301**	**100.0**

	2000-2005		2006		2007	
	N.	%	N.	%	N.	%
FIXA Adler	1168	4.5	1573	29.4	1607	27.7
EP-FIT PLUS Endoplus	263	1.0	343	6.4	584	10.1
DELTA PF Lima	280	1.1	239	4.5	262	4.5
TRIDENT Stryker Howmedica	766	3.0	291	5.4	242	4.2
EXPANSION Mathys	128	0.5	206	3.9	236	4.1
ABGII Stryker Howmedica	1492	5.8	192	3.6	234	4.0
REFLECTION Smith & Nephew	1023	4.0	189	3.5	218	3.8
FITMORE Sulzer-Centerpulse-Zimmer	1704	6.6	233	4.4	177	3.1
BICON PLUS Endoplus	522	2.0	190	3.6	172	3.0
SELEXYS TH Mathys	-	-	49	0.9	154	2.7
CLS Sulzer-Centerpulse-Zimmer	2731	10.6	163	3.1	152	2.6
RECAP RESURFACING Biomet	17	0.1	119	2.2	128	2.2
TRABECULAR METAL Zimmer	51	0.2	39	0.7	103	1.8
FIXA TI-POR Adler	-	-	-	-	95	1.6
VERSAFITCUP CC Medacta	23	0.1	57	1.1	94	1.6
BS Citieffe	-	-	50	0.9	86	1.5
DUROM HIP RESURFACING Zimmer	31	0.1	51	1.0	80	1.4
DUOFIT PDT Samo	35	0.1	17	0.3	69	1.2
TRABECULAR METAL MONOBLOCK Zimmer	241	0.9	71	1.3	66	1.1
TRILOGY Zimmer	898	3.5	50	0.9	61	1.1
CFP Link	289	1.1	81	1.5	55	1.0
CUP MAXIMOM Symbios	-	-	6	0.1	54	0.9
TRILOGY AB Zimmer	151	0.6	29	0.6	52	0.9
HILOCK LINE Symbios	332	1.3	84	1.6	51	0.9
PINNACLE SECTOR II DePuy	144	0.6	141	2.6	49	0.8
EXCEED ABT Biomet	-	-	3	0.1	48	0.8
AnCA FIT Wright Cremascoli	6418	24.7	153	2.9	45	0.8
COOPER Permedica	77	0.3	41	0.8	39	0.7
MRS RIVESTIMENTO Lima	4	0.0	43	0.8	36	0.6
CUPULE AVANTAGE Biomet	155	0.6	65	1.2	32	0.6
MALLORY Biomet	99	0.4	40	0.7	29	0.5
MBA Groupe Lepine	129	0.5	24	0.4	26	0.4
EASY HIT Medica	189	0.7	23	0.4	25	0.4
JUMP Permedica	30	0.1	1	0.0	25	0.4
ALLOFIT S Zimmer	134	0.5	33	0.6	24	0.4
SPH BLIND Lima	142	0.5	6	0.1	20	0.3
DUOFIT PSF Samo	1220	4.7	111	2.1	18	0.3
BHR Smith & Nephew	53	0.2	23	0.4	15	0.3
M2A Biomet	134	0.5	33	0.6	13	0.2
STANDARD CUP Zimmer	94	0.4	28	0.5	12	0.2
EXCEED PC Biomet	136	0.5	34	0.6	11	0.2
PORO-LOCK HIT Medica	55	0.2	3	0.1	10	0.2
MC MINN Link	79	0.3	2	0.0	3	0.1
Resurfacing ASR DePuy	35	0.1	16	0.3	3	0.1
LINEAGE Wright	34	0.1	42	0.8	2	0.0
STANDARD CUP Protek Sulzer	1150	4.4	19	0.4	-	-
ABG Stryker Howmedica	237	0.9	-	-	-	-
SPH CONTACT Lima	233	0.9	1	0.0	-	-
ELLIPTICAL CUP Stratec	197	0.8	-	-	-	-

MARBURG Zimmer	174	0.7	-	-	-	-
OSTEOLOCK Stryker Howmedica	170	0.7	-	-	-	-
SECUR-FIT Stryker Osteonics	169	0.7	-	-	-	-
ELLIPTICAL CUP HEDROCEL Stratec	154	0.6	-	-	-	-
ALBI + Wright Cremascoli	150	0.6	-	-	-	-
METASUL STAR CUP Sulzer	144	0.6	-	-	-	-
DURALOC OPTION DePuy	81	0.3	-	-	-	-
SPH PEG Lima	74	0.3	-	-	-	-
DURALOC SECTOR DePuy	71	0.3	1	0.0	-	-
RM Mathys	56	0.2	-	-	-	-
FITEK Sulzer	52	0.2	-	-	-	-
CBF Mathys	51	0.2	-	-	-	-
UNICUP Mathys	51	0.2	-	-	-	-
TIFLEX Permedica	50	0.2	-	-	-	-
Others (with less than 50)	1086	4.2	147	2.7	272	4.7
Total	**25856**	**100.0**	**5355**	**100.0**	**5789**	**100.0**

In this table cups designed for resurfacing are reported if implanted in traditional THA.

5.2 Cups used in revision surgery

	2000-2005		2006		2007	
	N.	**%**	**N.**	**%**	**N.**	**%**
MULLER Protek-Sulzer-Centerpulse-Zimmer	114	25.8	8	17.9	14	35.9
CONTEMPORARY Stryker Howmedica	93	21.1	7	15.6	7	17.9
MULLER Samo	41	9.3	6	13.3	4	10.3
MULLER Lima	30	6.8	2	4.4	3	7.7
ZCA Zimmer	25	5.7	1	2.2	2	5.1
CUPULE AVANTAGE CEMENTED Biomet	7	1.6	7	15.6	2	5.1
MULLER Smith & Nephew	10	2.3	2	4.4	1	2.6
CCB Mathys	19	4.3	0	0.0	0	0.0
MULLER Wright Cremascoli	56	12.7	2	4.4	0	0.0
Others (less than 10 cases each)	46	10.4	10	22.2	6	15.4
Total	**441**	**100.0**	**45**	**100.0**	**39**	**100.0**

	2000-2005		2006		2007	
	N.	**%**	**N.**	**%**	**N.**	**%**
FIXA Adler	25	1.9	31	13.9	35	15.6
TRIDENT Stryker Howmedica	49	3.8	32	14.3	34	15.0
TRABECULAR METAL Zimmer	15	1.2	14	6.2	24	10.6
TRILOGY Zimmer	90	7.0	13	5.8	16	7.1
DELTA PF Lima	4	0.3	11	4.9	14	6.2
TRIDENT ARC2F Stryker Howmedica	4	0.3	14	6.2	9	4.0
MC MINN Link	76	5.9	5	2.2	6	2.7
EP-FIT PLUS Endoplus	1	0.1	3	1.3	6	2.7
REFLECTION Smith & Nephew	9	0.7	2	0.9	5	2.2
SPH BLIND Lima	5	0.4	1	0.4	5	2.2
SPH BICOMPONENTE Lima	1	0.1	4	1.8	5	2.2
PROCOTYL-Z-PIVOT Wright Cremascoli	8	0.6	8	3.6	4	1.8
ABGII Stryker Howmedica	12	0.9	1	0.4	3	1.3
TRILOGY AB Zimmer	8	0.6	3	1.3	2	0.9
SPH REVISION Lima	8	0.6	2	0.9	2	0.9
BICON PLUS Endoplus	4	0.3	4	1.8	2	0.9
BOFOR Endoplus	3	0.2	5	2.2	2	0.9
AnCA FIT Wright Cremascoli	293	22.7	4	1.8	1	0.4
FITMORE Zimmer	40	3.1	6	2.7	1	0.4
LOR ALLOPRO Sulzer	43	3.3	3	1.3	1	0.4
PROCOTYL-E Wright Cremascoli	34	2.6	1	0.4	1	0.4
PINNACLE MULTIHOLE II DePuy	20	1.6	9	4.0	1	0.4
STANDARD CUP PROTEK Sulzer	130	10.1	1	0.4	-	-
DUOFIT PSF Samo	36	2.8	13	5.8	-	-
OSTEOLOCK Stryker Howmedica	47	3.6	-	-	-	-
CLS Zimmer	39	3.0	-	-	-	-
CONICAL SCREW CUP Protek	25	1.9	-	-	-	-
SECUR-FIT Stryker Osteonics	25	1.9	-	-	-	-
ARTHOPOR II Johnson&Johnson	17	1.3	-	-	-	-
ALLOFIT S Zimmer	16	1.2	-	-	-	-
HAC CERAFIT CUP Ceraver Osteal	14	1.1	-	-	-	-
CERAFIT Ceraver Osteal	13	1.0	-	-	-	-
SPH CONTACT Lima	13	1.0	-	-	-	-
CUSTOM MADE PROCOTYL Z PIVOT Wright Cremascoli	12	0.9	-	-	-	-
HILOCK REV Symbios	9	0.7	1	0.4	-	-
MARBURG Centerpulse	10	0.8	-	-	-	-
Others (less than 10 cases each)	135	10.5	35	15.1	47	20.8
Total	**1293**	**100.0**	**226**	**100.0**	**226**	**100.0**

5.3 Stems used in primary surgery

	2000-2005		2006		2007	
	N.	%	N.	%	N.	%
APTA Adler	247	3.1	329	34.5	190	24.6
EXETER Stryker Howmedica	753	9.6	135	14.2	124	16.1
BASIS Smith & Nephew	432	5.5	105	11.0	103	13.3
SPECTRON Smith & Nephew	600	7.6	43	4.5	43	5.6
VERSYS ADVOCATE Zimmer	89	1.1	43	4.5	37	4.8
P507 Samo	534	6.8	44	4.6	35	4.5
CCA Mathys	89	1.1	31	3.3	25	3.2
ARCAD SO Symbios	13	0.2	12	1.3	25	3.2
C STEM DePuy	262	3.3	33	3.5	16	2.1
DEFINITION Stryker Howmedica	298	3.8	19	2.0	15	2.0
MBA Groupe Lepine	58	0.7	10	1.1	15	2.0
AB Citieffe	43	0.5	13	1.4	15	2.0
AD Samo	341	4.3	10	1.1	11	1.4
SL Lima	51	0.6	4	0.4	11	1.4
LUBINUS SP2 Link	252	3.2	21	2.2	4	0.5
DUOFIT CFS Samo	65	0.8	2	0.2	4	0.5
LC Samo	338	4.3	10	1.1	3	0.4
VERSYS CEMENTED LD Zimmer	126	1.6	5	0.5	3	0.4
MS 30 Zimmer	178	2.3	-	-	2	0.3
JVC Wright Cremascoli	719	9.2	3	0.3	1	0.1
ABGII Stryker Howmedica	57	0.7	1	0.1	1	0.1
MRL Wright Cremascoli	470	6.0	-	-	-	-
VERSYS CEMENTED Zimmer	333	4.2	-	-	-	-
AHS Wright Cremascoli	295	3.7	-	-	-	-
ABG Stryker Howmedica	226	2.9	-	-	-	-
ULTIMA Johnson&Johnson	199	2.5	-	-	-	-
ANCA Wright Cremascoli	90	1.1	-	-	-	-
FULLFIX Mathys	65	0.8	-	-	-	-
PERFECTA RA Wright	60	0.8	-	-	-	-
Others (less than 50 cases each)	605	7.7	78	8.2	89	11.5
Total	**7888**	**100.0**	**951**	**100.0**	**772**	**100.0**

	2000-2005		2006		2007	
	N.	%	N.	%	N.	%
APTA Adler	644	3.0	854	17.8	855	16.1
SL PLUS Endoplus	937	4.4	423	8.8	568	10.7
RECTA Adler	325	1.5	401	8.3	532	10.0
CBC Mathys	169	0.8	147	3.1	348	6.5
ABGII Stryker Howmedica	1570	7.3	300	6.3	320	6.0
CONUS Zimmer	2549	11.9	328	6.9	309	5.8
PROXIPLUS Endoplant Gmbh	60	0.3	133	2.8	235	4.4
TAPERLOC Biomet	318	1.5	203	4.3	225	4.2
CLS Zimmer	2956	13.7	286	6.0	141	2.7
ALATA ACUTA S Adler	3	0.0	92	1.9	141	2.7
C2 Lima	367	1.7	89	1.9	140	2.6
VERSYS FIBER METAL TAPER Zimmer	705	3.3	58	1.2	135	2.5
CFP Link	328	1.5	133	2.8	106	2.0
SYNERGY Smith & Nephew	229	1.1	26	0.5	98	1.8
ANCA FIT Wright Cremascoli	4097	19.0	141	3.0	81	1.5
MODULUS HIP SYSTEM Lima	107	0.5	82	1.7	73	1.4
HIPSTAR Stryker Howmedica	209	1.0	101	2.1	72	1.4
Z1 Citieffe	1	0.0	40	0.8	67	1.3
QUADRA-S Medacta	36	0.2	35	0.7	54	1.0
SPS MODULAR Symbios	24	0.1	16	0.3	53	1.0
ARCAD HA Symbios	24	0.1	46	1.0	50	0.9
CONELOCK SHORT Biomet	1	0.0	46	1.0	35	0.7
ACCOLADE Stryker Osteonics	150	0.7	47	1.0	34	0.6
PBF Permedica	98	0.5	32	0.7	34	0.6
MULTIFIT Samo	3	0.0	23	0.5	34	0.6
NANOS Endoplant Gmbh	3	0.0	22	0.5	34	0.6
QUADRA-H Medacta	-	-	34	0.7	33	0.6
FIT STEM Lima	148	0.7	53	1.1	32	0.6
BHS Smith & Nephew	332	1.5	70	1.5	24	0.5
CORAIL DePuy	273	1.3	61	1.3	24	0.5
MAYO Zimmer	54	0.3	21	0.4	23	0.4
PROFEMUR L Wright Cremascoli	19	0.1	28	0.6	23	0.4
ALLOCLASSIC SL Zimmer	12	0.1	21	0.4	22	0.4
SUMMIT DePuy	25	0.1	82	1.7	19	0.4
S. ROM Johnson&Johnson	100	0.5	22	0.5	18	0.4
PORO-LOCK II HIT Medica	73	0.3	2	0.0	18	0.4
EASY Hitmedica	183	0.9	22	0.5	16	0.3
DUOFIT RTT Samo	29	0.1	10	0.2	14	0.3
SL REVISION Zimmer	83	0.4	15	0.3	13	0.3
MBA HAP Groupe Lepine	56	0.3	19	0.4	13	0.3
DUOFIT RKT Samo	245	1.1	36	0.8	12	0.2
SPS Symbios	190	0.9	20	0.4	11	0.2
PPF Biomet	128	0.6	9	0.2	5	0.1
ARCAD CN Symbios	67	0.3	12	0.3	5	0.1
PROFEMUR Z Wright Cremascoli	619	2.9	9	0.2	2	0.0
EHS Wright Cremascoli	276	1.3	32	0.7	1	0.0
STELO MODULARE NDS1 Citieffe	70	0.3	5	0.1	1	0.0
ALLOCLASSIC SL Centerpulse	64	0.3	5	0.1	1	0.0

METABLOC Zimmer	68	0.3	1	0.0	1	0.0
ABG Stryker Howmedica	331	1.5	-	-	-	-
ANCA-FIT CLU Wright Cremascoli	312	1.5	2	0.0	-	-
PROXILOCK FT Stratec	301	1.4	4	0.1	-	-
STEM Wright Cremascoli	208	1.0	-	-	-	-
G3 Citieffe	177	0.8	-	-	-	-
ALLOCLASSIC SL ALLOPRO Sulzer	112	0.5	-	-	-	-
CITATION Stryker Howmedica	112	0.5	-	-	-	-
PROFEMUR C Wright Cremascoli	86	0.4	-	-	-	-
PPF Stratec	83	0.4	-	-	-	-
PERFECTA Wright	65	0.3	-	-	-	-
MERIDIAN Stryker Howmedica	54	0.3	-	-	-	-
Others (less than 50 cases each)	578	2.7	77	1.6	212	4.0
Total	**21446**	**100.0**	**4776**	**100.0**	**5317**	**100.0**

5.4 Stems used in revision surgery

	2000-2005		2006		2007	
	N.	%	N.	%	N.	%
APTA Adler	8	3.0	8	16.3	10	29.4
EXETER Stryker Howmedica	44	16.3	11	22.5	9	26.5
JVC Wright Cremascoli	27	10.0	2	4.1	3	8.8
AD Samo	26	9.6	1	2.0	1	2.9
VERSYS REVISION CALCAR Zimmer	9	3.3	5	10.2	-	-
ANCA Wright Cremascoli	25	9.3	-	-	-	-
Others (less than 10 cases each)	131	48.5	22	44.9	11	32.4
Total	**270**	**100.0**	**49**	**100.0**	**34**	**100.0**

	2000-2005		2006		2007	
	N.	%	N.	%	N.	%
RESTORATION Stryker Howmedica	37	2.5	50	22.5	52	22.6
SL REVISION Zimmer	17	1.2	18	8.1	26	11.3
ALATA AEQUA REVISION Adler	-	-	8	3.6	15	6.5
ZMR REVISION TAPER CONE Zimmer	17	1.2	6	2.7	12	5.2
MGS Samo	52	3.5	15	6.8	12	5.2
EMPERION Smith & Nephew	-	-	3	1.3	10	4.3
REVISION HIP Lima	3	0.2	7	3.2	10	4.3
PROFEMUR R VERS. 4 Wright Cremascoli	367	25.0	20	9.0	10	4.3
ALATA ACUTA S Adler	-	-	7	3.2	9	3.9
C2 Lima	31	2.1	4	1.8	9	3.9
MODULUS HIP SYSTEM Lima	4	0.3	4	1.8	6	2.6
SL PLUS Endoplus	10	0.7	6	2.7	6	2.6
S. ROM Johnson&Johnson	110	7.5	17	7.7	6	2.6
CONUS Zimmer	65	4.4	2	0.9	5	2.2
VERSYS FIBER METAL TAPER Zimmer	11	0.8	1	0.4	4	1.7
CONELOCK REVISION Stratec	25	1.7	8	3.6	4	1.7
SLR PLUS Endoplus	9	0.6	1	0.4	3	1.3
SL REVISION Centerpulse	21	1.4	2	0.9	3	1.3
MP RECONSTRUCTION PROSTHESIS Link	34	2.3	4	1.8	3	1.3
REEF DePuy	7	0.5	2	0.9	1	0.4
CLS Zimmer	33	2.3	2	0.9	1	0.4
ANCA FIT Wright Cremascoli	55	3.7	2	0.9	1	0.4
ANCA-FIT CLU Wright Cremascoli	10	0.7	-	-	-	-
APTA Adler	8	0.5	5	2.3	-	-
CBK REVISION STEM Mathys	18	1.2	2	0.9	-	-
ZMR REVISION TAPER Zimmer	30	2.0	-	-	-	-
PROFEMUR non noto Wright Cremascoli	38	2.6	1	0.4	-	-
RESTORATION T3 Stryker Howmedica	74	5.0	-	-	-	-
SL REVISION Sulzer	291	19.8	8	3.6	-	-
Others (less than 10 cases each)	92	6.3	17	7.7	23	10.0
Total	**1469**	**100.0**	**222**	**100.0**	**231**	**100.0**

5.5 Number of different types of implant

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

	Primary THA	
	Stems	**Cups**
2000	93	87
2001	98	92
2002	94	90
2003	110	94
2004	99	84
2005	110	90
2006	98	87
2007	113	100

In year 2007 13 new types of cup and 15 new types of stem were implanted.

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

	Total revision	
	Stems	**Cups**
2000	48	58
2001	55	64
2002	48	59
2003	60	62
2004	40	46
2005	44	45
2006	55	55
2007	50	60

The marked dispersion of models is evident. The low number of the homogeneous population according to type of component implanted will make the statistic evaluation of the effectiveness of the device difficult.
Types have not been considered different when only change of trade-marked occurred (ex. Sulzer-Centerpulse, or Johnson & Johnson-Depuy)
.

5.6 Resurfacing prosthesis

The resurfacing prosthesis represents an innovative solution for some categories of patients The following Table shows the percentages of traditional joint arthroplasty andresurfacing prostheses.

	Primary surgery	
	Traditional	**Resurfacing**
2000	100.0%	-
2001	99.9%	0.1%
2002	99.3%	0.7%
2003	98.5%	1.5%
2004	97.9%	2.1%
2005	96.9%	3.1%
2006	96.6%	3.4%
2007	96.8%	3.2%

Types of resurfacing from **01/01/2001** to **31/12/2007**

Type of prostheses	**N.**	**%**
BHR – Smith & Nephew	564	68.6
ASR – DePuy	39	4.7
MRS – Lima	43	5.2
ADEPT – Finsbury	35	4.3
RECAP – Biomet	26	3.2
CONSERVE PLUS – Wright	17	2.1
ICON – International Orthopaedics	22	2.7
MITCH TRH – Finsbury	47	5.7
DURON Hip Resurfacing – Zimmer	9	1.1
BMHR – Smith & Nephew	20	2.4
Total*	**822**	**100.0**

* 1 case missing

5.7 Modular neck

30,3%of stems implanted in primary surgery have modular neck.

	Primary surgery	
	Standard neck	**Modular neck**
2000	78.2	21.8
2001	74.8	25.2
2002	70.9	29.1
2003	72.8	27.2
2004	69.6	30.4
2005	67.1	32.9
2006	63.7	36.3
2007	64.6	35.4

Stems with modular neck

	2000-2005		2006		2007	
	N.	**%**	**N.**	**%**	**N.**	**%**
APTA Adler	891	10.8	1183	56.8	1045	48.8
RECTA Adler	326	4.0	401	19.3	532	24.8
ALATA ACUTA S Adler	3	0.1	92	4.4	142	6.6
ANCA FIT Wright Cremascoli	4109	49.9	142	6.8	81	3.8
MODULUS HIP SYSTEM Lima	108	1.3	82	3.9	73	3.4
SPS MODULAR Symbios	24	0.3	16	0.8	53	2.5
MERCURIUS Adler	-	-	-	-	39	1.8
MULTIFIT Samo	3	0.1	23	1.1	34	1.6
HYDRA Adler	-	-	-	-	26	1.2
PROFEMUR L Wright Cremascoli	19	0.2	28	1.3	23	1.1
S-ROM DePuy	39	0.5	22	1.1	18	0.8
MBA Groupe Lepine	58	0.7	10	0.5	15	0.7
MBA HAP Groupe Lepine	57	0.7	19	0.9	13	0.6
PROFEMUR Z Wright Cremascoli	620	7.5	9	0.4	2	0.1
JVC Wright Cremascoli	719	8.7	3	0.1	1	0.1
EHS Wright Cremascoli	276	3.4	32	1.5	1	0.1
STELO MODULARE NDS1 Citieffe	70	0.8	5	0.2	1	0.1
ANCA-FIT Dual fit Wright Cremascoli	312	3.8	2	0.1	-	-
STEM Wright Cremascoli	208	2.5	-	-	-	-
G3 Citieffe	177	2.1	-	-	-	-
PROFEMUR C Wright Cremascoli	86	1.0	-	-	-	-
ALBI PTC Wright Cremascoli	31	0.4	2	0.1	-	-
Others (less than 20 each)	102	1.2	14	0.7	41	1.9
Total	**8238**	**100.0**	**2085**	**100.0**	**2140**	**100.0**

5.8 Articular coupling and head diameter

Number of primary total hip arthroplasty operations carried out on patients with admission date between 1st January 2000 and 31st December 2007, according to ***type of operation and articular coupling****.*

	Total hip arthroplasty		**Total revision**	
	N.	**%**	**N.**	**%**
Metal-polyethylene	9677	24.7	577	27.3
Metal- polyethylene crosslinked	3831	9.8	318	15.1
Ceramic-polyethylene	8470	21.6	619	29.3
Ceramic- polyethylene crosslinked	1089	2.8	92	4.4
Ceramic-ceramic	12147	31.0	429	20.3
Metal-metal	3765	9.6	76	3.6
Cerid- polyethylene	184	0.5	-	-
Total*	**39163**	**100.0**	**2111**	**100.0**

* 2093 missing data for primary and 165 for revision

Percentage of primary surgery with crosslinked poly

	Total hip arthroplasty		
	Standard poly	**Crosslinked poly**	**Undefined poly**
2000	45.7	9.6	44.7
2001	77.8	15.8	6.4
2002	80.8	15.3	3.9
2003	81.2	17.3	1.5
2004	76.3	22.7	1.0
2005	73.6	25.3	1.0
2006	72.3	27.2	0.4
2007	73.0	26.8	0.2

*Percentage of total hip arthroplasty according **to articular coupling** during the years. In brackets percentage of cross-linked poly*

	Primary surgery			
	met-poly	**cer-poly**	**cer-cer**	**met-met**
2000	45.6 (?)	28.9 (?)	18.5	7.0
2001	41.2 (?)	30.6 (?)	20.6	7.6
2002	39.5 (?)	30.8 (?)	22.4	7.3
2003	39.8 (10.3)	28.4 (1.4)	23.7	8.1
2004	35.6 (11.2)	28.0 (3.2)	27.9	8.5
2005	34.1 (11.0)	23.0 (3.4)	33.7	9.2
2006	29.6 (9.2)	17.6 (3.7)	40.3	12.5
2007	28.8 (7.9)	16.4 (4.3)	43.1	11.7

*Percentage of total revision according **to articular coupling** during the years. In brackets percentage of cross-linked poly*

	Total revision			
	met-poly	**cer-poly**	**cer-cer**	**met-met**
2000	47.4	34.5	17.1	1.0
2001	48.9	38.9	10.1	2.1
2002	41.3	45.0	11.7	2.0
2003	40.7 (12.3)	45.0 (6.0)	13.3	1.0
2004	43.5 (11.6)	30.5 (2.0)	20.3	5.7
2005	41.6 (13.6)	26.7 (4.8)	23.5	8.2
2006	45.2 (18.9)	22.0 (4.1)	26.3	6.5
2007	39.0 (17.9)	23.0 (7.7)	34.9	3.1

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

	Elective THA			
	met-poly	**cer-poly**	**cer-cer**	**met-met**
<40	7.0	13.9	57.4	21.7
40-49	10.8	14.9	53.3	21.0
50-59	15.9	17.8	47.6	18.7
60-69	30.5	25.3	34.5	9.7
70-79	45.2	31.5	19.6	3.7
> 80	63.9	23.3	10.1	2.7

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2007, according **to material** and **diameter of the head**.

	Diameter of the head (mm)											
	22		26		28		32		36		>=38	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
Biolox forte	-	-	-	-	15554	47.7	3545	85.2	2179	72.8	-	-
Cr-Co	110	73.3	16	80.0	13623	41.8	431	10.4	419	14.0	1095	100.0
Stainless steel	39	26.0	4	20.0	2688	8.2	116	2.8	-	-	-	-
Zirconia	1	0.7	-	-	444	1.4	18	0.4	-	-	-	-
Cerid	-	-	-	-	180	0.6	-	-	-	-	-	-
Biolox delta	-	-	-	-	100	0.3	52	1.2	393	13.1	-	-
Revision ceramic	-	-	-	-	-	-	-	-	1	0.1	-	-
Total*	**150**	**100.0**	**20**	**100.0**	**32589**	**100.0**	**4162**	**100.0**	**2992**	**100.0**	**1095**	**100.0**

- 248 (0.6%) missing data

5.9 Prosthesis fixation

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2007, according **to type of operation** and **fixation method**.

Fixation method	Primary THAi	%	Total revision	%
Cementless	31226	76.0	1546	68.1
Hybrid (stem cemented and cementless cup)	5718	13.9	195	8.6
Cemented	3883	9.4	159	7.0
Cementless stem and cemented cup	300	0.7	371	16.3
Total*	**41127**	**100.0**	**2271**	**100.0**

* data not supplied in 129 primary operations and 5 revision operations

Fixation of the acetabular component of the resurfacing prosthesis was press fit in 100% of the cases and in 14,5% of the cases screws were used.

*Percentage of total hip arhroplasties **according to fixation**, during the years*

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	Primary surgery			
	Cemented	**Cementless**	**Hybrid**	**Reverse hybrid**
2000	15.8	60.5	22.9	0.8
2001	14.4	65.8	19.1	0.7
2002	12.2	70.9	16.1	0.8
2003	11.1	73.1	15.1	0.7
2004	8.8	77.8	12.4	1.0
2005	7.1	80.2	11.9	0.8
2006	4.8	84.2	10.4	0.6
2007	3.4	87.9	8.1	0.6

*Percentage of total hip arhroplasties **according to fixation and class age***

	Elective Primary surgery			
	Cemented	**Cementless**	**Hybrid**	**Reverse hybrid**
<40	1.0	96.8	1.5	0.7
40-49	0.5	98.0	1.1	0.4
50-59	0.9	95.3	3.3	0.5
60-69	2.2	85.6	11.7	0.5
70-79	11.5	66.2	21.4	0.9
≥80	33.9	46.3	18.2	1.6

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

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

Percentage of total hip arhroplasties ***according to fixation and class age*** - 2007

	Elective primary surgery year 2007			
	Cemented	**Cementless**	**Hybrid**	**Reverse hybrid**
<40	0.6	98.4	0.5	0.5
40-49	0.5	98.3	1.0	0.2
50-59	0.4	98.4	0.7	0.5
60-69	0.8	95.3	3.7	0.2
70-79	3.5	82.7	13.2	0.6
≥80	16.2	62.6	20.0	1.2

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

	Total revision			
	Cemented	**Cementless**	**Hybrid**	**Reverse hybrid**
2000	10.9	63.1	9.6	16.4
2001	9.4	63.0	8.2	19.4
2002	6.7	65.2	7.4	20.7
2003	7.3	68.5	7.3	16.9
2004	6.9	69.6	8.9	14.6
2005	6.4	69.1	8.6	15.9
2006	5.7	72.9	11.1	10.3
2007	3.1	75.2	9.9	11.8

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

	Total revision			
	Cemented	**Cementless**	**Hybrid**	**Reverse hybrid**
<40	2.9	85.4	2.9	8.8
40-49	5.4	85.1	4.1	5.4
50-59	2.5	80.8	5.1	11.6
60-69	4.6	71.4	7.0	17.0
70-79	6.0	66.8	9.6	17.6
≥80	18.0	52.9	11.9	17.2

5.10 Bone cement

Type of cement *used in primary surgery with at least one cemented component and in hemiarthroplasty (information recorded in RIPO from 30/09/2001)*

Type of cement	THA %	Hemiarthroplasty %
Surgical Simplex P – Howmedica	33.4	30.4
Cemex System – Tecres	13.9	31.4
Palacos R – Biomet	8.7	3.0
Amplicem 3 – Amplimedical	5.8	4.6
Antibiotic Simplex – Howmedica	*4.4*	*3.0*
Cemex – Tecres	4.0	7.0
Smartset HV – Depuy	3.9	0.9
Cemex RX – Tecres	2.6	8.3
CMW 3 – Depuy	2.1	2.1
Cemex + Cemex System - Tecres	2.2	-
Amplicem 1 + Amplicem 3 – Amplimedical	1.9	-
Exolent High – Elmdown	1.6	1.2
Sulcem 3 – Centerpulse	1.5	2.3
Amplicem 1 – Amplimedical + Smartset HV – Depuy	1.5	-
Cemex System – Tecres + Surgical Simplex P – Howmedica	1.3	-
Cemfix 3 – Teknimed	1.1	-
Aminofix 1 – Groupe Lepine	1.0	-
Versabond – Smith & Nephew	1.0	-
Cemfix 1 – Teknimed	0.9	0.3
Palacos R 40 – SP Europe	0.9	0.2
Cemex RX + Cemex System - Tecres	0.8	-
Smartset MV – Depuy	0.6	0.9
Amplicem 1 – Amplimedical	0.5	0.1
Cemex Genta System – Tecres	*0.5*	*0.7*
Cemex Genta - Cemex Genta System – Tecres	*0.4*	-
CMW 1 – Depuy	0.4	0.7
Refobacin Bone Cement R – Biomet	*0.3*	-
Vacu Mix Plus CMW 3 - Depuy	0.3	0.5
Cemex Genta – Tecres	*0.2*	*0.1*
Cemex XL – Tecres	0.2	0.9
Palacos R – Biomet + Surgical Simplex P – Howmedica	0.2	-
Sulcem 1 – Centerpulse	0.2	0.2
Endurance – Depuy	0.1	0.5
Exolent Low - Elmdown	0.1	0.3
CMW 1 G – Depuy	-	*0.2*
Other	1.5*	0.2
Total	**100.0%**	**100.0%**

* in 0.7% of cases it is antibiotic-loaded.

The stem is cemented in 79.5% of cases under pressure with applicator, in 18,3% manually, and in the remaining 2,2% by aspiration system

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

The most commonly used surgical approaches are lateral and postero-lateral.
64% of THA is implanted through lateral approach, 27,9% through postero-lateral.
Minimally invasive approach is used in 2,8% of operations.
86,4% of resurfacing prostheses is implanted through postero-lateral approach.
54.2% of hemiarthroplasties is implanted through lateral approach, 41,8% through postero-lateral

86.4% of resurfacing is implanted through postero-lateral approach

In 14,3% of revision surgery of cups, **reinforcement rings** were uses.

6. Types of hemiarthroplasty

6.1 Stem and head

TYPES OF HEMIARTHROPLASTY (head + stem)	**N.**	**%**
SPERI LOCK + SPERI SYSTEM II Hit Medica	1502	8.9
C1 Citieffe + AB Citieffe	1465	8.7
SPERI LOCK + SL STREAKES Hit Medica	767	4.6
UHR Osteonics + ACCOLADE Stryker Osteonics	688	4.1
SPERI LOCK + SL Hit Medica	677	4.0
CUPOLA MOBILE BIARTICOLARE + SL Permedica	631	3.8
CUPOLA SEM + SEM II D.M.O.	602	3.6
CUPOLA BIPOLARE + CCA Mathys	560	3.3
CUPOLA MOBILE + JVC Wright Cremascoli	469	2.8
JANUS + FIN Bioimpianti	445	2.7
TESTA BIARTICOLARE + SL Lima	426	2.5
TESTA ELLITTICA + LC Samo	416	2.4
TESTA BIARTICOLARE LOCK + LOGICA MIRROR Lima	332	2.0
ULTIMA + ULTIMA LX Johnson & Johnson	311	1.9
CUPOLA MOBILE + AHS Wright Cremascoli	307	1.8
ULTIMA MONK + G2 Depuy	303	1.8
UHR Osteonics + RELIANCE Stryker Howmedica	296	1.7
CENTRAX + HIP FRACTURE Stryker Howmedica	288	1.7
BI-POLAR + PPF Biomet	256	1.5
MODULAR BIPOLAR + STANDARD STRAIGHT Protek	251	1.5
SPHERIC Amplitude + APTA Adler	245	1.4
RETENTIVE MOBILE CUP Cedior + ORTHO-FIT Allopro	210	1.3
TESTA BIARTICOLARE LOCK + LOGICA Lima	210	1.3
UHR Osteonics + EXETER Stryker Howmedica	202	1.2
BICENTRIC + RELIANCE Stryker Howmedica	200	1.2
TESTA BIARTICOLARE LOCK + SL Lima	181	1.1
C1 Citieffe + VERSYS Zimmer	180	1.1
CUPOLA MOBILE Wright Cremascoli + VERSYS Zimmer	178	1.0
TESTA BIPOLARE Amplimedical + SL Amplimedical	155	0.9
CUPOLA MOBILE Tekno-Fin + STANDARD STRAIGHT Protek	145	0.9
CUPOLA MOBILE + ORTHO-FIT Centerpulse	135	0.8
CUPOLA MOBILE + MRL Wright Cremascoli	129	0.8
CENTRAX + EXETER Stryker Howmedica	128	0.8
CUPOLA BIPOLARE + VERSYS HERITAGE Zimmer	127	0.8
UHR Osteonics + DEFINITION Stryker Howmedica	127	0.8
CUPOLA MOBILE + ORTHO-FIT Zimmer	120	0.7
MODULAR BIPOLAR + STANDARD STRAIGHT Zimmer	110	0.7
SPERI LOCK Hit Medica + MRL Wright Cremascoli	107	0.6
TESTA BIPOLARE + DUOFIT CKA Samo	99	0.6
CORON + ENDON Tantum	81	0.5
ULTIMA + ULTIMA STRAIGHT Johnson & Johnson	73	0.4
CUPOLA MOBILE + QUADRA-C Medacta	72	0.4
TESTA BIPOLARE + H-AC STEM FURLONG Jri	72	0.4
BICONTACT + BICONTACT Aesculap	67	0.4
THOMPSON + THOMPSON Corin	66	0.4
C1 Citieffe + DEON Bioimpianti	64	0.4
SPERI LOCK Hit Medica + ALBI PTC Wright Cremascoli	60	0.4

RETENTIVE MOBILE CUP Cedior + METABLOC Protek	56	0.3
CUPOLA SEM + SEM.D.M.O.	53	0.3
CENTRAX + DEFINITION Stryker Howmedica	51	0.3
Other (328 types less than 50 each)	1909	11.4
Total *	**16784**	**100%**

*180 missing data (1,1%)

6.2 Other characteristics of hemiarthroplasties

Number of surgeries according to **head type**

Head type	N.	%
Bipolar head to be assembled in the operating theatre	15304	91.5
Preassembled bipolar head	891	5.3
Monopolar head	526	3.2
Total*	**16721**	**100.0**

*** 63** missing cases, equal to 0.4%

The most commonly used heads are biarticular, pre-assembled and ready for implantation. Two components to be assembled during surgery are very rarely used.

In 90,2% of cases the stem of the hemiarthroplasties was cemented and the stem had a modular neck in only 6% of cases.

In 1.5% of cases the hemiarthroplasties had a ceramic head, all the other heads were metal.

7. Blood transfusion

Percentages of operations performed on patients admitted between 1st January 2003 and 31st December 2007 **according to type of operation and transfusion**

Type of surgery	None	Autologus (recovery)	Autologus (predeposit)	Homologous	Autologous and Homologous
Emergency primary	22.1	11.3	0.0	58.0	8.6
Elective primary	11.6	17.4	43.7	16.3	11.0
Revision	8.2	12.0	20.7	42.4	16.7

In the following tabs, the analysis has been performed according to type of operation and and healthcare structure

Emergency primary THA and hemiarthroplasty				
Type of hospital	**None**	**Autologus (recovery)**	**Homologous**	**Autologous and homologous**
AOSP	31.7	3.9	63.8	0.6
Private	9.0	30.0	28.0	33.0
AUSL	38.0	5.2	52.7	4.1
IOR	4.1	0.2	95.7	0.0

Elective THA				
Type of hospital	**None**	**Autologus**	**Homologous**	**Autologous and homologous**
AOSP	13.6	69.7	12.8	3.9
Private	6.1	69.8	7.6	16.5
AUSL	18.7	53.8	16.0	11.5
IOR	4.0	57.2	31.5	7.3

8. Complications occurred during hospitalization

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

The rate of complications in **primary surgery** carried out on patients hospitalised between January 1st 2000 and December 31st 2007.

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	152	*0.4*	Hematoma	397	*1.0*	Anemia	1487	*3.6*
Diaphyseal fracture	140	*0.3*	Prosthesis disloc	202	*0.5*	Hyperpyrexia	349	*0.8*
			SPE paralysis	83	*0.2*	Genito-urinary	185	*0.4*
Anesthesiologic complications.	66	*0.2*	Deep vein thromb	62	*0.2*	Gastro-intestinal	151	*0.4*
			Infection	31	*0.1*	Cardiovascular	86	*0.2*
Cotyle fracture	49	*0.1*	Crural paralysis	44	*0.1*	Embolism	74	*0.2*
			Bed sores	43	*0.1*	Collaps	64	*0.2*
Greater trochanter fract	67	*0.2*	Bleeding	94	*0.2*	Respiratory	63	*0.2*
						Infarction	49	*0.1*
Others	55	*0.1*	Others	133	*0.3*	Dispnea	39	*0.1*
						Others	261	*0.6*
Total	**529**	***1.3***	**Total**	**1089**	***2.6***	**Total**	**2808**	***6.8***

The rate of complications in **revision surgery** carried out on patients hospitalised between January 1st 2000 and December 31st 2007

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	38	*0.6*	Hematoma	93	*1.3*	Anemia	317	*4.6*
Diaphyseal fracture	104	*1.5*	Prosthesis disloc	61	*0.9*	Cardiovascular	31	*0.4*
			SPE paralysis	31	*0.4*	Hyperpyrexia	49	*0.7*
Anesthesiologic complications.	20	*0.3*	Infection	19	*0.3*	Collaps	23	*0.3*
			Bleeding	41	*0.6*	Genito-urinary	24	*0.3*
Cotyle fracture	11	*0.2*	Bed sores	11	*0.2*	Gastro-intestinal	19	*0.3*
			Deep vein thromb	7	*0.1*	Embolism	15	*0.2*
Greater trochanter fracture	17	*0.2*	Crural paralysis	5	*0.1*	Respiratory	9	*0.1*
Others Altro	24	*0.3*	Others Altro	25	*0.4*	Infarction	17	*0.2*
						Others	65	*0.9*
Total	**214**	***3.1***	**Total**	**293**	***4.2***	**Total**	**569**	***8.3***

The rate of complications in **hemiarthroplasty** carried out on patients hospitalised between January 1st 2000 and December 31st 2007.

Complications observed during hospitalization								
Intra-operative			**Post-operative local**			**Post-operative general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Calcar fracture	40	*0.2*	Hematoma	108	*0.6*	Anemia	898	*5.4*
			Prosthesis disloc	79	*0.5*	Genito-urinary	179	*1.1*
Anesthesiologic complications	66	*0.4*	Bed sores	68	*0.4*	Hyperpyrexia	144	*0.9*
			Deep venous thromb	46	*0.3*	Cardiovascular	102	*0.6*
Diaphyseal fracture	26	*0.2*	SPE paralysis	42	*0.3*	Respiratory	106	*0.6*
			Infection	18	*0.1*	Gastro-intestinal	92	*0.5*
Cotyle fracture	2	*0.01*	Bleeding	14	*0.1*	Collaps	142	*0.8*
						Embolism	83	*0.5*
						Confusion.	24	*0.1*
Greater trochanter fracture	33	*0.2*	Crural paralysis	1	*0.01*	Cerebral ischemia	26	*0.2*
Others	22	*0.1*	Others	18	*0.1*	Infarction	55	*0.3*
						Others	146	*0.9*
Total	**189**	***1.1***	**Total**	**394**	***2.3***	**Total**	**1997**	***11.9***

The complications recorded refer only to those that occurred during hospitalization.

8.1 Deaths during hospitalization

Number of deaths in prosthetic surgery on patients hospitalized between January 1st 2000 and December 31st 2007.
(the deaths recorded are those that occurred during hospitalization).

Years 2000-2007			
Years of operation	**Deaths**	**n. of operations**	**Percentage**
Primary THA	113	41256	0.3
Hemiarthroplasty	693	16784	4.1
Revision	46	6895	0.7
Prosthesis removal	9	410	2.2
Resurfacing prostheses	-	823	-

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

Death in first 90 days after surgery - Hemiarthroplasty			
Years of operation	**Deaths**	**n. of operations**	**Percentage**
2000	175	1755	10.0
2001	177	2124	8.3
2002	155	1937	8.0
2003	141	2021	7.0
2004	171	2233	7.7
2005	170	2297	7.4
2006	158	2363	6.7
2007	134	2054	6.5
Total	**1281**	**16784**	**7.6**

9. Duration of pre-operative hospitalization

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

Year 2000			
Type of operation	**N.**	***Mean pre-op***	**Range**
Primary THA	4282	2.4	0-49
Hemiarthropl	1755	3.5	0-44
Revision	719	3.9	0-52
Prosthesis removal	37	5.3	0-20
Year 2007			
Type of operation	**N.**	***Mean pre-op***	**Range**
Primary THA	6068	1.8	1-76
Hemiarthropl	2041	3.8	1-35
Revision	997	3.6	1-59
Resurfacing	198	1.3	1-5
Prosthesisremoval	60	7.6	1-92

Days of pre-operative hospitalization are diminishing in all types of operation but hemiarthroplasty.

10. Analysis of survival of primary surgery

10.1 Cox multivariate analysis

The Cox multivariate analysis identifies any variables that are independent from each other that can influence the event, in our case the removal of at least one prosthesis component. Analysis was performed on three indipendent 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 2007 were analyzed.

COX PROPORTIONAL RISK MODEL

Variables

Dependent: Follow-up
Independent: Age,gender, diagnosis, number of operation perfomed per year

Number of valid observations 41.033
Non revised: 40.150
Revised: 883

Chi-square: 46.9 *p*= 0.0001

VARIABLE	SIGNIFICANCE (P)
Gender	**NS** (0.13)
Age	**NS** (0.30)
Diagnosis	**S** (0.001)
Less than 50 operations/year	**NS** (0.33)

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.
The only variable in the model that influences significantly the outcome of surgery is preoperative diagnosis, as already verified last year.
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 loosening.
To analyze the influence of the disease, the patients were divided into 6 groups:
- coxarthrosis,
- rheumatic arthritis (rheumatoid arthritis, psoriasis, rhizomelic spondylitis)
- femoral fractures and their consequences (necrosis and post-traumatic arthrosis)
- idiopathic necrosis of the femoral head
- sequelae of congenital and infantile diseases (LCA, DCA, Perthes, epiphysiolysis)
- "others" that include sequelae of septic coxitis, coxitis from TBC, ankylosis, and metastases.

In the case shown in the following table a significantly increased risk is observed in the case of arthroplasty following "femoral fracture and their sequelae" or following "rheumatic arthritis." Or to treate rare pathologies, such as septic coxitis

The patients affected by rheumatic arthritis had, in fact, a 1.6-fold greater risk in comparison with subjects of matching sex and age treated for coxarthrosis. This risk rate is at the limit of statistical significance.
Patients who had undergone arthroplasty because of femoral fracture or sequelae of fracture had a 1.65-fold greater risk in comparison to subjects of matching sex and age treated for coxarthrosis.
Patients of the grup 'Other pathologies' had a 2.2-fold greater risk in comparison to subjects of matching sex and age treated for coxarthrosis. In thos heterogeneous group septic coxitis represent the higher risk pathology.

Conversely, in patients treated by arthroplasty due to cephalic necrosis, or to correct sequelae of congenital and infantile diseases the risk of loosening was not significantly higher than in patients treated for coxarthrosis

Pathology	**Relative risk rate**	**Confidence interval 95%**		**Significance (p)**
Others (sequelae of coxitis, Paget's disease, metastasis, etc..)	2.2	1.19	4.0	S (0.011)
Sequelae congenital diseases	-	-	-	NS (0.89)
Idiopatic necrosis of femoral head	-	-	-	NS (0.19)
Fracture and Sequelae (both femoral and acetabular)	1.65	1.4	2.0	S (0.0001)
Rheumatic arthritis	1.63	1.00	2.65	S (0.05)

10.2 Rate of failure

Prosthesis failure is defined as the revision of even one prosthetic component. As already mentioned in the introduction of this report the recovery of data of operations not reported to RIPO is in progress. The uncertainty due to the failure to report about 10% of operations performed in the Region, may lead to an underestimation of the revision rate that is not quantifiable at the moment.
The following table shows the number of primary joint arthroplasty operations performed in the period from January 2000 to December 2007 in the first column, the second and third columns show the number of revision operations performed on the same patients.
Some revision operations were performed in the same hospital as the primary operation while others were performed at other hospitals in the Emilia-Romagna Region.

Maximum follow-up is 8 years

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital
Primary THA	41256	697	191
Hemiarthroplasty	16784	187	51
Total revision	2276	110	40
Total	**60316**	*994*	**282**

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

Maximum follow-up is 6 years

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital
Resurfacing prostheses	823	24	1

Revision surgery has been divede in two classes: major if one of both bone-fixed components has been revised, and minor if liner,and/ or head, and/or modular neck have been exchanged)
The following table shows the **rate of revision** according to type of surgery:

Type of operation	Major revisions	Minor revisions	Revision rate	Percentage
Primary THA	666	222	888/41256	2.2
Hemiarthroplasty	230	8	238/16784	1.4
Resurfacing	25	-	25/823	3.0
Total revision	128	22	150/2276	6.6

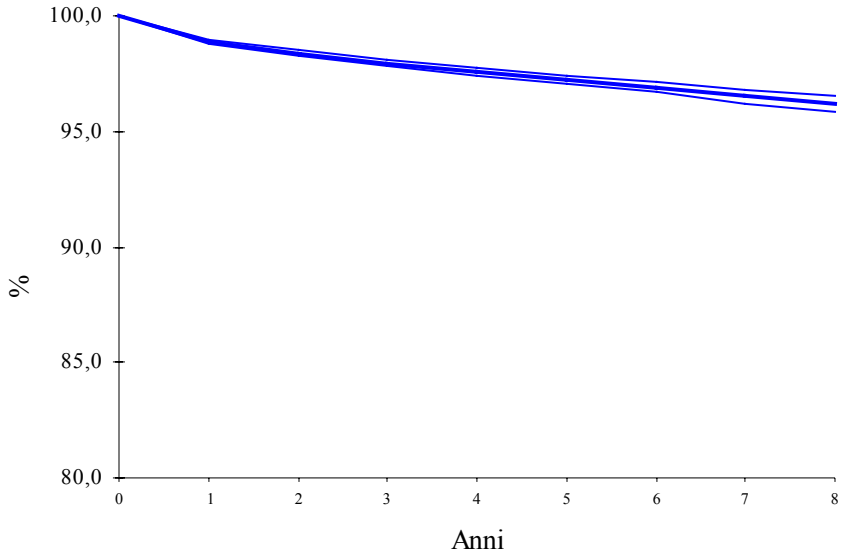
10.3 Survival curves according to Kaplan Meier

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

10.4 Analysis of survival in primary total hip arthroplasty
41256 primary arthroprostheses are under observation. Of these, 888 revisions were carried out for the reasons given at the bottom of the table.

Number of arthroprostheses	Removals	% revision
41.256	**888**	**2.2**

Survival curve



Results in detail
(i.c. = confidence interval)

Years	% in site	c.i. at 95	
0	100.0	100.0	100.0
1	98.9	98.8	99.0
2	98.4	98.2	98.5
3	98.0	97.8	98.1
4	97.5	97.4	97.7
5	97.2	97.0	97.4
6	96.9	96.7	97.1
7	96.5	96.2	96.8
8	96.2	95.8	96.6

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	Percentage %	*Distribution of cause of failure*
Recurrent prosthesis luxation	**251**/41256	0.6	*28.3*
within 60 days	*140/41256*		
over 60 days	*111/41256*		
Aseptic loosening of the stem	**156**/41256	0.4	**17.6**
	7/41256		
over 60 days	*149/41256*		
Aseptic loosening of the cup	**124**/41256	0.3	**14.0**
	19/41256		
over 60 days	*105/41256*		
Global aseptic loosening	**56**/41256	0.1	**6.3**
	2/41256		
over 60 days i	*54/41256*		
Periprosthetic bone fracture	**89**/41256	0.2	**10.0**
	43/41256		
over 60 days	*46/41256*		
Septic loosening	**59**/41256	0.1	**6.6**
	7/41256		
over 60 days	*52/41256*		
Breakage of prosthesis	**63**/41256	0.15	**7.1**
Pain without loosening	**20**/41256	0.05	**2.2**
Primary instability	**22**/41256	0.05	**2.5**
Others	**36**/41256	0.09	**4.0**
Unknown	**12**/41256	0.03	**1.4**
Total	*888/41256*	**2.2**	**100.0**

Percentage of causes of revision according to follow-up

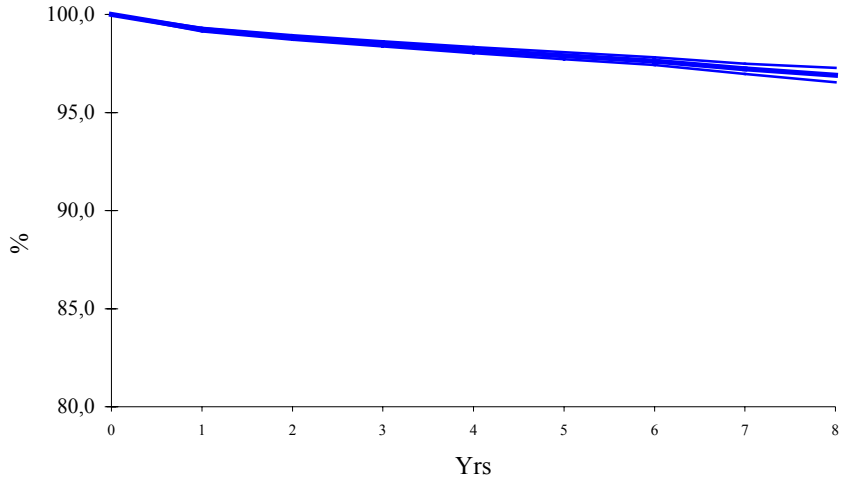
Cause of revision	0-2 Years	*3-4 years*	*>5 years*
Recurrent prosthesis dislocation	35.9	12.5	*12.5*
Aseptic loosening	29.5	53.4	57.8
Periprosthetic bone fracture	11.7	6.8	10.9
Septic loosening	7.3	6.0	4.7
Breakage of prosthesis	4.2	14.5	6.3
Others	11.4	6.8	7.8

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

41.256 primary arthroprostheses are under observation. Of these, 666 revisions were carried out to remove cup and/or stem

Number of arthroprostheses	Removals	% revision
41.256	**666**	**1.6**

Survival curve



Results in detail
(i.c. = confidence interval)

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.2	99.1	99.3
2	98.8	98.7	98.9
3	98.5	98.4	98.6
4	98.2	98.0	98.3
5	97.9	97.7	98.1
6	97.6	97.4	97.8
7	97.2	97.0	97.5
8	96.9	96.5	97.3

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

Case-mix

To perform a comparison among the survival of several prosthesis types correctly (Tables 10.6, 10.10 and 10.12), it is necessary to introduce a parameter that takes into account the complexity of the series treated. As in the Swedish register, the calculation of a case-mix was chosen.

According to the Cox multivariate analysis, the hip prosthesis in RIPO was at greater risk of failure in patients affected by rheumatic arthritis, or treated for femur fracture and their sequelae or for rare diseases. The percentage of patients with these characteristics treated by primary hip arthroplasty in Emilia Romagna is 15.2%.

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

Cemented cups and stems are in bold

Cup (stem) Manufacturer	From years	N.	% fracture and reumatic arthritis	*n. of revision*	% survival 3 yrs	i.c al 95%	% survival 7 yrs	i.c al 95%
AnCa Fit (AnCa Fit) Wright Cremascoli	2000	4120	13.6	127	97.6	0.5	96.4	0.6
FIXA (APTA) Adler	2004	2245	13.4	21	98.1	1.1	-	-
CLS (CLS) SulzerCenterpulse Zimmer	2000	1577	14.7	33	98.6	0.6	96.9	1.2
ABGII (ABGII) Stryker Howmedica	2000	1455	9.6	14	99.1	0.5	98.7	0.75
FIXA (RECTA) Adler	2004	1215	7.7	16	97.6	1.5	-	-
FITMORE (CONUS) SulzerCenterpulse Zimmer	2000	925	13.9	15	98.3	0.9	97.9	1.1
FITMORE (CLS) SulzerCenterpulse Zimmer	2000	796	8.8	14	98.2	1.0	97.8	1.2
BICON PLUS (SL PLUS) Endoplus	2000	734	10.4	9	98.3	1.1	98.3	1.1
EP-FIT PLUS (SL PLUS) ENDOPLUS	2003	698	17.2	2	99.6	0.5	-	-
CLS (CONUS) SulzerCenterpulse Zimmer	2000	608	13.8	15	98.4	1.0	96.0	2.4
TRILOGY (VERSYS FIBER) Zimmer	2000	605	4.1	14	97.7	1.3	97.4	1.3
FIXA (**APTA**) Adler	2004	556	16.5	10	97.8	1.4	-	-
AnCa Fit (PROFEMUR Z) Wright Cremascoli	2002	544	9.6	21	96.6	1.5	-	-
DUOFIT PSF (**P507**) Samo	2000	535	31.8	8	99.2	0.8	97.1	2.3
REFLECTION (**BASIS**) Smith & Nephew	2001	503	3.8	7	98.8	1.0	-	-
STANDARD CUP (CONUS) SulzerCenterpulse Zimmer	2000	471	5.3	15	98.0	1.3	96.2	2.3
TRIDENT (ABGII) Stryker Howmedica	2002	453	11.5	11	97.2	1.6	-	-
CONTEMPORARY (**EXETER**) Stryker Howmedica	2000	447	17.2	8	98.2	1.4	97.7	1.6
EP-FIT PLUS (PROXIPLUS) Endoplus	2004	404	11.1	6	96.9	2.75	-	-
EXPANSION (CBC) Mathys	2000	404	28.5	6	96.3	4.2	-	-
REFLECTION (BHS) Smith & Nephew	2001	397	4.5	8	98.3	1.3	-	-
CFP (CFP) Link	2001	386	2.1	2	99.3	1.0	-	-
STANDARD CUP (CLS) SulzerCenterpulse Zimmer	2000	350	12.9	5	99.4	0.8	97.3	2.73
MULLER (**AD**) Samo	2000	344	37.5	12	97.4	1.8	95.7	2.4
MULLER (**JVC**) Wright Cremascoli	2000	336	15.2	5	98.7	1.2	97.6	2.5
DUOFIT PSF (**LC**) Samo	2000	331	26.0	4	98.7	1.2	98.7	1.2
TRIDENT (HIPSTAR) Stryker Howmedica	2000	317	16.1	0	100.0	-	-	-

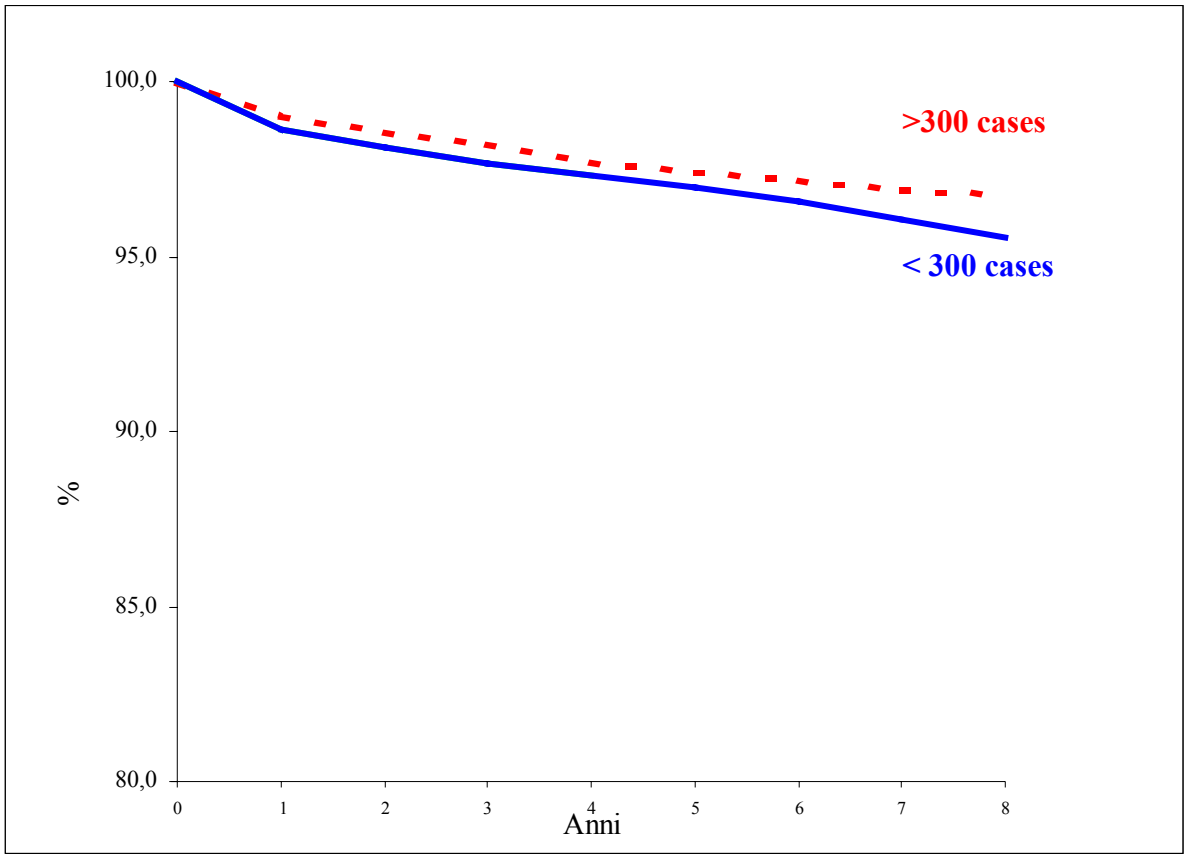
MULLER (**MRL**) Wright Cremascoli	2000	312	22.1	10	97.6	1.7	96.3	2.3
REFLECTION (SYNERGY) Smith & Nephew	2000	312	5.4	8	99.3	1.0	-	-
AnCa Fit (Anca Dual Fit) Wright Cremascoli	2000	304	27.0	5	99.7	0.65	97.6	2.15
Other models (< *300 cases)*	2000	18526	15.8	457	97.6	0.2	96.0	0.4
All Models	2000	41256	15.2	888	98.5	0.1	97.2	0.2

The marked dispersion of prosthesis types and the wide variability of the combinations between acetabulum and stems enable the comparison of only some types of prosthesis.
To provide, anyway, an indication of the survival of the prosthesis types less represented in data banks, they were grouped together to make a class of prostheses of which less than 300 were implanted over 7 years.
They were compared with the prosthesis types of which more than 300 were implanted (those of the previous table), also grouped into a single class.

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

	N.	Removals	% revision
Models < 300 cases	18526	457	2.5
Models > 300 cases	22689	431	1.9

Survival curve



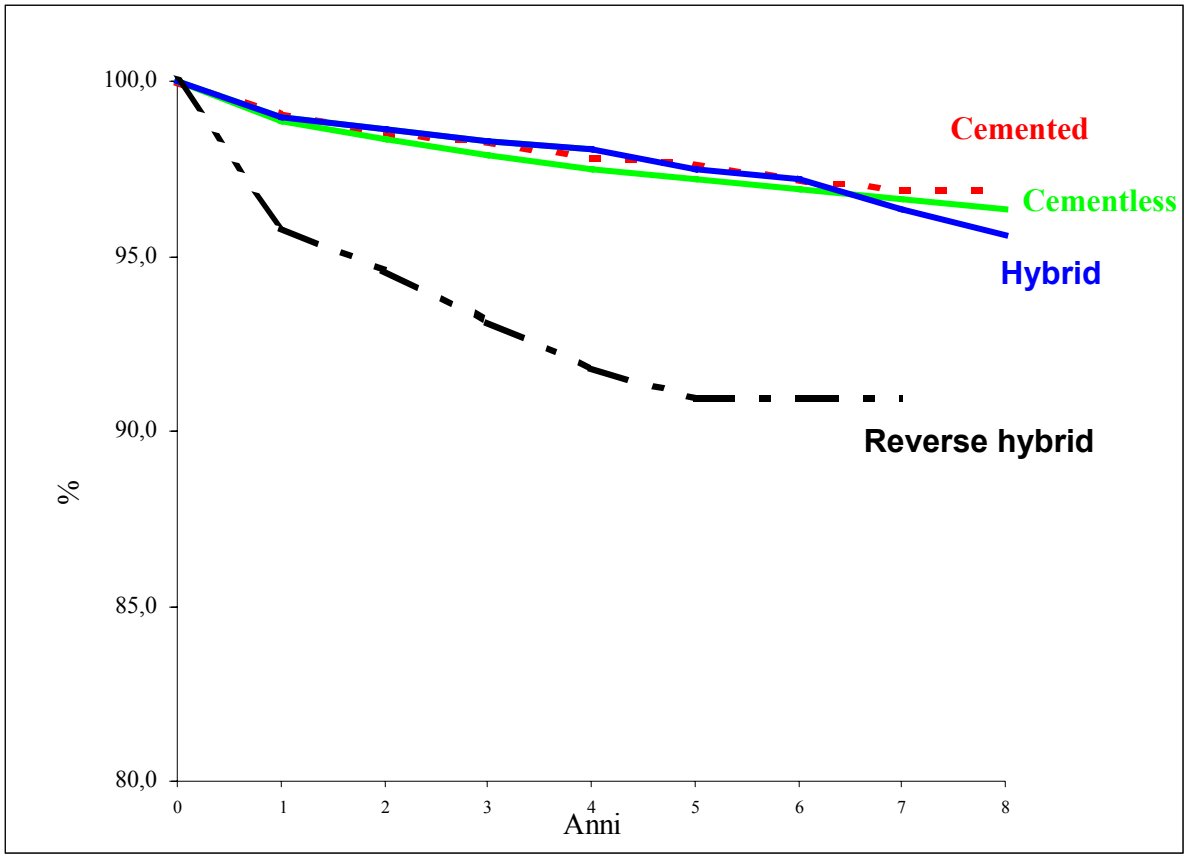
Curves are significantly different (p=0.001, Test di Wilcoxon)

Results in detail

Models < *300 cases*			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	98.6	98.5	98.8
2	98.1	97.9	98.3
3	97.6	97.4	97.9
4	97.3	97.1	97.6
5	97.0	96.7	97.3
6	96.6	96.2	96.9
7	96.0	95.6	96.5
8	95.5	94.9	96.1
Models >300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.1	98.9	99.2
2	98.6	98.4	98.8
3	98.2	98.0	98.4
4	97.7	97.5	98.0
5	97.4	97.2	97.7
6	97.2	96.9	97.5
7	96.9	96.6	97.3
8	96.8	96.4	97.2

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

Fixation		Removals	% revision
Cementless	31.225	653	2.1
Hybrid (cemented stem, cementless cup)	5.718	129	2.3
Cemented	3.883	80	2.1
Riverse hybrid (cementless stem, cemented cup).	300	20	6.7



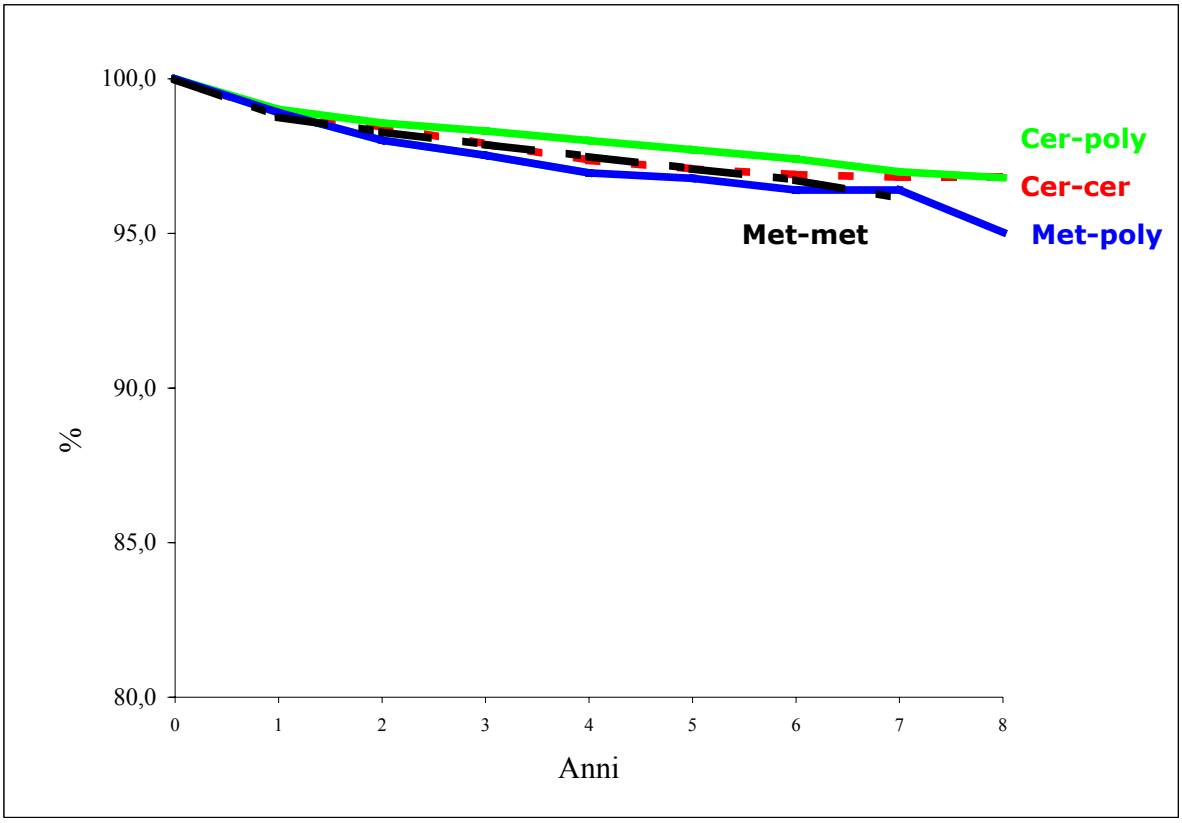
Results in detail

Cemented			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.1	98.8	99.4
2	98.5	98.1	98.9
3	98.3	97.9	98.7
4	97.8	97.3	98.4
5	97.6	97.1	98.2
6	97.2	96.5	97.8
7	96.9	96.2	97.7
8	96.9	96.2	97.7
Cementless			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	98.9	98.7	99.0
2	98.3	98.2	98.5
3	97.9	97.7	98.1
4	97.5	97.3	97.7
5	97.2	97.0	97.4
6	96.9	96.6	97.2
7	96.6	96.3	96.9
8	96.4	95.9	96.8
Hybrid			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.0	98.7	99.3
2	98.6	98.3	98.9
3	98.3	97.9	98.6
4	98.1	97.7	98.5
5	97.5	97.0	98.0
6	97.2	96.7	97.7
7	96.4	95.6	97.1
8	95.6	94.5	96.7
Reverse hybrid			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	95.8	93.5	98.1
2	94.6	91.9	97.3
3	93.1	90.0	96.2
4	91.8	88.3	95.4
5	90.9	87.0	94.9
6	90.9	87.0	94.9
7	90.9	87.0	94.9

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

Coupling	N.	Removals	% revision
Metal-poly	14787	354	2.4
Ceramic-ceramic	12147	231	1.9
Ceramic-poly	10154	201	2.0
Metal-metal	3765	87	2.3

Survival curve



Cox multivariate analysis demonstrated that cross-linked poly is not significantly different from traditional poly. Analysis was performed only on prostheses implanted after 2003. Follow-up is therefore very short

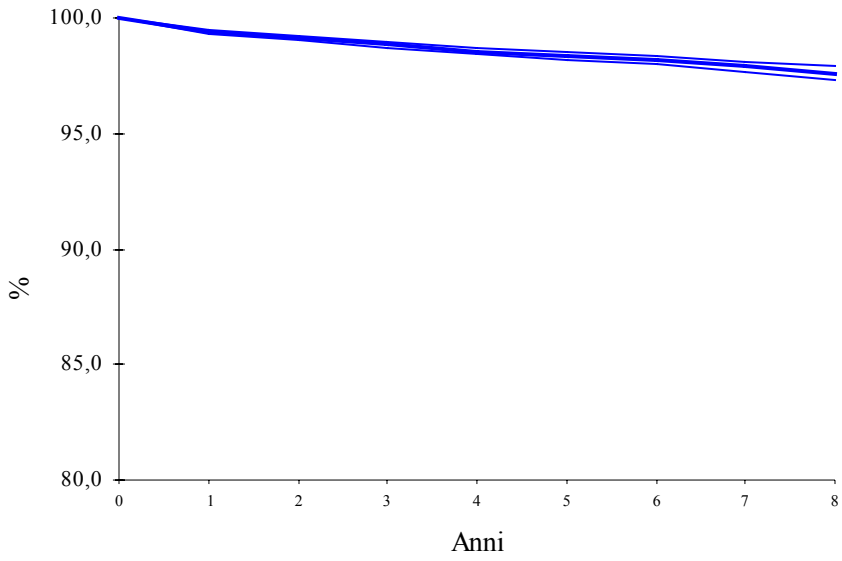
10.9 Survival analysis of acetabular component

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

Number of arthroprostheses	Removals of the cup and/or liner	% revision
41256	**511***	**1.2**

*124 of them liner only

Survival curve



Results in detail

Years	% in site	i.c. al 95%	
0	100.0	100.0	100.0
1	99.4	99.3	99.5
2	99.1	99.0	99.2
3	98.8	98.7	99.0
4	98.6	98.4	98.7
5	98.4	98.2	98.5
6	98.2	98.0	98.4
7	97.9	97.7	98.1
8	97.6	97.3	97.9

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

Cemented cups in bold

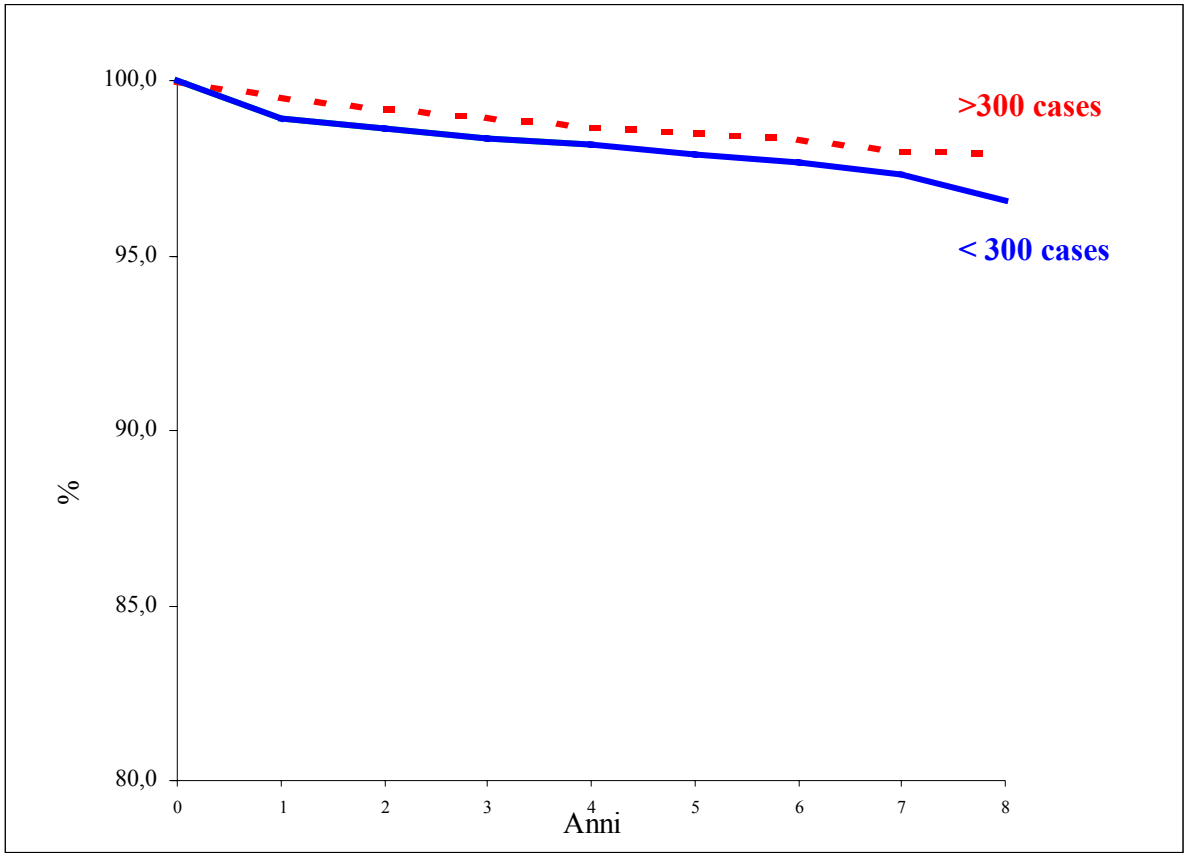
Cup	From year	N.	%fracture and reumatic arthritis	*n. revision*	% survival *3 yrs*	i.c 95%	%survival 7 yrs	i.c 95%
AnCA FIT Wright Cremascoli	2000	6616	13.4	93	99.0	0.25	98.3	0.4
Fixa – Adler	2004	4348	12.5	17	99.3	0.4	-	-
CLS Sulzer, Centerpulse,Zimmer	2000	3046	16.2	42	99.1	0.35	98.3	0.6
FITMORE Sulzer	2000	2114	13.5	24	98.9	0.5	98.5	0.6
ABGII Stryker Howmedica	2000	1918	9.0	13	99.5	0.3	99.1	0.5
REFLECTION Smith & Nephew	2000	1430	5.3	12	99.6	0.35	98.5	0.9
DUOFIT PSF Samo	2000	1349	26.8	22	98.6	0.65	98.1	0.8
TRIDENT Stryker Howmedica	2002	1299	11.2	12	98.9	0.6	-	-
EP-FIT Plus – Endoplus	2003	1182	15.0	8	98.9	0.8	-	-
STANDARD CUP PROTEK Sulzer	2000	1176	13.8	23	98.9	0.6	98.2	0.8
TRILOGY Zimmer	2000	1009	6.6	12	98.9	0.7	98.8	0.7
MULLER Wright Cremascoli	2000	951	17.1	13	98.8	0.7	98.6	0.8
BICON PLUS Endoplus	2000	884	10.4	10	98.5	1.0	98.5	1.0
DELTA PF – Lima	2003	781	10.1	3	99.3	0.8	-	-
CONTEMPORARY Stryker Howmedica	2000	673	15.3	12	98.6	1.0	97.2	1.6
Expansion - Mathys	2003	567	24.5	4	97.7	2.6	-	-
ZCA Zimmer	2000	525	28.0	3	99.6	0.6	99.3	0.85
HILOCK LINE Symbios	2000	468	10.5	10	97.2	1.8	97.2	1.8
CFP Link	2000	426	4.5	1	99.6	0.8	-	-
MULLER Samo	2000	416	38.9	12	97.8	1.5	96.5	2.0
MULLER Smith & Nephew	2000	405	29.9	8	98.3	1.35	96.8	2.5
PE (Muller Protek) Sulzer	2000	390	42.6	9	98.3	1.4	96.7	2.2
Trabecular Metal monoblock – Zimmer	2003	378	7.7	3	99.4	0.8	-	-
Pinnacle Sector II – Depuy	2002	334	8.7	2	99.2	1.1	-	-
Other (with less than 300 cases each)	2000	8530	15.1	143	98.4	0.3	97.3	0.5
All Models	2000	41256	15.2	511	98.8	0.1	97.9	0.2

The marked dispersion of prosthesis types enables a comparison of only some types of acetabulum.
To provide, anyway, an indication of the survival of the prosthesis types less represented in data banks, they were grouped together to make a class of prostheses of which less than 300 were implanted over 7 years.
They were compared with the prosthesis types of which more than 300 were implanted (those of the previous table), also grouped into a single class.

Analysis of the survival according to commercial type (Acetabulum)

	N.	Removals	% revision
Models <300 cases	8530	143	1.7
Models > 300 cases	32685	368	1.1

Survival curve



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

Results in detail

Models <300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	98.9	98.7	99.1
2	98.6	98.4	98.9
3	98.4	98.1	98.7
4	98.2	97.8	98.5
5	97.9	97.5	98.2
6	97.7	97.3	98.1
7	97.3	96.8	97.9
8	96.5	95.6	97.5
Models > 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.5	99.4	99.6
2	99.2	99.1	99.3
3	99.0	98.8	99.1
4	98.7	98.5	98.8
5	98.5	98.3	98.7
6	98.3	98.2	98.5
7	98.0	97.8	98.3
8	98.0	97.7	98.2

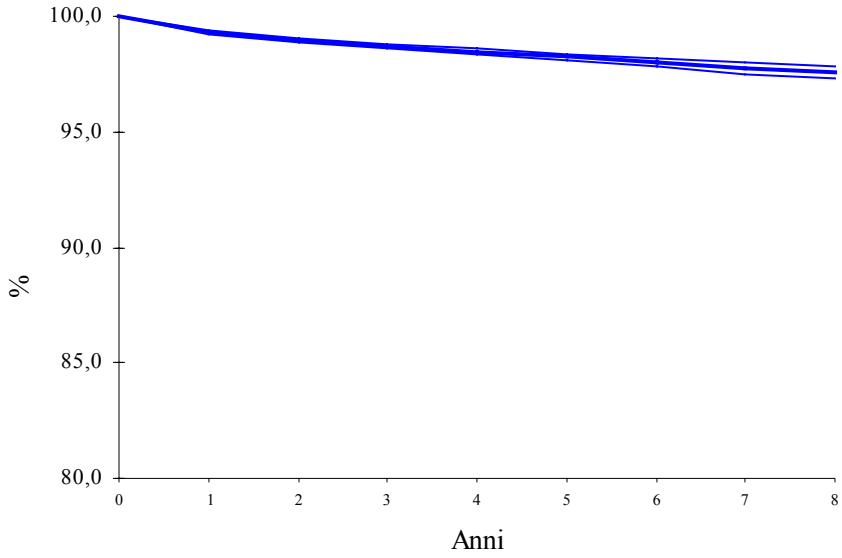
10.11 Survival analysis of stem

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

Number of arthroprostheses	Removals of the stem	% revision
41.256	**557***	**1.35**

*109 revision of modular neck only

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.3	99.2	99.4
2	99.0	98.9	99.1
3	98.7	98.6	98.8
4	98.5	98.3	98.6
5	98.2	98.1	98.4
6	98.0	97.9	98.2
7	97.7	97.5	98.0
8	97.6	97.3	97.9

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

Cemented stem in bold.

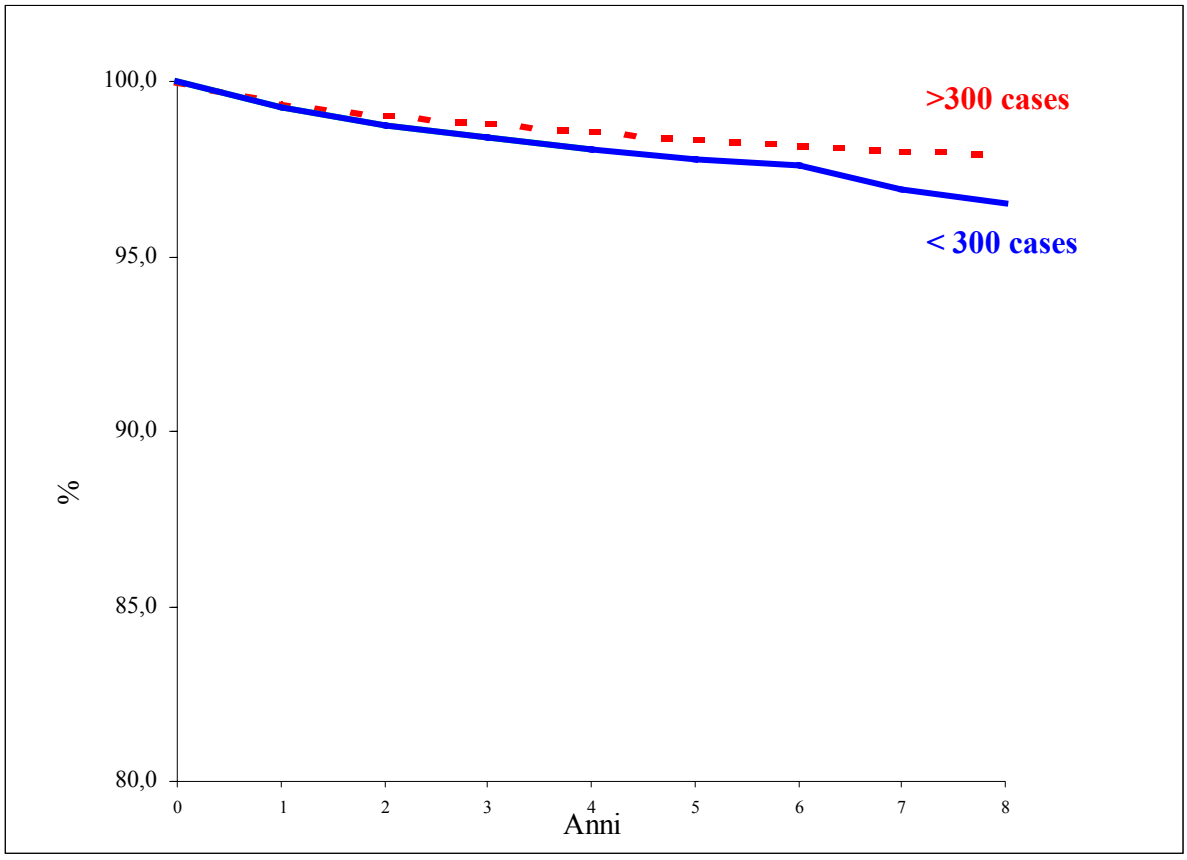
Stem	From year	N.	% fracture and reumatic arthritis	n. revisi onN. rev.	%surv ival *3 yrs*	c.i at 95%	%surv ival 7 yrs	c.i. at 95%
ANCA FIT Wright Cremascoli	2000	4332	13.8	117	97.8	0.5	96.9	0.6
CLS Sulzer Centerpulse Zimmer	2000	3388	12.3	47	98.9	0.4	97.9	0.7
CONUS Sulzer Centerpulse Zimmer	2000	3201	10.7	29	99.0	0.4	98.9	0.4
APTA RIVESTITO Adler	2004	2352	13.3	22	98.0	1.0	-	-
ABGII Stryker Howmedica	2000	2249	11.6	20	99.1	0.4	98.8	0.6
SL PLUS Endoplus	2000	1921	14.4	8	99.5	0.4	99.5	0.4
RECTA Adler	2004	1259	8.6	16	97.7	1.5	-	-
EXETER Stryker Howmedica	2000	1012	12.3	8	99.4	0.5	98.5	1.2
VERSYS FIBER METAL TAPER Zimmer	2000	905	5.7	9	98.9	0.7	98.9	0.7
APTA Cem Adler	2004	765	18.7	10	98.4	1.0	-	-
TAPERLOC Biomet	2002	729	7.4	7	98.9	0.8	-	-
JVC Wright Cremascoli	2000	723	11.8	13	98.4	0.9	97.7	1.5
SPECTRON Smith & Nephew	2000	686	35.1	12	99.3	0.7	96.9	2.0
CBC - Mathys	2000	653	21.3	5	99.0	0.9	99.0	0.9
BASIS Smith & Nephew	2001	640	3.9	2	100.0	-	98.2	2.6
PROFEMUR Z Wright Cremascoli	2002	631	10.5	17	97.4	1.3	-	-
P507 Samo	2000	613	31.0	6	99.6	0.5	97.7	2.1
C2 Lima	2000	596	9.4	1	99.8	0.4	99.8	0.4
CFP Link	2000	581	4.0	1	99.8	0.4	99.8	0.4
MRL Wright Cremascoli	2000	470	23.2	8	99.1	0.9	98.0	1.4
PROXIPLUS ENDOPLANT GMBH	2005	428	11.0	5	97.9	2.0	-	-
BHS Smith & Nephew	2001	427	4.7	6	98.8	1.1	98.3	1.4
Hipstar - Stryker Howmedica	2002	382	16.0	0	100.0	-	-	-
SYNERGY Smith & Nephew	2000	370	5.9	3	99.7	0.6	-	-
AD Samo	2000	362	38.1	9	98.4	1.4	96.8	2.1
Corail – De Puy	2000	358	12.6	4	98.8	1.2	98.8	1.2
LC Samo	2000	351	27.9	2	99.4	0.8	99.4	0.8
VERSYS CEMENTED Zimmer	2000	333	20.1	3	99.4	0.9	99.0	1.2
DEFINITION Stryker Howmedica	2000	332	12.7	2	99.6	0.7	99.1	1.2
ABG rivestito -Stryker Howmedica	2000	331	9.4	2	99.7	0.6	99.4	0.9
AnCA DualFit Wright Cremascoli	2000	314	25.8	5	99.7	0.6	97.7	2.1
C Stem – De Puy	2002	311	5.1	0	100.0	-	-	-
EHS Wright Cremascoli	2000	309	7.8	2	100.0	-	97.6	3.6
PROXILOCK FT Stratec	2000	305	10.2	8	97.3	1.9	97.3	1.9
AHS Wright Cremascoli	2000	300	7.1	4	98.9	1.2	97.9	2.3
Others (with less than 300 cases each)	2000	8301	19.1	144	98.4	0.3	96.9	0.6
All models	2000	41256	15.2	557	98.8	0.2	97.7	0.2

The marked dispersion of prosthesis types enables a comparison of only some types of stem.
To provide, anyway, an indication of the survival of the prosthesis types less represented in data banks, they were grouped together to make a class of prostheses of which less than 300 were implanted over 7 years.
They were compared with the prosthesis types of which more than 300 were implanted (those of the previous table), also grouped into a single class.

Analysis of the survival according to commercial type (stem)

	N.	Removals	% revision
Models <300 cases	8301	144	1.7
Models >300 cases	32914	413	1.3

Survival curve



Curves are significantly different (p=0.009, Test di Wilcoxon)

Results in detail

Models < 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.2	99.0	99.4
2	98.7	98.4	99.0
3	98.4	98.1	98.7
4	98.0	97.7	98.4
5	97.7	97.3	98.1
6	97.6	97.1	98.0
7	96.9	96.3	97.5
8	96.4	95.6	97.3
Models > 300 cases			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.4	99.3	99.4
2	99.0	98.9	99.1
3	98.8	98.7	98.9
4	98.6	98.4	98.7
5	98.3	98.2	98.5
6	98.2	98.0	98.4
7	98.0	97.7	98.2
8	97.9	97.6	98.2

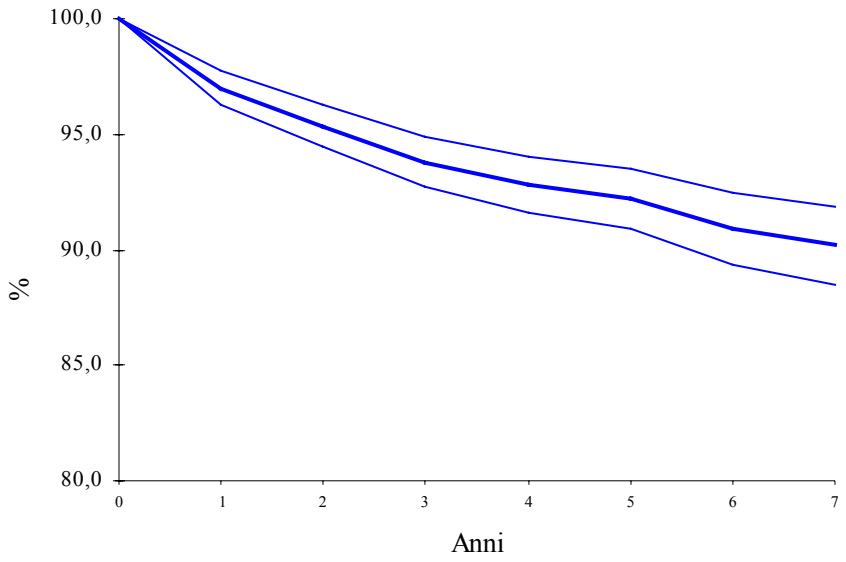
10.13 Survival analysis of total revision

First total revision implants are considered 'surviving' until it is necessary to revise even one single component (also the liner or the modular neck only).

In the present analysis the survival of the total revision operations was calculated. These operations were considered as "surviving" up to the moment when it was not necessary to perform a second revision of any component (even just a bearing or modular neck).

Number of arthroprostheses	Second revision	% revision
2276	**150**	**6.6**

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	97.0	96.3	97.7
2	95.3	94.4	96.3
3	93.8	92.7	94.9
4	92.8	91.6	94.0
5	92.2	90.9	93.5
6	90.9	89.4	92.4
7	90.2	88.5	91.9

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

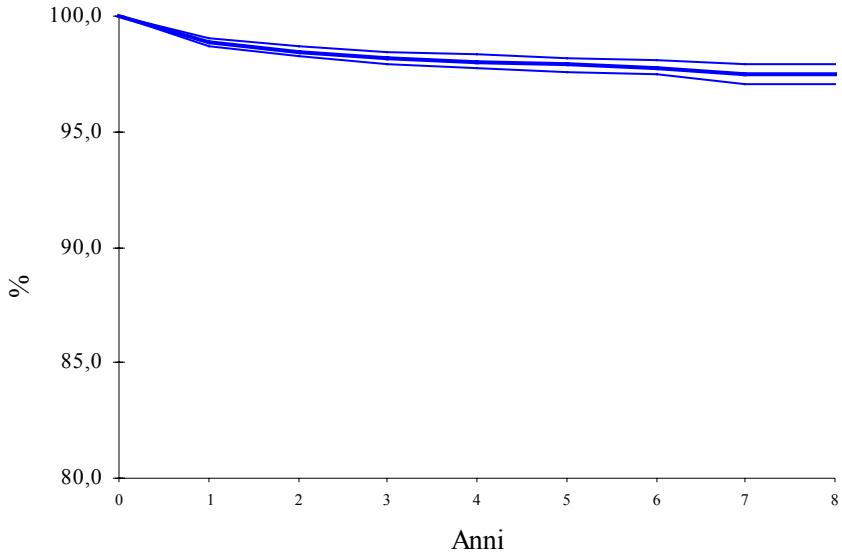
Cause of revision	**Rate**	*%*	**% distribution of failure** *causes*
Prosthesis luxation	**35**/2276	1.5	*23.3*
Aseptic loosening of the cup	**34**/2276	1.5	**22.7**
Aseptic loosening of the stem	**26**/2276	1.1	**17.3**
Septic loosening	**20**/2276	0.9	**13.3**
Total aseptic loosening	**15**/2276	0.6	**10.0**
Bone fracture	**12**/2276	0.5	**8.0**
Prosthesis breakage	**2**/2276	0.09	**1.3**
Pain without loosening	**1**/2276	0.04	**0.7**
Primary instability	**1**/2276	0.04	**0.7**
Other	**2**/2276	0.09	**1.3**
Unknown	**2**/2276	0.09	**1.3**
Total	*150/2276*	**6.6**	**100.0**

10.14 Survival analysis of hemiarthroplasty

Survival of hemiartroplasty was calculated considering revision of the head as a failure

N of hemiarthroplasty	Removal	% of revision
16784	**238**	**1.4**

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	98.9	98.7	99.0
2	98.5	98.3	98.7
3	98.2	98.0	98.5
4	98.1	97.8	98.3
5	97.9	97.6	98.2
6	97.8	97.5	98.1
7	97.5	97.1	98.0
8	97.5	97.1	98.0

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

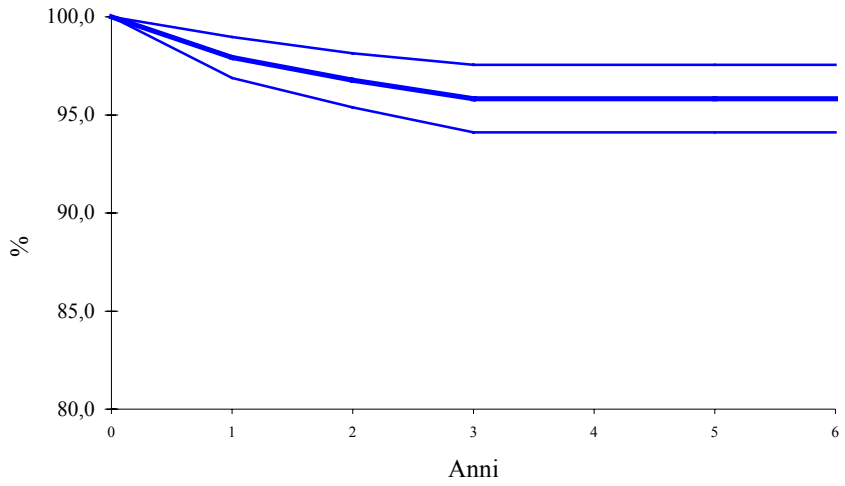
Cause of revision	Rate	%	Distribution of causes
Prosthesis luxation	112/16784	0.67	47.0
Aseptic loosening of the stem	48/16784	0.3	20.1
Cotyloiditis	35/16784	0.2	14.7
Periprosthetic bone fracture	14/16784	0.1	5.9
Septic loosening	18/16784	0.1	7.6
Unknown	3/16784	0.02	1.3
Others	8/16784	0.05	3.4
Total	**238/16784**	**1.4**	**100.0**

10.15 Survival analysis of resurfacing

Maximum follow-up is 6 years. This should be borne in mind when comparing the curves so far described, where the maximum follow-up is 8 years.

Resurfacing	Removals	% of revisions
823	**25**	**3.0**

Survival curve



Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	97.9	96.9	99.0
2	96.8	95.4	98.1
3	95.8	94.1	97.6
4	95.8	94.1	97.6
5	95.8	94.1	97.6
6	95.8	94.1	97.6

Type of prosthesis	N.	N.of failures	%
BHR – Smith & Nephew	564	11	1.95
MITCH TRH – Finsbury	47	1	2.1
MRS – Lima	43	5	11.6
ASR – DePuy	39	1	2.6
ADEPT – Finsbury	35	1	2.9
RECAP – Biomet	26	3	11.5
ICON – International Orthopaedics	22	1	4.5
BMHR – Smith & Nephew	20	-	-
CONSERVE PLUS – Wright	17	-	-
DURON Hip Resurfacing – Zimmer	9	1	11.1
Unknown	1	1	100.0
Total	**823**	**25**	**3.0**

PART TWO: KNEE PROSTHESIS

July 2000 – December 2007

11. RIPO capture

11.1 Capture for RIPO per hospital in years 2000-2004

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), according to Agency was 93.5% for year 2007 Data are refered to primary knee prosthesis (8154),revision (8155) and prosthesis removal (8006)

11.2 Ratio public/private treatment

Percentage of primary arthroprostheses, hemiarthroplasties and revisions of the kneeperformed 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

From database SDO

Percentage of primary total knee arthroprostheses and revision performed in public and private hospitals.

Type of operation	**Public**	**Private**
	%	**%**
Primary bicompartmental	65.4	73.5
Primary unicompartmental	10.5	11.3
Primary tricompartmental ^	14.8	9.6
Revision	6.6	4.9
Prosthesis removal	2.0	0.4
Implant of patella	0.7	0.3
Total	**100.0**	**100.0**

12. Type of operation

Bicompartmental implant has only femoral and tibial component, whilst tricompartmental one has patella too.
Implant of patella occurs when a bicompartmental knee prosthesis is transformed into a tricompartmental with a second surgery.

*Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2007, according to **type***

Type of operation	Number	Percentage
Primary bicompartmental	20.538	69.0
Primary unicompartmental	3.226	10.8
Primary tricompartmental ^	3.569	12.0
Revision	1.676	5.6
Prosthesis removal	337	1.1
Implant of patella	149	0.5
Other (debridment…)*	304	1.0
Total	**29.799**	**100.0**

* including 42 *Hemicap – Arthrosurface*, 18 *Avon-Patello-Femoral Joint Stryker*, 6other patello-femoral,50 spacer replacements, 35 stiff knee loosenings, 28 surgical cleaning and 5 dislocation reductions.
^ 177 liner replacements, 45 femoral component only replacements, 103 tibial component only replacements, 1324 total replacements

Percentage of different prostheses in the years

Years of operation	Percentage unicompartmental	Percentage bicompartmental	Percentage tricompartmental
2001	10.0	81.4	8.6
2002	12.7	80.0	7.3
2003	12.8	78.5	8.7
2004	12.8	75.4	11.8
2005	12.4	75.7	11.9
2006	10.9	69.8	19.3
2007	11.6	70.4	18.0

13. Descriptive statistics of patients with knee prosthesis

13.1. Age

Number of knee operations carried out on patients with admission date between 1st July2000 and 31st December 2007, 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		Totale
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	
Bi-tricomp	81	0.3	223	0.9	1465	6.1	7167	29.7	12471	51.8	2699	11.2	24106
Unicomp	2	0.1	69	2.1	534	16.6	1327	41.2	1108	34.3	185	5.7	3225
Revision	8	0.5	35	20.9	120	7.2	516	30.8	806	48.1	191	11.5	1676
Prosthesis. removal	6	1.8	11	3.3	37	11.0	114	33.8	142	42.1	27	8.0	337
Patella only	1	0.7	6	4.0	7	4.7	50	33.6	71	47.6	14	9.4	149
Other	14	4.6	17	5.6	66	21.7	103	33.9	93	30.6	11	3.6	304
Total*	**112**	**0.4**	**361**	**1.2**	**2229**	**7.5**	**9277**	**31.1**	**14691**	**49.3**	**3127**	**10.5**	**29797**

* 2 data (0.01%) are missing

Mean age at surgery, according to type of operation.-years 2000-2007

Type of operation	Mean age	Range
Primary bi/tricompartmental	71.5	14–94
Primary unicompartmental	67.5	39-89
Revision	70.8	26-90
Total	**70.9**	**14–94**

Mean age at surgery, according to type of operation.-years 2001-2007

Type of operation	Year 2001		Year 2007	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental	71.7	23-93	71.1	17-92
Primary unicompartmental *	69.5	45-88	65.8	39-85
Revision	72.4	26-87	69.8	33-87

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

Mean age at surgery, according to type of operation.-years 2000-2007 according to private or public hospital

.

Type of operation	Public		Private	
	Mean age	Range	Mean age	Range
Primary bi/tricompartmental *	71.3	13-92	69.2	58-79
Primary unicompartmental ^	67.8	39-88	66.4	39-87

* mean age for bicompartimental in public and private hospital is significantly different (t-test, p=0.001)
^ mean age for unicompartimental in public and private hospital is significantly different (t-test, p=0.001)

13.2 Gender

rNumber of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2007, according to **type of operation** and **gender** of patients at the time of surgery.

Type of operation	Males		Females		Total
	N.	%	N.	%	N.
Bi/tricompartmental	6083	25.2	18024	74.8	24107
Unicompartmental	921	28.5	2305	71.5	3226
Revision	386	23.0	1290	77.0	1676
Prosthesis removal	115	34.1	222	65.9	337
Patella only	32	21.5	117	78.5	149
Other	100	32.9	204	67.1	304
Total	**7.637**	**25.6**	**22.162**	**74.4**	**29.799**

13.3 Side of surgery

There is a prevalence of operations performed on the right side (55.1%) in comparison with the left side (44.9%). The percentage was calculated on patients with only one knee prosthesis affected by primary arthritis.
In the hip the prevalence of the right side is in 59.3% of the cases.

13.4 Bilateral arthroplasty

In the period of registry observation (8 years) 2694 patients underwent bilateral operations.
2452 patients (91.0%) chose to undergo the second operation at the same hospital from where the first one was performed.
75 patients (2,8%) chose to undergo the second operation at a different hospital from where the first one was performed to follow the surgeon.
167 patients (6,2%) 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 hip to be treated was the right one in 54,6% of cases; beside this 4,2% of bilateral patients underwent also to hip prosthesis

13.5 Diseases treated with unicompartmental knee prosthesis

Number of primary unicompartmental knee prosthesis operations carried out on patients with admission date between 1st July 2000 and 31st December 2007, according to

diagnosis.

Diagnosis in unicomp. knee prosthesis	Number	Percentage
Primary arthritis	2745	85.3
Necrosis of the condyle	216	6.7
Deformity	146	4.5
Post-traumatic necrosis	40	1.2
Post-traumatic arthritis	41	1.3
Sequelae of fracture	12	0.4
Sequelae of osteotomy	6	0.2
Rheumatic arthritis	8	0.2
Others	5	0.2
Total *	**3.219**	**100.0**

* 7 data are missing (0.2%)

13.6 Diseases treated with bi-tricompartmental knee prosthesis

Number of primary bi-tricompartmental knee prosthesis operations carried out on patients with admission date between 1st July 2000 and 31st December 2005, according to **diagnosis**.

Diagnosis in bi/tricompartmental knee prosth.	Number	Percentage
Primary arthritis	21.123	88.0
Deformity	1.172	4.9
Rheumatic arthritis	461	1.9
Post-traumatic arthritis	439	1.8
Sequelae of fracture	320	1.3
Sequelae of osteotomy	171	0.7
Necrosis of the condyle	131	0.5
Sequelae of septic artrithis	35	0.1
Post-traumatic necrosis	41	0.2
Tumor	12	0.1
Sequelae of poliomielitis	15	0.1
Other	94	0.4
Total*	**24.014**	**100.0**

- 93 (0.4%) missing data

13.7 Causes for revision or removal

Number of revision operations carried out on patients admitted between 1s t July 2000 and 31 December 2007, according to ***diagnosis****.*

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

Diagnosis in revision	Number	*Percentage*
Total aseptic loosening	678	41.0
Prosthesis removal	253	15.3
Insert wear	128	7.7
Septic loosening	109	6.6
Aseptic loosening of tibial component	123	7.4
Pain without loosening	125	7.6
Aseptic loosening of femoral component	56	3.4
Prosthesis luxation	33	2.0
Bone fracture	17	1.0
Prosthesis fracture	19	1.2
Stiffness	22	1.3
Instability	21	1.3
Other	70	4.2
Total*	**1.654**	**100.0**

*22 (1,3%) data missing

Number of prosthesis removal carried out on patients admitted between 1s t July 2000 and 31 December 2007, according to **diagnosis**.

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

Diagnosis in removal	Number	*Percentage*
Septic loosening	317	95.2
Total aseptic loosening	12	3.6
loosening of tibial component	2	0.6
Intolerance	1	0.3
Prosthesis luxation	1	0.3
Total*	**333**	**100.0**

*4 missing data (1.2%)

14. Types of knee prosthesis

14.1 Unicompartmental prosthesis

Prostheses used in patients patients admitted between 1s t July 2000 and 31 December 2007, primary surgery

In italics allpoly tibia

TYPE OF PROSTHESIS	N.	%
OXFORD UNICOMPARTIMENTAL PHASE 3 - Biomet Merck	832	25.9
GENESIS UNI - Smith & Nephew	311	9.6
EFDIOS - Citieffe	296	9.2
PRESERVATION UNI – ALL POLY - DePuy	293	9.1
ALLEGRETTO UNI - Protek-Sulzer	233	7.2
UC-PLUS SOLUTION - Endoplus	229	7.1
MITUS - ENDO-MODEL UNI – ALL POLY - Link	229	7.1
MILLER GALANTE UNI - Zimmer	154	4.8
ZIMMER UNI - Zimmer	126	3.9
HLS - UNI EVOLUTION - ALL POLY - Tornier	107	3.3
MAIOR - Finceramica	78	2.4
GKS - ONE - Permedica	65	2.0
OPTETRAK - UNI - ALL POLY -Exactech	53	1.6
PFC - UNI - DePuy	43	1.3
BALANSYS - UNI - Mathys	35	1.1
GENESIS UNI - ALL POLY - Smith & Nephew	34	1.1
EIUS UNI - ALL POLY - Stryker Howmedica	28	0.9
UNICIA - VECTEUR ORTHOPEDIC - Stratec	27	0.8
UNI BUK - ALL POLY – Biomet Merck	8	0.2
PRESERVATION UNI - DePuy	7	0.2
UC-PLUS SOLUTION - ALL POLY - Endoplus	7	0.2
MITUS - ENDO-MODEL UNICONDYLAR SLED - Link	6	0.2
ADVANCE - UNICOMPARTIMENTAL - ALL POLY - Wright	5	0.2
DURACON UNI - Stryker Howmedica	2	0.1
ACCURIS - UNI – Smith & Nephew	2	0.1
AMC - UNI - Corin Medical	1	0.0
GKS - ONE - Permedica+UC-PLUS SOLUTION - Endoplus	1	0.0
Unknown	14	0.4
Total	**3.226**	**100.0**

14.2 Bi-tricompartmental knee prosthesis

Prostheses used in patients admitted between 1s t July 2000 and 31 December 2007, primary surgery

TYPE OF PROSTHESIS	N.	%
NEXGEN – Zimmer	6.193	25.7
PROFIX – Smith & Nephew	3.748	15.5
P.F.C – DePuy	1.928	8.0
SCORPIO – Stryker Howmedica	1.490	6.2
GENESIS II – Smith & Nephew	925	3.8
INTERAX – Stryker Howmedica	732	3.0
GEMINI MK II – Link	650	2.7
LCS – DePuy	637	2.6
T.A.C.K. – Link	631	2.6
OPTETRACK – Exactech	592	2.5
ADVANCE – Wright	547	2.3
ROTAGLIDE – Corin Medical	498	2.1
AGC – Kirschner Biomet Merck	493	2.0
GENIUS TRICCC – Dedienne Santé	448	1.9
TC-PLUS - SOLUTION - PS – Endoplus	447	1.9
SCORE – Amplitude	428	1.8
MULTIGEN - Lima	360	1.5
913 – Wright Cremascoli	357	1.5
VANGUARD - PS - Biomet Merck France	341	1.4
PERFORMANCE – Kirschner Biomet Merck	277	1.1
HLS – EVOLUTION – Tornier	269	1.1
G. K. S. – Permedica	259	1.1
NUOVA DURACON II – Stryker Howmedica	258	1.1
ENDO-MODEL – Link	211	0.9
CONTINUUM KNEE SYSTEM – Stratec Medical	166	0.7
RO.C.C. – Biomet Merck France	163	0.7
FIRST - Symbios Orthopedie Sa	131	0.5
TRIATHLON – Stryker Howmedica Osteonics	107	0.4
GSP - TREKKING - PS - Samo	83	0.3
CINETIQUE - Medacta SA	82	0.3
JOURNEY - Smith & Nephew	65	0.3
E.MOTION - B.Braun	63	0.3
Unknown	174	0.7
Others	354	1.5
Total	**24.107**	***100.0***

14.3 Revision prosthesis

Prostheses used in patients admitted between 1s t July 2000 and 31 December 2007, in total revision surgery

TYPE OF PROSTHESIS	N.	%
NEXGEN – Zimmer	379	28.5
ENDO-MODEL – Link	174	13.1
P.F.C. – DePuy	139	10.5
AGC – Kirschner Biomet Merck	107	8.1
PROFIX – Smith & Nephew	86	6.5
MODULAR ROTATING HINGE – Stryker Howmedica	55	4.2
RT-PLUS - Endoplus	52	3.9
G. K. S. – Permedica	43	3.2
OPTETRACK – Exactech	37	2.8
SCORPIO – Stryker Howmedica	35	2.6
INTERAX – Stryker Howmedica	34	2.6
LEGION – CONSTRAINED - Smith & Nephew	20	1.5
NUOVA DURACON II – Stryker Howmedica	18	1.4
S-ROM NRH - DePuy	18	1.4
GENESIS II – Smith & Nephew	12	0.9
ADVANCE – Wright	11	0.8
GENIUS TRICCC – Dedienne Santé	10	0.8
GENUFITT – Lafitt (fem) + EFDIOS – Citieffe (tib)	8	0.6
GEMINI MKII – Link	8	0.6
LCS - DePuy	8	0.6
C. K. S. – Stratec Medical	7	0.5
TC – solution – Endoplus	7	0.5
913 – Wright Cremascoli	6	0.5
ROTAGLIDE – Corin Medical	6	0.5
VANGUARD – Biomet	5	0.4
T.A.C.K. – Link	4	0.3
CEDIOR – Sulzer	2	0.2
Unknown	13	1.0
Others	20	1.5
Total	**1.324**	**100.0**

14.4 Prosthesis fixation

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31s t December 2005, **according to prosthesis fixation**

Fixation	Primary unicomp.		Primariy bi/tricomp..		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	2838	88.1	20979	87.1	1277	96.6	25094	87.7
Uncemented	328	10.2	1605	6.7	21	1.6	1954	6.8
Fem cementless + tib cemented	44	1.4	1328	5.5	17	1.3	1389	4.9
Fem cem + tib cementless	10	0.3	164	0.7	7	0.5	181	0.6
Total*	**3.220**		**24.076**		**1.322**		**28.618**	

- 39 (0,1%)data are missing

Fixation of TKA according to year of implant

Years of operation	%Cemented	% Cementless	% cemented tibia	% cemented femur
2001	82.0	8.2	9.1	0.7
2002	78.8	9.0	11.8	0.4
2003	82.5	9.5	7.6	0.4
2004	87.9	7.6	4.0	0.5
2005	89.7	6.3	3.3	0.7
2006	90.7	5.5	3.4	0.4
2007	90.9	4.7	3.0	1.4

14.5 Type of insert

Stabilization of bi-tricompartimental knee prostheses

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

Type of insert of bi-tricompartimental knee prsthesis according to year of implant

Years of operation	% fixed liner	% mobile liner
2001	74.3	25.7
2002	72.3	27.7
2003	69.8	30.2
2004	67.9	32.1
2005	65.9	34.1
2006	58.8	41.2
2007	62.5	37.5

14.6 Bone Cement

Types of cement used since 1-1-2002
In italics bone cement loaded with antibiotic

Cement	%
Surgical Simplex P - Howmedica	33.0
Antibiotic Simplex - Howmedica	*18.9*
Palacos R - Biomet	8.0
Refobacin Bone Cement R – Biomet	*5.9*
Cemex System – Tecres	4.0
Osteobond – Zimmer	3.9
Cemex – Tecres	3.5
Aminofix 1 - Groupe Lepine	*3.2*
Versabond AB - Smith & Nephew	*2.8*
Refobacin Revision - Biomet	*2.1*
Versabond - Smith & Nephew	2.0
Amplicem 1 – Amplimedical	1.8
Cemex Genta System - Tecres	*1.4*
CMW 3 G - DePuy	*1.3*
Cemex rx - Tecres	1.1
Other bone cement without antibiotic	4.9
Other bone cement loaded with antibiotic	*2.2*
Total	**100.0**

Bone cement loaded with antibiotic is used in 37,8% of cases.

15. Complications occurred during hospitalization

The rate of complications in **primary unicompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2007

Complications occurred during hospitalization								
Intra-operative			**Local post-operative**			**General post-op**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Femoral fracture,	1	*0.03*	Infection	1	*0.03*	Genito-urinary	2	*0.06*
			SPE paralysis	1	*0.03*	Gastro-intestinal	4	*0.1*
Tibial fracture	3	*0.09*	DVT	1	*0.03*	Hyperpyrexia,	7	*0.2*
						Embolism	3	*0.09*
			Hematoma	7	*0.2*	Collaps	1	*0.03*
						Anemia,	5	*0.2*
Other	2	*0.06*	Other	1	*0.03*	Other	16	*0.5*
Total	**6**	***0.2***	**Total**	**11**	***0.3***	**Total**	**38**	***1.2***

The rate of complications in primary **Bi-tricompartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2007

Complications occurred during hospitalization								
Intra-operative			**Local Post-operative**			**General Post-op.**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Femoral fracture	17	*0.07*	Hematoma	209	*0.9*	Genito-urinary	71	*0.3*
Tibial fracture	7	*0.03*	DVT	46	*0.2*	Gastro-intestinal	68	*0.3*
Tibial tuberosity fracture,	5	*0.02*	Infection	10	*0.04*	Hyperpyrexia	198	*0.8*
						Embolism	32	*0.1*
						Collaps	23	*0.1*
Rupture collateral ligaments	10	*0.04*	SPE paralysis	24	*0.1*	Infarct	20	*0.1*
						Anemia,	242	*1.0*
						Minor cardiac	49	*0.2*
Rupture patella tendon	7	*0.03*	Prosthesis disloc	3	*0.01*			
						Minor respiratory	23	*0.1*
Anesthesiologicc omplications.	8	*0.03*	Instability of ligaments	6	*0.02*	Confusion	29	*0.1*
						Dispnea	19	*0.1*
Other	15	*0.06*	Other	67	*0.3*	Other	93	*0.4*

The rate of complications in revision surgery carried out on patients hospitalized between July 1st 2000 and December 31st 2007

Complications occurred during hospitalization								
Intra-operative			**Post-operative local**			**Post-op.general**		
	N.	**%**		**N.**	**%**		**N.**	**%**
Femoral fracture	4	*0.2*	Infection	4	*0.2*	Anemia	29	*1.7*
Tibial fracture	3	*0.2*				Genito-urinary	2	*0.1*
Fracture of tibial tuberosity	3	*0.2*	SPE paralysis	2	*0.1*	hyperpyrexia,Iperpi ressia	17	*1.0*
Patellar tendon ropture	5	*0.3*	Prosthesis disloc	4	*0.2*	Minor cardiac	6	*0.4*
						Gastro-intestinal	8	*0.5*
Anesthesiologic complications	1	*0.1*	Hematoma	27	*1.6*	Collaps	1	*0.1*
						Embolism	2	*0.1*
Other	4	*0.2*	Other	12	*0.7*	Other	14	*0.8*
Total	**20**	***1.2***	**Total**	**49**	***2.9***	**Total**	**79**	***4.7***

15.1 Deaths occurred during hospitalization

Rate of deaths in knee prosthetic surgery carried out on patients hospitalized between July 1s t 2000 and December 31st 2007.

Registered deaths occurred during hospitalization

Year 2000-2007			
Type of surgery	**Deaths**	**Number of surgery**	***Percentage***
Primary uni	-	3226	-
Primary bi/tricomp	26	24107	0.1
Revision	2	1676	0.1
Removal	1	337	0.3

16. Analysis of survival of primary surgery
16.1 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 indipendent variables, sex, age at surgery, pathology, type of prosthesis (bi/tri comp ves unicomp), type of insert (fix vs mobile) and volume of operations perfomed in the hospital.
All primary hip arthroplasties performed in the region between july 2000 and December 2007 were analyzed.

COX PROPORTIONAL RISK MODEL

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

Number of valid observations 27.264
Non revised: 26.719
Revised: 545

Chi-square: 117.56 *p*= 0.0001

VARIABLE	***SIGNIFICANCE (P)***
Gender (Males vs females))	**NS** (0.320)
Age (less than 70 yrs vs more than 70 yrs)	**S** (0.001)
Diagnosis (arthrosis vs other)	**NS** (0.859)
Type of prosthesis (bi-tri compartmental vs uni)	**S** (0.0001)
Type of insert (Fix vs mobile)	**S** (0.001)
Hospitals (less than 50 operations/year vs more than 50 operations/year)	**NS** (0.61)

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

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

For age:

Age	Relative risk rate	Confidence interval 95%		Significance (p)
Less than 70 yrs	1.8	1.5	2.1	0.001

Younger patients have higher risk of revision

For liner

Insert	Relative risk rate	Confidence interval 95%		Significance (p)
Mobile	1.4	1.16	1.64	0.001

Mobile liner have higher risk

For type of prosthesis

Type of prosthesis	Relative risk rate	Confidence interval 95%		Significance (p)
Uni compartmental	1.95	1.6	2.4	0.0001

16.2 Rate of failure

As already written in hip section, the recovery of data of operations not reported to RIPO is in progress. The uncertainty due to the failure to report about 10% of operations performed in the Region, may lead to an underestimation of the revision rate that is not quantifiable at the moment.

The following table shows the number of primary joint arthroplasty operations performed in the period from July 2000 to December 2007 in the first column, the second and third columns show the number of revision operations performed on the same patients. Some revision operations were performed in the same hospital as the primary operation while others were performed at other hospitals in the Emilia-Romagna Region.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in adifferent hospital	*N. Total revision*	*% revision*
Primary bicompartmental	20.538	255	108	363	1.8
Primary tricompartmental	3.569	56	5	61	1.7
Primary unicomp.	3.226	92	29	121	3.75
Total revision	1.324	57	18	75	5.7
Total	**28.657**	**460**	**160**	**620**	**2.2**

In 26,1% of the primary total prostheses that are replaced, the patient undergoes revision surgery in a different hospital from the one where the primary operation was performed.

16.3 Survival curves according to Kaplan Meier

The survival curve calculated by the Kaplan Meier method enables an estimation of the probability that each individual has of maintaining their initial condition (prosthesis in place) over time.

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

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

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

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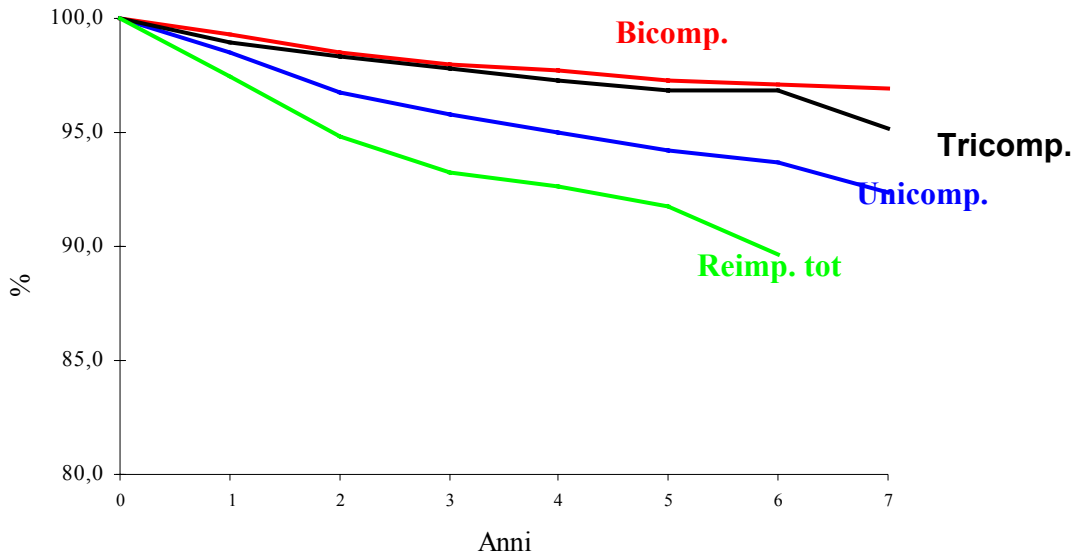
Type of surgery	N. implants	N. major revisions	N. minor revisions	% revisions
Primary bicompartmental	20.538	297	66	1.8
Primary tricompartmental	3.569	49	12	1.7
Primary unicomp..	3.226	109	12	3.75
Total revision	1.324	66	9	5.7

Survival curves



Results in detail

Uni-compartmental			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	98.5	98.1	99.0
2	96.8	96.1	97.5
3	95.8	94.9	96.6
4	95.0	94.0	95.9
5	94.2	93.1	95.3
6	93.7	92.4	95.0
7	92.4	90.2	94.6
Bi-compartmental			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.3	99.1	99.4
2	98.5	98.3	98.7
3	98.0	97.8	98.2
4	97.7	97.4	97.9
5	97.3	97.0	97.6
6	97.1	96.7	97.4
7	96.9	96.5	97.3
Tri-compartmental			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	99.0	98.6	99.3
2	98.3	97.8	98.8
3	97.8	97.2	98.4
4	97.2	96.4	98.0
5	96.9	95.9	97.8
6	96.9	95.9	97.8
7	95.2	92.7	97.7
Total revision			
Years	**% in site**	**c.i. at 95%**	
0	100.0	100.0	100.0
1	97.5	96.6	98.4
2	94.9	93.5	96.2
3	93.3	91.6	94.9
4	92.6	90.9	94.4
5	91.7	89.7	93.8
6	89.7	86.8	92.5
7	89.7	86.8	92.5

At 7 years follow-up there is a significant difference between uni-compartmental and bicompartmental (Statistica di Wilcoxon (Gehan), p=0.001).

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

Primary uni-compartmental

Cause of revision	Rate	Percentage	% distribution of cause of failure
Total aseptic loosening	**43**/3226	1.3	35.5
Pain without loosening	**21**/3226	0.7	17.4
Tibial aseptic loosening	**13**/3226	0.4	10.7
Femoral aseptic loosening	**12**/3226	0.4	9.9
Septic loosening	**11**/3226	0.3	9.1
Liner wear	**11**/3226	0.3	9.1
Bone fracture	**2**/3226	0.1	1.7
Other	**8**/3226	0.2	6.6
Total	**121/3226**	**3.8**	**100.0**

Primary bi-tricompartmental

Cause of revision	Rate	Percentage	% distribution of cause of failure
Septic loosening	**133**/24107	0.55	31.4
Total aseptic loosening	**100**/24107	0.41	23.6
Tibial aseptic loosening	**45**/24107	0.19	10.6
Pain without loosening	**34**/24107	0.14	8.0
Liner wear	**28**/24107	0.12	6.6
Luxation	**21**/24107	0.09	5.0
Femoralaseptic loosening	**15**/24107	0.06	3.5
Stiffness	**13**/24107	0.05	3.1
Bone fracture	**3**/24107	0.01	0.7
Unknown	**6**/24107	0.02	1.4
Other	**26**/24107	0.11	6.1
Total	**424/24107**	***1.8***	***100.0***

Total revision

Cause of second revision	Rate	Percentage	% distribution of cause of failure
Septic loosening	**31**/1324	2.3	41.3
Total aseptic loosening	**13**/1324	1.0	17.3
Pain without loosening	**4**/1324	0.3	5.3
Femoral loosening	**4**/1324	0.3	5.3
Tibial loosening	**3**/1324	0.2	4.1
Unknown	**3**/1324	0.2	4.1
Luxation	**4**/1324	0.3	5.3
Other	**13**/1324	1.0	17.3
Total	**75/1324**	**5.7**	**100.0**

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

To expand the subject further data are given.

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

Type of insert	n. of operation	Removals	Rate	%
Fixed	15.944	250	250/15944	1.6
Mobile	8.137	174	174/8137	2.1

Primary surgery-fixed insert

Cause of revision	Rate	%	% distribution of cause of failure
Septic loosening	**83**/15944	0.52	33.2
Total aseptic loosening	**51**/15944	0.32	20.4
Tibial loosening	**28**/15944	0.18	11.2
Pain without loosening	**20**/15944	0.13	8.0
UsuraInsert wear inserto	**18**/15944	0.11	7.2
Luxation	**10**/15944	0.06	4.0
Femoral loosening	**7**/15944	0.04	2.8
Stiffness	**8**/15944	0.05	3.2
Other	**25**/15944	0.16	10.0
Total	**250**/15944	***1.6***	***100.0***

Primary surgery-mobile insert

Cause of revision	Rate	%	% distribution of cause of failure
Septic loosening	**49**/8137	0.60	28.2
Total aseptic loosening	**48**/8137	0.59	27.6
Tibial loosening	**14**/8137	0.17	8.0
Pain without loosening	**14**/8137	0.17	8.0
Insert wear	**10**/8137	0.12	5.7
Luxation	**11**/8137	0.14	6.3
Femoral loosening	**8**/8137	0.10	4.6
Stiffness	**5**/8137	0.06	2.9
Other	**15**/8137	0.18	8.6
Total	**174**/8137	***2.1****	***100.0***

Prostheses with mobile bearings have a failure rate connected to the bearing (bearing wear, dislocation, aseptic loosening) that is on the whole not different from that of fixed-bearing prostheses.
Therefore, it was assessed whether the type of bearing mobility might be a discriminating factor.
Repeating the Cox multivariate analysis, on only the primary cemented arthroplasties due to knee arthritis showed that the bearing with only rotation mobility increases the risk of failure by 1.3 times compared to the fixed one, whereas that with dual movement (rotation and antero-posterior sliding) increases it by 1.7 times, again compared to the fixed bearing.
There is no significant difference between the two types.

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

In rare cases bicompartmental prosthesis was transformed into tricompartmental prosthesis, with the addition of the patella component, during a second operation.
That was done in 83 cases (out of 20,538 bicompartmental prostheses recorded in the RIPO).
The mean time lapse between primary bicompartmental arthroplasty and implanting the patella was 1.5 years (CI at 95% 1.23-1.69).
These 83 re-operations were not states considered as failures of the bicompartmental prosthesis.

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

To perform a comparison among the survival of several prosthesis types correctly, it is necessary to introduce a parameter that takes into account the complexity of the series treated. As in the Swedish register, the calculation of a case-mix was chosen.
According to the Cox multivariate analysis, the knee prosthesis has a greater risk of failure in patients under 70 years old. The percentage of patients with these characteristics treated by primary knee arthroplasty in Emilia Romagna is 44.5%.
Series with a higher percentage should be considered as complex series.

Type	Starting Years	N.	% of patients younger than 70	n. failures	% survival at 6	I.C. al 95%
OXFORD UNICOMPARTIMENTAL PHASE 3 - Biomet Merck	2000	832	65.9	32	94.0	91.3-96.6
GENESIS UNI - Smith & Nephew	2000	311	68.2	12	92.8	88.4-97.2
EFDIOS - Citieffe	2000	296	60.1	18	93.3	90.1-96.5
PRESERVATION UNI – ALL POLY - DePuy	2002	293	61.8	10	-	-
ALLEGRETTO UNI - Protek-Sulzer	2000	233	61.4	13	92.5	88.2-96.8
UC-PLUS SOLUTION - Endoplus	2000	229	68.6	4	97.3	94.4-100
MITUS - ENDO-MODEL UNI – ALL POLY - Link	2003	229	66.4	5	-	-
MILLER GALANTE UNI - Zimmer	2001	154	67.5	5	96.5	93.5-99.5
ZIMMER UNI - Zimmer	2005	126	70.6	-	-	-
HLS - UNI EVOLUTION - ALL POLY - Tornier	2001	107	38.3	-	-	-
Other (less than 100 cases)	2000	416	62.4	22	92.3	88.0-96.7
All models	2000	3226	63.9	121	93.7	92.4-95.0

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

	Starting year	*N.*	% of patients younger than 70	N. failures	% survival at 6 years	C.I. 95%
NEXGEN – Zimmer	2000	6193	43.7	84	97.9	97.4-98.4
PROFIX – Smith & Nephew	2000	3748	45.8	57	97.6	97.0-98.3
P.F.C – DePuy	2000	1928	44.9	45	96.8	95.8-97.9
SCORPIO – Stryker Howmedica	2002	1490	41.9	18	-	-
GENESIS II – Smith & Nephew	2000	925	45.1	6	98.5	97.3-99.7
INTERAX – Stryker Howmedica	2000	732	34.6	31	94.6	92.7-96.6
GEMINI MK II – Link	2002	650	34.5	3	-	-
LCS – DePuy	2000	637	42.9	11	97.6	96.0-99.1
T.A.C.K. – Link	2000	631	39.6	32	94.4	92.4-96.3
OPTETRACK – Exactech	2000	592	36.7	8	97.3	95.4-99.3
ADVANCE – Wright	2001	547	33.3	13	96.2	93.9-98.5
ROTAGLIDE – Corin Medical	2000	498	36.5	22	94.6	92.2-96.9
AGC – Kirschner Biomet Merck	2001	493	36.9	6	98.2	96.6-99.8
GENIUS TRICCC – Dedienne Santé	2000	448	25.9	16	94.6	91.7-97.5
TC-PLUS - SOLUTION - PS – Endoplus	2003	447	39.1	5	-	-
SCORE – Amplitude	2004	428	31.3	1	-	-
MULTIGEN – Lima	2001	360	36.7	7	-	-
913 – Wright Cremascoli	2000	357	44.8	4	98.7	97.5-100
VANGUARD - PS - Biomet Merck France	2005	341	55.7	2	-	-
PERFORMANCE – Kirschner Biomet Merck	2000	277	48.7	8	96.8	94.5-99.0
HLS – EVOLUTION – Tornier	2000	269	31.2	2	99.2	98.0-100
G. K. S. – Permedica	2001	259	34.7	4	97.9	95.9-100
NUOVA DURACON II – Stryker Howmedica	2000	258	32.6	6	97.2	95.0-99.4
ENDO-MODEL – Link	2000	211	32.6	3	97.0	92.9-100
Others (less than 100 cases)	2000	1388	44.6	30	95.7	93.9-97.5
All models	2000	24107	41.9	424	97.1	96.7-97.4