



## **REPORT of R.I.P.O.**

*Register of orthopedic prosthetic implantology  
Laboratorio di Tecnologia Medica – I.O.R.*

### **OVERALL DATA**

### **HIP AND KNEE ARTHROPLASTY**

### **IN EMILIA ROMAGNA REGION**

**1st January 2000 – 31st December 2004**

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## **Foreword**

This report, elaborated by the Register of Orthopedic Prosthetic Implantology (RIPO), presents the most significant results of the descriptive statistical analyses performed on operations of hip and knee arthroplasty carried out in Emilia-Romagna, between 1<sup>st</sup> January 2000 and 31<sup>st</sup> December 2004. (<http://ripo.cineca.it>)

The data include for the hip, besides primary arthroplasty, revision surgery, prosthesis removal and hemiarthroplasty

In section two knee prostheses (both uni and bicompartmental) revisions and prosthesis removal are reported.

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.

When forms were missing or lacking important information (patient identification, type of prosthesis implanted), the representative of the hospital was asked to supply it.

This report, combined with the report on the data of single units, provides a full picture of regional implantology practice, and offers surgeons a very useful tool for making decisions and informing patients.

## **Notes on methodology**

Elaboration includes data concerning the period 1<sup>st</sup> January 2000 to 31<sup>st</sup> December 2004, which arrived before 1<sup>st</sup> June 2005. The collection of data about the knee started in July 2000.

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 data collected to date has a maximum follow-up of 5 years, therefore, prosthesis survival evaluations can be made.

Survival curves were calculated and plotted according the actuarial method of Kaplan and Meier. The prosthesis is considered to be "surviving" until surgical intervention is needed to replace even one component. Thus, revision surgery represents the end-point.

The degree of reliability of the curves may be influenced by the incomplete communication of operations performed in Emilia-Romagna to RIPO; that is why comparison with the SDO databank was made.

### **Scientific board of RIPO**

On March 4th 2004 the Scientific board of RIPO met for the first time to elect its internal chairman.

The board will remain in charge for three years is composed by

**Dr. Stefano Liverani,**

Responsabile del Servizio Presidi Ospedalieri – Regione Emilia-Romagna;

**Dr. Salvatore Ferro,**

Dirigente Medico del Servizio Presidi Ospedalieri – Regione Emilia-Romagna;

**Dr. Roberto Grilli,**

Responsabile Area Governo Clinico – Agenzia Sanitaria Regionale – Regione Emilia-Romagna;

**Dr. Andrea Donatini, (to be substituted)**

Responsabile Area Economia e Salute – Ag. Sanitaria Regionale – Regione Emilia-Romagna;

**Dr. Paolo Costa,**

Direttore U.O. Ortopedia e Traumatologia – Az. Osp. di Reggio Emilia;

**Prof. Leo Massari,**

Direttore U.O. Ortopedia – Az. Osp. Universitaria di Ferrara;

**Dr. Luigi Prosperi,**

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**Dr. Luigi Specchia,**

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Funzionario del Servizio Presidi Ospedalieri – Regione Emilia-Romagna.

Bologna, 20th June 2005

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

# **PART ONE: HIP PROSTHESIS**

January 2000 – December 2004

## 1. RIPO support

### 1.1 Support 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. Data are referred to primary hip prosthesis (8151), hemiarthroplasty (8152), revision (8153) and prosthesis removal (8005).

<b>SUPPORT TO RIPO</b>					
	<b>Year 2000 %</b>	<b>Year 2001 %</b>	<b>Year 2002 %</b>	<b>Year 2003 %</b>	<b>Year 2004 %</b>
<b>BOLOGNA Province</b>					
AZIENDA Bologna Nord	103.3*	106.0*	102.6*	96.0	105.4*
AZIENDA Bologna Sud	78.7	90.0	93.7	86.4	78.2
AZIENDA Città di Bologna	77.7	93.4	98.6	95.6	95.6
AZIENDA Imola	57.6	93.9	87.2	87.1	75.4
Az. Osp. S. Orsola-Malpighi	<b>97.3</b>	95.6	82.5	86.7	89.4
Istituti Ortopedici Rizzoli	102.3*	99.4	101.9*	99.6	100.0
<b>FERRARA Province</b>					
AZIENDA Ferrara	102.2*	96.9	91.7	79.8	81.2
Az. Ospedaliera di Ferrara	98.0	89.2	91.7	83.6	74.3
<b>FORLÌ-CESENA Province</b>					
AZIENDA Forlì	91.6	92.5	82.0	91.9	88.1
AZIENDA Cesena	100.6*	103.9*	93.7	87.9	84.7
<b>MODENA Province</b>					
AZIENDA Modena	78.2	92.0	95.7	93.8	97.1
Az. Osp. Policlinico di Modena	89.6	95.9	89.5	39.7	74.7
<b>PARMA Province</b>					
AZIENDA Parma	73.6	100.5*	109.6*	102.4*	98.2
Az. Ospedaliera di Parma	75.7	79.3	86.2	91.5	93.8
<b>PIACENZA Province</b>					
AZIENDA Piacenza	70.0	95.8	105.3*	97.4	96.1
<b>RAVENNA Province</b>					
AZIENDA Ravenna	93.3	100.7*	98.0	97.1	96.1
<b>REGGIO EMILIA Province</b>					
AZIENDA Reggio Emilia	77.2	75.5	81.4	89.6	90.8
Arcispedale Santa M. Nuova	104.3*	86.0	103.8*	72.5	100.3*
<b>RIMINI Province</b>					
AZIENDA Rimini	101.0*	101.5*	100.0	91.7	98.4
<b>TOTAL</b>	<b>87.8</b>	<b>94.3</b>	<b>95.4</b>	<b>91.7</b>	<b>92.7</b>

\* Percentage higher than 100 is possibly due to a mistake in SDO code

## 1.2 Percentage of RIPO support year 2004

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), according to Orthopaedic department.

11 operations performed in two 'non accredited' private hospitals of Bologna (Villalba and Villa Toniolo) are not here reported

<b>YEAR 2004</b>			
<b>BOLOGNA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA BOLOGNA</b>			
<b>Bologna Città</b>			
Casa di cura "Villa Regina" (non accr.)	40	55	<b>95.6</b>
Casa di cura "Villa Erbosa"	105	105	
Casa di cura "Villa Nigrisoli"	121	122	
Casa di cura "Villa Torri"	204	205	
Casa di cura "Villa Laura"	114	116	
Ospedale Maggiore, Bellaria	147	161	
<b>Bologna Nord</b>			
Bentivoglio, Budrio, S. Giovanni in Persiceto	97	92	<b>105.4*</b>
<b>Bologna Sud</b>			
Ospedale Civile di Verqato	52	82	<b>78.2</b>
Casa di cura "Prof. Nobili"	18	18	
Casa di cura "Villa Chiara"	38	38	
<b>Total</b>	<b>936</b>	<b>994</b>	
Azienda Ospedaliera S. Orsola-Malpighi	312	349	<b>89.4</b>
Istituti Ortopedici Rizzoli	1596	1596	<b>100.0</b>
<b>AZIENDA IMOLA</b>			
Osp. Civile di Imola – Castel San Pietro	248	329	<b>75.4</b>

<b>FERRARA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
Stab. Ospedaliero di Cento, Bondeno	194	191	<b>81.2</b>
Ospedale Civile Argenta	158	174	
Ospedale Civile Comacchio – Delta	53	134	
<b>Total</b>	<b>405</b>	<b>499</b>	
Azienda Ospedaliera di Ferrara	165	222	<b>74.3</b>



<b>YEAR 2004</b>			
<b>FORLÌ-CESENA Province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA FORLÌ'</b>			
Ospedale "Morgagni-Pierantoni" Forlì, Forlimpopoli, Santa Sofia	129	155	<b>88.1</b>
Villa Igea Forlì	5	5	
Casa di cura "Villa Serena" Forlì	66	67	
<b>Total</b>	<b>200</b>	<b>227</b>	
<b>AZIENDA CESENA</b>			
Ospedale "M. Bufalini" Cesena, Bagno di Romagna, Cesenatico	133	198	<b>84.7</b>
Casa di cura "Malatesta Novello" Cesena	223	223	
Casa di cura "S. Lorenzino" Cesena	4	4	
<b>Total</b>	<b>360</b>	<b>425</b>	

<b>MODENA Province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA MODENA</b>			
Ospedale S. Agostino-Estense	370	358	<b>97.1</b>
Ospedale Civile degli Infermi, Carpi	199	199	
Ospedale di Finale Emilia	0	10	
Ospedale S. Maria Bianca, Mirandola	110	102	
Ospedale Civile Castelfranco Emilia	0	39	
Ospedale Civile, Sassuolo	92	98	
Ospedale Civile, Vignola	92	86	
Ospedale, Pavullo	64	64	
Hesperia Hospital	35	34	
Casa di cura Prof. Fogliani	23	24	
<b>Total</b>	<b>985</b>	<b>1014</b>	
Azienda Ospedaliera Policlinico di Modena	236	316	<b>74.7</b>

<b>PARMA Province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA PARMA</b>			
Ospedale Civile, Fidenza, San Secondo Parmense	83	86	<b>98.2</b>
Ospedale Santa Maria, Borgo Val di Taro	80	80	
Casa di cura "Città di Parma"	61	62	
<b>Total</b>	<b>224</b>	<b>228</b>	
Azienda Ospedaliera di Parma	488	520	<b>93.8</b>

<b>YEAR 2004</b>			
<b>PIACENZA Province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA PIACENZA</b>			
Ospedale Civile, Piacenza	137	148	<b>96.1</b>
Presidio Val Tidone, Castel San Giovanni	69	62	
Presidio Val D'Arda, Fiorenzuola D'Arda, Cortemaggiore	120	129	
<b>Total</b>	<b>326</b>	<b>339</b>	

<b>RAVENNA Province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA RAVENNA</b>			
Ospedale S. Maria delle Croci, Ravenna	140	143	<b>96.1</b>
Presidio Ospedaliero, Lugo	244	244	
Ospedale per gli Infermi, Faenza	122	132	
Casa di cura "Domus Nova"	9	9	
Casa di cura "S. Francesco"	123	124	
Casa di cura "Villa Maria Cecilia"	38	39	
Casa di cura "S. Pier Damiano"	99	115	
<b>Total</b>	<b>775</b>	<b>806</b>	

<b>REGGIO EMILIA Province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA REGGIO EMILIA</b>			
Ospedale, Guastalla	109	104	<b>90.8</b>
Ospedale S. Sebastiano, Correggio	0	5	
Ospedale di Montecchio Emilia	71	71	
Ospedale di Scandiano	85	78	
Ospedale S. Anna, Castelnovo Monti	93	92	
Casa di cura "Villa Salus"	90	93	
Casa di cura "Villa Verde"	-	50	
<b>Total</b>	<b>448</b>	<b>493</b>	
Arcispedale Santa Maria Nuova -RE	267	266	<b>100.3*</b>

<b>RIMINI Province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA RIMINI</b>			
Ospedale Infermi, Rimini, Sant Arcangelo	95	100	<b>98.4</b>
Ospedale G. Ceccarini, Riccione, Cattolica	159	160	
Casa di cura "Sol et Salus"	166	167	
Casa di cura "Villa Maria"	2	2	
<b>Total</b>	<b>422</b>	<b>429</b>	

<b>TOTAL</b>	<b>8.393</b>	<b>9.052</b>	<b>92.7</b>
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\* Percentage higher than 100 is possibly due to a mistake in SDO code

### 1.3 Ratio public/private treatment

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

<b>% of operations performed in public hospitals (AUSL, AOSP, IRCCS)</b>			
<b>Year of surgery</b>	<b>Primary arthroprosthesis</b>	<b>Hemiarthroplasty</b>	<b>Revision</b>
<b>2000</b>	77.0	97.0	78.0
<b>2001</b>	81.0	97.3	77.0
<b>2002</b>	78.0	97.5	79.0
<b>2003</b>	75.1	98.4	76.1
<b>2004</b>	75.3	97.6	76.1

Source: data bank S.D.O. 2004

More than  $\frac{3}{4}$  of THA (Total Hip Arthroplasties) and nearly all hemiarthroplasties are performed in public hospitals.

No significant differences can be evidenced during the years

## 2. Quality of data

The reliability of data provided by the Units is assessed at the time they are inserted into the databank. An index number between 2 (data missing or incongruent) and 8 (data complete and probable) is assigned to each admission form.

Number of arthroplasty operations carried out on patients with admission date between 1<sup>st</sup> January 2000 and 31<sup>st</sup> December 2004, according to **quality** of data.

Quality	Number operations	Percentage
2	1.032	2.7
4	631	1.6
6	1.863	4.8
8	34.944	90.9
<b>Total</b>	<b>38.470</b>	<b>100.0</b>

The quality of the data supplied to RIPO is much better than that of past years, although it would be desirable that all the units fill in the form as clearly and fully as possible. 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 2004 this percentage was much higher, 98%.

There are still, in isolated cases, some difficulties due to inaccurate reporting of data.

### 3. Type of operation

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2004, according to **type**.

Type of operation	Number of operation	Percentage
Primary THA	23.966	62.3
Total and partial revision*	4.110	10.7
Hemiarthroplasty	9.952	25.8
Prosthesis removal	223	0.6
Other**	220	0.6
<b>Total</b>	<b>38.471</b>	<b>100.0</b>

\* 1.396 total revision, 1.530 cup revision, 626 stem revision, 261 head revision, 297 revision of hemiarthroplasty

\*\* Including 110 luxation reductions, 49 debridements, 11 ossification removals, 7 hematoma drains and 5 fixation device removals

The percentage distribution of primary total arthroplasties, hemiarthroplasty and revision remained constant throughout the five years.

#### 4. Passive and active mobility

Number of THA and TKA operations performed in the Emilia-Romagna region on patients according to their origin from outside the Emilia-Romagna region.

Region of residence	Primary THA	Primary TKA
Piemonte	24	22
Lombardia	100	79
Veneto	129	107
Friuli	11	10
Liguria	34	28
Marche	181	195
Toscana	127	122
Umbria	74	63
Lazio	73	41
Campania	107	92
Abruzzo	66	35
Molise	21	6
Basilicata	42	23
Puglia	191	207
Calabria	95	111
Sicilia	166	164
Sardegna	18	26
Other regions and abroad	27	8
<b>Total</b>	<b>1.486</b>	<b>1.339</b>

Source: data bank S.D.O. 2004

25.4% of primary THA performed in Emilia Romagna is done on patients non-resident in the Region. The percentage is 31.3% for TKA.

Movement of Emilia-Romagna residents to other regions.

Region of residence	Primary THA	Primary TKA
Lombardia	251	216
Veneto	54	86
Liguria	24	2
Toscana	21	12
Marche	17	20
Altre regioni	19	9
<b>Total</b>	<b>386</b>	<b>345</b>

Source: data bank S.D.O. 2003

7.9% of primary TKA performed on resident in Emilia Romagna is done outside the region. Percentage is 12.3% for TKA.

## 5. Descriptive statistics of patients

### 5.1 Age

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2004, according to **type of operation** and **age group** of patients at the time of surgery.

Type of operation	<40		40-49		50-59		60-69		70-79		=80		Total
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	
Primary THA	774	3.2	1559	6.5	3475	14.5	7437	31.1	8619	36.0	2086	8.7	23.950
Hemi arthroplasty	9	0.1	16	0.2	72	0.7	390	3.9	2730	27.5	6713	67.6	9.930
Revision	70	1.7	139	3.4	395	9.6	1178	28.7	1715	41.7	612	14.9	4.109
Prosthesis removal	4	1.8	14	6.3	17	7.6	61	27.3	97	43.5	30	13.5	223
Other	12	5.5	11	5.0	30	13.6	57	25.9	71	32.3	39	17.7	220
<b>Total*</b>	<b>869</b>		<b>1.739</b>		<b>3.989</b>		<b>9.123</b>		<b>13.232</b>		<b>9.480</b>		<b>38.432</b>

\* 39 data (0.1%) are missing

The hemiarthroplasty were mostly, but not exclusively, implanted in persons over the age of eighty. The percentage of patients over 90 treated by hemiarthroplasty was stable throughout the four-year analysis of the register and now is set at 17.8%

### 5.2 Sex

Number of hip operations carried out on patients with admission date between 1st January 2000 and 31st December 2004, according to **type of operation** and **sex** of patient.

Type of operation	Male		Female		Total
	N.	%	N.	%	N.
Primary THA	8.997	37.5	14.969	62.5	23.966
Hemi arthroplasty	2.327	23.4	7.625	76.6	9.952
Revision	1.224	29.8	2.886	70.2	4.110
Prosthesis removal	76	34.1	147	65.9	223
Other	89	40.5	131	59.5	220
<b>Total</b>	<b>12.713</b>	<b>33.0</b>	<b>25.758</b>	<b>67.0</b>	<b>38.471</b>

### 5.3 Side of surgery

Coxarthrosis more often affects right hip (58.1%). The percentage has been calculated on patients wearing only one implant.

### 5.4 Clinical condition

Number of arthroplasty operations carried out on patients with admission date between 1st January 2000 and 31st December 2004, according to **Charnley classification** of patients at the time of surgery

Clinical condition	Number	Percentage
<b>One hip affected</b>	25.121	67.0
Two hips affected	8.913	23.8
Other diseases restricting movement	3.468	9.2
<b>Total*</b>	<b>37.502</b>	<b>100.0</b>

\* 969 data (2.5%) are missing

Clinical condition of patients admitted to **public and private hospitals, and scientific institutions** for primary arthroplasty or revision surgery

Clinical condition	Ausl	Private	I.O.R
<b>One hip affected</b>	72.1%	61.3%	63.9%
Two hips affected	18.5%	32.9%	29.2%
Other diseases restricting movement	9.4%	5.8%	6.9%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

### 5.5 Bilateral arthroplasty

In the period of registry observation (5 years) 996 patients underwent bilateral operations. About 7% 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% of cases

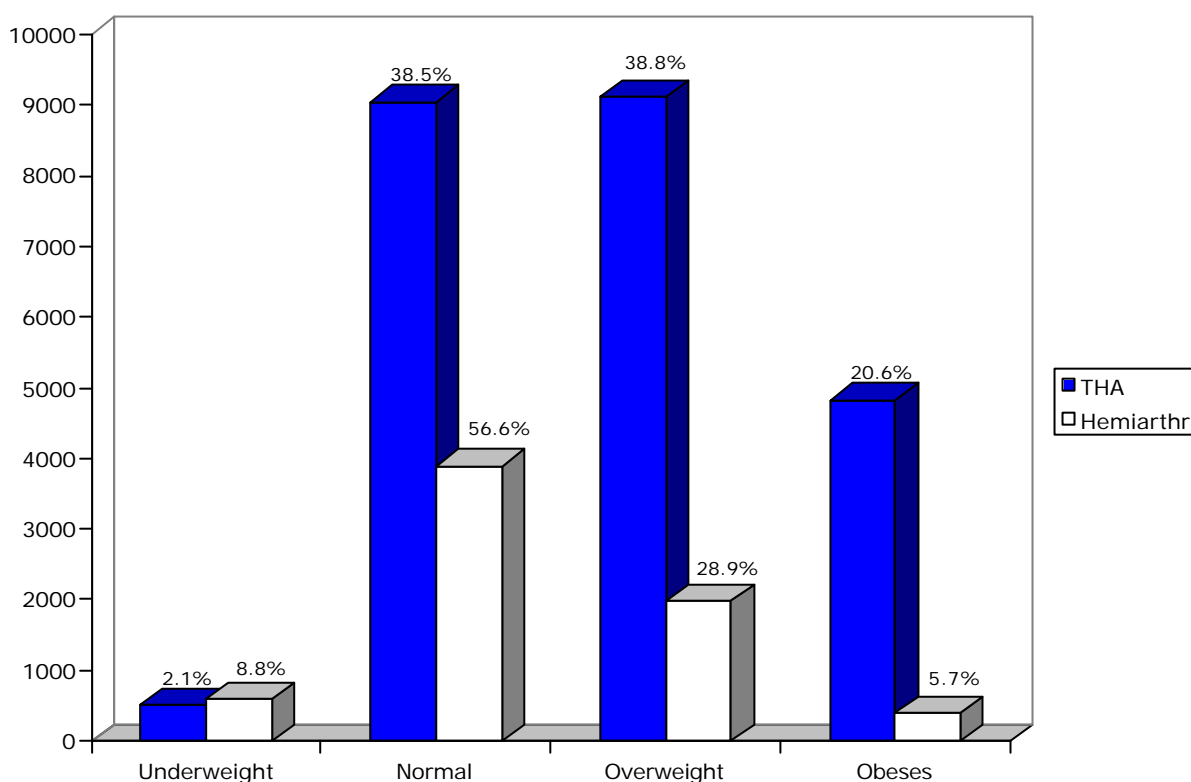


## 5.6 Body mass index

Number of arthroplasty operations carried out on patients with admission date between 1st January 2000 and 31st December 2004, according to **body mass index** of patients at the time of surgery.

Body Mass Index	Primary THA and revision	Hemiarthroplasty	Total
Underweight (= 19)	504	599	1.103
Normal (20-25)	9.041	3.883	12.924
Overweight (26-29)	9.106	1.983	11.089
Obese (= 30)	4.829	394	5.223
<b>Total*</b>	<b>23.480</b>	<b>6.859</b>	<b>30.339</b>

\* 7.689 data (20.2%) are missing



Overweight and obesity, calculated according to BMI [weight in kg/(height in meters)<sup>2</sup>], are characteristics found in more than 60% of patients undergoing hip arthroplasty. Elderly patients undergoing hemiarthroplasty are overweight or obese only in 34.7% of cases. In this group scarce nutrition is more common. Difference between the two groups is significant (Chi square test)

This information, however, is not completely reliable due to the high percentage of values not supplied to RIPO (nearly on fifth of the total).

## 5.7 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 2004, according to diagnosis.

Diagnosis in primary arthroplasty	Number	Percentage
Primary arthritis*	15.763	66.1
Sequelae of LCA and DCA	3.080	12.9
Femoral neck fracture	2.031	8.5
Femoral head necrosis (idiopathic, due to dialysis, due to steroids)	1.313	5.5
Post traumatic arthritis	607	2.5
Post traumatic necrosis	347	1.5
Rheumatic arthritis	332	1.4
Femoral neck fracture sequelae	101	0.4
Epiphysiolysis sequelae	60	0.2
Perthes disease sequelae	56	0.2
Septic coxitis sequelae	43	0.2
Tumor	38	0.2
Paget's disease sequelae	23	0.1
TBC coxitis sequelae	22	0.1
Other	47	0.2
<b>Total**</b>	<b>23.863</b>	<b>100.0</b>

\* 595 patients (2.3%) are younger than 50 years or older

\*\* 103 data (0.4%) are missing

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

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

Diagnosis in primary arthroplasty	Percentage				
	2000	2001	2002	2003	2004
Primary arthrosis	66.8	65.1	63.6	67.4	67.6
Sequelae of LCA and DCA	13.5	13.3	13.1	12.0	11.9
Femoral neck fracture	9.0	9.1	9.3	8.0	7.6
Femoral head necrosis idiopathic	4.8	5.3	5.0	5.3	6.0
Post traumatic arthritis	2.1	2.1	2.7	2.0	2.7
Post traumatic necrosis	1.3	1.5	2.0	1.3	1.4
Rheumatic arthritis	1.4	1.6	1.4	1.2	1.0
Other	1.1	2.0	2.9	2.8	1.8

Percentage distribution is similar over the five years.

Percentage distribution of diagnosis in THA, according to **type of healthcare center**.

Diagnosis in primary arthroplasty	Percentage			
	AOSP	Private	AUSL	I.O.R
Primary arthrosis	65.8	75.5	65.2	54.7
Sequelae of LCA and DCA	12.9	11.1	11.3	21.4
Femoral neck fracture	11.6	1.3	12.6	6.4
Femoral head necrosis idiopathic	4.2	5.4	5.4	4.2
Post traumatic arthritis	1.5	2.3	1.3	5.4
Post traumatic necrosis	0.9	1.2	1.6	2.3
Rheumatic arthritis	1.4	1.6	1.0	2.7
Other	1.7	1.6	1.6	2.9

With regards to distribution of diseases according to type of healthcare center, Hospital Agencies and Local Health Agencies have similar percentages, and they treat a high number of femur fractures, unlike the private centers. Rizzoli has a high percentage of treatment for sequelae of congenital and infant diseases and for traumas.

98.0% of hemiarthroplasties are implanted for femoral neck fracture

During 2004 ratio hemiarthroplasty:total hip replacements due to intracapsular fractures was 3.5:1 (from data base SDO 2004).

Distribution of percentage of patients affected by femoral neck fracture, according to **type of operation** and **healthcare center**.

Type of operation	Percentage			
	AOSP	Privato	AUSL	I.O.R
<b>Primary THA</b>	12.1	36.8	17.2	29.0
<i>Patients mean age</i>	<i>69.7 yrs</i>	<i>71.6 yrs</i>	<i>70.6 yrs</i>	<i>69.7 yrs</i>
<b>Hemiarthroplasty</b>	87.9	63.2	82.8	71.0
<i>Patients mean age</i>	<i>82.0 yrs</i>	<i>81.7 yrs</i>	<i>82.4 yrs</i>	<i>84.1 yrs</i>

The treatment of femoral neck fracture, in patients matched for age, differs between public centers (AOSP and AUSL) and IOR (Istituto Ortopedico Rizzoli). In the former hemiarthroplasty is preferred, while in the latter about a third is treated by total joint arthroplasty. Relatively few fractures are treated in private centers, therefore, comparison cannot be performed.

## 5.8 Causes for revision

Number of revision operations carried out on patients admitted between 1<sup>st</sup> January 2000 and 31 December 2004, according to **diagnosis**.

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

*In italics the cause of hemiarthroplasty revision*

<b>Diagnosis in revision</b>	<b>Number</b>	<b>Percentage</b>
Cup aseptic loosening	1.280	31.5
Total aseptic loosening	1.227	30.2
Stem aseptic loosening	456	11.2
Prosthesis luxation	284	7.0
Prosthesis removal	116	2.9
Bone fracture	106	2.6
<i>Hemiarthroplasty stem loosening</i>	105	2.6
<i>Hemiarthroplasty luxation</i>	82	2.0
Prosthesis breakage*	80	2.0
Poly wear	75	1.8
Septic loosening	74	1.8
<i>Cotiloiditis</i>	59	1.4
Pain without loosening	53	1.3
<i>Pain without loosening in hemiarthroplasty</i>	17	0.4
<i>Bone fracture in hemiarthroplasty</i>	8	0.2
Other (ossification, trauma...)	47	1.1
<b>Total**</b>	<b>4.069</b>	<b>100.0</b>

\* 12 cup fracture, 17 stem fracture, 14 head fracture, 22 insert fracture

\*\* 41 data missing, equal to 1.0% of the series of revision operations

On the whole, aseptic loosening is the cause of more than 72% of revisions carried out in the region.

Septic loosening, although limited to 1.8%, represents a worrying figure, especially considering that even revisions performed for "prosthesis removal" may be due to infection.

However, it should be highlighted that many revisions are performed on patients who underwent primary arthroplasty in other regions.

## 6. 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.

### 6.1 Cups used in primary arthroplasty

TYPE OF CUP	NUMBER	PERCENTAGE
ANCA FIT – Cremascoli	5.993	25.0%
CLS – Sulzer	2.457	10.3%
FITMORE – Sulzer	1.362	5.7%
ABG II – Howmedica	1.208	5.0%
STANDARD CUP – Sulzer	1.147	4.8%
DUOFIT PSF – Samo	1.051	4.4%
MULLER – Cremascoli	888	3.7%
REFLECTION – Smith & Nephew	881	3.7%
TRILOGY – Zimmer	801	3.3%
TRIDENT – Howmedica	457	1.9%
CONTEMPORARY – Howmedica	450	1.9%
ELLIPTICAL CUP – Stratec	374	1.6%
MULLER – Sulzer	355	1.5%
ZCA – Zimmer	354	1.5%
MULLER – Samo	353	1.5%
ABG – Howmedica	313	1.3%
BICON-PLUS – Endoplus	296	1.2%
HILOCK LINE – Symbios	248	1.0%
MULLER – Smith & Nephew	232	1.0%
SPH CONTACT – Lima	224	0.9%
RESURFACING – Birmingham	215	0.9%
CFP – Link	212	0.9%
MARBURG – Allopro Sulzer	171	0.7%
OSTEOLOCK – Howmedica	169	0.7%
SECUR-FIT – Osteonic	168	0.7%
EASY – Hit Medica	153	0.6%
METASUL STAR CUP – Sulzer	145	0.6%
ALBI – Cremascoli	143	0.6%
DURALOC – DePuy	135	0.6%
TRILOGY AB – Zimmer	114	0.5%
MULLER – Lima	113	0.5%
MBA – Groupe Lépine	101	0.4%
ALLOFIT S – Allopro	92	0.4%
DELTA PF – Lima	90	0.4%
EXCEED PC – Biomet Merck	87	0.4%
TRABECULAR metal monoblock - Zimmer	87	0.4%
SPH BLIND – Lima	83	0.3%
Unknown	76	0.3%
<b>TOTAL</b>	<b>21.798</b>	<b>91.0%</b>

The remaining 2.168 cups (9.0%), were of nearly 85 different types, all with less than 80 per type.

On the whole, 122 different types of cups were used in primary operations.

## 6.2 Cups used in revision surgery

TYPE OF CUP	NUMBER	PERCENTAGE
AnCA FIT – Cremascoli	280	18.5
STANDARD CUP – Sulzer	127	8.4
MULLER – Sulzer	96	6.4
CONTEMPORARY – Howmedica	84	5.6
TRILOGY – Zimmer	82	5.4
MC MINN – Link	62	4.1
MULLER – Cremascoli	53	3.5
OSTEOLOCK – Howmedica	47	3.1
LOR – Allopro Sulzer	42	2.8
MULLER – Samo	40	2.6
PROCOTYL-E – Cremascoli	36	2.4
CLS – Sulzer	35	2.3
FITMORE – Sulzer	34	2.3
DUOFIT PSF – Samo	28	1.9
TRIDENT – Howmedica	27	1.8
SECUR-FIT – Osteonic	25	1.7
CONICAL SCREW CUP – Protek	25	1.7
HAC CERAFIT CUP – Ceraver Osteal	22	1.5
MULLER – Lima	22	1.5
ZCA – Zimmer	21	1.4
CCB – Mathys	20	1.3
ARTHOPOR II – Johnson & Johnson	16	1.1
ALLOFIT S – Allopro Sulzer	16	1.1
Unknown	15	1.0
<b>TOTAL</b>	<b>1.255</b>	<b>83.4</b>

The remaining 255 cups (16.6%), were of nearly 40 different types, all with less than 15 per type.

On the whole, 70 different types of cups were used in revision surgery.

### 6.3 Stems used in primary surgery

TYPE OF STEM	NUMBER	PERCENTAGE
AnCA FIT – Cremascoli	3.802	15.9
CLS – Sulzer	2.543	10.6
CONUS – Sulzer	2.150	9.0
ABGII – Howmedica	1.215	5.1
JVC - Cremascoli	661	2.8
EXETER – Howmedica	637	2.7
ABG – Howmedica	606	2.5
VERSYS FIBER METAL TAPER – Zimmer	586	2.4
PROFEMUR Z – Cremascoli	569	2.4
SPECTRON – Smith & Nephew	549	2.3
SL PLUS – Endoplus	510	2.1
MRL – Cremascoli	470	2.0
VERSYS CEMENTED – Zimmer	456	1.9
P507 Samo	452	1.9
BASIS – Smith & Nephew	330	1.4
LC – Samo	314	1.3
AD – Samo	314	1.3
ANCA-FIT CLU – Cremascoli	302	1.3
PROXILOCK FT – Stratec	291	1.2
AHS – Cremascoli	290	1.2
C2 – Lima	275	1.1
DEFINITION – Howmedica	263	1.1
EHS – Cremascoli	252	1.1
CFP – Link	236	1.0
SYNERGY – Smith & Nephew	227	0.9
LUBINUS SP2 – Link	222	0.9
CORAIL – DePuy	214	0.9
HIP RESURFACING – Birmingham	212	0.9
STEM – Cremascoli	209	0.9
DUOFIT RKT – Samo	206	0.9
ULTIMA – Johnson & Johnson	200	0.8
G3 – Citieffe	177	0.7
MS 30 – Protek Sulzer	174	0.7
IMAGE – Smith & Nephew	174	0.7
ALLOCLASSIC SL – Allopro Sulzer	169	0.7
PPF – Biomet Merck	167	0.7
TAPERLOC – Biomet Merck	159	0.7
SPS – Symbios	155	0.6
EASY – Hitmedica	149	0.6
C STEM – DePuy	148	0.6
HIPSTAR – Howmedica	117	0.5
PERFECTA – Wright	112	0.5
CITATION – Howmedica	111	0.5

(%)

<b>TYPE OF STEM</b>	<b>NUMBER</b>	<b>PERCENTAGE</b>
CBC – Mathys	99	0.4
BHS – Smith & Nephew	97	0.4
ANCA – Cremascoli	94	0.4
ACCOLADE – Osteonics	92	0.4
PBF/S - Permedica	91	0.4
PROFEMUR – Cremascoli	86	0.4
MBA – Groupe Lépine	84	0.4
C-STEM - DePuy	82	0.3
S. ROM – Johnson & Johnson	78	0.3
METABLOC - Zimmer	67	0.3
FULLFIX – Mathys	64	0.3
SL REVISION – Sulzer	64	0.3
FIT STEM - Lima	64	0.3
STELO MODULARE NDS1 - Citieffe	61	0.3
Unknown	106	0.4
<b>TOTAL</b>	<b>22.604</b>	<b>94.6%</b>

The remaining 1.362 stems (5.4%) were of nearly 65 different types, all with less than 60 per type.

On the whole, 120 different types of stems were used in primary operations.



#### 6.4 Stems used in revision surgery

TYPE OF STEM	NUMBER	PERCENTAGE
PROFEMUR – Cremascoli	399	26.4
SL REVISION – Sulzer	279	18.5
S.ROM – Johnson & Johnson	89	5.9
RESTORATION T3 – Howmedica	65	4.3
AnCA FIT - Cremascoli	54	3.6
CONUS - Sulzer	51	3.4
MGS – Samo	40	2.6
EXETER - Howmedica	36	2.4
MP RECONSTRUCTION – Link	32	2.1
ZMR – Zimmer	29	1.9
CLS – Sulzer	27	1.8
AD – Samo	26	1.7
C2 – Lima	26	1.7
AnCA – Cremascoli	25	1.7
JVC – Cremascoli	24	1.6
CONELock REVISION – Stratec	23	1.5
CBK – Mathys	17	1.1
AnCA-FIT CLU – Cremascoli	12	0.8
<b>TOTAL</b>	<b>1.254</b>	<b>83.0</b>

The remaining 256 stems (17.0%) were of nearly 40 different types, all with less than 10 per type.

On the whole, 60 different types of stems were used in revision surgery.

It should be pointed out that in 7.3% of primary operations **heads and stems manufactured by different companies** were implanted in the same operations. If this analysis is limited to implants performed in 2004 the percentage drops to 4.6%.

The surgeon that makes such a choice assumes, in the unfortunate case of failure, full responsibility for the event. Manufacturers and retailers, in fact, do not normally answer to failure or accidents that occur to their prosthetic components implanted in combination with components from other companies.

#### Resurfacing prosthesis

The types of resurfacing prostheses used are listed among the cups and, for convention, among the stems. They represent 1.1% of primary implants performed between 2000 and 2004 in the Region.

## 6.5 Number of different types of implant

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

Year of operation	Primary surgery	
	Stems	Cups
2000	93	87
2001	98	92
2002	94	90
2003	110	94
2004	99	84

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

Year of operation	Total revision	
	Stems	Cups
2000	48	58
2001	55	64
2002	48	59
2003	60	62
2004	40	46

The high number of implant types is evident. The low number of uniform population per type of component implanted will make statistical analysis of the efficacy of a device difficult. However, we point out that in 2004 the number of different types implanted has fallen probably due to the merger of some large manufacturing companies.

Types have not been considered different when only change of trade-marked occurred (eg. Sulzer-Centerpulse, or Johnson & Johnson-DePuy)

### Percentage trend of the 4 most commonly implanted stems in Emilia-Romagna

<b>STEMS in primary surgery</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
ANCA FIT – Cremascoli	15.0%	15.8%	17.2%	15.4%	15.9%
CLS Sulzer, Centerpulse, Zimmer	12.5%	10.1%	10.6%	10.5%	9.7%
CONUS Sulzer, Centerpulse, Zimmer	8.4%	9.1%	9.5%	9.5%	8.3%
ABGII – Howmedica	0.9%	4.8%	5.8%	6.1%	7.0%

### Percentage trend of the 4 most commonly implanted cups in Emilia-Romagna

<b>CUPS in primary surgery</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
AnCA FIT – Cremascoli	22.1%	24.4%	25.7%	25.1%	27.2%
CLS Sulzer, Centerpulse, Zimmer	11.6%	9.9%	11.2%	10.2%	8.7%
ABGII – Howmedica	2.0%	7.5%	6.9%	4.5%	4.3%
FITMORE – Sulzer	5.6%	6.2%	5.3%	6.0%	5.3%

It can be seen that the trend for the choice of cups and stems for primary operations has remained rather constant.

The exception, obviously, concerns the ABGII type introduced at the beginning of the registration period.

## 6.6 Modular neck

Nearly 26% of stems implanted in primary surgery have modular neck. ANCA-fit stem by Cremascoli, the more common stem in the region, short necks are used in 61% of operations.

Straight neck is implanted in 46.1% of operations, anti-retro versus inn 40.0% and varus-valgus in 20.1%.

## 6.7 Articular coupling and head diameter

Number of primary total hip arthroplasty operations carried out on patients with admission date between 1<sup>st</sup> January 2000 and 31st December 2004, according to **type of operation and articular coupling**.

Articular coupling	Total hip arthroplasty		Total revision	
	N.	%	N	%
Metal-polyethylene	9.435	39.6	663	44.8
Ceramic - polyethylene	6.878	28.8	566	38.2
Ceramic - ceramic	5.368	22.5	218	14.7
Metal-metal	2.010	8.4	34	2.3
Cerid- polyethylene	173	0.7	-	-
<b>Total*</b>	<b>23.864</b>	<b>100.0</b>	<b>1481</b>	<b>100.0</b>

\* 102 missing data for primary and 29 for revision

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

Year of operation	Primary surgery			
	met-pol	cer-pol	cer-cer	met-met
2000	45.4%	28.3%	19.5%	6.8%
2001	40.8%	30.3%	21.4%	7.5%
2002	38.9%	30.4%	22.8%	7.9%
2003	38.1%	28.0%	24.7%	9.2%
2004	34.9%	27.6%	27.5%	10.0%

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

Year of operation	Total revision			
	met-pol	cer-pol	cer-cer	met-met
2000	43.7%	34.8%	20.0%	1.5%
2001	49.1%	38.0%	10.8%	2.1%
2002	42.3%	43.0%	12.7%	2.0%
2003	40.0%	44.9%	13.8%	1.3%
2004	43.4%	30.2%	20.9%	5.5%

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

Age class	Elective THA			
	met-pol	cer-pol	cer-cer	met-met
<40	7.1%	17.6%	49.2%	26.1%
40-49	12.5%	17.8%	45.7%	24.0%
50-59	18.7%	20.8%	40.5%	20.1%
60-69	34.4%	28.4%	28.1%	9.1%
70-79	47.9%	35.6%	14.9%	1.6%
> 80	63.9%	28.7%	7.1%	0.3%

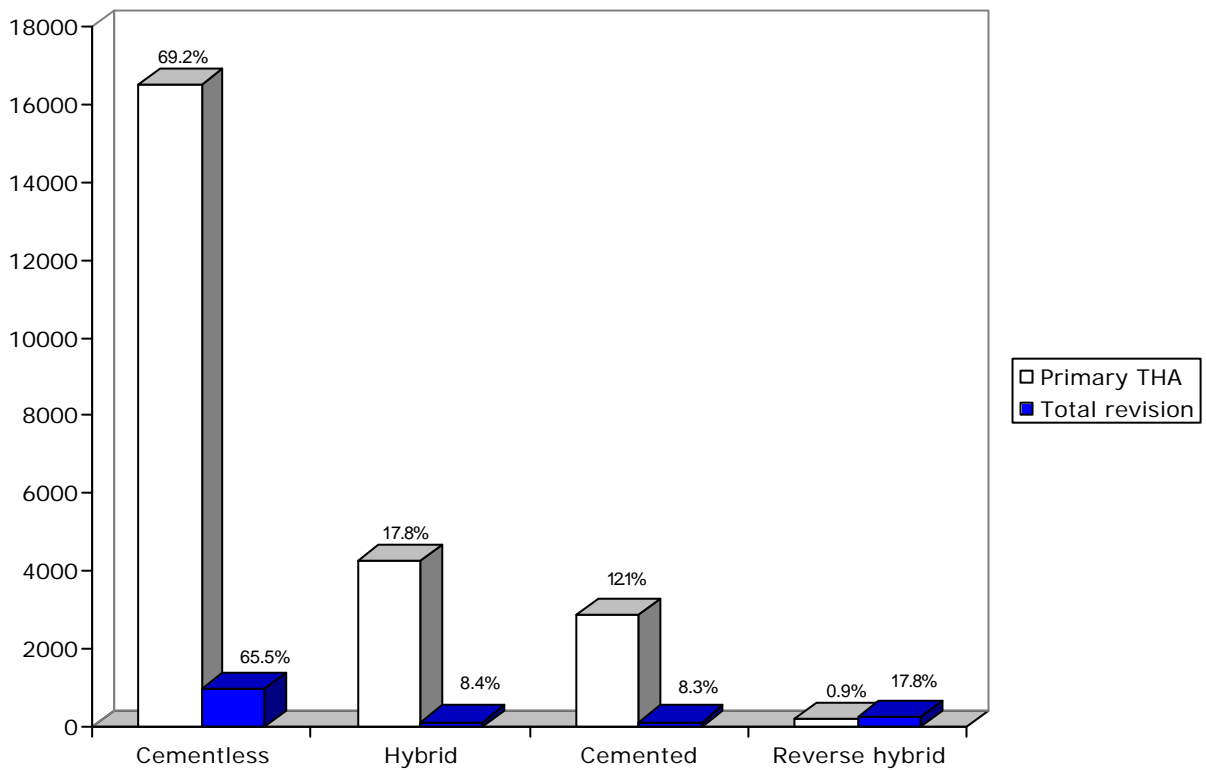
Head diameter is almost always 28 mm, no matter what the material is. Few metal Metasul heads have a greater diameter, up to 38 mm.

### 6.8 Prosthesis fixation

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31<sup>st</sup> December 2004, according to **type of operation** and **fixation method**.

Fixation method	Primary THA	Total revision
Uncemented	16.531	976
Hybrid (stem cemented and cementless cup)	4.252	126
Cemented prostheses	2.894	124
Cementless stem and cemented cup	211	265
<b>Total*</b>	<b>23.888</b>	<b>1.491</b>

\* Data not supplied in 78 primary operations and 19 revision operations



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

Year of operation	Primary surgery			
	Cemented	Cementless	Hybrid	Reverse hybrid
2000	14.2%	62.1%	22.8%	0.9%
2001	14.4%	65.4%	19.4%	0.8%
2002	12.1%	70.0%	17.0%	0.9%
2003	11.0%	71.7%	16.5%	0.8%
2004	8.6%	76.2%	14.2%	1.0%

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

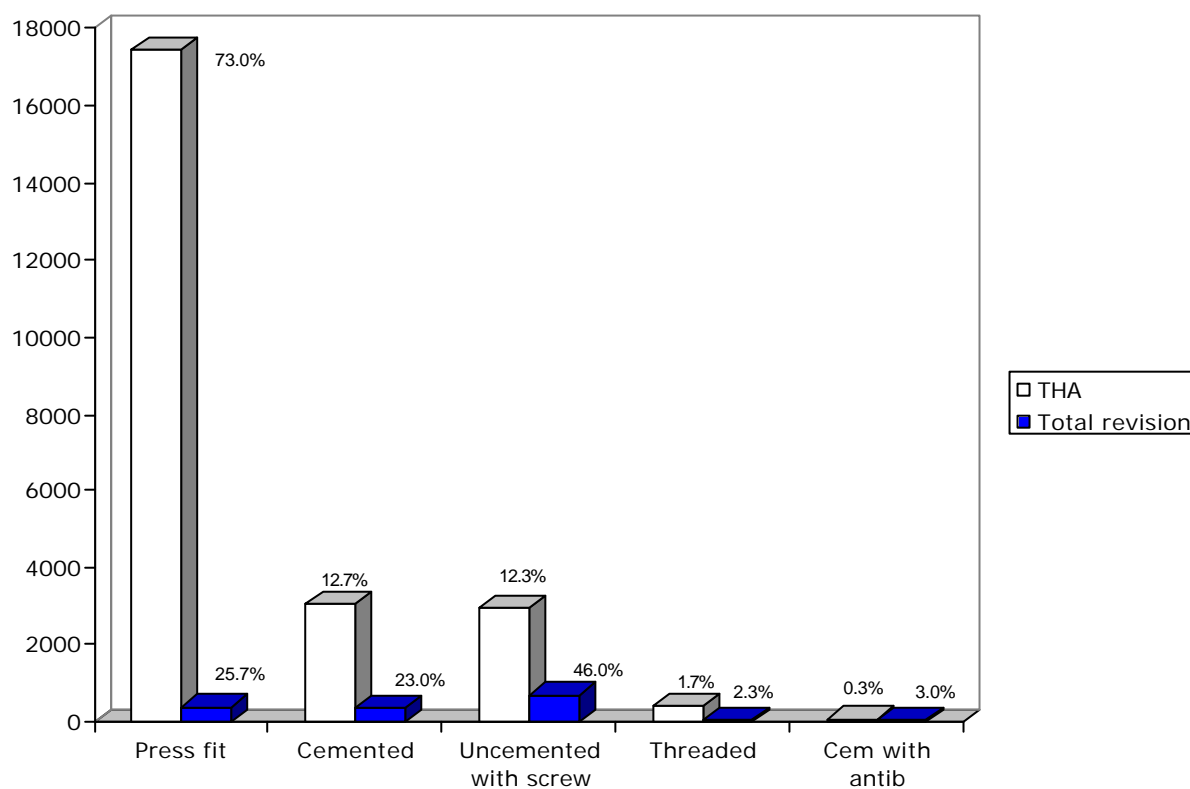
Year of operation	Total revision			
	Cemented	Cementless	Hybrid	Reverse hybrid
2000	11.1%	61.5%	11.1%	16.3%
2001	9.5%	63.3%	8.3%	18.9%
2002	6.7%	65.0%	8.0%	20.3%
2003	7.2%	68.1%	7.2%	17.4%
2004	7.0%	68.2%	9.1%	15.7%

## 6.9 Cup fixation

Number of hip operations carried out on patients admitted between 1<sup>st</sup> January 2000 and 31<sup>st</sup> December 2004, according to **type of operation and cup fixation**.

Cup fixation	THA	Total revision
Press-fit, uncemented	17.450	387
Cemented without antibiotic	3.030	346
Press fit with screw, uncemented	2.951	691
Threaded	417	34
Cemented with antibiotic	77	45
<b>Total*</b>	<b>23.925</b>	<b>1.503</b>

\* 41 missing data for THA and 7 for revision



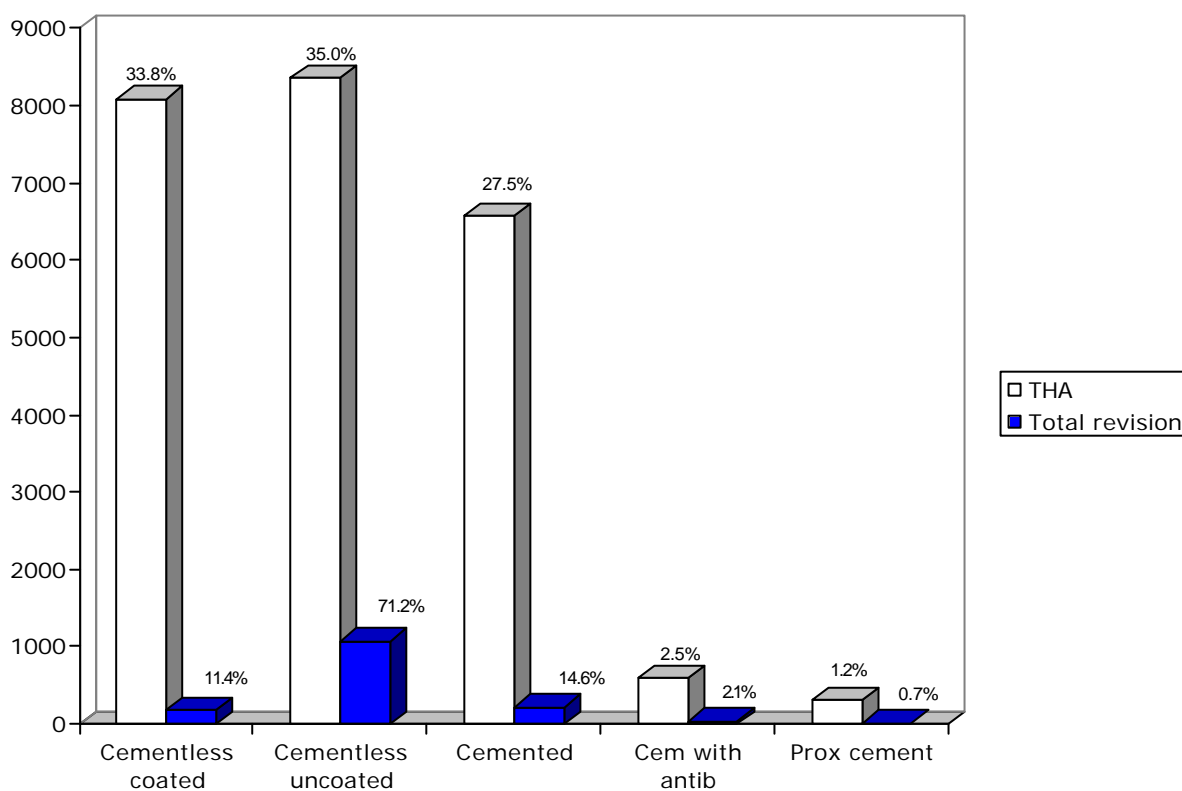


## 6.10 Stem fixation

Number of hip operations carried out on patients admitted between 1<sup>st</sup> January 2000 and 31<sup>st</sup> December 2004, according to **type of operation and stem fixation**.

Stem fixation	THA	Total revision
Uncemented, HA coated	8.086	171
Uncemented, no ceramic coating	8.362	1.065
Cemented without antibiotic	6.569	219
Cemented with antibiotic	587	31
Proximally cemented	301	10
<b>Total*</b>	<b>23.905</b>	<b>1.496</b>

\* 61 missing data for THA and 14 for revision



## 6.11 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	30.0%	23.6%
AMPLICEM 3	11.8%	5.2%
CEMEX	20.2%	39.8%
PALACOS R	11.2%	4.3%
CMW 3	5.7%	5.9%
ANTIBIOTIC SIMPLEX	6.4%	2.5%
CEMEX RX	2.9%	8.7%
CEMFIX 3	1.6%	-
CEMEX ISO	0.7%	0.3%
SULCEM 3	1.4%	2.2%
CEMFIX 1	0.4%	0.1%
SULCEM 1	0.3%	0.5%
CMW 1	0.9%	1.2%
AMPLICEM 1	1.0%	0.9%
CEMEX XL	0.2%	1.2%
ALTRO	5.3%	3.6%
<b>TOTAL</b>	<b>100.0%</b>	<b>100.0%</b>

Bone cement preparation for stem fixation is done under vacuum in 54.4% of cases.

The stem is cemented in 79.8% of cases under pressure with applicator, in 18.6% manually, and in the remaining 1.6% by aspiration system.

## 6.12 Surgical techniques (surgical approach, bone graft, reinforcement rings)

The most commonly used surgical approaches are lateral and postero-lateral. 66.5% of THA is implanted through lateral approach, 28.0% through postero-lateral. Minimally invasive approach is used in 0.5% of operations.

56.1% of hemiarthroplasties is implanted through lateral approach, 40.4% through postero-lateral

Number of hip arthroplasty operations on patients admitted between 1st January 2000 and 31st December 2004, according to **type of operation and bone graft**.

Graft	THA		Total revision		Stem revision		Cup revision		Total
	N.	%	N.	%	N.	%	N.	%	
Not used	22.809	95.1	855	56.6	572	90.8	935	56.6	25.171
Acetabular	876	3.7	567	37.5	13	2.1	677	41.0	2.133
Femoral	208	0.9	24	1.6	36	5.7	8	0.5	276
Both	73	0.3	64	4.2	9	1.4	32	1.9	178
<b>Total</b>	<b>23.966</b>		<b>1.510</b>		<b>630</b>		<b>1.652</b>		<b>27.758</b>

In 15.6% of revision surgery of cups, reinforcement ring were uses.

More commonly used are MULLER – Sulzer (67.6% ) and Burch-Schneider – Sulzer (23.6% of cases).

## 7. Types of hemiarthroplasty

### 7.1 Stem and head

<b>TYPES OF HEMIARTHROPLASTY head + stem</b>	<b>N.</b>	<b>%</b>
SPERI-LOCK + SPERI-SYSTEM II – Hit Medica	837	8.4
SPERI-LOCK + SL –Hit Medica	723	7.3
C1 + AB – Citieffe	637	6.4
TESTA BIARTICOLARE – Lima + SL – Hit Medica	426	4.3
TESTA BIARTICOLARE + SL – Lima	426	4.3
CUPOLA MOBILE BIARTICOLARE + SL – Permedica	411	4.1
CUPOLA BIPOLARE + CCA – Mathys	387	3.9
CUPOLA SEM + STELO SEM II – D.M.O.	352	3.5
ULTIMA + ULTIMA LX – Johnson & Johnson	322	3.2
MODULAR BIPOLAR + STANDARD STRAIGHT – Protek	307	3.1
CUPOLA MOBILE + AHS – Cremascoli	300	3.0
CENTRAX + HIP FRACTURE – Howmedica	289	2.9
CUPOLA MOBILE + STANDARD STRAIGHT – Centerpulse	239	2.4
UHR + ACCOLADE – Osteonics	239	2.4
CUPOLA MOBILE + JVC – Cremascoli	234	2.4
TESTA ELLITTICA + LC – Samo	209	2.1
RETENTIVE MOBILE CUP – Cedior + ORTHO-FIT – Allopro	208	2.1
JANUS + FIN – Bioimpianti	201	2.0
BICENTRIC + RELIANCE Howmedica	199	2.0
SPERI-LOCK + SL STREAKES – Hit Medica	189	1.9
TESTA BIARTICOLARE LOCK + LOGICA – Lima	174	1.7
TESTA BIPOLARE + SL – Amplimedical	157	1.6
CUPOLA MOBILE – Centerpulse + ORTHO-FIT – Allopro	147	1.5
CENTRAX + EXETER – Howmedica	129	1.3
CUPOLA MOBILE + MRL – Cremascoli	129	1.3
CUPOLA MOBILE – Cremascoli + VERSYS – Zimmer	117	1.2
C1 – Citieffe + VERSYS – Zimmer	111	1.1
SPERI-LOCK – Hit Medica + MRL – Cremascoli	107	1.1
UHR + RELIANCE – Howmedica	106	1.1
BI-POLAR + PPF - Biomet Merck	102	1.0

(%)

(continua)

<b>TYPES OF HEMIARTHROPLASTY head + stem</b>	<b>N.</b>	<b>%</b>
TESTA BIARTICOLARE + LOGICA – Lima	88	0.9
ULTIMA + ULTIMA STRAIGHT – Johnson & Johnson	86	0.9
CUPOLA BIPOLARE + VERSYS – Zimmer	85	0.9
TESTA BIARTICOLARE + DUOFIT CKA – Samo	85	0.9
BICONCONTACT + BICONCONTACT – Aesculap	68	0.7
CUPOLA SEM + STELO SEM – D.M.O.	65	0.7
TESTA BIPOLARE + FURLONG H-AC – JRI	64	0.6
C1 – Citieffe + DEON – Bioimpianti	63	0.6
TESTA BIARTICOLARE – Lima + SL Hit – Medical	58	0.6
RETENTIVE MOBILE CUP – Cedior + METABLOC – Protek	55	0.6
UHR – Osteonics + EXETER – Howmedica	53	0.5
JANUS – Bioimpianti + SPERI–SYSTEM II – Hit Medica	47	0.5
CENTRAX + DEFINITION – Howmedica	43	0.4
ULTIMA MONK + G2 – DePuy	42	0.4
UNKNOWN	131	1.3
<b>TOTAL</b>	<b>9.447</b>	<b>95.1</b>

In the remaining 508 cases (4.9%) 206 different types of prosthesis were used numbering less than 40 units per type.

It should be pointed out that in 5.9% of hemiarthroplasty heads and stems manufactured by different companies were implanted in the same operations.

In year 2004 the percentage reduced to 3.0%.

## 7.2 Other characteristics of hemiarthroplasties

Number of surgeries according to **head type**.

<b>Head Type</b>	<b>N.</b>	<b>%</b>
Preassembled bipolar head	8.980	90.7
Bipolar head to be assembled in the operating	620	6.3
Monopolar head	295	3.0
<b>Total*</b>	<b>9.895</b>	<b>100.0</b>

\* 57 missing cases, equal to 0.6%

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 93.2% of cases the stem of the hemiarthroplasties was cemented and the stem had a modular neck in only 4.3% of cases.

In 2.0% of cases the hemiarthroplasties had a ceramic head, all the other heads were metal.

8.2% of the metal heads had collars.

## 8. Antibiotic prophylaxis

### 8.1 Antibiotic prophylaxis in primary surgery

List of active principles used in preoperative antibiotic prophylaxis in cases of primary arthroplasty.

The number indicates the cases where the active principle was used alone or in combination

ACTIVE PRINCIPLE	Number	Percentage
AMOXICILLINA	302	1.3%
AMOXICILLINA + GENTAMICINA	326	1.4%
AMPICILLINA	298	1.2%
AMPICILLINA + SULBACTAM	248	1.0%
AMPICILLINA + GENTAMICINA	170	0.7%
CEFAMANDOLO	172	0.7%
CEFAMANDOLO + GENTAMICINA	142	0.6%
CEFAMANDOLO + TOBRAMICINA	164	0.7%
CEFAZOLINA	6.252	26.1%
CEFAZOLINA + GENTAMICINA	573	2.4%
CEFAZOLINA + NETILMICINA	400	1.7%
CEFAZOLINA + TOBRAMICINA	3.999	16.7%
CEFEPIME	339	1.4%
CEFOTAXIME	657	2.7%
CEFODIZIMA	200	0.8%
CEFTAZIDIMA	200	0.8%
CEFTIZOXIMA	720	3.0%
CEFTRIAZONE	1.300	5.4%
CEFTRIAZONE + TOBRAMICIN	170	0.7%
CEFUROXIMA	2.191	9.1%
CEFUROXIMA + TOBRAMICIN	75	0.3%
CEFUROXIMA + NETILMICINA	29	0.1%
CIPROFLOXACINA	279	1.2%
GENTAMICIN	450	1.9%
PEFLOXACINA	150	0.6%
TEICOPLANINA	1.097	4.6%
TEICOPLANINA + NETILMICINA	275	1.1%
TOBRAMICIN	29	0.1%
VANCOMICIN	551	2.3%
VANCOMICIN + GENTAMICIN	730	3.0%
VANCOMICIN + TOBRAMICIN	133	0.6%
OTHER	645	2.7%
UNKNOWN*	700	2.9%
<b>TOTAL</b>	<b>23.966</b>	<b>100.0%</b>

\* In 700 cases, although antibiotic prophylaxis was carried out, the active principle used was not reported to the registry.

## 8.2 Antibiotic prophylaxis in revision surgery

List of active principles used in preoperative antibiotic prophylaxis in cases of revision surgery.

The number indicates the cases where the active principle was used alone or in combination

ACTIVE PRINCIPLE	NUMBER	PERCENTAGE
AMOXICILLIN	44	1.1%
AMOXICILLIN + GENTAMICIN	49	1.2%
AMPICILLIN	24	0.6%
CEFAMANDOLO	28	0.7%
CEFAMANDOLO + GENTAMICIN	59	1.4%
CEFAMANDOLO + TOBRAMICINA	31	0.8%
CEFAZOLINA	921	22.4%
CEFAZOLINA + GENTAMICINA	59	1.4%
CEFAZOLINA + NETILMICINA	32	0.8%
CEFAZOLINA + TOBRAMICINA	722	17.6%
CEFEPIME	29	0.7%
CEFOTAXIME	60	1.5%
CEFTAZIDIMA	12	0.3%
CEFTIZOXIMA	165	4.0%
CEFTRIAXONE	168	4.1%
CEFTRIAXONE + TOBRAMICINA	34	0.8%
CEFUROXIMA	324	7.9%
CEFUROXIMA + TOBRAMICINA	34	0.8%
CIPROFLOXACINA	14	0.3%
GENTAMICINA	50	1.2%
PEFLOXACINA	6	0.1%
PIPERACILLINA	12	0.3%
TEICOPLANIN	227	5.5%
TEICOPLANIN + LEVOFLOXACINA	65	1.6%
TEICOPLANIN + NETILMICINA	51	1.2%
VANCOMICIN	133	3.2%
VANCOMICIN + GENTAMICINA	184	4.5%
VANCOMICIN + TOBRAMICINA	51	1.2%
UNKNOWN	250	6.1%
OTHER	272	6.6%
<b>TOTAL</b>	<b>4.110</b>	<b>100.0%</b>

Prophylaxis is performed by multiple administrations in 81.6% primary arthroplasties, 81.5 % of hemiarthroplasty, and 83.4% of revision operations.

In the remaining percentages a single administration is used at the moment of induction.

## 9. Blood transfusion

Percentages of operations performed on patients admitted between 1st January 2000 and 31st December 2004 **according to type of operation and transfusion**

Type of surgery	None	Autologus (recovery)	Autologus (predeposit)	Homologous	Autologous and Homologous
Emergency primary	33.0%	4.3%	-	59.6%	3.1%
Elective primary	16.4%	11.8%	48.0%	13.9%	9.9%
Revision	8.9%	7.8%	24.9%	41.5%	16.9%

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

EMERGENCY PRIMARY				
Type of hospital	None	Autologus (recovery)	Homologous	Autologous and homologous
AOSP	27.3%	2.6%	69.9%	0.2%
Private	9.0%	25.8%	40.5%	24.7%
AUSL	38.7%	4.5%	52.9%	3.9%
IOR	11.9%	2.1%	86.0%	0.0%

ELECTIVE PRIMARY					
Type of hospital	None	Autologus (recovery)	Autologus (predeposit)	Homologous	Autologous and Homologous
AOSP	11.6%	6.1%	69.3%	9.3%	3.7%
Private	10.3%	29.0%	38.2%	10.0%	12.5%
AUSL	21.0%	8.5%	45.9%	13.6%	11.0%
IOR	18.0%	0.2%	50.8%	22.5%	8.5%



## 10. Complications occurred during hospitalization

The rate of complications in **primary surgery** carried out on patients hospitalized between January 1st 2000 and December 31st 2004.

COMPLICATIONS OBSERVED DURING HOSPITALIZATION								
INTRA-OPERATIVE			POST-OPERATIVE LOCAL			POST-OPERATIVE GENERAL		
Description	N.	%	Description	N.	%	Description	N.	%
Calcar fracture	82	0.3	Hematoma	229	1.0	Anemia	436	1.8
Diaphyseal fracture	78	0.3	Prosthesis disloc	137	0.6	Hyperpyrexia	120	0.5
			SPE paralysis	53	0.2	Genito-urinary	95	0.4
Anesthesiologic complications	33	0.1	Deep vein thromb	41	0.2	Gastro-intestinal	69	0.3
			Infection	21	0.1	Cardiovascular	53	0.2
Cotyle fracture	25	0.1	Crural paralysis	28	0.1	Embolism	36	0.2
			Bed sores	26	0.1	Collaps	33	0.1
Others	42	0.2	Bleeding	22	0.1	Respiratory	23	0.1
			Others	63	0.3	Others	77	0.3
<b>Total</b>	<b>260</b>	<b>1.1</b>	<b>Total</b>	<b>620</b>	<b>2.6</b>	<b>Total</b>	<b>942</b>	<b>3.9</b>

The rate of complications in **revision surgery** carried out on patients hospitalized between January 1st 2000 and December 31st 2004.

COMPLICATIONS OBSERVED DURING HOSPITALIZATION								
INTRA-OPERATIVE			POST-OPERATIVE LOCAL			POST-OPERATIVE GENERAL		
Description	N.	%	Description	N.	%	Description	N.	%
Calcar fracture	29	0.7	Hematoma	49	1.2	<b>Anemia</b>	90	2.2
Diaphyseal fracture	61	1.5	Prosthesis disloc	45	1.1	Cardiovascular	22	0.5
			SPE paralysis	20	0.5	Hyperpyrexia	20	0.5
Anesthesiologic complications	9	0.2	Infection	12	0.3	Collaps	20	0.5
			Bleeding	12	0.3	Genito-urinary	14	0.3
Cotyle fracture	5	0.1	Bed sores	6	0.1	Gastro-intestinal	10	0.2
			Deep venous thromb	6	0.1	Embolism	8	0.2
Others	14	0.3	Crural paralysis	3	0.1	Respiratory	4	0.1
			Others	14	0.3	Others	15	0.4
<b>Total</b>	<b>118</b>	<b>2.9</b>	<b>Total</b>	<b>167</b>	<b>4.1</b>	<b>Total</b>	<b>195</b>	<b>4.7</b>

The rate of complications in **hemiarthroplasty** carried out on patients hospitalized between January 1st 2000 and December 31st 2004.

COMPLICATIONS OBSERVED DURING HOSPITALIZATION								
INTRA-OPERATIVE			POST-OPERATIVE LOCAL			POST-OPERATIVE GENERAL		
Description	N.	%	Description	N.	%	Description	N.	%
Calcar fracture	20	0.2	Hematoma	54	0.5	Anemia	240	2.4
			Prosthesis disloc	47	0.5	Genito-urinary	94	0.9
Anesthesiologic complications	32	0.3	Bed sores	37	0.4	Hyperpyrexia	78	0.8
			Deep venous thromb	25	0.3	Cardiovascular	59	0.6
Diaphyseal fracture	17	0.2	SPE paralysis	20	0.2	Respiratory	47	0.5
			Infection	9	0.1	Gastro-intestinal	44	0.4
Cotyle fracture	-	-	Bleeding	7	0.1	Collaps	43	0.4
			Crural paralysis	1	0.0	Embolism	37	0.4
Others	36	0.4	Others	13	0.1	Confusion	23	0.2
						Cerebral ischemia	5	0.1
						Others	25	0.3
<b>Total</b>	<b>105</b>	<b>1.1</b>	<b>Total</b>	<b>213</b>	<b>2.1</b>	<b>Total</b>	<b>695</b>	<b>7.0</b>

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

The intra-operative complication rate of revision surgery is almost three times that of primary surgery. The rate of dislocation of the prosthesis during hospitalization in revision surgery is double that of primary surgery. Endoprosthesis operations have a high rate of general complications.

### 10.1 Deaths during hospitalization

Number of deaths in prosthetic surgery on patients hospitalized between January 1st 2000 and December 31st 2004 (the deaths recorded are those that occurred during hospitalization).

Year 2000-2004			
Type of operations	Deaths	N. of operations	Percentage
Primary THA	58	23.966	0.24
Hemi-arthroplasty	332	9.952	3.3
Revision	24	4.110	0.6
Prosthesis removal	2	223	0.9

### 11. 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.	Range
Prosthesis removal	37	5.3	0-20
Revision	719	3.9	0-52
Hemi-arthroplasty	1.755	3.5	0-44
Primary	4.282	2.4	0-49
Other	46	9	0-36

Year 2004			
Type of operation	N.	Mean.	Range
Prosthesis removal	52	5.1	0 - 27
Revision	823	3.7	0 - 87
Hemi- arthroplasty	2.152	3.8	0 - 62
Primary	5.363	1.9	0 - 59
Other	43	9.9	0 - 96

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

## 12. Analysis of survival of primary surgery

### 12.1 Cox multivariate analysis

The Cox multivariate analysis identifies any variables that are independent from each other that can influence the event, in our case the removal of at least one prosthesis component. Analysis was performed on three independent variables, sex, age at surgery and pathology.

Other variables that might influence the outcome of surgery, such as the method of fixing the prosthesis, or joint coupling, were not introduced into the analysis because they were not independent (for example, prosthesis fixation depends on the patient's age).

All primary hip arthroplasties performed in the region between 2000 and 2004 were analyzed.

COX PROPORTIONAL RISK MODEL	
<b>Variables</b>	
<i>Dependent:</i> Follow-up	
<i>Independent:</i> Age,sex, diagnosis	
<b>Number of valid observations</b>	<b>23.966</b>
Non revised:	23.587
Revised:	379
Chi-square:	17.9 p= 0.0217
VARIABLE	SIGNIFICANCE ( P )
<b>Sex</b>	<b>NS (0.72)</b>
<b>Age</b>	<b>NS (0.79)</b>
<b>Diagnosis</b>	<b>S (0.008)</b>

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.

Conversely, a relative risk rate above 1 indicated an increased 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.

The following table shows a significant increase in risk in the case of patients treated by arthroplasty due to femoral fracture, or rheumatic arthritis. In patients affected by rheumatic arthritis the risk was 2.23 times greater than in patients of the same sex and age treated for coxarthrosis. In patients affected by femoral fracture the risk was 1.6 times greater than in patients of the same age and sex treated for coxarthrosis.

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.

<b>Variable diagnosis</b>	<b>Relative risk rate</b>	<b>Confidence interval 95%</b>		<b>Significance (p)</b>
Others (sequelae of coxitis, Paget's disease, metastasis, etc.)	-	-	-	NS (0.53)
Sequelae congenital diseases	-	-	-	NS (0.84)
Idiopathic necrosis of femoral head	-	-	-	NS (0.24)
Femoral neck fracture and sequelae	1.6	1.2	2.2	S (0.001)
Rheumatic arthritis	2.2	1.1	5.4	S (0.02)

## 12.2 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 2004 in the first column, the second and third columns show the number of revision operations performed on the same patients. Some revision operations were performed in the same hospital as the primary operation while others were performed at other hospitals in the Emilia-Romagna Region.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital
Primary THA	23.966	308	71
Hemiarthroplasty	9.952	95	24
Total revision	1.510	74	14
<b>Total</b>	<b>35.428</b>	<b>477</b>	<b>109</b>

In 18.7% 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. With regards to hemiarthroplasty, the percentage is 20.2%. and to total revision the percentage is 15.9%

The following table shows the rate of revision according to type of surgery:

Type of operation	Revision rate	Percentage
Primary THA	379/23.966	1.6%
Hemiarthroplasty	119/99.52	1.2%
Total revision	88/1.510	5.8%

## 12.3 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.

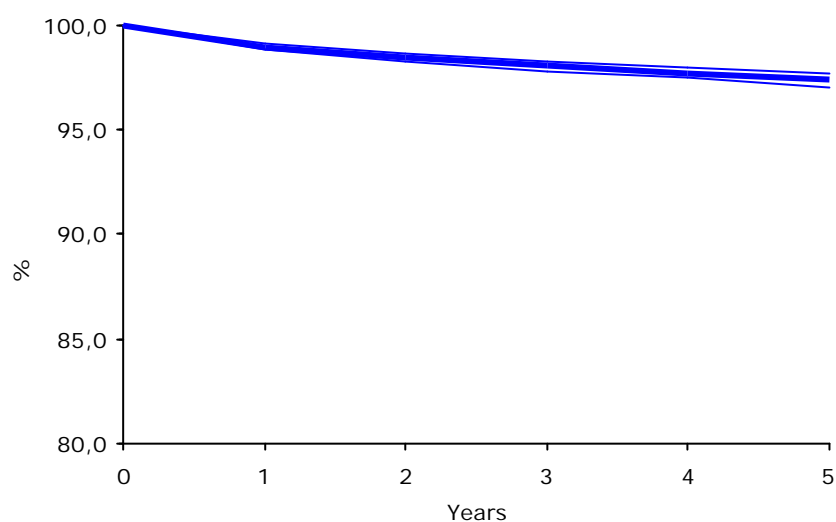
## 12.4 Analysis of survival in primary total hip arthroplasty

23,966 primary arthroplasties are under observation. Of these, 379 revisions were carried out for the reasons given at the bottom of the table.

Number of arthroplasties	Removals	% revision
23.966	379*	1.6

\* 21 prosthesis removal, 19 revision of the cup, 33 revision of head and insert, 55 revision of the head, 46 total revision, 123 revision of the stem and 82 revision of cup and head.

### Survival curve



### Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.0	98.8	99.1
2	98.5	98.3	98.6
3	98.1	97.8	98.3
4	97.8	97.5	98.0
5	97.4	97.1	97.7

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

<b>Cause of revision</b>	<b>Rate</b>	<b>%</b>	<b>% distribution of cause of failure</b>
<b>Recurrent prosthesis luxation</b>	<b>125/23.966</b>	<b>0.52%</b>	<b>33.0%</b>
<i>within 60 days</i>	<b>79/23.966</b>		
<i>over 60 days</i>	<b>46/23.966</b>		
<b>Aseptic loosening of the stem</b>	<b>63/23.966</b>	<b>0.26%</b>	<b>16.6%</b>
<i>within 60 days</i>	<b>4/23.966</b>		
<i>over 60 days</i>	<b>59/23.966</b>		
<b>Aseptic loosening of the cup</b>	<b>58/23.966</b>	<b>0.24%</b>	<b>15.3%</b>
<i>within 60 days</i>	<b>13/23.966</b>		
<i>over 60 days</i>	<b>45/23.966</b>		
<b>Global aseptic loosening</b>	<b>34/23.966</b>	<b>0.14%</b>	<b>9.0%</b>
<i>within 60 days</i>	<b>12/23.966</b>		
<i>over 60 days</i>	<b>22/23966</b>		
Periprosthetic bone fracture	<b>33/23.966</b>	<b>0.14%</b>	<b>8.7%</b>
Septic loosening	<b>27/23.966</b>	<b>0.11%</b>	<b>7.1%</b>
Breakage of prosthesis	<b>12/23.966</b>	<b>0.05%</b>	<b>3.2%</b>
Pain without loosening	<b>8/23.966</b>	<b>0.03%</b>	<b>2.1%</b>
Other	<b>7/23.966</b>	<b>0.03%</b>	<b>1.8%</b>
Unknown	<b>12/23.966</b>	<b>0.05%</b>	<b>3.2%</b>
<b>Total</b>	<b>379/23966</b>	<b>1.6%</b>	<b>100.0%</b>

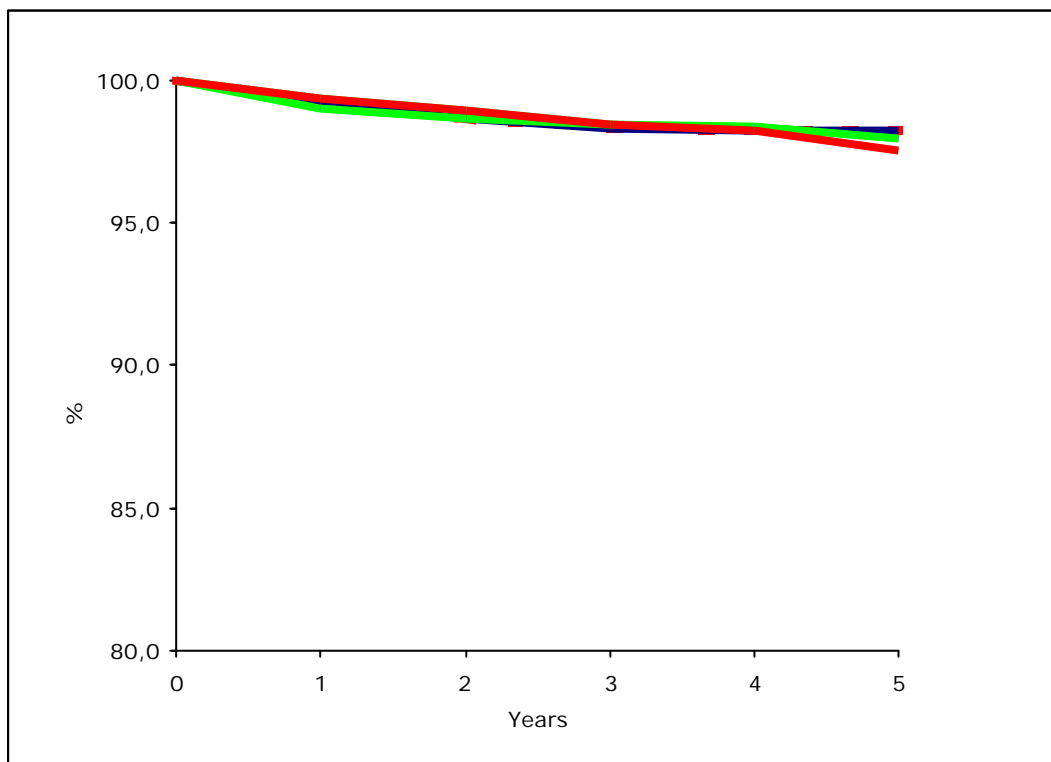


### 12.5 Analysis of survival in primary total hip arthroplasty according to fixation and articular coupling

In this analysis cemented, cementless and hybrid prostheses were considered. At a maximum follow-up of 5 years, there is no difference among the three types of fixation.

Fixation	N.	Removals	% revision
Cemented	2.894	41	1.4%
Cementless	16.531	270	1.6%
Hybrid (cemented stem, cementless cup)	4.252	56	1.3%

#### Survival curve



## Results in detail

<b>Cemented</b>			
<b>Years</b>	<b>% in site</b>	<b>c.i. at 95%</b>	
<b>1</b>	99.1	98.8	99.5
<b>2</b>	98.6	98.2	99.1
<b>3</b>	98.3	97.8	98.8
<b>4</b>	98.2	97.7	98.8
<b>5</b>	98.2	97.7	98.8

<b>Cementless</b>			
<b>Years</b>	<b>% in site</b>	<b>c.i. at 95%</b>	
<b>1</b>	99.0	98.8	99.2
<b>2</b>	98.7	98.4	98.9
<b>3</b>	98.4	98.1	98.7
<b>4</b>	98.4	98.1	98.7
<b>5</b>	98.0	97.4	98.5

<b>Hybrid</b>			
<b>Years</b>	<b>% in site</b>	<b>c.i. at 95%</b>	
<b>1</b>	99.3	99.1	99.6
<b>2</b>	98.9	98.6	99.3
<b>3</b>	98.5	98.0	98.9
<b>4</b>	98.3	97.8	98.7
<b>5</b>	97.5	96.6	98.4

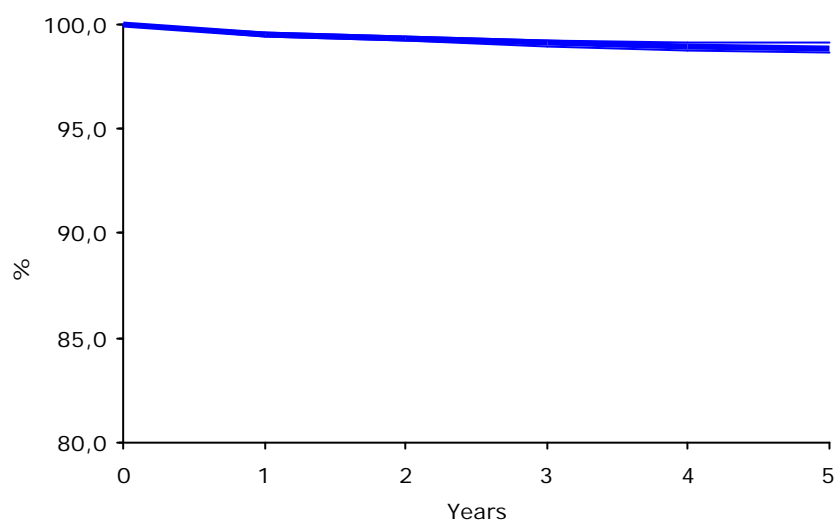
Also articular coupling does not influence prosthesis survival at a maximum follow-up of 5 years.

## 12.6 Survival analysis of acetabular component

Analysis was performed on primary cups. Cup 'survives' until it is completely revised (revision of the liner only has not been considered as cup failure)

Number of arthroplasties	Removals of the cup	% revision
23.966	168	0.7%

### Survival curve



### Results in detail

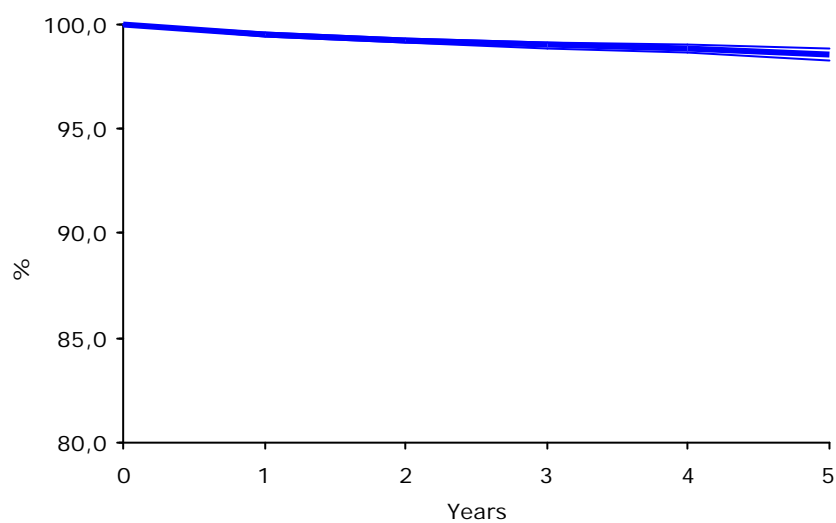
Years	% in site	c.i. at 95%	
		Lower	Upper
0	100.0	100.0	100.0
1	99.5	99.4	99.6
2	99.3	99.2	99.4
3	99.1	99.0	99.3
4	99.0	98.8	99.1
5	98.9	98.7	99.1

## 12.7 Survival analysis of the stem

Analysis was performed on primary stems. Stem 'survives' until it is completely revised (revision of the modular neck only has not been considered as stem failure)

Number of arthroplasties	Removals of the stem	% revision
23.966	190	0.8%

### Survival curve



### Results in detail

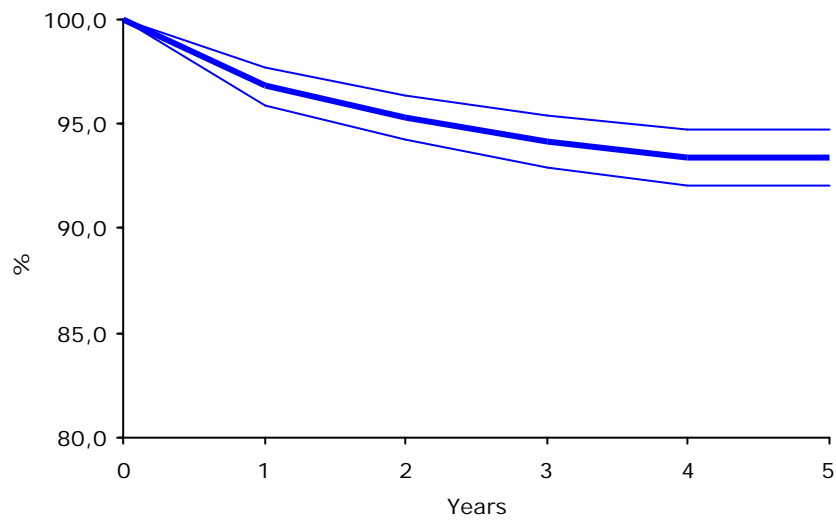
Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.6	99.5	99.7
2	99.2	99.1	99.4
3	99.0	98.8	99.2
4	98.8	98.6	99.0
5	98.6	98.3	98.8

## 12.8 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).

Number of first revision	Second revision	% of revision
1.510	88	5.8%

### Survival curve



### Results in detail

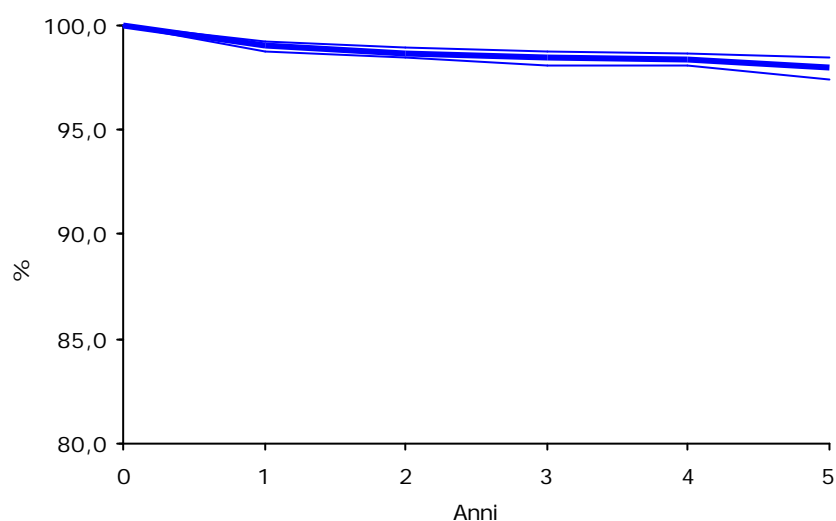
Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	96.8	95.9	97.7
2	95.3	94.2	96.4
3	94.1	92.9	95.4
4	93.4	92.0	94.8
5	93.4	92.0	94.8

## 12.9 Survival analysis of hemiarthroplasty

Revision of the head was considered as a failure. Therefore transformation of hemiarthroplasty into total arthroplasty was considered as a failure

Number of hemiarthroplasty	Removals	% of revision
9.952	119	1.2%

### Survival curve



### Results in detail

Years	% in site	c.i. at 95%	
0	100.0	100.0	100.0
1	99.0	98.8	99.2
2	98.7	98.4	98.9
3	98.4	98.1	98.7
4	98.4	98.1	98.7
5	98.0	97.4	98.5

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

Cause of revision	Rate	%	% distribution of failure causes
Prosthesis luxation	64	0.64%	53.8%
Aseptic loosening of the stem	22	0.22%	18.5%
Acetabular erosion	14	0.14%	11.7%
Pain without loosening	10	0.10%	8.4%
Bone fracture	5	0.05%	4.2%
Septic loosening	2	0.02%	1.7%
Other	2	0.02%	1.7%
<b>Total</b>	<b>119</b>	<b>1.2%</b>	<b>100.0%</b>

## **PART TWO: KNEE PROSTHESIS**

July 2000 – December 2004

### 13. RIPO support

#### 13.1 Support 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. Data are referred to primary knee prosthesis (8154), revision (8155) and prosthesis removal (8006)

<b>SUPPORT TO RIPO</b>						
	<b>Year 2000%</b>	<b>Year 2001%</b>	<b>Year 2002%</b>	<b>Year 2003%</b>	<b>Year 2004%</b>	
<b>BOLOGNA Province</b>						
AZIENDA Bologna Nord	-	-	50.0	106.2	85.7	} 97.4
AZIENDA Bologna Sud	200.0*	87.0	98.4	90.4	81.6	
AZIENDA Città di Bologna	77.9	91.7	96.6	98.2	95.6	
AZIENDA Imola	61.9	85.4	92.3	82.0	78.1	
Az. Osp. S. Orsola-Malpighi	43.8	89.5	83.3	89.3	96.4	
Istituti Ortopedici Rizzoli	86.3	100.0	100.0	98.7	100.0	
<b>FERRARA Province</b>						
AZIENDA Ferrara	80.2	67.0	56.3	53.6	48.9	
Az. Ospedaliera di Ferrara	70.0	89.5	83.3	38.1	33.3	
<b>FORLÌ-CESENA Province</b>						
AZIENDA Forlì	109.1*	91.7	97.7	104.8*	95.9	
AZIENDA Cesena	85.1	97.6	98.4	97.4	95.7	
<b>MODENA Province</b>						
AZIENDA Modena	67.1	87.0	91.4	93.1	88.2	
Az. Osp. Policlinico di Modena	84.6	100.0	82.0	92.9	56.7	
<b>PARMA Province</b>						
AZIENDA Parma	44.7	97.0	93.5	93.5	96.2	
Az. Ospedaliera di Parma	60.0	75.0	87.9	86.0	92.7	
<b>PIACENZA Province</b>						
AZIENDA Piacenza	28.6	83.3	101.6*	97.3	84.7	
<b>RAVENNA Province</b>						
AZIENDA Ravenna	70.7	98.8	96.8	92.1	91.6	
<b>REGGIO EMILIA Province</b>						
AZIENDA Reggio Emilia	23.1	33.1	52.1	79.1	74.3	
Arcispedale Santa M. Nuova	150.0*	93.8	93.8	69.6	80.7	
<b>RIMINI Province</b>						
AZIENDA Rimini	100.0	101.5*	96.2	95.6	98.0	
<b>TOTAL</b>	<b>71.0</b>	<b>88.3</b>	<b>90.4</b>	<b>86.4</b>	<b>89.4</b>	

\* Percentage higher than 100 is possibly due to a mistake in SDO code.



### 13.2 Percentage of RIPO support year 2004

Percentage of R.I.P.O. capture calculated versus Schede di Dimissione Ospedaliera (S.D.O.), according to Orthopaedic department. Data are referred to knee prosthesis (8154), revision (8155) and removal (8006).

<b>YEAR 2004</b>			
<b>BOLOGNA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA BOLOGNA</b>			
<b>Bologna Città</b>			
Casa di cura "Villa Regina" (non accr.)	27	29	<b>99.4</b>
Casa di cura "Villa Erbosa"	165	166	
Casa di cura "Villa Nigrisoli"	147	148	
Casa di cura "Villa Torri"	167	165	
Casa di cura "Villa Laura"	292	291	
Ospedale Maggiore, Bellaria	9	12	
<b>Bologna Nord</b>			
Bentivoglio, Budrio, S. Giovanni in Persiceto	18	21	<b>85.7</b>
<b>Bologna Sud</b>			
Ospedale Civile di Vergato	15	30	<b>81.6</b>
Casa di cura "Prof. Nobili"	21	21	
Casa di cura "Villa Chiara"	35	36	
<b>Total</b>	<b>896</b>	<b>920</b>	
Azienda Ospedaliera S. Orsola-Malpighi	27	28	<b>96.4</b>
Istituti Ortopedici Rizzoli	685	685	<b>100</b>
<b>AZIENDA IMOLA</b>			
Osp. Civile di Imola – Castel San Pietro	50	64	<b>78.1</b>

<b>FERRARA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
Stab. Ospedaliero di Cento, Bondeno	48	49	<b>48.9</b>
Ospedale Civile Argenta	89	92	
Ospedale Civile Comacchio – Delta	-	139	
<b>Total</b>	<b>137</b>	<b>280</b>	
Azienda Ospedaliera di Ferrara	7	21	<b>33.3</b>

<b>YEAR 2004</b>			
<b>FORLÌ-CESENA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA FORLÌ'</b>			
Ospedale "Morgagni-Pierantoni" Forlì, Forlimpopoli, Santa Sofia	60	65	<b>95.9</b>
Villa Igea Forlì	21	20	
Casa di cura "Villa Serena" Forlì	14	14	
<b>Totale</b>	<b>95</b>	<b>99</b>	
<b>AZIENDA CESENA</b>			
Ospedale "M. Bufalini" Cesena, Bagno di Romagna, Cesenatico	6	12	<b>95.7</b>
Casa di cura "Malatesta Novello" Cesena	281	280	
Casa di cura "S. Lorenzino" Cesena	29	38	
<b>Total</b>	<b>316</b>	<b>330</b>	

<b>MODENA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA MODENA</b>			
Ospedale S. Agostino-Estense	71	70	<b>88.2</b>
Ospedale Civile degli Infermi, Carpi	51	51	
Ospedale di Finale Emilia	-	2	
Ospedale S. Maria Bianca, Mirandola	20	29	
Ospedale Civile Castelfranco Emilia	-	9	
Ospedale Civile, Sassuolo	13	14	
Ospedale Civile, Vignola	24	25	
Ospedale, Pavullo	20	19	
Hesperia Hospital	32	32	
Casa di cura Prof. Fogliani	112	111	
Casa di cura Villa Fiorita	-	27	
<b>Total</b>	<b>343</b>	<b>389</b>	
Azienda Ospedaliera Policlinico di Modena	67	118	<b>56.7</b>

<b>PARMA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA PARMA</b>			
Ospedale Civile, Fidenza, San Secondo Parmense	44	51	<b>96.2</b>
Ospedale Santa Maria, Borgo Val di Taro	85	89	
Casa di cura "Città di Parma"	178	179	
<b>Total</b>	<b>307</b>	<b>319</b>	
Azienda Ospedaliera di Parma	90	97	<b>92.4</b>

<b>ANNO 2004</b>			
<b>PROVINCIA DI PIACENZA</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA PIACENZA</b>			
Ospedale Civile, Piacenza	29	31	<b>84.7</b>
Presidio Val Tidone, Castel San Giovanni	87	106	
Presidio Val D'Arda, Fiorenzuola D'Arda, Cortemaggiore	34	40	
<b>Total</b>	<b>150</b>	<b>177</b>	

<b>RAVENNA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA RAVENNA</b>			
Ospedale S. Maria delle Croci, Ravenna	12	17	<b>91.6</b>
Presidio Ospedaliero, Lugo	83	81	
Ospedale per gli Infermi, Faenza	15	20	
Casa di cura "Domus Nova"	50	60	
Casa di cura "S. Francesco"	151	150	
Casa di cura "Villa Maria Cecilia"	36	35	
Casa di cura "S. Pier Damiano"	91	115	
<b>Total</b>	<b>438</b>	<b>478</b>	

<b>REGGIO EMILIA province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA REGGIO EMILIA</b>			
Ospedale, Guastalla	31	30	<b>74.3</b>
Ospedale S. Sebastiano, Correggio	-	4	
Ospedale di Montecchio Emilia	11	11	
Ospedale di Scandiano	14	11	
Ospedale S. Anna, Castelnovo Monti	3	2	
Casa di cura "Villa Salus"	172	175	
Casa di cura "Villa Verde"	-	78	
<b>Total</b>	<b>231</b>	<b>311</b>	
Arcispedale Santa Maria Nuova –RE	21	26	<b>80.7</b>

<b>RIMINI province</b>	<b>N° of operations communicated to RIPO</b>	<b>N° operations communicated via S.D.O.</b>	<b>% support to R.I.P.O.</b>
<b>AZIENDA RIMINI</b>			
Ospedale Infermi, Rimini, Sant Arcangelo	14	14	<b>98.0</b>
Ospedale G. Ceccarini, Riccione, Cattolica	34	34	
Casa di cura "Sol et Salus"	174	175	
Casa di cura "Villa Maria"	26	26	
Casa di cura prof. Montanari	-	4	
<b>Total</b>	<b>248</b>	<b>253</b>	

<b>TOTAL</b>	<b>4.108</b>	<b>4.595</b>	<b>89.4</b>
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7 operations have been performed in private non-accredited hospitals (Villalba and Villa Toniolo) and are not reported here

### 13.3 Ratio public/private treatment

Percentage of primary arthroplasties, hemiarthroplasties and revisions of the knee performed in public hospitals.

<b>% of operations performed in public hospitals (AUSL, AOSP, IRCCS)</b>		
<b>Year of surgery</b>	<b>Primary</b>	<b>Revision</b>
<b>2000</b>	57.0%	75.0%
<b>2001</b>	59.0%	71.0%
<b>2002</b>	53.0%	70.0%
<b>2003</b>	49.0%	68.0%
<b>2004</b>	47.1%	58.3%

From database SDO

Operations performed in public hospitals are progressively decreasing.

#### **14. Type of operation**

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2004, according to **type**

<b>Type of operation</b>	<b>Number</b>	<b>Percentage</b>
Primary bicompartimental	9.926	73.5%
Primary unicompartmental	1.530	11.3%
Primary tricompartmental	1.114	8.3%
Revision	734	5.4%
Prosthesis removal	122	0.9%
Implant of patella	39	0.3%
Other (debridment...)	38	0.3%
<b>Total*</b>	<b>13.503</b>	<b>100.0%</b>

\* In 33 cases (0.2%) data was not communicated to RIPO. These cases have been excluded from the following analyses.

Bicompartimental implant has only femoral and tibial component, whilst tricompartmental one has patella too.

Implant of patella occurs when a bicompartimental knee prosthesis is transformed into a tricompartmental with a second surgery.

## 15. Descriptive statistics of patients with knee prosthesis

### 15.1 Age

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2004, according to **type of operation** and **age group** of patients at the time of surgery.

Type of operation	<40		40-49		50-59		60-69		70-79		=80		Total
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	
Bi-tricomp	35	0.3	65	0.6	559	5.1	3.304	29.9	5.925	53.7	1.147	10.4	<b>11.035</b>
Unicomp	-	-	19	1.2	205	13.4	632	41.3	588	38.4	85	5.6	<b>1.529</b>
Revision	4	0.5	11	1.5	43	5.8	218	29.7	375	51.1	83	11.3	<b>734</b>
Prosthesis removal	2	1.6	1	0.8	12	9.8	39	32.0	58	47.5	10	8.2	<b>122</b>
Patella only	-	-	1	2.6	1	2.6	14	36.8	20	52.6	2	5.2	<b>38</b>
Other	-	-	-	-	6	15.8	13	34.2	16	42.1	3	7.9	<b>38</b>
<b>Total*</b>	<b>41</b>		<b>97</b>		<b>826</b>		<b>4.220</b>		<b>6.982</b>		<b>1.330</b>		<b>13.496</b>

\* 7 data (0.05%) are missing

Mean age at surgery, according to type of operation.

Type of operation	Mean age	Range
Primary bi/tricompartmental	71.7	19-93
Primary unicompartmental	68.5	41-88
Revision	71.3	41-90
<b>Total</b>	<b>71.3</b>	<b>19-93</b>

## 15.2 Sex

Number of knee operations carried out on patients with admission date between 1st July 2000 and 31st December 2004, according to **type of operation** and **sex** of patient.

Type of operation	Male		Female		Total
	N.	%	N.	%	N.
Bi- tricomp	2.637	23.9	8.403	76.1	11.040
Unicomp	384	25.1	1.146	74.9	1.530
Revision	174	23.7	560	76.3	734
Prosthesis. removal	45	36.9	77	63.1	122
Patella only	10	25.6	29	74.4	39
Other	12	31.6	26	68.4	38
<b>Total</b>	<b>3.262</b>	<b>24.2</b>	<b>10.241</b>	<b>75.8</b>	<b>13.503</b>

Females are more frequently treated with knee prostheses, as well as with hip prostheses.

## 15.3 Side of surgery

Coxarthrosis more often affects right knee (54.7%). The percentage has been calculated on patients wearing only one implant.

## 15.4 Clinical condition

Number of arthroplasty operations carried out on patients with admission date between 1st July 2000 and 31st December 2004, according to **clinical condition** of patients at the time of surgery.

Clinical condition	Number	Percentage
One knee affected	6.974	52.6%
Both knees affected	3.425	25.8%
Controlateral knee with prosthesis	2.034	15.3%
Other diseases that restrict motor ability	545	4.1%
Carrier of joint prostheses other than that of the knee	286	2.2%
<b>Total*</b>	<b>13.264</b>	<b>100.0%</b>

\* 239 cases (1.8%) missing

### 15.5 Bilateral arthroplasty

In the period of registry observation (54 months) 1077 patients underwent bilateral operations. About 5.7% 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 53.4% of cases; beside this 2.8% of bilateral patients underwent also to hip prosthesis.

### 15.6 Body mass index

Number of arthroplasty operations carried out on patients with admission date between 1st July 2000 and 31st December 2004, according to **body mass index** of patients at the time of surgery.

<b>Body mass index</b>	<b>Number</b>	<b>Percentage</b>
Underweight (= 19)	69	0.6%
Normal (20-25)	2.388	20.2%
Overweight (26-29)	4.722	40.0%
Obese (= 30)	4.636	39.2%
<b>Total*</b>	<b>11.815</b>	<b>100.0%</b>

\* 1.688 data (12.5%) are missing

Overweight and obesity, calculated according to BMI [weight in kg/(height in meters)<sup>2</sup>], are characteristics found in more than 79% of patients undergoing knee arthroplasty. In hip prosthesis the percentage is 53.8%.



### 15.7 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 2004, according to diagnosis.

Diagnosis in unicompartmental knee prosthesis	Number	Percentage
Primary arthritis	1.369	89.4%
Necrosis of the condyle	87	5.7%
Deformity	28	1.8%
Post-traumatic arthritis	18	1.2%
Post-traumatic necrosis	18	1.2%
Sequelae of fracture	6	0.4%
Sequelae of osteotomy	3	0.2%
Rheumatic arthritis	1	0.1%
<b>Total</b>	<b>1.530</b>	<b>100.0%</b>

### 15.8 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 2004, according to diagnosis.

Diagnosis in bi/tricompartmental knee prosthesis	Number	Percentage
Primary arthritis	9.881	89.9%
Deformity	315	2.9%
Rheumatic arthritis	215	1.9%
Post-traumatic arthritis	202	1.8%
Sequelae of fracture	141	1.3%
Sequelae of osteotomy	93	0.8%
Necrosis of the condyle	66	0.6%
Sequelae of septic arthritis	19	0.2%
Post-traumatic necrosis	18	0.2%
Tumor	15	0.1%
Sequelae of TBC arthritis	11	0.1%
Other	18	0.2%
<b>Total*</b>	<b>10.994</b>	<b>100.0%</b>

\* 46 (0.4%) missing data

## 15.9 Causes for revision or removal

Number of **revision operations** carried out on patients admitted between 1<sup>st</sup> July 2000 and 31 December 2004, according to **diagnosis**.

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

Diagnosis in revision	Number	Percentage
Total aseptic loosening	325	44.7%
Prosthesis removal	92	12.7%
Insert wear	79	10.9%
Septic loosening	60	8.2%
Aseptic loosening of tibial component	49	6.7%
Pain without loosening	40	5.5%
Aseptic loosening of femoral component	30	4.1%
Prosthesis luxation	15	2.1%
Bone fracture	9	1.2%
Prosthesis fracture	9	1.2%
Stiffness	7	1.0%
Other	12	1.7%
<b>Total*</b>	<b>727</b>	<b>100.0%</b>

\* 7 (1.0%) data missing

It should be evidenced the high percentage of septic loosening (20.9%). The datum is constant during the years.

Number of **prosthesis removal** carried out on patients admitted between 1<sup>st</sup> July 2000 and 31 December 2004, according to **diagnosis**.

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

Diagnosis in removal	Number	Percentage
Septic loosening	119	98.3%
Total aseptic loosening	2	1.7%
<b>Total*</b>	<b>121</b>	<b>100.0%</b>

\* 1 missing datum (0.8%)

## 16. Types of knee prosthesis

### 16.1 Unicompartmental prosthesis

Prostheses used in patients admitted between 1<sup>st</sup> July 2000 and 31 December 2004, primary surgery

TYPE OF PROSTHESIS	N.	%
OXFORD UNI – Biomet Merck	421	27.5
EFDIOS – Citieffe	254	16.6
ALLEGRETTO UNI – Protek Sulzer	205	13.4
GENESIS UNI – Smith & Nephew	131	8.6
PRESERVATION UNI–ALL POLY – DePuy	121	7.9
MILLER GALANTE UNI – Zimmer	103	6.7
MITUS – ENDO-MODEL UNI–ALL POLY – Link	75	4.9
HLS UNI EVOLUTION–ALL POLY – Tornier	53	3.5
P.F.C. UNI – DePuy	43	2.8
UC – PLUS SOLUTION – Endoplus	38	2.5
UNICIA – Vecteur Orthopedic – Stratec	27	1.8
UNISPACER KNEE SYSTEM – Centerpulse	19	1.2
GENESIS UNI-ALL POLY – Smith & Nephew	16	1.0
MITUS – ENDO-MODEL UNI – Link	6	0.4
ADVANCE UNI–ALL POLY – Wright	5	0.3
EIUS UNI–ALL POLY – Stryker Howmedica	5	0.3
DURACON UNI - Stryker Howmedica	2	0.1
UNI BUK–ALL POLY – Biomet Merck	2	0.1
CINETIQUE – Medacta	2	0.1
UC – PLUS SOLUTION–ALL POLY – Endoplus	2	0.1
<b>TOTAL</b>	<b>1.530</b>	<b>100.0</b>

ALL POLY prostheses have polyethylene tibial component.

## 16.2 Bi-tricompartimental knee prosthesis

Prostheses used in patients admitted between 1<sup>st</sup> July 2000 and 31 December 2004, primary surgery.

TYPE OF PROSTHESIS	N.	%
NEXGEN – Zimmer	2.979	27.0%
PROFIX – Smith & Nephew	1.835	16.6%
P.F.C – DePuy	897	8.1%
INTERAX – Stryker Howmedica	634	5.7%
T.A.C.K. – Link	615	5.6%
SCORPIO – Stryker Howmedica	516	4.7%
LCS – DePuy	411	3.7%
913 – Cremascoli	312	2.8%
GENIUS TRICCC – Dedienne Santé	295	2.7%
ADVANCE – Wright	290	2.6%
OPTETRACK – Exactech	287	2.6%
ROTAGLIDE – Corin Medical	287	2.6%
PERFORMANCE – Kirschner Biomet Merck	236	2.1%
GENESIS II – Smith & Nephew	207	1.9%
NUOVA DURACON II – Stryker Howmedica	171	1.5%
GEMINI MK II – Link	151	1.4%
ENDO-MODEL – Link	142	1.3%
HLS – EVOLUTION – Tornier	136	1.2%
G. K. S. – Permedica	105	1.0%
RO.C.C. – Biomet Merck France	102	0.9%
C. K. S. – Stratec Medical	101	0.9%
AGC – Kirschner Biomet Merck	56	0.5%
CONSENSUS – Hayes Medical.	42	0.4%
CEDIOR – Sulzer	33	0.3%
GENUFITT – Lafitt (fem. comp. and insert) + EFDIOS – Citieffe (tibial comp.)	33	0.3%
Unknown	30	0.4%
Other	137	1.2%
<b>TOTAL</b>	<b>11.040</b>	<b>100.0%</b>

### 16.3 Revision prosthesis

Prostheses used in patients admitted between 1<sup>st</sup> July 2000 and 31 December 2004, in total revision surgery.

TYPE OF PROSTHESIS	N.	%
NEXGEN – Zimmer	160	27.0%
ENDO-MODEL – Link	104	17.6%
PROFIX – Smith & Nephew	55	9.3%
AGC – Kirschner Biomet Merck	50	8.4%
P.F.C. – DePuy	60	10.1%
INTERAX – Stryker Howmedica	23	3.9%
G. K. S. – Permedica	13	2.2%
MODULAR ROTATING HINGE – Stryker Howmedica	12	2.0%
OPTETRACK – Exactech	12	2.0%
S-ROM NRH - DePuy	10	1.7%
GENIUS TRICCC – Dediene Santé	9	1.5%
GENUFITT – Lafitt ( Fem. comp and insert) + EFDIOS – Citieffe (Tibial comp)	8	1.4%
TOTAL STABILIZER – Stryker Howmedica	8	1.4%
C. K. S. – Stratec Medical	7	1.2%
ADVANCE – WRIGHT	7	1.2%
913 – Cremascoli	4	0.7%
NUOVA DURACON II – Stryker Howmedica	4	0.7%
ROTAGLIDE – Corin Medical	4	0.7%
T.A.C.K. – Link	4	0.7%
CEDIOR – Sulzer	2	0.3%
SCORPIO – Stryker Howmedica	2	0.3%
Other	18	3.0%
Unknown	16	2.7%
<b>TOTAL</b>	<b>592</b>	<b>100.0%</b>

## 16.4 Relationship between joint components

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31<sup>st</sup> December 2004, **according to femoral-tibial component relationship.**

Component relationship	Primary unicom.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Non stabilized	1.530	100.0	5.786	52.5	90	15.6	<b>7.406</b>	<b>56.4</b>
Posterior stabilized	-	-	5.020	45.5	247	42.8	<b>5267</b>	<b>40.1</b>
Pivot	-	-	169	1.5	181	31.4	<b>350</b>	<b>2.7</b>
Hinge	-	-	53	0.5	59	10.2	<b>112</b>	<b>0.8</b>
<b>Total*</b>	<b>1.530</b>		<b>11.028</b>		<b>577</b>		<b>13.135</b>	

\* 27 data are missing (0.2%)

## 16.5 Articular coupling

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31<sup>st</sup> December 2004, **according to articular coupling.**

Articular coupling	Primary unicom.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Metal-poly	1.496	97.8	10.973	99.4	587	99.2	<b>13.056</b>	<b>99.2</b>
Cer-poly	15	1.0	67	0.6	5	0.8	<b>87</b>	<b>0.7</b>
Other	19	1.2	-	-	-	-	<b>19</b>	<b>0.1</b>
<b>Total*</b>	<b>1.530</b>		<b>11.040</b>		<b>592</b>		<b>13.162</b>	

\* 28 data are missing (0.2%)

## 16.6 Articular insert

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31<sup>st</sup> December 2004, **according to articular insert.**

Type of insert	Primary unicom.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Fix	1.107	72.4	7.797	70.7	501	87.9	<b>9.405</b>	<b>71.6</b>
Mobile	423	27.6	3.237	29.3	69	12.1	<b>3.729</b>	<b>28.4</b>
<b>Total*</b>	<b>1.530</b>		<b>11.034</b>		<b>570</b>		<b>13.134</b>	

\* 28 data are missing (0.2%)

## 16.7 Prosthesis fixation

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31<sup>st</sup> December 2004, **according to prosthesis fixation.**

Fixation	Primary unicom.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	1.259	82.3	9.726	88.2	559	97.2	<b>11.544</b>	<b>87.9</b>
Cementless	264	17.2	854	7.8	9	1.6	<b>1127</b>	<b>8.6</b>
Femoral cementless + tibial cemented	7	0.5	420	3.8	5	0.9	<b>432</b>	<b>3.3</b>
Femoral cem + tibial cementless	-	-	26	0.2	2	0.3	<b>28</b>	<b>0.2</b>
<b>Total*</b>	<b>1.530</b>		<b>11.026</b>		<b>575</b>		<b>13.131</b>	

\* 31 data are missing (0.2%)

## 16.8 Fixation of femoral component

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31<sup>st</sup> December 2004, **according to femoral component fixation.**

Fixation of femoral component	Primary unicom.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	1.259	82.3	9.085	82.3	125	21.6	<b>10.469</b>	<b>79.6</b>
Cementless without screw	271	17.7	1212	11.0	14	2.4	<b>1.497</b>	<b>11.4</b>
Cemented with intramedullary stem	-	-	671	6.1	440	75.7	<b>1.111</b>	<b>8.5</b>
Cementless with intramedullary stem	-	-	62	0.6	2	0.3	<b>64</b>	<b>0.5</b>
<b>Total*</b>	<b>1.530</b>		<b>11.030</b>		<b>581</b>		<b>13.141</b>	

\* 21 data are missing (0.2%)

## 16.9 Fixation of tibial component

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st July 2000 and 31<sup>st</sup> December 2004, **according to tibial component fixation.**

Fixation of tibial component	Primary unicom.		Primarily bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Cemented	1.255	82.1	8.173	74.1	91	15.7	<b>9.519</b>	<b>72.4</b>
Cemented with intramed stem	-	-	1.977	17.9	474	81.6	<b>2.450</b>	<b>18.7</b>
Cementless without screw	19	1.2	770	7.0	3	0.5	<b>792</b>	<b>6.0</b>
Cemented without screw	245	16.0	35	0.3	8	1.4	<b>288</b>	<b>2.2</b>
Cementless with intramed stem	-	-	75	0.7	5	0.9	<b>80</b>	<b>0.6</b>
Cemented with screw	11	0.7	-	-	-	-	<b>11</b>	<b>0.1</b>
<b>Total*</b>	<b>1.530</b>		<b>11.029</b>		<b>581</b>		<b>13.140</b>	

\* 22 data are missing (0.2%)

## 16.10 Cement

Bone cement used for fixation of knee prosthesis is Surgical Simplex P in 40.0% of cases. Bone cement loaded with antibiotic is used in 14.0% of cases.



### 16.11 Surgical technique

The most commonly used **surgical approach is the antero-medial** (93.6 %) regardless of type of operation.

#### Surgery of patella (non - prosthetic)

Number of surgery on patella performed on patients admitted to hospital between 1st July 2000 and 31<sup>st</sup> December 2004, during prosthetization of the knee.

Type of surgery of patella	Number	Percentage
None	5.879	48.2
Patella-plasty	3.383	27.8
Denervation of patella	1.981	16.2
Both	947	7.8
<b>Total</b>	<b>12.190</b>	<b>100.0%</b>

#### Use of bone grafts (data collected since 2002)

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st January 2002 and 31<sup>st</sup> December 2004, according to type of operation and use of bone grafts

Bone grafts	Primary unicom.		Primary bi/tricomp.		Total revision		Total	
	N.	%	N.	%	N.	%	N.	%
Not used	1.141	100.0	7.241	99.1	314	89.4	<b>8.696</b>	<b>98.8</b>
Femoral	-	-	40	0.6	9	2.6	<b>49</b>	<b>0.6</b>
Tibial and femoral	-	-	24	0.3	19	5.4	<b>43</b>	<b>0.5</b>
Tibial	-	-	4	0.1	9	2.6	<b>13</b>	<b>0.1</b>
<b>Total*</b>	<b>1.141</b>		<b>7.309</b>		<b>351</b>		<b>8.801</b>	

\* 1.153 data are missing (13.1%)

#### Use of augmentation blocks (data collected since 2002)

Number of knee prosthesis arthroplasty performed on patients admitted to hospital between 1st January 2002 and 31<sup>st</sup> December 2004, according to use of augmentation blocks

Augmentation blocks	Primary bi/tricomp.		Total revision	
	N.	%	N.	%
Non used	8.034	99.4	229	55.1
Tibial	<b>37</b>	<b>0.5</b>	54	13.0
Tibial and femoral	4	0.0	43	10.3
Femoral	9	0.1	90	21.6
<b>Total</b>	<b>8.084</b>		<b>416</b>	

## 17. Antibiotic prophylaxis

List of active principles used in preoperative antibiotic prophylaxis in cases of **knee arthroplasty**. (data registered since 2002)

ACTIVE PRINCIPLE	Percentage
AMPICILLIN	2.5%
AMPICILLIN + GENTAMICIN	1.5%
AMPICILLIN + SULBACTAM	1.4%
AMPICILLIN + SULBACTAM + GENTAMICIN	3.1%
CEFAMANDOLO	0.2%
CEFAMANDOLO + GENTAMICIN	0.2%
CEFAZOLINA	22.8%
CEFAZOLINA + GENTAMICIN	1.8%
CEFAZOLINA + TOBRAMICIN	14.7%
CEFEPIME	0.9%
CEFODIZIMA	3.4%
CEFOTAXIME	2.5%
CEFOTAXIME + LEVOFLOXACINA	1.6%
CEFTIZOXIMA	1.0%
CEFTRIAZONE	6.1%
CEFTRIAZONE + GENTAMICIN	1.1%
CEFUROXIMA	8.6%
CIPROFLOXACINA	1.6%
GENTAMICIN	1.0%
LEVOFLOXACINA	0.9%
TEICOPLANIN	4.8%
TEICOPLANIN + NETILMICINA	1.3%
VANCOMICIN	1.4%
VANCOMICIN + GENTAMICIN	7.4%
OTHER	8.2%
<b>TOTAL</b>	<b>100.0%</b>

Active principles used for the prophylaxis are the same as for hip, even if in different percentage.

### Way of administration

Multiple administrations are used in 85.4% of cases

## 18. Blood transfusion

Number of surgery between **01/01/2004** and **31/12/2004**, according to type of surgery and blood transfusion.

Type of surgery	None		Autologus (recovery)		Homologous		Aut. & Hom.	
	N.	%	N.	%	N.	%	N.	%
Primary bi/tricomp.	263	77.1	70	20.5	5	1.5	3	0.9
Primary uni	275	11.0	1663	66.3	252	10.0	320	12.7
Revision	18	12.1	70	47.0	41	27.5	20	13.4

\* 988 data are missing (25.0%)

Date are collected since September 2002, but in the first period too many data were missing. Therefore only data on 2004 are reported.

## 19. Complications occurred during hospitalization

The rate of complications in **primary uni-compartmental surgery** carried out on patients hospitalized between July 1st 2000 and December 31st 2004.

Types of complication	Uni		Bi/tricomp.		Revision		Removal		Total	
	N.	%	N.	%	N.	%	N.	%	N.	%
<b>Intra-operative</b> Bone fracture lesion of tendon or ligament	-	-	28	0.25	7	1.0	-	-	<b>35</b>	<b>0.26</b>
<b>General post-op.</b> anemia, fever, respiratory	15	1.0	248	2.2	22	3.0	2	1.6	<b>287</b>	<b>2.1</b>
<b>Local post-op</b> hematoma, TVP, prosthesis disloc	4	0.26	114	1.0	10	1.4	-	-	<b>128</b>	<b>0.94</b>

### 19.1 Deaths occurred during hospitalization

Rate of deaths in knee prosthetic surgery carried out on patients hospitalized between July 1<sup>st</sup> 2000 and December 31st 2004.

Type of surgery	Deaths	Number of surgery	Percentage
Primary bi/tricomp	8	11.040	0.07%
Primary uni	-	1.530	-
Revision	1	734	0.14%
Removal	1	122	0.82%

Registered deaths occurred during hospitalization

## 20. Duration of pre-operative hospitalization

Days of pre-operative hospitalization (mean, minimal, maximal) according to type of operations and year of operation year 2001

Year 2001			
Type of operation	N.	Mean.	Range
Primary bi/tricomp.	1.974	2.0	1-14
Primary unicomp.	220	2.4	1-13
Revision	140	4.1	1-18

Days of pre-operative hospitalization (mean, minimal, maximal) according to type of operations and year of operation year 2004

Year 2004			
Type of operation	N.	Mean.	Range
Primary bi/tricomp.	3.263	1.7	1-31
Primary unicomp.	504	1.4	1-9
Revision	211	3.8	1-32

## 21. Analysis of survival of primary surgery

### 21.1 Cox multivariate analysis

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

All primary hip arthroplasties performed in the region between July 2000 and December 2004 were analyzed.

COX PROPORTIONAL RISK MODEL	
<b>Variables</b>	
Dependent: Follow-up	
Independent: Age, sex, diagnosis, type of prosthesis, type of insert	
<b>Number of valid observations 12.509</b>	
Non revised: 12.328	
Revised: 181	
Chi-square: 34.118 $p= 0.0001$	
VARIABLE	SIGNIFICANCE ( P )
<b>Sex</b> (males vs females)	<b>S</b> (0.012)
<b>Age</b> (less than 70 yrs vs more than 70 yrs)	<b>S</b> (0.025)
<b>Diagnosis</b> (arthrosis vs other)	<b>NS</b> (0.46)
<b>Type of prosthesis</b> (bi- tri compartmental vs uni)	<b>S</b> (0.0005)
<b>Type of insert</b> (fix vs mobile)	<b>S</b> (0.025)

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 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.

Relative risk is compared to females. Males have a greater risk.

Sex	Relative risk rate	Confidence interval 95%		Significance (p)
Males	1.5	1.1	2.0	S (0.011)

Relative risk is compared older than 70yrs. Younger have greater risk.

Age	Relative risk rate	Confidence interval 95%		Significance (p)
Less than 70yrs	1.4	1.0	1.9	S (0.025)

Relative risk is compared to fix insert. Mobile inserts have greater risk.

Insert	Relative risk rate	Confidence interval 95%		Significance (p)
Mobile	1.4	1.0	1.9	S (0.027)

Relative risk is compared to bi-compartmental. Uni-compartmental prostheses have greater risk.

Type of prosthesis	Relative risk rate	Confidence interval 95%		Significance (p)
Uni compartmental	1.9	1.3	2.7	S (0.0005)

## 21.2 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 2004 in the first column, the second and third columns show the number of revision operations performed on the same patients. Some revision operations were performed in the same hospital as the primary operation while others were performed at other hospitals in the Emilia-Romagna Region.

Type of operation	Number of operations	N. of revisions performed in the same hospital	N. of revisions performed in a different hospital	% revision
Primary bi\trcomp	11.040	117	30	1.3%
Primary unicom.	1.530	30	7	2.4%
Total revision	592	23	2	4.2%
<b>Total</b>	<b>13.162</b>	<b>170</b>	<b>39</b>	<b>1.6%</b>

In 20.1% 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.

### 21.3 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.

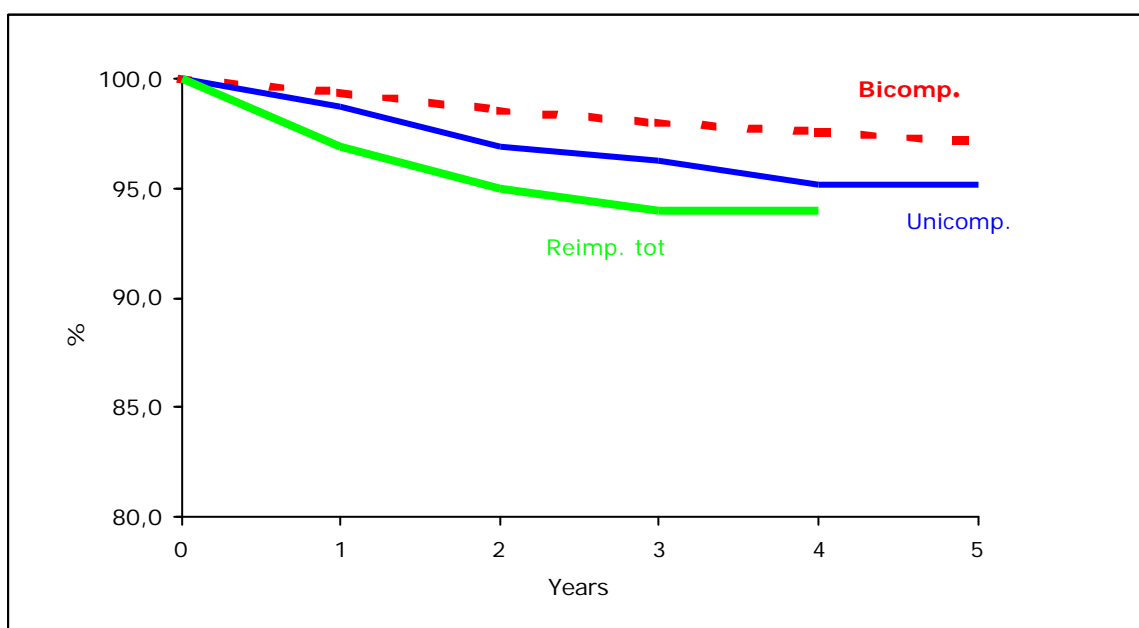
The following paragraphs show the survival curves calculated separately for primary uni , bi/tri compartmental and total joint revision.

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

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.

Type of surgery	N. implants	N. revisions	% revisions
Primary bi\tricomp	11.040	147	1.3%
Primary unicom.	1.530	37	2.4%
Total revision	592	25	4.2%

#### Survival curves



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 bi-compartmental

Cause of revision	Rate	Percentage	% distribution of cause of failure
Septic loosening	53/11.040	0.48%	36.1%
Total aseptic loosening	29/11.040	0.26%	19.7%
Tibial loosening	15/11.040	0.14%	10.2%
Insert loosening	15/11.040	0.14%	10.2%
Femoral loosening	8/11.040	0.07%	5.4%
Pain without loosening	8/11.040	0.07%	5.4%
Luxation	7/11.040	0.06%	4.8%
Stiffness	3/11.040	0.03%	2.0%
Unknown	4/11.040	0.04%	2.7%
Bone fracture	3/11.040	0.03%	2.0%
Other	2/11.040	0.02%	1.4%
<b>Total</b>	<b>147/11.040</b>	<b>1.33%</b>	<b>100.0%</b>

#### Primary uni-compartmental

Cause of revision	Rate	Percentage	% distribution of cause of failure
Pain without loosening	12/1.530	0.78%	32.4%
Septic loosening	6/1.530	0.39%	16.2%
Total loosening	8/1.530	0.52%	21.6%
Femoral aseptic loosening	2/1.530	0.13%	5.4%
Tibial aseptic loosening	5/1.530	0.33%	13.5%
Bone fracture	1/1.530	0.07%	2.7%
Other	3/1.530	0.20%	8.1%
<b>Total</b>	<b>37/1.530</b>	<b>2.42%</b>	<b>100.0%</b>

Rate of revision for bi-tricompartamental prosthesis according to type of insert

Poly insert	N.	Removals	Rate	Percentage
Fix	9.405	119	119/9405	1.2%
Mobile	3.729	65	65/3729	1.7%

Rate of revision for bi-tricompartamental prosthesis according to femoral-tibial component relationship

Femoral-tibial component relationship	N.	Removals	Rate	Percentage
Non stabilized	7.406	120	120/7406	1.6%
Posteriorly stabilized	5.267	61	61/5267	1.2%



## 21.5 Second time surgery for patella prothesization

In 16 patients out of 9926 with bi-compartmental knee prosthesis, a re-operation was necessary to substitute natural patella with an artificial one. Here are the details

Primary bi-compartmental prosthesis	Reason for patellar prosthesis	Time before re-operation
GENIUS TRICCC – Dedienne Santé	Patellar pain	97 days
GENIUS TRICCC – Dedienne Santé	?	238 days
GENIUS TRICCC – Dedienne Santé	?	277 days
GENIUS TRICCC – Dedienne Santé	Pain without loosening	1.4 year
GENIUS TRICCC – Dedienne Santé	?	301 days
GENIUS TRICCC – Dedienne Santé	Patellar pain	186 days
HLS EVOLUTION ROTATOIRE – Tornier	?	1.1 year
MULTIGEN-PS – Lima	Patellar pain	1.2 year
NEXGEN-CR - Zimmer	Patellar pain	2.0 years
NEXGEN-LPS - Zimmer	Damage of patellar cartilage	1.6 year
PFC-PS - De Puy Johnson & Johnson	Patellar pain	1.8 year
PROFIX-CONFORMING Smith & Nephew	Patellar pain	1.0 year
PROFIX-CONFORMING Smith & Nephew	?	1.8 year
PROFIX-CONFORMING Smith & Nephew	Dolore senza mobilizzazione	2.4 years
ROTAGLIDE - Corin medical	Patellar pain	90 days
ROTAGLIDE - Corin Medical	Patellar pain	1.2 year

These operations are not to be considered as implant failure; they are registered to quantify the two-stage surgery.

## 21.6 Rate of failure according to type of prosthesis (uni-compartmental)

TYPE OF PROSTHESIS	N. of implant	n. of revision	%
OXFORD UNI – Biomet Merck	421	13	3.1
EFDIOS – Citieffe	254	6	2.4
ALLEGRETTO UNI – Protek Sulzer	205	5	2.4
GENESIS UNI – Smith & Nephew	131	2	1.5
PRESERVATION UNI–ALL POLY – DePuy	121	1	0.8
MILLER GALANTE UNI – Zimmer	103	2	1.9
MITUS – ENDO-MODEL UNI–ALL POLY – Link	75	2	2.7
HLS UNI EVOLUTION–ALL POLY – Tornier	53	-	-
P.F.C. – UNI – DePuy	43	5	11.6
UC – PLUS SOLUTION – Endoplus	38	-	-
UNICIA – Vecteur Orthopedic, Stratec	27	-	-
UNISPACER KNEE SYSTEM – Centerpulse	19	-	-
GENESIS UNI-ALL POLY – Smith & Nephew	16	-	-
MITUS – ENDO-MODEL UNI – Link	6	-	-
ADVANCE UNI–ALL POLY – Wright	5	1	20.0
EIUS UNI–ALL POLY – Stryker Howmedica	5	-	-
DURACON UNI - Stryker Howmedica	2	-	-
UNI BUK–ALL POLY – Biomet Merck	2	-	-
CINETIQUE – Medacta	2	-	-
UC – PLUS SOLUTION–ALL POLY – Endoplus	2	-	-
<b>TOTAL</b>	<b>1.530</b>	<b>37</b>	<b>2.4</b>

The figures may be affected by the fact that, as previously stated, the data received by RIPO are incomplete. About 10% of the operations performed in the Region were not reported to the register, therefore, the failure rate may not be accurate.

Note that the data do not take into consideration any different risk factor rate in each type of prosthesis.

## 21.7 Rate of failure according to type of prosthesis (bi-tricompartamental)

TYPE OF PROSTHESIS	N. of implant	n. of revision	%
NEXGEN – Zimmer	2.979	26	0.9
PROFIX – Smith & Nephew	1.835	16	0.9
P.F.C –DePuy	897	11	1.2
INTERAX – Stryker Howmedica	634	23	3.6
T.A.C.K. – Link	615	16	2.6
SCORPIO – Stryker Howmedica	516	2	0.4
LCS – DePuy	411	6	1.5
913 – Cremascoli	312	3	1.0
GENIUS TRICCC – Dedienne Santé	295	4	1.4
ADVANCE – Wright	290	7	2.4
OPTETRACK – Exactech	287	4	1.4
ROTAGLIDE – Corin Medical	287	6	2.1
PERFORMANCE – Kirschner Biomet Merck	236	5	2.1
GENESIS II – Smith & Nephew	207	1	0.5
NUOVA DURACON II – Stryker Howmedica	171	4	2.3
GEMINI MK II – Link	151	1	0.7
ENDO-MODEL – Link	142	1	0.7
HLS – EVOLUTION – Tornier	136	1	0.7
G. K. S. – Permedica	105	1	1.0
RO.C.C. – Biomet Merck France	102	-	-
C. K. S. – Stratec Medical	101	-	-
AGC – Kirschner Biomet Merck	56	-	-
CONSENSUS – Hayes Medical.	42	1	2.4
CEDIOR – Sulzer	33	2	6.1
GENUFITT – Lafitt (fem. comp and insert) + EFDIOS – Citieffe (tibial comp.)	33	1	3.0
Unknown	30	2	6.7
Other	137	1	0.7
<b>TOTAL</b>	<b>11.040</b>	<b>147</b>	<b>1.3</b>