Orthopride

Belgian Hip and Knee Arthroplasty Registry

Annual Report

2014

December 2015

CONTENT

LIST OF TABLES

LIST OF FIGURES

1 GENERAL INTRODUCTION

This Annual Report of the Belgian Hip and Knee Arthroplasty Registry, called Orthopride is the third formal public report. This report includes information about the goals, the developments and the results of the registration.

The 2014 Hip and Knee Arthroplasty Report is based on the analysis of 20.338 primary and revision hip and knee procedures recorded by the Registry with a procedure date from July 1st, 2014 to December 31st, 2014.

The Registry began data collection about hip and knee joint replacement on September 1st, 2009 on a voluntary basis. Since 2009 a continued development has improved the registration. On July 1st, 2014, registration became mandatory. Because the data collection was limited before this date (see Table 1.1), this reports only presents the data of the second half of 2014.

The importance and effectiveness of the Registry will be enhanced greatly by time. The accumulation of data allows for more meaningful outcome analyses to be undertaken. The Registry information presented in this report represents about 82% of hip and knee joint replacement procedures undertaken nationally between July 1 and December 31, 2014.

Because the reimbursement of the prosthesis is coupled to the registration since September 1, 2015, it is anticipated that the reports in the upcoming years will contain information on approximately 100% of hip and knee joint replacements performed in Belgium.

Table 1.1 Total joint replacement procedures entered in Orthopride compared to the invoiced procedures recorded by the National Institute for Health and Disability Insurance

	2009	2010	2011	2012	2013	1/01-30/06 2014	1/07-31/12 2014
Hip replacements in Registry	681	1309	2767	4170	5373	3308	10557
Knee replacements in Registry	534	1556	3128	4659	5457	3527	9781
Total replacements in Registry	1215	2865	5895	8829	10830	6835	20338
Invoiced knee replacements	19561	19742	21301	22004	22287	24088	
Invoiced hip replacements	23723	24051	24629	25798	25936	25582	
Total invoiced replacements	43284	43793	45930	47802	48223	49670	
Registered/invoiced	**2,8%**	**6,5%**	**12,8%**	**18,5%**	**22,5%**	**27,5%**	**81,9%**

Background

Joint replacement is a commonly performed major surgical procedure that has considerable success in alleviating pain and disability. Hip and knee arthroplasty is currently the international standard of care for treating advanced degenerative and rheumatologic hip and knee joint disease, as well as certain

joint fractures. As in other countries, joint replacement surgery is a common procedure in Belgium, with almost 50.000 hip and knee replacements undertaken in 2014 (see Table 1.1).

National registries have been established in many countries to monitor the rates of primary and revision replacement surgery. The Swedish knee arthroplasty register was the first national register of its vein, followed by registers from more and more countries. By now, there are several national registries from a large part of the European countries and furthermore from the United States, Canada, Australia, and New Zealand.

National joint arthroplasty registries facilitate healthcare quality improvement. Based on registered data, researchers can evaluate efficacy and analyze the quality of care and the survival of prostheses. Furthermore, national registries play an important role in the comparative analysis of implant performance, the detection of revision rates following total joint arthroplasty, and identification of patients for the purpose of follow-ups and recalls.

The Belgian Orthopedic Associations (BVOT and SORBCOT) recognized the need to establish a National Arthroplasty Registry in 2001. This was in part based on the documented success of a number of arthroplasty registries in other countries and the publication of a report made by a private health insurer about hip replacement. However, it took several years before the National Arthroplasty Registry was established. In September 2008, the National Institute for Health and Disability Insurance together with both Orthopedic Associations agreed to fund the Registry development. Data collection on hip and knee replacement surgery in our National Arthroplasty Registry, called Orthopride started in September 2009. Since 2013, the National Institute for Health and Disability Insurance and the Flemish Orthopedic Society provide funding to maintain the Registry. Although the registration is mandatory since July 1st, 2014, about 82% of the prostheses were registered at the date of extraction (October 5, 2015).

Aims of our Registry

The purpose of Orthopride is to define, improve and maintain the quality of care for patients receiving joint replacement surgery. This is achieved by collecting a defined minimum data set that enables outcomes to be determined based on patient characteristics, prosthesis type and features, method of prosthesis fixation and surgical technique used. These collected data are used to investigate the quality of knee and hip replacement surgery and the lifespan of the prosthesis. Since the Registry can be accessed at any time through a web application, information can be obtained about the patient's type of prosthesis which was used.

Information obtained by the analysis of Registry data is used to benefit the community. Therefore, it is our duty to disseminate the results of the analysis. A first Annual Report was released in December 2011 and was sent to all orthopedic surgeons by regular mail. A second Report dates from April 2013. This report was published on the website of the National Institute for Health and Disability Insurance. Both previous reports were written in our national languages Dutch and French. This third Annual Report was prepared in English so the broader public would be able to consult the results of the analysis.

Data Collection / Validation

Each surgeon provides patient and procedural characteristics and prosthesis identification data via an online secured web application. Data entry can also be done by an administrator of the surgeon but the data are validated afterwards by the surgeon. A system-to-system web service is available, but only 2 hospitals succeeded in connecting.

Since the origin of Orthopride, several limitations in the data collection and validation were noticed which has led to an adaptation of the Registry application on January 1st, 2015 to a more appropriate registration. Until January 2015, Orthopride was not linked to the National Identification Registry and prosthesis identification data were collected as non-obligatory free text fields. January 1st, 2015, a new version of the application was launched which is now coupled with the National Identification Registry. Prosthesis identification is currently performed by means of notification codes, unique Belgian codes. Next tot this, some additional parameters are collected since then as alignment and preoperations. Although other National Registries show promising results with Patient Reported Outcome Measures, no such measures are yet collected in Orthopride.

One of the key moments of 2014 was the obligation of registration, which was necessary to increase the scientific value of the National Registry which aims at a better quality of care for the patient.

Registered data

Data presented in this Report refer to procedures with a date between July 1st, 2014 and December 31st, 2014 and were based on the extract of October 5, 2015.

Because of the alterations in registration on January 1st, 2015 and the possibility to register retrospectively, data were extracted from 2 different databases. 18.212 registrations were extracted from the application used until December 31st, 2014 and 2.126 registrations were extracted from the 2015 database.

Data are submitted to the Registry by orthopedic surgeons from both public and private hospitals. 101 hospitals participated in the data collection that are respresented in this Report.

The most commonly used outcome measure in National Registries is time to first revision surgery. This is an unambiguous measure of the need for further intervention. Combined with a careful analysis of potential confounding factors this can be used as a measure of the success or otherwise of a procedure. Due to the limited amount of recorded knee and hip replacements in Orthopride before the obligation and the corresponding errors this may cause in survival analyses, we decided not yet to publish such kind of analyses. Hereby, this Reports mainly contains descriptive results: patient demographics like age, gender and indication, type and amount of hip and knee replacements and the division and variation in surgical techniques as fixation and approach. Also some descriptive results of revisions are presented such as reasons for revisions.

The importance of this Report is that it establishes that it is possible to collect detailed and useful information on joint replacement surgery. In addition, it demonstrates a method of presenting some of

that data. In doing so, it provides the opportunity for interested parties to comment on the presentation and provide much welcomed feedback. Through this process it will be possible to enhance both the quality of information provided as well as the presentation style.

Limitations and recent developments

At the moment Orthopride is not connected to other Health Registries. The Registry data are therefore not compared to data from other health departments. The lack of a validation process is one of the big limitations. Although limited data control is performed in the web application during the registration, data errors can occur at any of the registered data; that is, errors in patient identification, procedural characteristics and prosthesis details. Caution is therefore warranted in the interpretation of the results.

In the literature, several outcome measures are used to quantify the efficacy of a treatment, f.i. rating scales and questionnaires to measure pain intensity and mobility or radiography to quantify alignment or the degree of loosening. None of these are collected in Orthopride at the moment.

At the moment, a web application is in development with the cooperation of the Scientific Institute of Public Health (WIV-ISP) with the aim of making the entered data available to the orthopedic surgeons. This application will permit the orthopedic surgeons to draw their own statistics and to compare those to national data.

Acknowledgement

At the time of this report 452 orthopedic surgeons of 101 hospitals participated in data collection. The registry would like to acknowledge the hospitals, orthopedic surgeons and registrars for their cooperation. In addition, we have received continued support and cooperation from the National Institute for Health and Disability Insurance and the Orthopedic Associations (BVOT and SORBCOT).

2 KNEE REPLACEMENT

2.1 INTRODUCTION

The information presented in this section of the report is the data collected by the Belgian Hip and Knee Arthroplasty Registry from July 1st, 2014 until December 31st, 2014. As mentioned previously it represents about 82% of joint replacement surgery undertaken in Belgium (see Table 1.1).

The total number of knee procedures recorded between July 1st, 2014 until December 31st, 2014 was 9781. Of the 9781 procedures submitted, 9048 (92,5%) were primary procedures and 733 (7,5%) were revision procedures including revisions with a new prosthesis (n=711) and resections (n=22).

Of the 9781 records of a primary knee operation 4 had a missing age. The type of implanted prosthesis could not be deducted for 91 primary and 71 revision prostheses and the type of fixation was unknown for 50 primary and 6 revision prostheses.

The revision burden rate stands at 7,5% for the collection period. This revision burden is in line with other National Registries which present revision burdens between 5,0 and 8,9%.

2.2 PRIMARY KNEE REPLACEMENT

Between July 1st, 2014 and December 31st, 2014, 9048 primary knee procedures in 8699 patients were recorded. Data on knee replacements include patient characteristics, operation techniques and details of the implant.

The knee is made up of three compartments: a medial, lateral and patellofemoral compartment. The medial, lateral or patellofemoral compartments can be replaced independently, if clinically appropriate. When a 'total' knee prosthesis is implanted the medial and lateral compartments are always replaced and the patella is resurfaced if the surgeon considers this to be of benefit to the patient. If the medial or lateral compartment is replaced then the term 'unicompartmental' is applied to the implant. When the medial and patellofemoral compartment are replaced, the term 'bicompartmental' is used.

There is variation in the constraint of the tibial insert depending on whether the posterior cruciate ligament is preserved (cruciate retaining) or sacrificed (posterior-stabilised) at the time of surgery. Additional constraint may be necessary to allow the implant to deal with additional ligament deficiency or bone loss, where a constrained condylar or hinged knee would be used, even in a primary situation.

During the registration in Orthopride, orthopedic surgeons need to choose between 9 different kinds of primary prostheses which are medial and lateral unicompartmental knees, patellofemoral, bicompartmental, posterior cruciate retaining, posterior-stabilised, ultra-congruent, constrained condylar or hinge. When the surgeon considers the terms inappropriate for the implanted prosthesis he or she can indicate 'other implant'.

The tibial construct may be modular with a metallic tibial tray and a polyethylene insert or non-modular being constructed of polyethylene alone. The tibial insert may be mobile or remain in a fixed position on the tibial tray. This also applies to medial and lateral unicompartmental knees. During the registration, the orthopedic surgeon indicates whether the insert was mobile or fixed.

This chapter summarizes the patient demographics, the operation techniques and the characteristics and types of knee prostheses in primary knee replacement registered in Orthopride.

2.2.1 Demographics

Demographics of primary knee replacement patients are shown in Table 2.1

The average age for a primary knee replacement was 67,5 years. About 22% of the patients were younger that 60 years. Approximately 63% of the patients were female. On average, female patients were older than male patients at the time of their primary knee replacement (68 ± 10 years and 66 ± 10 years respectively) (Figure 2.1).

The single largest indication recorded for knee replacement was osteoarthritis, recorded in 95% of all primary procedures (Table 2.1). Trauma was indicated more in males (3,6%) than in females (1,6%) while osteoarthritis was indicated more in females (96%) compared to males (94%) (Table 2.2).

Table 2.1 Age, gender and indications for primary knee replacement patients

	N=9048
Mean age (years) (SD)	67,5 (10,3)
Age groups [missing]	**% (N)[4]**
<45	1,6 (145)
45-59	20,5 (1850)
60-69	32,8 (2967)
70-79	32,9 (2979)
>=80	12,2 (1103)
Gender	**% (N)**
Male	37,4 (3383)
Female	62,6 (5665)
Indication	**% (N)**
Osteoarthritis	95,2 (8614)
Trauma	2,4 (215)
Previous infection	0,2 (14)
Inflammatory arthropathy	0,7 (65)
Avascular necrosis	1 (92)
Fracture	0,1 (6)
Indication other	0,5 (42)

Figure 2.1 Age distribution by gender for primary knee replacement patients

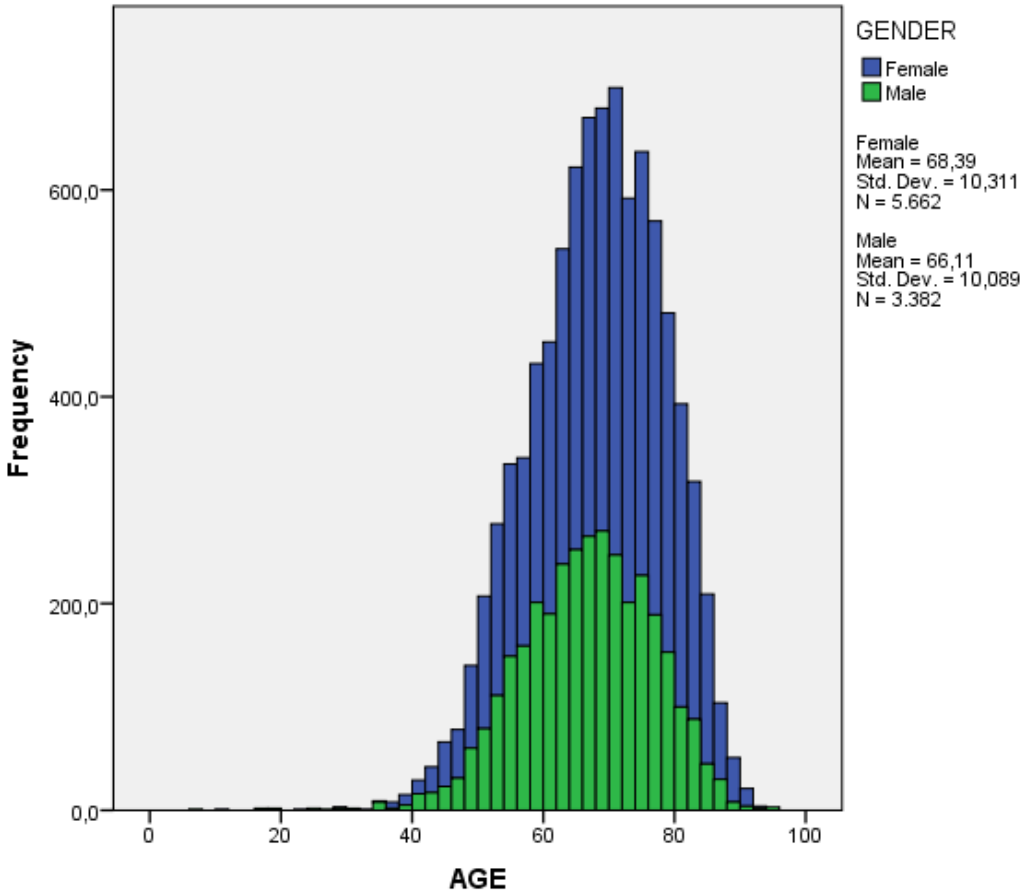


Table 2.2 Indications for primary knee replacements based on gender

	Male	Female
	N=3383	N=5665
	% (N)	**% (N)**
Osteoarthritis	93,9 (3176)	96 (5438)
Trauma	3,6 (122)	1,6 (93)
Previous infection	0,2 (8)	0,1 (6)
Inflammatory arthropathy	0,7 (24)	0,7 (41)
Avascular necrosis	1 (33)	1 (59)
Fracture	0 (1)	0,1 (5)
Indication other	0,6 (19)	0,4 (23)

2.2.2 Surgical technique and implant characteristics

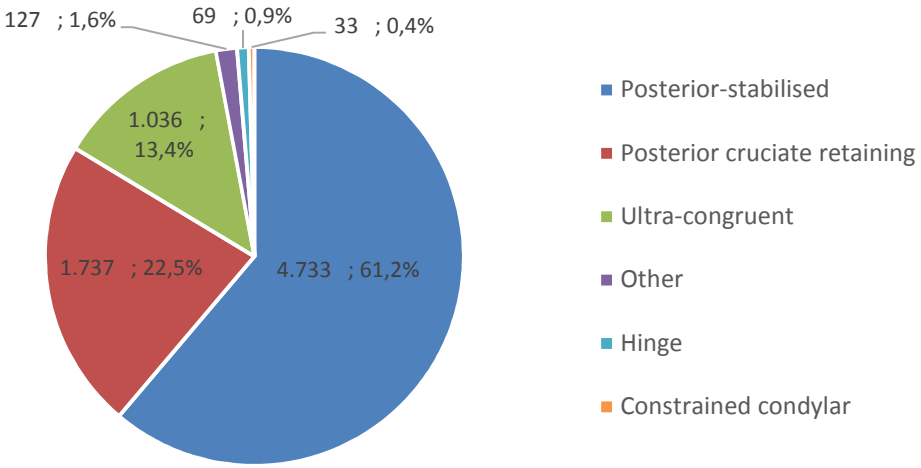
The majority of the replacements were total knee replacements (86,4%) (Table 2.3). Other types accounted for 7,7% unicompartmental, 4,4% bicompartmental and 1,5% patellofemoral replacements.

Table 2.3 Numbers and percentages of primary knee replacement types

	Number	Percentage of total (%)
Total knee replacement	7735	86,4
Unicompartmental replacement	690	7,7
Bicompartmental replacement	398	4,4
Patellofemoral replacement	134	1,5
All types [missing]	**8957 [91]**	**100**

Figure 2.2 shows that the most frequently used total prosthesis for primary knee replacements was the posterior-stabilised prosthesis (61,2%).

Figure 2.2 Distribution of primary total knee prosthesis types



Details of mean age, age group distribution and gender by type of replacement are given in Table 2.4. Patients undergoing a patellofemoral replacement were the youngest with an average age of 54 years. 77% of these patients were female which was higher compared to other replacement types. Age of patients with a unicompartmental replacement (62,5 years on average) was lower than those with a total or bicompartmental replacement (68 years on average) There was an equal balance between males and females receiving a unicompartmental knee replacement.

Table 2.4 Age and gender of primary knee replacement patients by type of replacement

	Total knee replacement	Unicompartmental replacement	Bicompartmental replacement	Patellofemoral replacement
	N=7735	**N=690**	**N=398**	**N=134**
Mean age (years) (SD)	68,2 (10)	62,5 (10,4)	67,7 (10,3)	54 (11,5)
Age groups [missing]	**% (N)[3]**	**% (N)[1]**	**% (N)**	**% (N)**
<45	1,2 (93)	2,2 (15)	1,8 (7)	20,9 (28)
45-59	18,1 (1399)	41,8 (288)	20,1 (80)	49,3 (66)
60-69	33,3 (2578)	30,3 (209)	31,9 (127)	18,7 (25)
70-79	34,5 (2665)	19,6 (135)	34,9 (139)	9 (12)
>=80	12,9 (997)	6,1 (42)	11,3 (45)	2,2 (3)
Gender	**% (N)**	**% (N)**	**% (N)**	**% (N)**
Male	36,5 (2821)	50,1 (346)	37,9 (151)	23,1 (31)
Female	63,5 (4914)	49,9 (344)	62,1 (247)	76,9 (103)

The method of fixation used to secure the vast majority of knee replacements in place was cement (85% from Table 2.5). Uncemented knee fixation mostly occurred in bicompartmental knee replacements (Figure 2.3).

Figure 2.4 demonstrates the distribution of fixation methods by age groups. The hybrid fixation was more frequently chosen in younger patients and cemented fixation in the oldest patients (>80 years). Uncemented fixation was used the least in patients more than 80 years of age.

Table 2.5 Numbers and percentages of primary knee prosthesis fixation

	Number	Percentage of total (%)
Cemented	7646	85,0
Reverse hybrid	59	0,7
Hybrid	395	4,4
Uncemented	898	10,0
Total number of procedures [missing]	**8998 [50]**	**100**

Figure 2.3 Method of fixation by primary knee prosthesis type

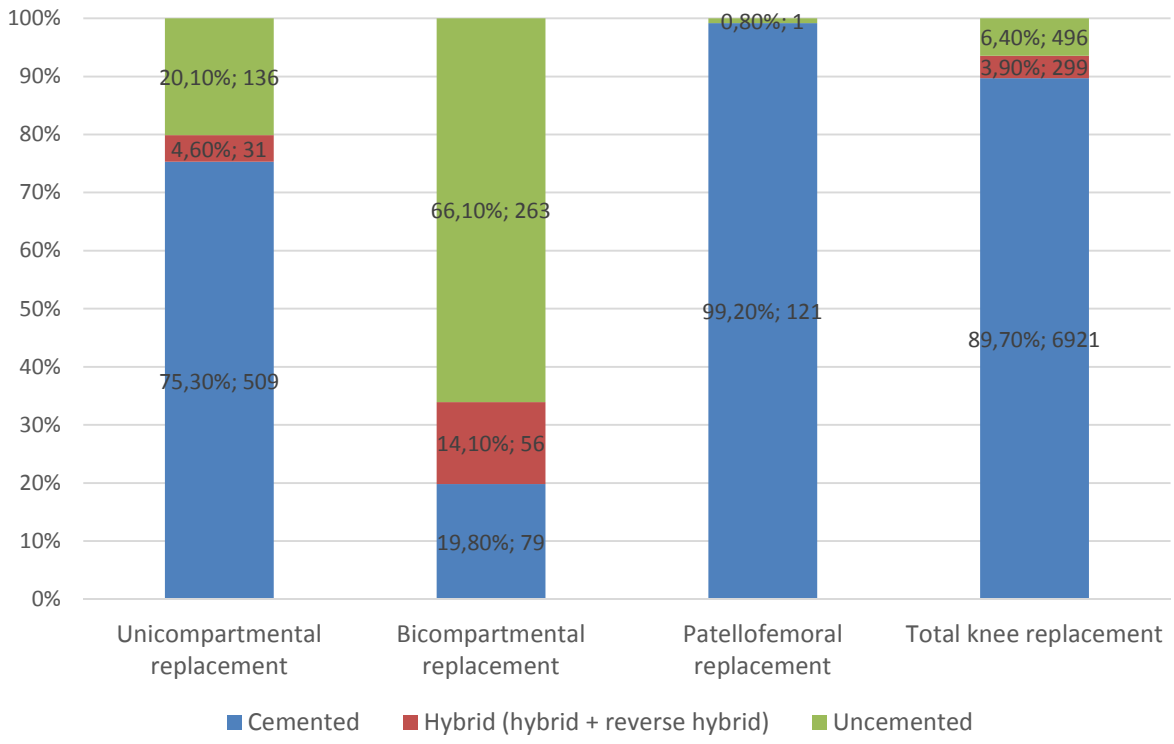
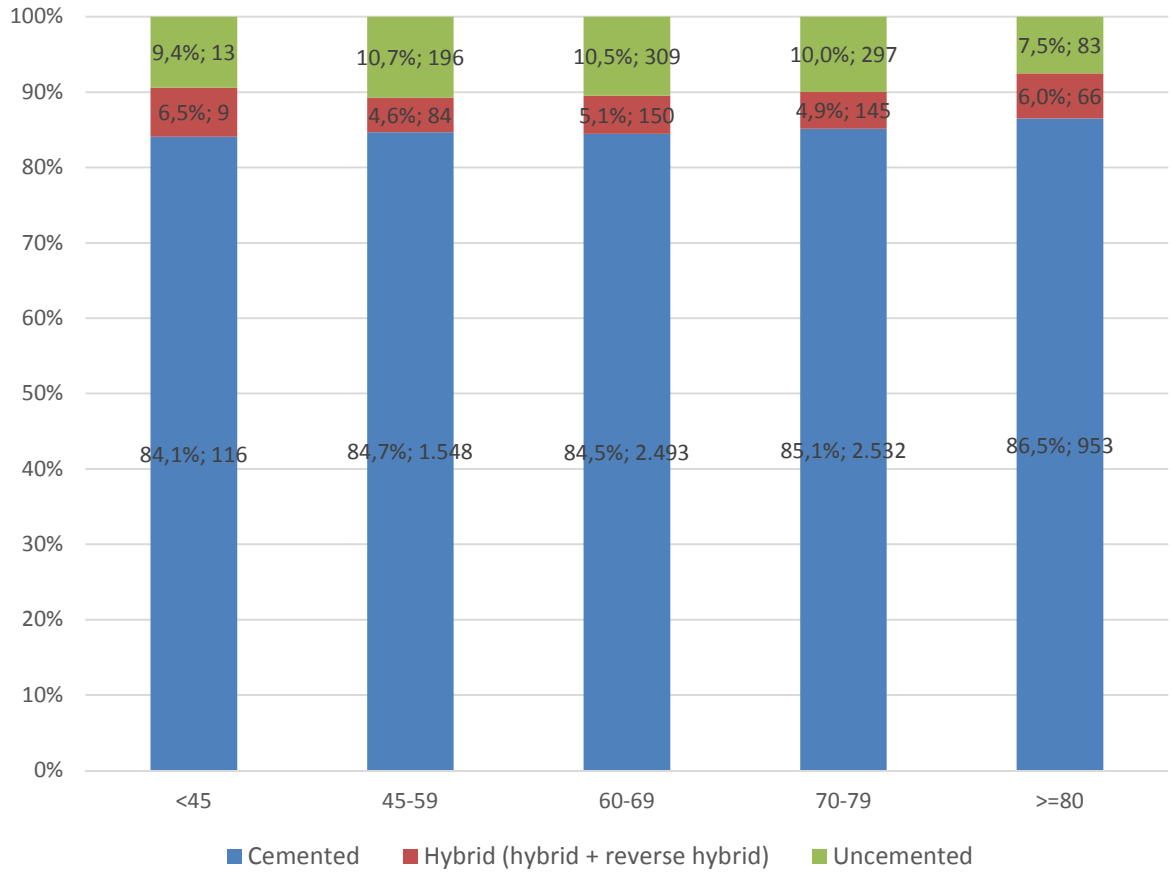


Figure 2.4 Method of fixation in primary knee replacements by age group



The most common surgical approach was the medial parapatellar approach, used in 58% of procedures, followed by the sub-vastus approach (19%) and mid-vastus approach (16%) (Figure 2.5). Figure 2.6 shows the diversity in surgical technique according to the primary knee prosthesis type.

Figure 2.5 Approach during primary knee replacements

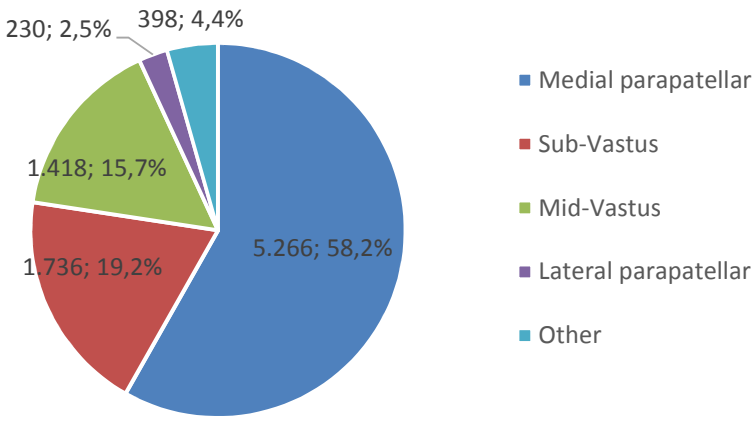
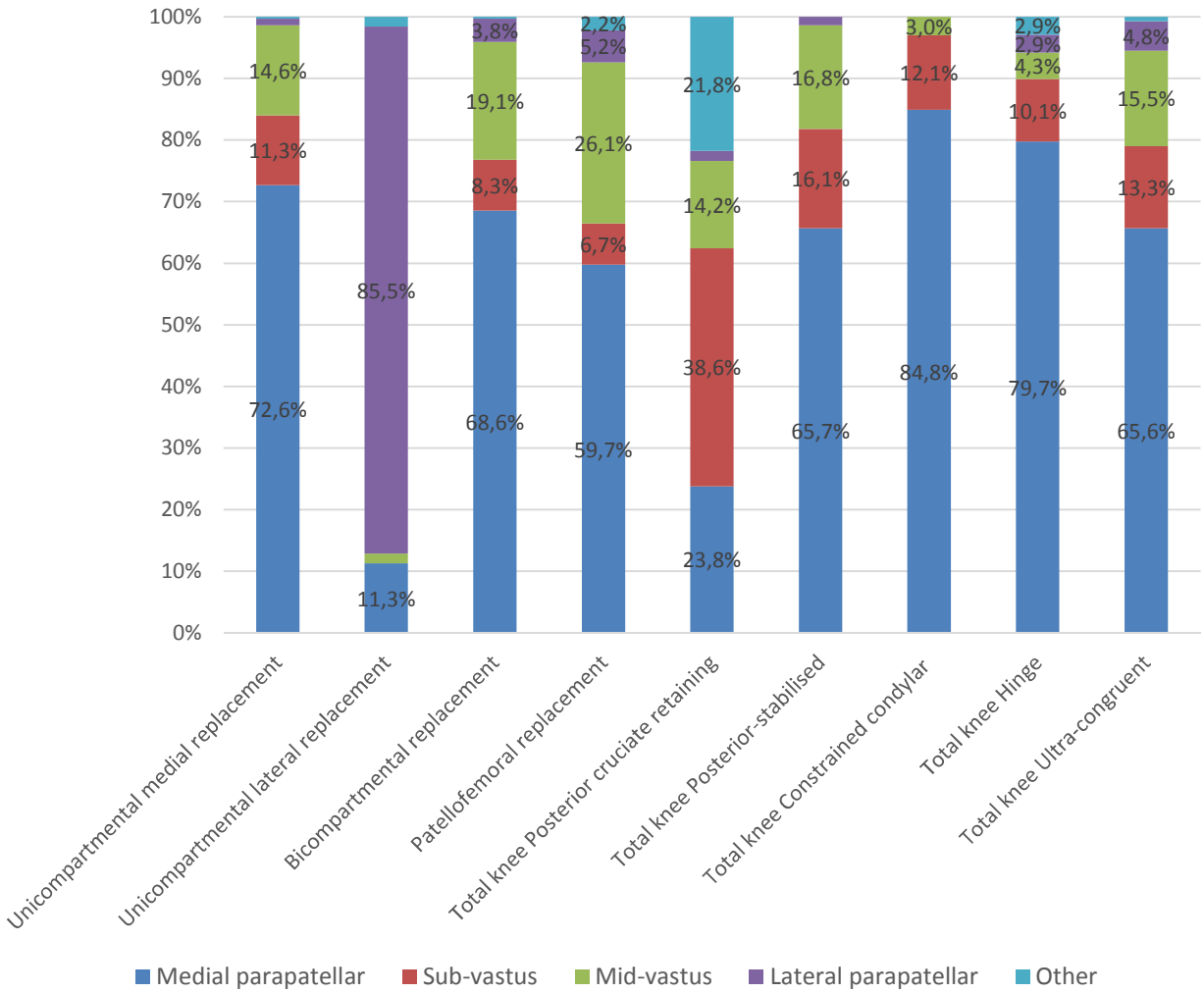


Figure 2.6 Approach by primary knee prosthesis type



Note: For readability of the figure, labels with percentages smaller than 2% are not displayed.

Tibial tubercle osteotomy was rarely undertaken, namely in 20 (0,2%) cases. Computer assisted navigation was used in 206 (2,3%) cases. Those navigation systems were mainly used in the placement of total posterior cruciate retaining (56,3%), posterior stabilised (17,5%) and ultrcongruent knee prostheses (17%). However, 72% of those cases in which computer assisted navigation was used, were performed in 3 hospitals who use computer assisted navigation on a regular basis (in 57 to 78% of their primary knee replacements).

In cases were a tibial insert was used during knee replacement (n=8813), this insert remained in 71% in a fixed position. The distribution of fixed and mobile inserts according to the prosthesis type are shown in Table 2.6.

Table 2.6 Insert type according to primary knee replacement type

	Unicompartmental medial replacement	Unicompartmental lateral replacement	Bicompartmental replacement	Total knee Posterior cruciate retaining	Total knee Posterior-stabilised	Total knee Constrained condylar	Total knee Hinge	Total knee Ultra-congruent	Other	Total
Fixed	51,0%	72,6%	14,8%	80,1%	86,5%	45,5%	10,1%	22,3%	69,3%	**70,8%**
Mobile	49,0%	27,4%	85,2%	19,9%	13,5%	54,5%	89,9%	77,7%	30,7%	**29,2%**
Total	**623**	**62**	**398**	**1734**	**4731**	**33**	**69**	**1036**	**127**	**8813**

The majority of primary total knee replacement procedures include resurfacing of the patella (76%). In patients <45 years patella resurfacing occurred a little less (in 70%) compared to the other age categories (Figure 2.7).

Figure 2.7 Patella resurfacing in primary total knee replacement according to age group

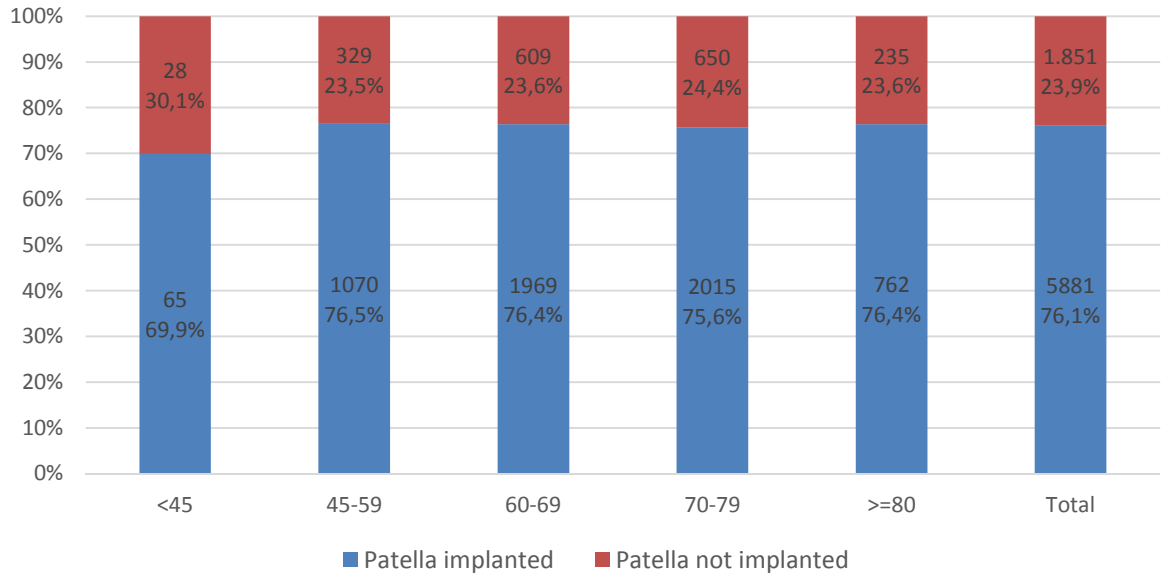


Table 2.7 shows the 10 leading brands of primary knees in Belgium in the second half of 2014.

Table 2.7 Top 10 primary knee prosthesis brands

	Brand	Producer	Percentage of total (%)
1	Genesis II	Smith & Nephew	15,9%
2	Vanguard	Biomet	12,0%
3	Triathlon	Stryker	11,0%
4	Persona	Zimmer	10,3%
5	Attune	DePuy	7,7%
6	LCS	DePuy	6,0%
7	Journey	Smith & Nephew	5,8%
8	Oxford	Biomet	3,6%
9	BPKS	Peter Brehm	2,6%
10	Evolution	MicroPort Orthopedics	2,5%

Note: Many other brands were recorded but all with a percentage below 2,5%.

2.3 REVISIONS AFTER PRIMARY KNEE REPLACEMENT

A total of 733 knee revision procedures were reported in 697 patients between July 1st, 2014 and December 31st, 2014. Revision procedures are re-operation for exchange or removal of one or more components. It is however possible that a patient receives more than one procedure for the same revision, for instance when a prosthesis is removed during a procedure because of an infection and during a second procedure, this patient receives a new prosthesis.

711 (97%) of those 733 revisions included the exchange by a new prosthesis or (a) new component(s), while 22 (3%) were resections. 619 (84,4%) were the first in line, 77 (10,5%) the second, 22 (3%) the third and 15 (2%) were more than the third revision procedure. In all cases of resections a spacer was introduced.

Data on patient characteristics at the moment of the revision procedure, operation technique and details of the revision implant are collected in the registry. However, details of the retrieved implant are not collected except which parts of the implant (insert/tibia/femur/patella) were removed. As during the primary procedures, a division is made between 9 different kinds of revision prostheses which are medial and lateral unicompartmental knees, patellofemoral, bicompartmental, posterior cruciate retaining, posterior-stabilised, ultra-congruent, constrained condylar or hinge. When the surgeon considers the terms inappropriate for the implanted prosthesis he or she can indicate 'other implant' as well.

This chapter summarizes the patient demographics, the operation techniques and the characteristics and types of revision prostheses during revision procedures registered in Orthopride.

As mentioned before, the revision burden of 7,5% in Belgium being the proportion of revisions compared to primary procedures, in line with other National Registries which present revision burdens between 5,0 and 8,9%. However, when analyzing the amount of knee replacements per 100.000 inhabitants, being on average 201 for primary knee procedures and 15 knee revision procedures for 2014, we need to admit that these numbers are high compared to other European countries. Belgium is within the top 4 of countries with the highest rates of knee replacement[a] next to Austria, Finland and Germany. Differences in population structure may explain part of these variations across countries. However, a number of other reasons may explain cross-country variations in the rate of knee replacement: 1) differences in the prevalence of osteoarthritis problems; 2) differences in social security systems and the capacity to deliver and pay for these expensive procedures; and 3) differences in clinical treatment guidelines and practices. In Belgium, there is a low threshold for care. This, together with the large number of hospitals and orthopedic surgeons may also partly explain the high number of knee replacement procedures.

[a] OECD (Organisation for Economic Co-operation and Development) report. http://www.oecd.org/

2.3.1 Demographics

The mean age of knee revision patients was 66,2 years (Table 2.8). Remarkably, the mean age of knee revision patients is significantly lower than the mean age for a primary knee replacement which was 67,5 years which is an indication for the higher revision burden in younger patients displayed in Figure 2.8. The revision burden is highest for the youngest patients (<45 years). Next to this, Table 2.9 shows that patients with more than one revision were on average even younger.

There were more female (66%) than male patients (34%) undergoing a knee revision procedure. The percentage of females with a revision is a little higher compared to the gender distribution during primary procedures (63% females compared to 37% males).

More than one indication for revision procedures may be given. Aseptic loosening was the most common indication for knee revisions (34%) followed by pain (24%) (Table 2.8 and Figure 2.9).

Table 2.8 Age, gender and indications for knee revision procedures

	N=733
Mean age (years) (SD)	66,2 (12,3)
Age groups	**% (N)**
<45	3,4 (25)
45-59	29,1 (213)
60-69	26,6 (195)
70-79	23,7 (174)
>=80	17,2 (126)
Gender	**% (N)**
Male	34,2 (251)
Female	65,8 (482)
Indication	**% (N)**
Aseptic loosening	33,8 (248)
Wear of polyethylene component	9,3 (68)
Instability	1,8 (13)
Infection	13,6 (100)
Periprosthetic fracture	5,5 (40)
Pain	24,1 (177)
Stiffness	7,1 (52)
Malalignment	9,1 (67)
Implant fracture	1,2 (9)
Progressive osteoarthritis in non-replaced component	11,6 (85)
Indication other	7,4 (54)

Note: Be careful with interpretation of these data since numbers are small.

Figure 2.8 Revision burden according to age category

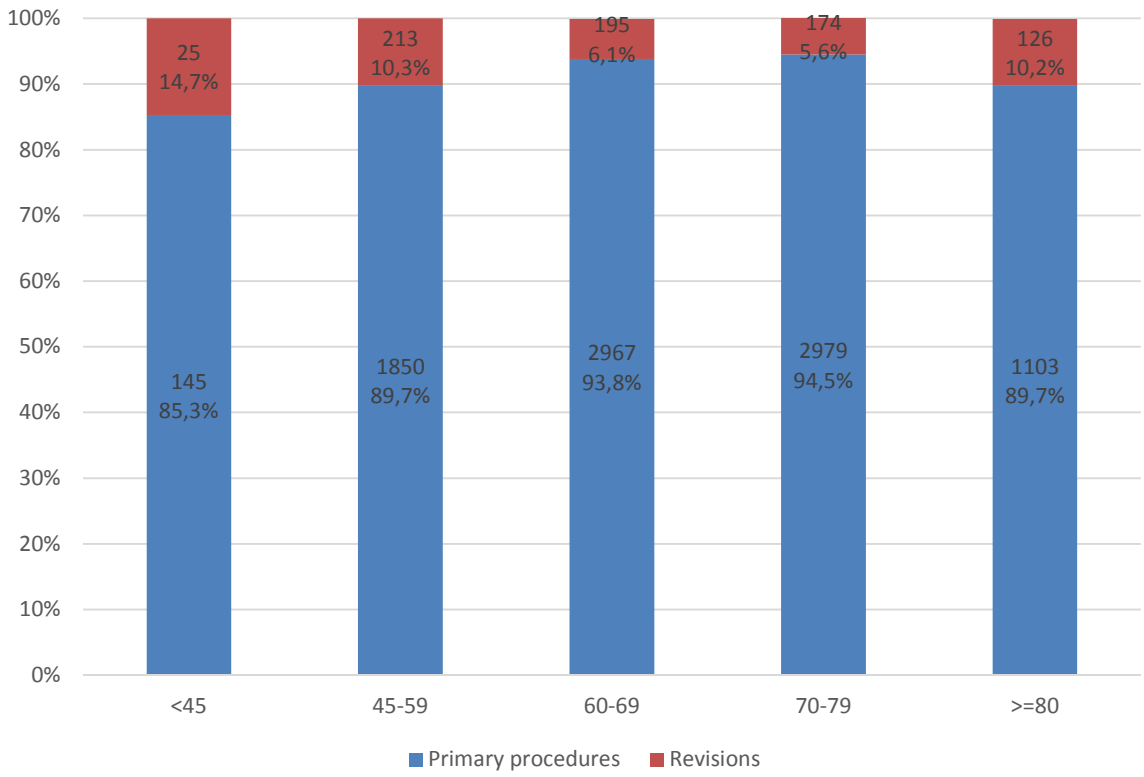
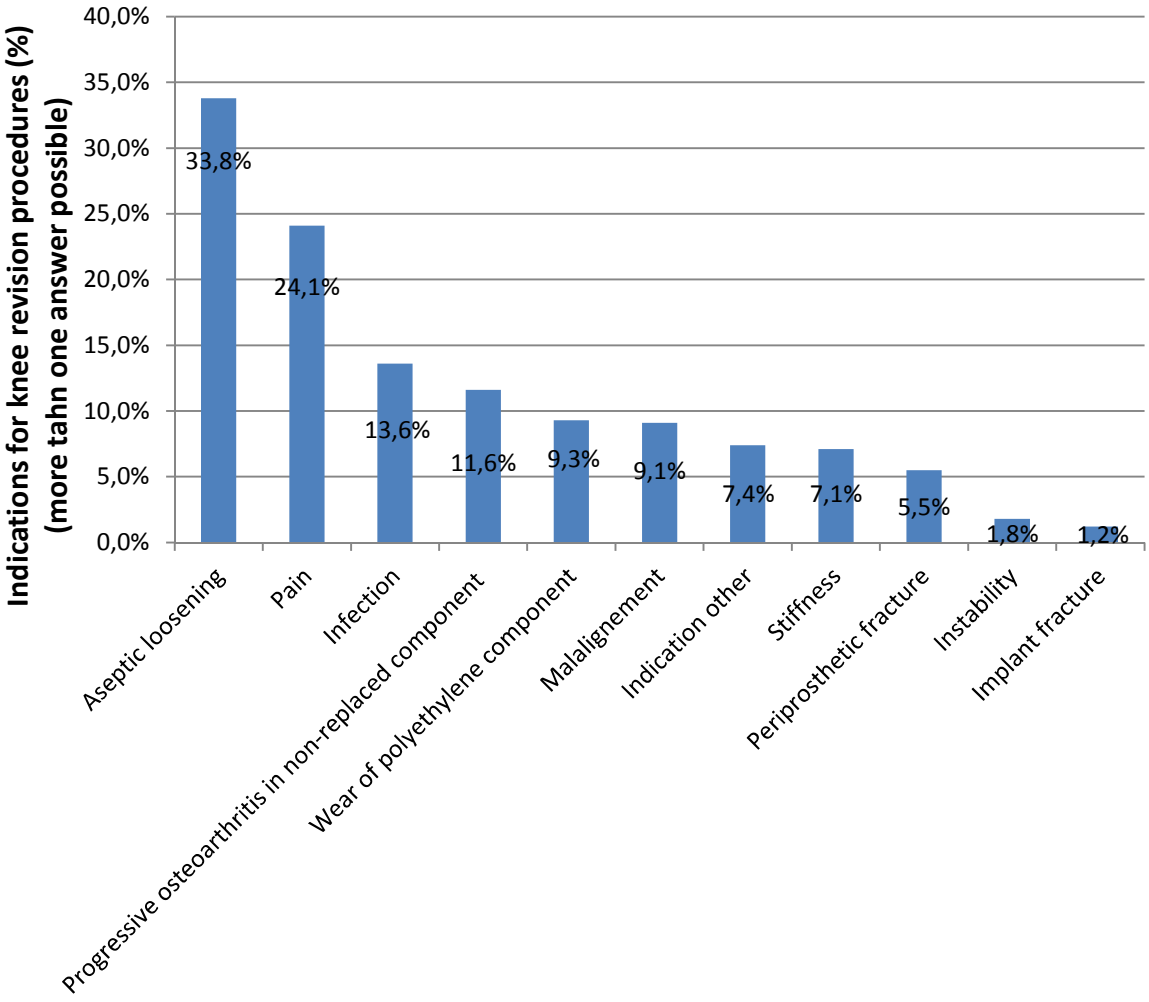


Table 2.9 Age and gender by number of knee revision procedures

	1st revision		2nd revision		3rd revision		>3rd revision	
	n	Mean age (years) (SD)	n	Mean age (years) (SD)	n	Mean age (years) (SD)	n	Mean age (years) (SD)
Male	209	64 (12,4)	28	63,2 (13,1)	9	61,1 (15,1)	5	50,8 (12,1)
Female	410	68,1 (12)	49	65,9 (10,2)	13	58,7 (10,4)	10	69,5 (11,5)
Total	**619**	**66,7 (12,3)**	**77**	**64,9 (11,3)**	**22**	**59,7 (12,2)**	**15**	**63,3 (14,5)**

Note: Be careful with interpretation of these data since numbers are small.

Figure 2.9 Indications for knee revision procedures



2.3.2 Surgical technique and implant characteristics

Table 2.10 shows which components were removed during knee revision procedures. In Table 2.11 the different combinations of removed components are shown. Both the insert, the tibial and femoral components were removed in almost two third of revision procedures (64%).

Table 2.10 Components removed during knee revision procedures

	Number	Proportion (%)[1]
Tibia	502	70,6
Femur	486	68,4
Patella	287	40,4
Insert	633	89,0
Total number of procedures	**711**	

[1]More than one component can be exchanged during a revision procedure.

Table 2.11 Combinations of removed components during knee revision procedures

	Number	Percentage of total (%)
All components	455	64,0
Tibia and insert	44	6,2
Patella and insert	21	3,0
Femur and insert	16	2,3
Insert only	85	12,0
Patella only	72	10,1
Femur only	2	0,3
Other combination	16	2,3
Total number of procedures	**711**	**100**

Table 2.12 shows the proportion of all kinds of knees implanted during revision procedures. The vast majority of revision replacements were of the total knee joint (91%). During 9% of the revision procedures a partial knee was implanted.

Table 2.12 Numbers and percentages of implanted knee types during knee revision procedures

	Number	Percentage of total (%)
Total knee replacement	582	90,9
Unicompartmental	2	0,3
Bicompartmental replacement	22	3,4
Patellofemoral replacement	34	5,3
Total number of procedures	**640**	**100**

Figure 2.10 shows that the most frequently used total prosthesis during knee revision procedures was the posterior stabilised prosthesis (49%).

Figure 2.10 Distribution of implanted total knee prosthesis types during revision procedures

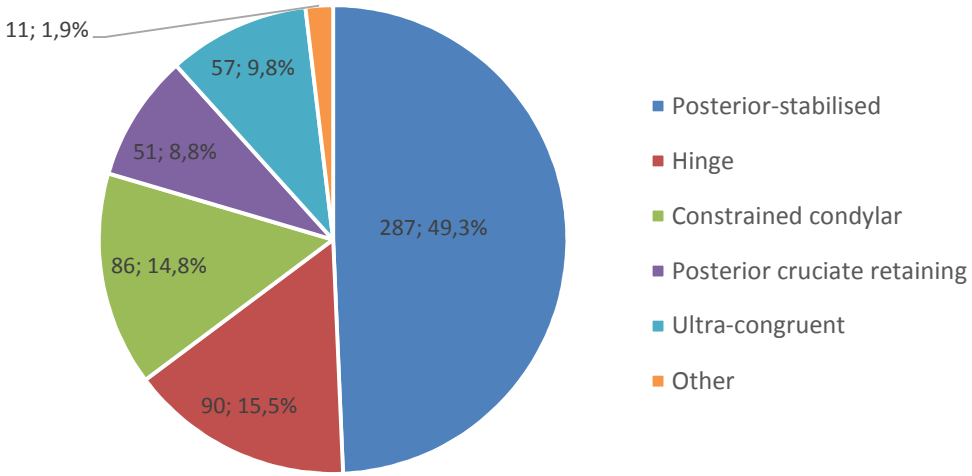
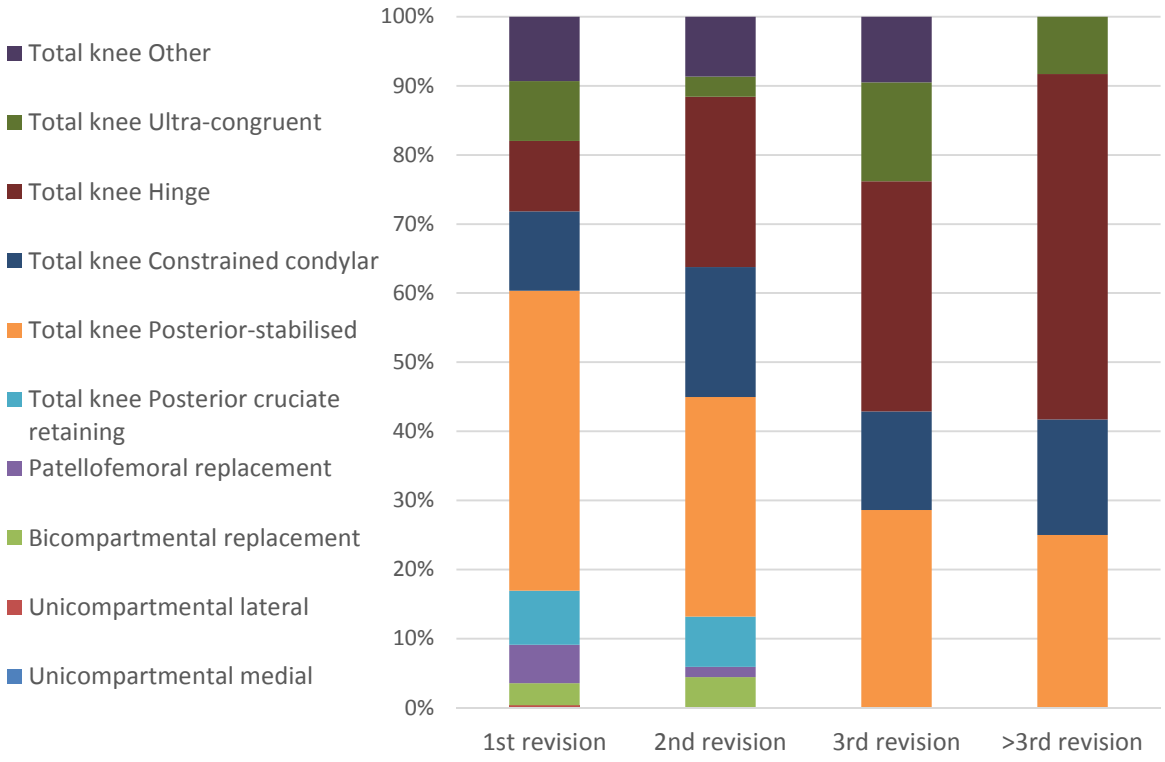


Figure 2.11 shows the type of implant according to the number of revisions. The most common implant type for the first and second revision is the posterior-stabilised knee replacement. When a patient however received several revisions, the chance that he/she receives a hinge increased.

Figure 2.11 Type of implanted knee prosthesis during revision procedures according to the number of revisions



	1st revision	2nd revision	3rd revision	>3rd revision
	N (%)	N (%)	N (%)	N (%)
Total knee Other	9 (1,7)	1 (1,6)	1 (5)	0 (0)
Total knee Ultra-congruent	51 (9,4)	2 (3,1)	3 (15)	1 (8,3)
Total knee Hinge	60 (11)	17 (26,6)	7 (35)	6 (50)
Total knee Constrained condylar	68 (12,5)	13 (20,3)	3 (15)	2 (16,7)
Total knee Posterior-stabilised	256 (47,1)	22 (34,4)	6 (30)	3 (25)
Total knee Posterior cruciate retaining	46 (8,5)	5 (7,8)	0 (0)	0 (0)
Patellofemoral replacement	33 (6,1)	1 (1,6)	0 (0)	0 (0)
Bicompartmental replacement	19 (3,5)	3 (4,7)	0 (0)	0 (0)
Unicompartmental lateral	1 (0,2)	0 (0)	0 (0)	0 (0)
Unicompartmental medial	1 (0,2)	0 (0)	0 (0)	0 (0)
Total number of procedures (%)	**544 (100)**	**64 (100)**	**20 (100)**	**12 (100)**

Note: Be careful with interpretation of these data since numbers are very small.

In 71% of the knee revision procedures the medial parapatellar surgical approach was used (Figure 2.12). Tibial tubercle osteotomy was undertaken in 30 cases (5%). Computer assisted navigation was rarely used (2 cases, 0,3%).

The method of fixation used to secure the vast majority of knee replacements during revision procedures in place is cement (96,5% from Table 2.13).

Figure 2.12 Approach during knee revision procedures

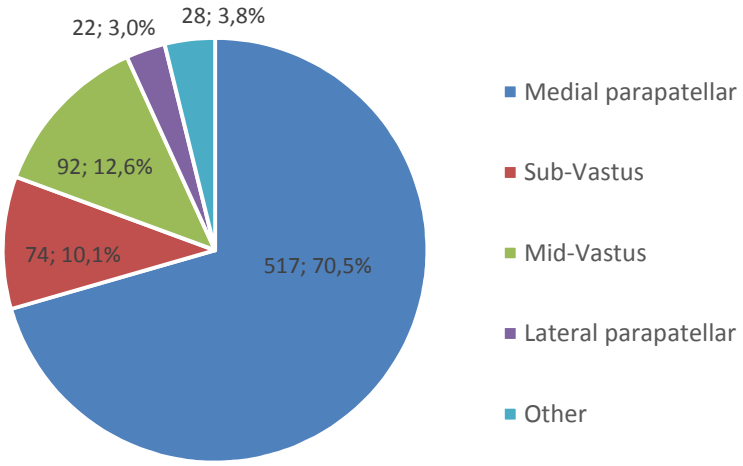


Table 2.13 Numbers and percentages of knee revisions by fixation

	Number	Percentage of total (%)
Cemented	503	96,5%
Reverse hybrid	2	0,4%
Hybrid	6	1,2%
Uncemented	10	1,9%
Total number of procedures [missing]	**521 [6]**	**100%**

Note: Only replacements during which the femoral and/or tibial component were replaced were taken into account.

The 5 leading brands of revision knees in Belgium in de second half of 2014 are shown Table 2.14.

Table 2.14 Top 5 knee revision prosthesis brands

	Brand	Producer	Percentage of total (%)
1	Legion	Smith & Nephew	15,4%
2	Vanguard	Biomet	10,8%
3	LCS	DePuy	9,8%
4	Genesis II	Smith & Nephew	8,6%
5	Nexgen	Zimmer	8,5%

Note: Many other brands were recorded as well but all with a percentage below 8,5%.

3 HIP REPLACEMENT

3.1 INTRODUCTION

In the period from July 1st, 2014 to December 31st, 2014, 10.557 hip procedures were recorded. Of those procedures, 9.529 (90,3%) were primary hip replacements and 1.028 (9,7%) were revision procedures including revisions with a new prosthesis (n=1.002) and resections (n=26).

Of the 10.557 hip records, 1 patient had a missing age, 43 bearing surfaces of primary hip replacements and 2 of revision procedures were missing, 830 head sizes were unknown and in 395 primary procedures, the type of fixation could not be deducted.

The revision burden rate stands at 9,7% for the collection period. This revision burden is in line with other National Registries which present revision burdens between 9,1% and 12,7%.

The mean age of patients who underwent a primary hip replacement was 70 years. 61% of hip replacements were performed in females. 52% of replacements occurred on the right side. Osteoarthritis was the primary diagnosis in 70% followed by fractures which accounted for 21%. In terms of surgical technique a posterior approach was used in 37% of procedures. In terms of bearing combinations in total hip replacement the use of ceramic-on-ceramic remains the most common selection in half of cases (53%) followed by a ceramic-on-polyethylene (31%) articulation. Most of hip prostheses had an uncemented fixation (82%). The preference to use large diameter heads to improve stability continues with about 40% of femoral heads being 36 millimeters, another 29% being 32 millimeters and 22% being 28 millimeters. Aseptic loosening was the most commonly recorded indication for revision surgery in 39% followed by periprosthetic fracture (19%).

3.2 PRIMARY HIP REPLACEMENT

Between July 1st, 2014 and December 31st, 2014, 9.529 primary hip procedures in 9.187 patients were recorded. Data on hip replacement include patient characteristics, operation techniques and details of the implant.

Based on the recorded data, a distinction is made between total hip replacements, hemi arthroplasty and hip resurfacing which includes a surface replacement of the femoral head combined with a metal acetabular cup. During the registration in Orthopride, orthopedic surgeons need to choose between four main categories of bearing surfaces for total hip replacements which are ceramic-on-ceramic (CoC), ceramic-on-polyethylene (CoP), metal-on-metal (MoM) and metal-on-polyethylene (MoP). When another bearing surface is used, ‘other’ can be indicated as well.

This chapter summarizes the patient demographics, the operation techniques and the characteristics and types of hip prostheses in primary hip replacement registered in Orthopride.

3.2.1 Demographics

Demographics of patients with a primary hip replacement are shown in Table 3.1. The average age for a primary hip replacement was 69,8 years (SD 12,6 years).

Approximately 61% of the patients were female. On average, female patients were older than male patients at the time of their primary hip replacement (72 years and 66 years respectively) (Figure 3.1).

The largest indication recorded for surgery was primary osteoarthritis, recorded in 70% of procedures, followed by fracture in 21% of procedures (Table 3.1). In female patients hip replacements are more indicated after fractures compared to men (25% compared to 14% in males) while in men avascular necrosis was more often the indication for hip replacement (8% compared to 3% in females) (Table 3.2).

Indications for primary hip replacements were largely depending on the age of the patient (Figure 3.2). Patients with a hip replacement after a fracture were generally older than patients with a planned procedure, while avascular necrosis and secondary osteoarthritis were more common indications in younger patients.

Table 3.1 Age, gender and indications for primary hip replacement patients

	N=9529
Mean age (years) (SD)	69,8 (12,6)
Age groups [missing]	**% (N)[1]**
<45	3,4 (327)
45-59	16,4 (1561)
60-69	26,5 (2529)
70-79	29,4 (2802)
>=80	24,2 (2309)
Gender	**% (N)**
Male	39,3 (3747)
Female	60,7 (5782)
Indication	**% (N)**
Primary osteoarthritis	69,9 (6658)
Secondary osteoarthritis	2,6 (247)
Avascular necrosis	5,2 (500)
Rheumatoid arthritis	0,3 (32)
Fracture	20,6 (1965)
Tumor	0,3 (25)
Hip dysplasia	0,6 (53)
Indication other	0,5 (49)

Figure 3.1 Age distribution by gender for primary hip replacement patients

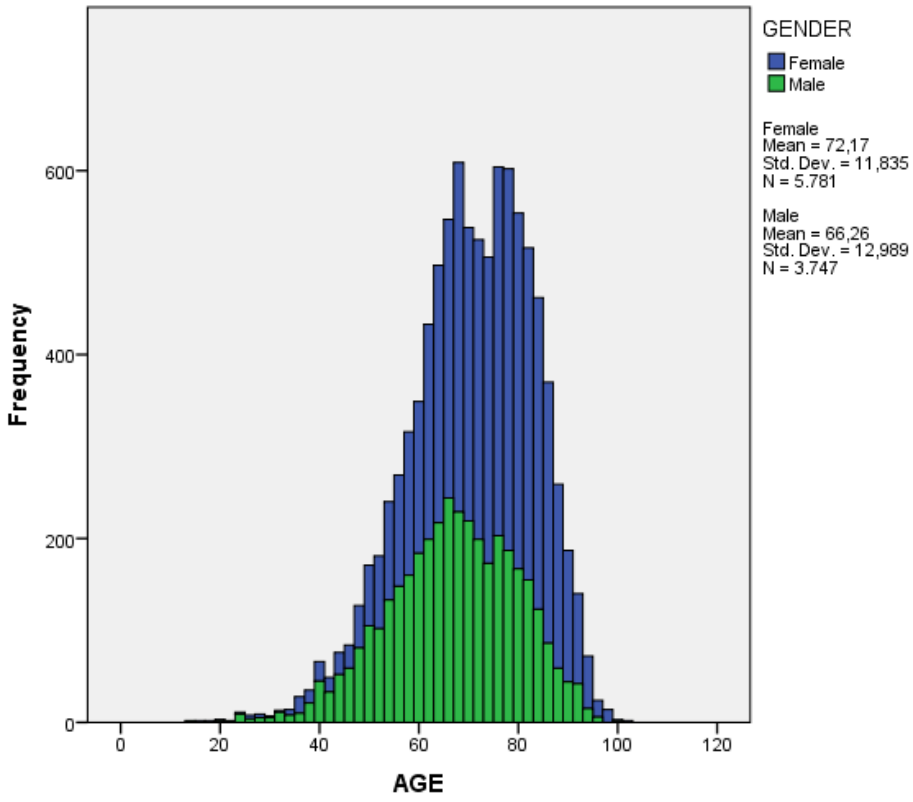
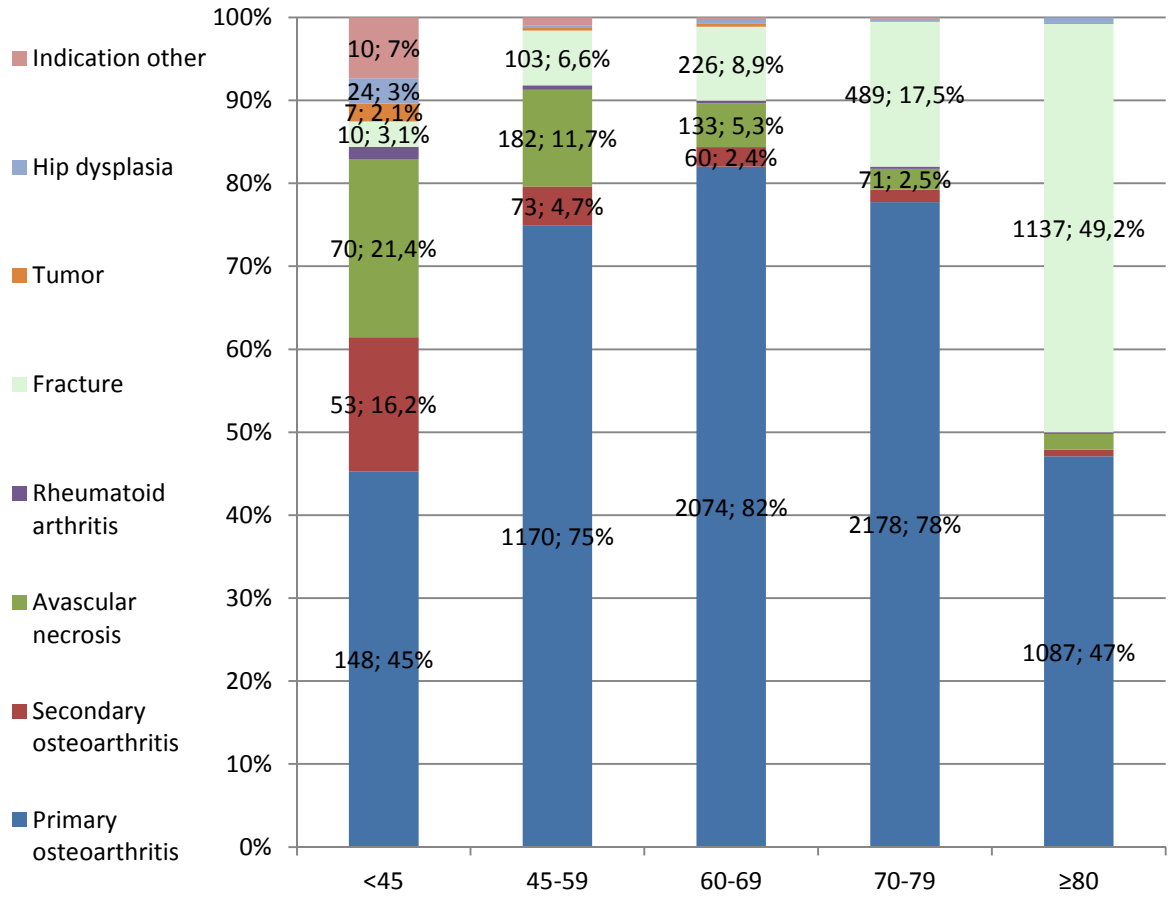


Table 3.2 Indications for primary hip replacement based on gender

	Male	Female
	N=3747	N=5782
	% (N)	% (N)
Primary osteoarthritis	72,2 (2707)	68,3 (3951)
Secondary osteoarthritis	3,8 (144)	1,8 (103)
Avascular necrosis	8,4 (314)	3,2 (186)
Rheumatoid arthritis	0,1 (5)	0,5 (27)
Fracture	14,1 (528)	24,9 (1437)
Tumor	0,3 (10)	0,3 (15)
Hip dysplasia	0,5 (19)	0,6 (34)
Indication other	0,5 (20)	0,5 (29)

Figure 3.2 Indications for primary hip replacement according to age category



Note: For readability of the figure, labels with values and percentages smaller than 2% are not displayed.

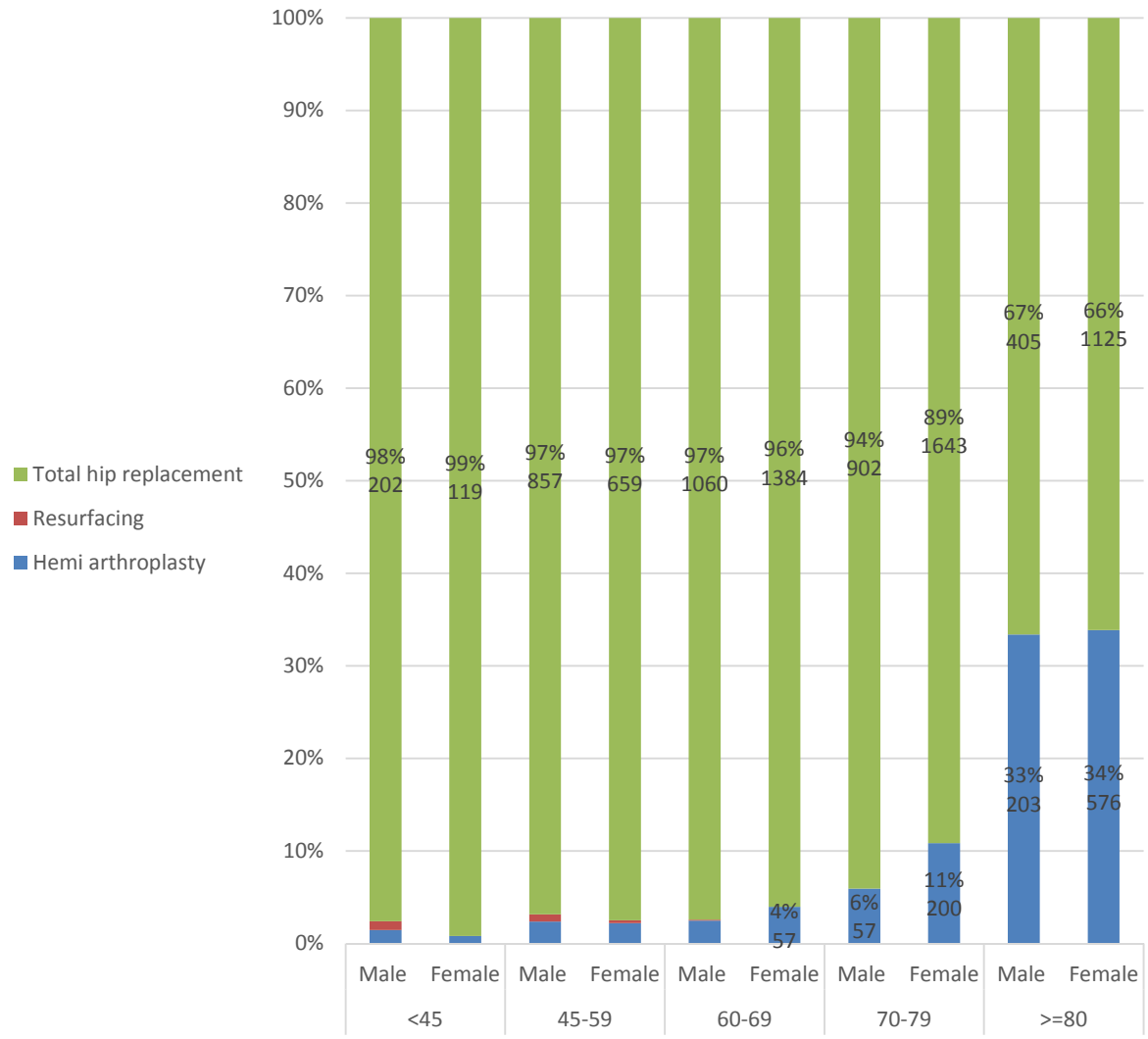
3.2.2 Surgical technique and implant characteristics

Of the 9.529 primary procedures undertaken in the second half of 2014, 8.357 (88%) were total hip replacements, 1.160 (12%) were hemi arthroplasty procedures and 12 (0,1%) were hip resurfacing procedures.

Fractures were the main indication for hemi arthroplasty (92%), next to primary osteoarthritis (6%). Indications for resurfacing procedures were primary osteoarthritis (9 of the 12 procedures or 75%), secondary osteoarthritis (1 out of 12 or 8,3%), dysplasia (1 out of 12 or 8,3%) and avascular necrosis (1 out of 12 or 8,3%).

Figure 3.3 shows that resurfacing procedures were mainly performed in males below 60 years of age and hemi arthroplasty procedures mainly in patients above 80 years. The mean age of resurfacing patients was 51 years (SD 6), while for hemi arthroplasty procedures, patients were on average 82 years (SD 9).

Figure 3.3 Type of primary hip replacement procedures by age groups and gender



Note: For readability of the figure, labels with values and percentages smaller than 4% are not displayed.

37% of primary hip replacements were performed using a posterior approach. The incision approach according to gender is shown in Figure 3.4. In male patients, the posterior approach was even more used than in female patients (38% in males compared to 36% in females). Figure 3.5 shows the incision approach by prosthesis type. The most frequently used incision approach was posterior for all procedure types. When a hemi arthroplasty was performed, the lateral approach (44%) was used more frequently than the posterior approach (32%).

In 1066 procedures (11%) custom instruments were used. Bone grafts were used in 104 (1,1%) procedures. During 1 procedure both autograft and allografts were uses, during 95 only autografts and during 8 only allografts.

Trochanteric osteotomy and femoral osteotomy were rarely performed namely in 14 en 15 (0,1%) cases respectively. The same counts for computer assisted navigation which was used in 6 cases to place the stem.

Figure 3.4 Approach used during primary hip replacement according to gender

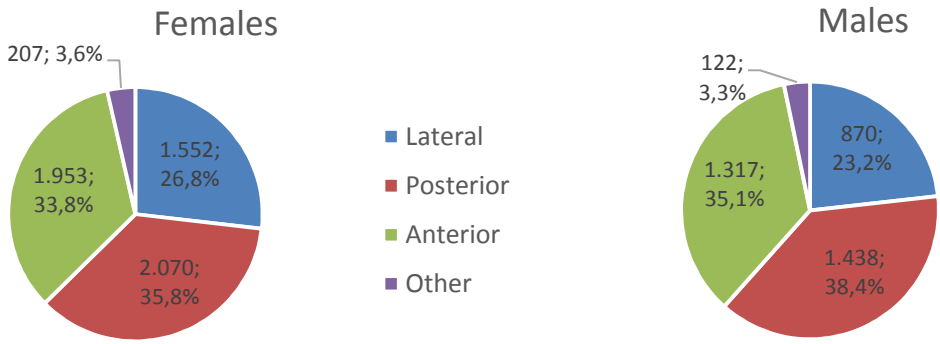


Figure 3.5 Approach used during primary hip replacement according to prosthesis type

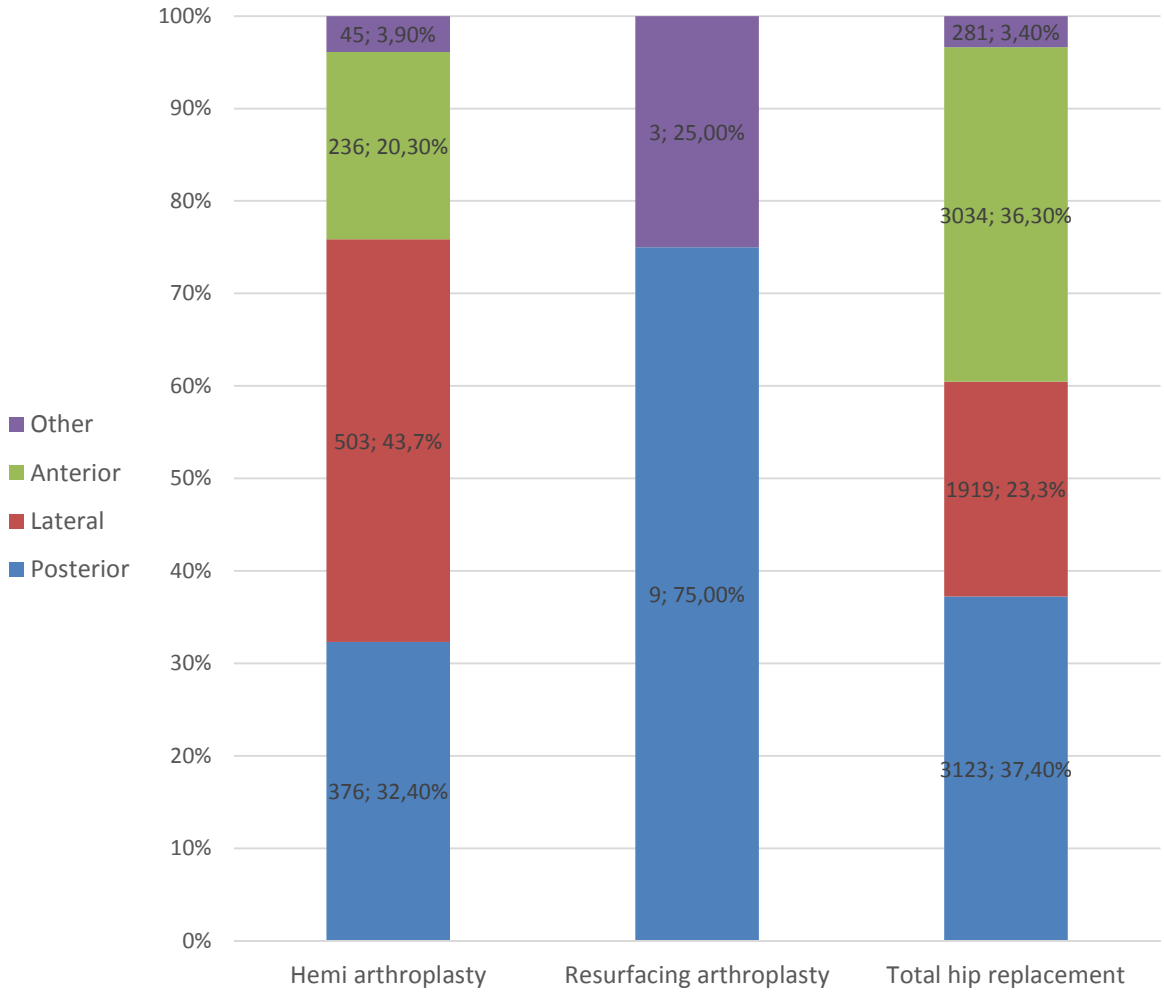


Table 3.3 shows that in terms of bearing combinations in total hip replacement (excluding resurfacings) the use of ceramic-on-ceramic remains the most common selection in 4.418 (53%) of cases followed by a ceramic-on-polyethylene (31%) articulation.

Table 3.3 Numbers and percentages of bearing surfaces in primary total hip replacements

	Number	Percentage of total (%)
Ceramic-ceramic	4.418	53,1
Ceramic-polyethylene	2.602	31,3
Metal-polyethylene	913	11,0
Metal-metal	154	1,9
Other	227	2,7
Total number of procedures [missing]	**8.314 [43]**	**100**

As in most countries, the most commonly used type of fixation remained cementless (82%) (Table 3.4).

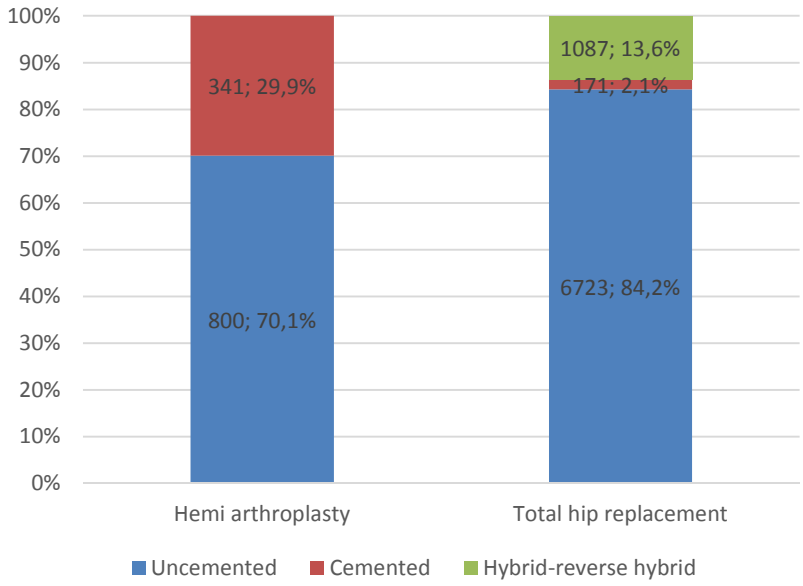
In cases where a cemented fixation was used, antibiotic-loaded bone cement was used in 90%.

The method of fixation was depending on the type of replacement (Figure 3.6). While resurfacing replacements were all hybrid, cementless fixation was used in 84% of the total hip replacements and 70% of the hemi arthroplasty procedures.

Table 3.4 Numbers and percentages of fixation method in primary hip replacements

	Number	Percent of total (%)
Uncemented	7.523	82,4
Cemented	512	5,6
Hybrid	1.016	11,1
Reverse hybrid	83	0,9
Total number of procedures [missing]	**9.134 [395]**	**100**

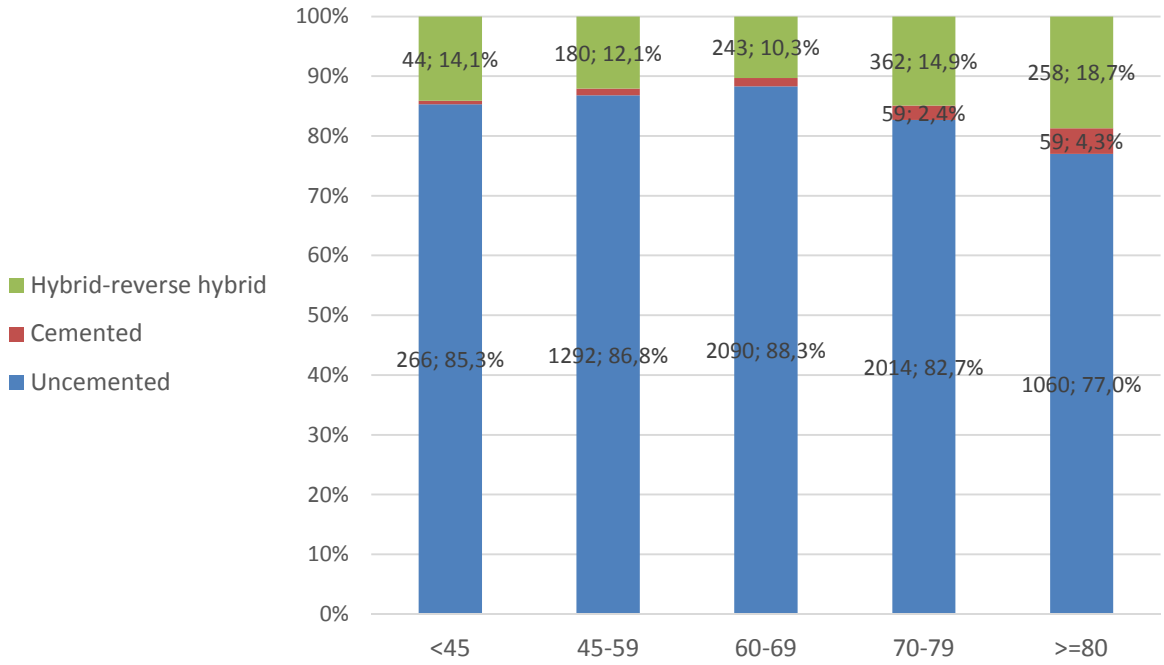
Figure 3.6 Fixation method in primary hip replacement procedures by type of replacement



Next to this, there was a correlation between patient's age and the method of fixation (Figure 3.7). Generally, hybrid fixation and uncemented fixation tended to be used more frequently in patients above 70 years.

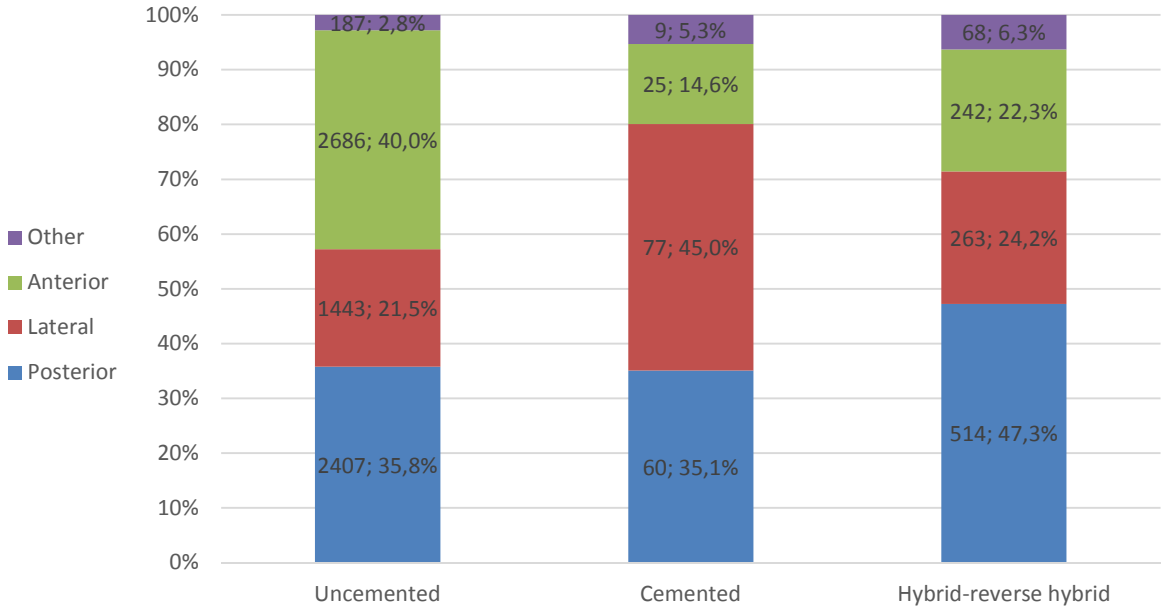
While in general the most common approach was posterior (37%), the preference to use the posterior approach (49%) was even more pronounced in hybrid hip replacements (Figure 3.8). However, in cemented hip replacements more than half of the hip joints (45%) were accessed laterally.

Figure 3.7 Fixation method in primary total hip replacement procedures by age group



Note: For readability of the figure, labels with values and percentages smaller than 2% are not displayed.

Figure 3.8 Incision approach in primary total hip replacements by fixation method



The preference to use large diameter heads to improve stability continues with about 40% of femoral heads being 36 millimeters, another 29% being 32 millimeters and 22% being 28 millimeters as shown in Table 3.5.

Table 3.5 Femoral head size in primary hip replacement

Head size (mm)	Number	Percentage of total (%)
22	180	2,1
28	1906	21,9
32	2525	29
36	3491	40,1
40	221	2,5
44	133	1,5
48	84	1
50	40	0,5
Total number of procedures [missing]	**8699 [830]**	**98,6**

Note: Head sizes which are used in <0,5% of the cases are not included in the table.

Table 3.6 shows the usage of the most popular brands of stems, cups, heads and inserts in primary hip replacement in Belgium recorded in the second half of 2014.

Table 3.6 Top five hip stems, heads, cups and inserts brands in primary hip replacements

	Stem		Head		Cup		Insert	
1	Corail (Depuy)	13,8%	Biolox Delta	48,8%	Pinnacle (DePuy)	13,5%	Biolox	30,1%
2	Polar (Smith& Nephew)	9,9%	Oxinium (Smith& Nephew)	6,7%	R3 (Smith& Nephew)	9,5%	R3 (Smith& Nephew)	6,7%
3	Avenir (Zimmer)	9,8%	Ceramys (Mathys)	4,9%	Allofit (Zimmer)	8,3%	Trident (Stryker)	6,0%
4	Amis (Medacta)	8,1%	Ceramic	4,7%	Exceed (Biomet)	6,8%	Trinity (Corin)	3,6%
5	Taperloc (Biomet)	6,4%	Co Cr	2,6%	Versafit (Medacta)	6,1%	Allofit (Zimmer)	2,6%
Total amount recorded		**8774**		**7954**		**8397**		**5920**

Note: Many other brands were recorded as well. The combinations of the different components are not displayed in this table.

3.3 REVISIONS AFTER PRIMARY HIP REPLACEMENT

A total of 1.028 hip revision procedures were recorded in 962 patients between July 1st, and December 31st, 2014. Revision procedures are re-operation for exchange or removal of one or more components. It is however possible that a patient receives more than one procedure for the same revision, for instance when a prosthesis is removed during a procedure because of an infection and during a second procedure, this patient receives a new prosthesis.

1.002 (97,5%) of those 1.028 revisions included the exchange by a new prosthesis or (a) new component(s), while 26 (2,5%) were resections. 828 (80,5%) were the first in line, 129 (12,5%) the second, 45 (4,4%) the third and 26 (2,5%) were more than the third revision procedure. In most of the resections (24 of 26, 92,3%) a spacer was introduced.

Data on patient characteristics at the moment of the revision procedure, operation technique and details of the revision implant are collected in the registry. However, details of the retrieved implant are not collected except which parts of the implant (head/complete femoral component and/or insert/complete acetabular component) were removed. As during the primary procedures, a division is made between four main categories of bearing surfaces for total hip replacements which are ceramic-on-ceramic (CoC), ceramic-on-polyethylene (CoP), metal-on-metal (MoM) and metal-on-polyethylene (MoP). When another bearing surface is used, 'other' can be indicated as well.

This chapter summarizes the patient demographics, the operation techniques and the characteristics and types of revision prostheses during revision procedures registered in Orthopride.

As mentioned before, the revision burden of 9,7% in Belgium being the proportion of revisions compared to primary procedures, is not higher compared to other countries. However, when analyzing the amount of hip replacements per 100.000 inhabitants, being on average 205 for primary hip procedures and 24 for hip revision procedures for 2014, we need to admit that these numbers are high compared to other European countries. Belgium is within the top 5 of countries with the highest rates of hip replacement[b] next to Germany, Austria, Sweden and Finland. Differences in population structure may explain part of these variations across countries. However, a number of other reasons may explain cross-country variations in the rate of hip replacement: i) differences in the prevalence of osteoarthritis or hip fractures; ii) differences in social security systems and the capacity to deliver and pay for these expensive procedures; and iii) differences in clinical treatment guidelines and practices. In Belgium, there is a low threshold for care. This together with the large number of hospitals and orthopedic surgeons may also partly explain the high number of hip replacement procedures.

[b] OECD (Organisation for Economic Co-operation and Development) report. http://www.oecd.org/

3.3.1 Demographics

Demographics of patients with a revision procedure at the hip are shown in Table 3.7. The mean age of hip revision patients was 71,2 years (SD 12,7). The revision burden according to age category is displayed in Figure 3.9.

Table 3.8 shows the mean age of hip revision patients according to the number of revisions. The more revisions the patients were subjected to, the lower the average age.

Hip revision procedures were more common in females (59%) compared to males, which is comparable with the proportion of females receiving a primary hip replacement.

More than one indication for revision may be given. Aseptic loosening was the most common indication for hip revisions (39%) followed by periprosthetic fracture (19%), instability (17%), wear (16%), pain (13%) and infection (11%) (Table 3.7 and Figure 3.10).

Table 3.7 Age, gender and indications for hip revision procedures

	N=1028
Mean age (years) (SD)	71,2 (12,7)
Age groups	**% (N)**
<45	3,5 (36)
45-59	14,7 (151)
60-69	22 (226)
70-79	30,2 (310)
>=80	29,7 (305)
Gender	**% (N)**
Male	41,3 (425)
Female	58,7 (603)
Indication	**% (N)**
Aseptic loosening	38,8 (399)
Infection	10,7 (110)
Instability	17,2 (177)
Wear	15,9 (163)
Periprosthetic fracture	18,7 (192)
Pain	13 (134)
Indication other	9,9 (102)

Figure 3.9 Revision burden according to age category

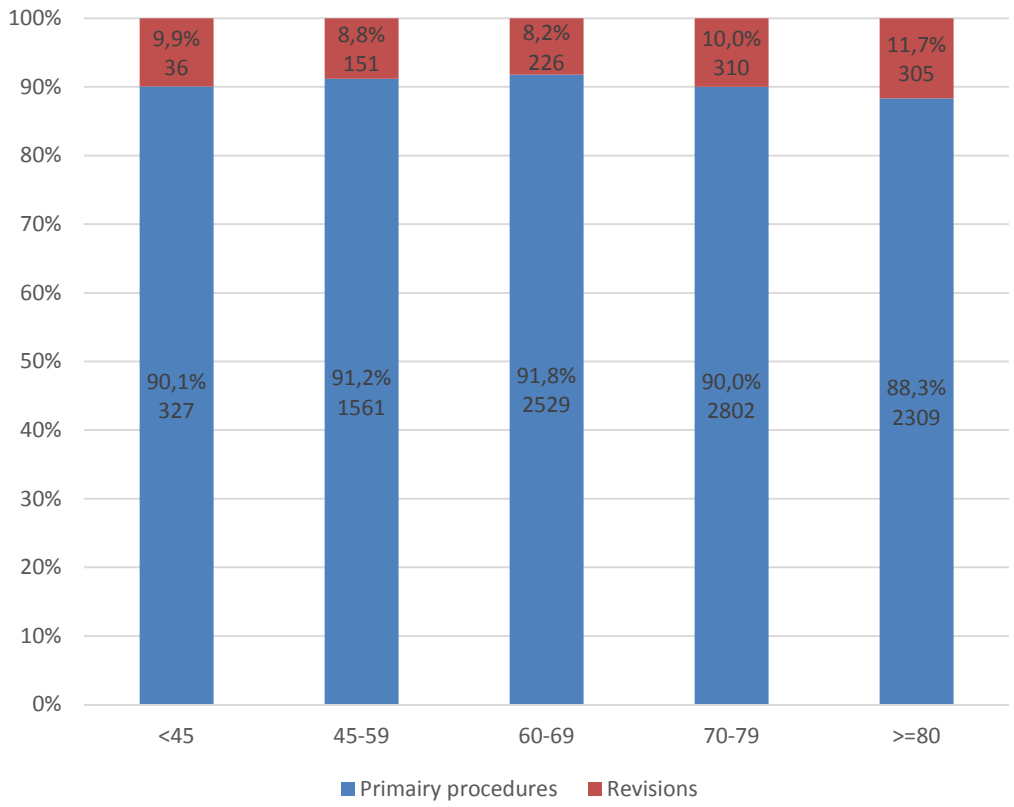
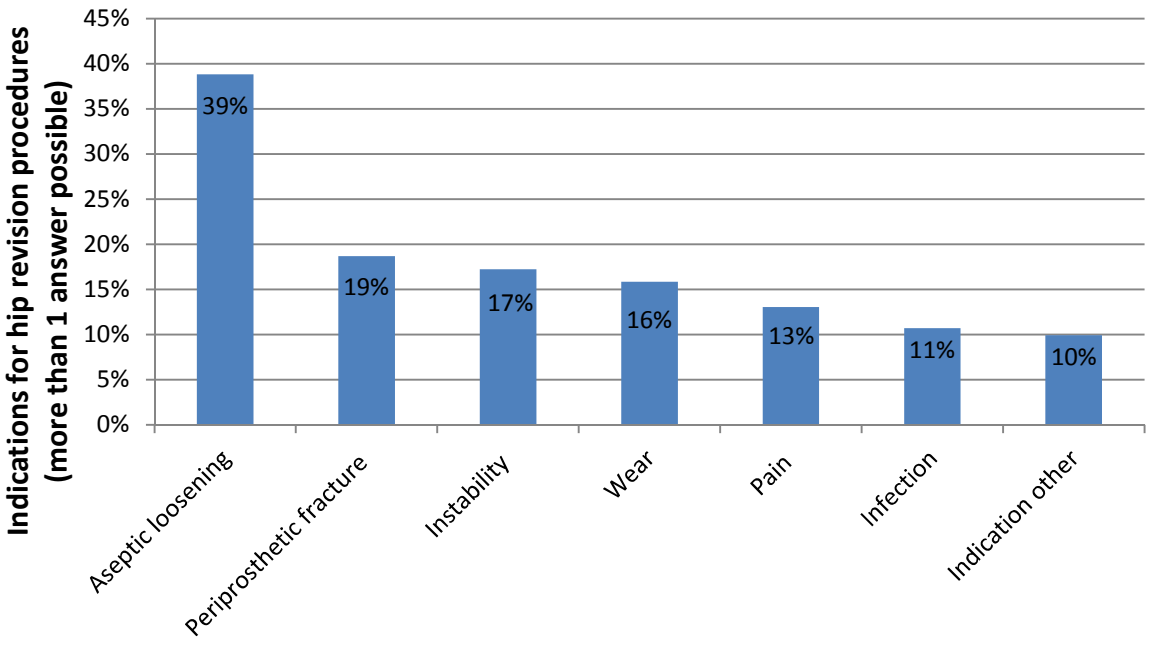


Table 3.8 Age and gender by number of hip revision procedures

	1st revision		2nd revision		3rd revision		>3rd revision	
	n	Mean age (years) (SD)	n	Mean age (years) (SD)	n	Mean age (years) (SD)	n	Mean age (years) (SD)
Male	340	68,7 (13)	51	66,4 (13,5)	22	62 (10,2)	12	59,4 (18,9)
Female	488	73,9 (11,7)	78	72,8 (10,3)	23	70,7 (14,5)	14	69,5 (13,8)
Total	**828**	**71,8 (12,5)**	**129**	**70,2 (12)**	**45**	**66,4 (13,2)**	**26**	**64,8 (16,8)**

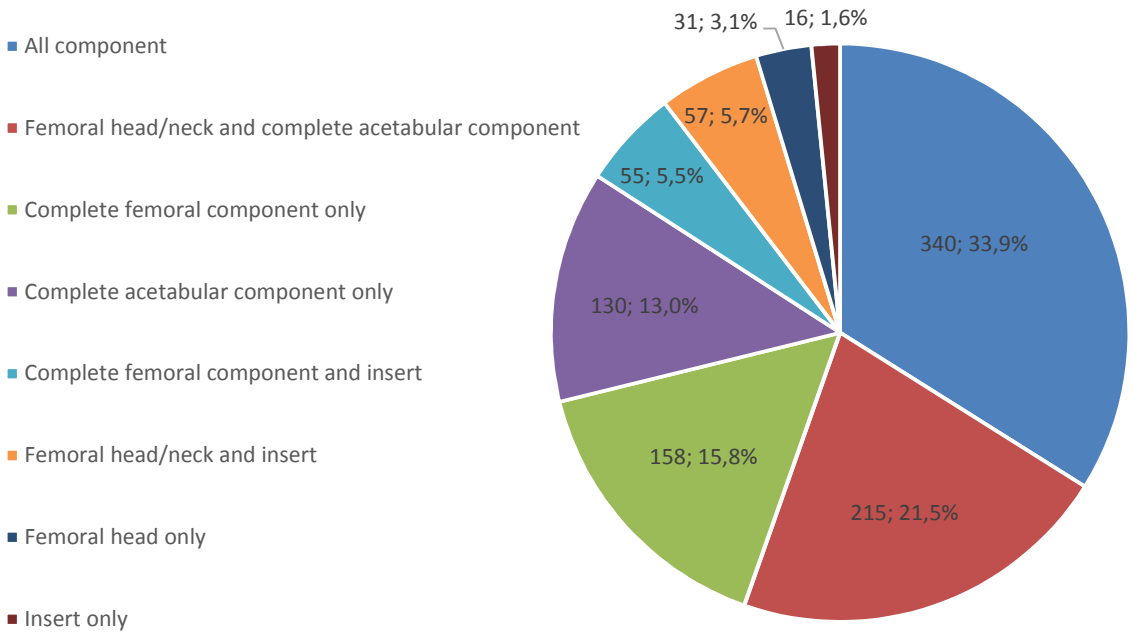
Figure 3.10 Indications for hip revision procedures



3.3.2 Surgical technique and implant characteristics

In Figure 3.11 the different combinations of revised components are shown. Both the femoral and acetabular components were exchanged in 34% of all revision procedures while the acetabular component together with the femoral head and/or neck were replaced in 21,5%.

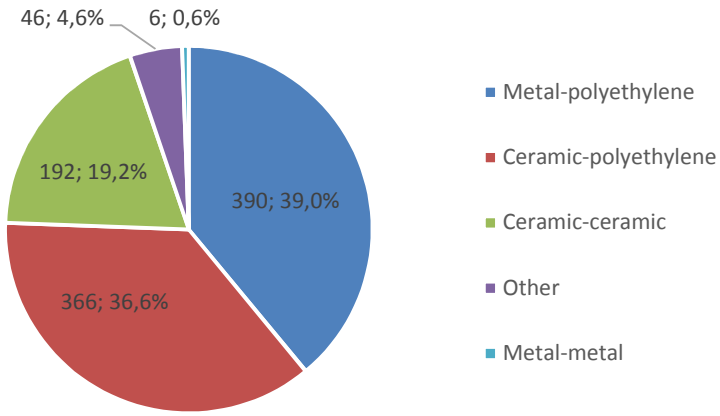
Figure 3.11 Combinations of revised components during hip revision procedures



During 24 of the 26 resections (92%), a spacer was introduced. Resections were mainly performed because of infections (92%, n=24). Other indications were pain (11,5%, n=3), aseptic loosening (7,7%, n=2) and wear (4%, n=1).

Figure 3.12 shows the distribution of the different bearing surfaces used during hip revision procedures. In 39% of the revision procedures a metal-on-polyethylene bearing surface was used and in 37% ceramic-on-polyethylene. Whereas in primary hip replacement ceramic-on-ceramic bearing surfaces were used in more that half of the procedures, during revisions only 19% of these types were used.

Figure 3.12 Bearing surface of hip revision replacement procedures



When the acetabular component was replaced during the revision procedure, a cementless fixation predominated (71%). Stems were cemented in 33,5% during revision procedures.

The incision approach used in hip revision procedures is shown in Figure 3.13. During a revision procedure the preference for the posterior approach (52%) was even more pronounced compared to during primary hip replacements (37%). In 16 revision procedures (1,6%) a trochanteric osteotomy was performed and femoral osteotomy was used in 44 (4,3%) cases. Computer assisted navigation was not used in any of the revision procedures. Bone grafts were often used, namely in 227 (23%) procedures. During 8 (0,8%) procedures both autograft and allografts were used, during 18 (1,8%) only autografts and during 201 (20,1%) only allografts.

Figure 3.13 Approach during hip revision procedures

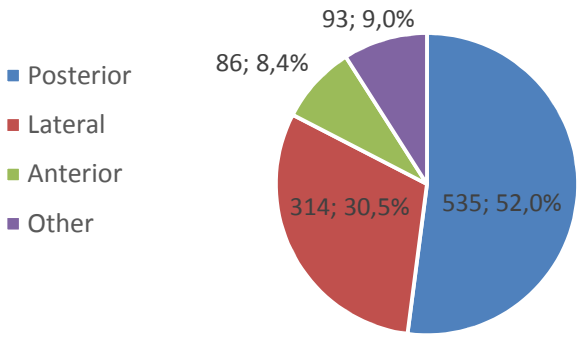


Table 3.9 shows the usage of the 5 most popular brands of stems, heads, cups and inserts in hip revision procedures in Belgium registered in the second half of 2014.

Table 3.9 Top five hip stems, heads, cups and inserts brands in hip revision procedures

	Stem		Head		Cup		Insert	
1	Revitan (Zimmer)	9,6%	Biolox Delta (CeramTec)	40,2%	Avantage (Biomet)	9,2%	Avantage (Biomet)	9,1%
2	Arcos (Biomet)	8,1%	Oxinium (Smith& Nephew)	10,1%	Trilogy (Zimmer)	9,2%	Biolox (CeramTec)	8,7%
3	Corail (Depuy)	6,0%	Co Cr	6,9%	Tritanium (Stryker)	6,8%	XLPE	4,6%
4	Profemur (Wright)	4,8%	Metal	4,7%	Pinnacle (DePuy)	6,2%	Trilogy (Zimmer)	4,1%
5	Echelon (Smith & Nephew)	4,6%	Ceramic	2,6%	Polarcup (Smith & Nephew)	6,1%	MDM (Stryker)	3,9%
Total amount recorded		**565**		**781**		**677**		**562**

Note: Many other brands were recorded as well but all with a percentage below 5%.

4 EPILOGUE

During 2014, a significant progress towards a comprehensive National Hip and Knee Arthroplasty Registry has been made by the obligation of the registration in July. This resulted in a huge increase in data collection which resulted in a penetration increase towards 82%. Since analysis on registered data on a voluntary basis would result in bias, the information presented in this report is based on the data collected after the obligation from July 1st, 2014 until December 31st, 2014.

At the moment, it is not possible to draw significant conclusions from such a small data set, particularly as it has been collected over such a short period. Due to the short existance of the Registry and the incompleteness during the years before, we decided to present only demographic data and not yet to perform sophisticated survival analyses. However the mandatory registration, the coupling of the registration with the reimbursement of the prosthesis and the extended life of the Registry will enable to analyze more interesting research questions which could eventually facilitate benefits to society.

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5 APPENDICES

5.1 GLOSSARY

Acetabular component (cup)	The portion of a total hip replacement prosthesis that is inserted into the acetabulum - the socket part of a ball and socket joint.
Approach	Method used by a surgeon to gain access to, and expose, the joint.
Arthrodesis	Is the artificial induction of joint ossification between two bones via surgery
Arthroplasty	A procedure where a natural joint is reconstructed with an artificial prosthesis.
Bearing type	The two surfaces that articulate together in a joint replacement.
Bicompartmental replacement	Involves the replacement of 2 of the 3 compartments of the knee, being the medial or the lateral and the patellofemoral compartment. It may also include the use of a patellar prosthesis.
Cement	The material used to fix cemented joint replacements to bone. Antibiotics can be added to bone cement to try and reduce the risk of infection.
Component	Part of a multipart implant.
Femoral component (hip)	Part of a total hip joint that is inserted into the femur (thigh bone) of the patient. It normally consists of a stem and head (ball).
Femoral component (knee)	Portion of a knee prosthesis that is used to replace the articulating surface of the femur (thigh bone).
Femoral head	Spherical portion of the femoral component of the artificial hip replacement.
Femoral stem	Part of a modular femoral component inserted into the femur (thigh bone). Has a femoral head mounted on it to form the complete femoral component.
Hemi arthroplasty	Partial joint replacement.
Hybrid hip prosthesis	Cemented stem, cementless socket.
Hybrid knee prosthesis	Cemented tibia, uncemented femur.
Indication	The reason for surgery.
Osteosynthesis	Surgical procedure including the reduction and internal fixation of a bone fracture with implantable devices.
Primary procedure	Occurs when the native joint surface(s) are replaced with artificial implants.

Prosthesis	Orthopedic implant used in joint replacement procedures, e.g. a total hip, a unicompartmental knee.
Resurfacing	Resurfacing of the femoral head with a surface replacement femoral prosthesis and insertion of a monobloc acetabular cup, with or without cement.
Reverse hybrid hip prosthesis	Cementless stem, cemented socket.
Reverse hybrid knee prosthesis	Cemented femur, uncemented tibia.
Revision	Re-operation for exchange or removal of one or more components of the implant.
Revision burden rate	Quotient of number of revisions in the form of replacement or extraction of the whole or parts of the prosthesis and the number of all operations (primary and revision).
Tibial component	Portion of a knee prosthesis that is used to replace the articulating surface of the tibia (shin bone) at the knee joint. May be modular or monobloc (one piece).
Trochanteric osteotomy	Temporary incision of the trochanter, used to aid exposure of hip joint during some types of total hip replacement.
Unicompartmental replacement	Replacement of one tibial condyle and one femoral condyle in the knee, with or without resurfacing of the patella.