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Annual Report

ITALIAN ARTHROPLASTY REGISTRY

riap

Italian Arthroplasty Registry

Addendum to the
Annual Report 2018

English version of Tables and Figures

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RIAP: the most important things to know

What is RIAP?

The Italian Arthroplasty Registry, RIAP, was started in 2006 within the framework of a collaboration between the Italian Ministry of Health, DG for Medical Devices and Pharmaceutical Services (DGDMF) and the Italian National Institute of Health (Istituto Superiore di Sanità, ISS), to set up a data flow to monitor the joint prostheses performance.

What are the goals?

Main aims of RIAP are to monitor the long-term effectiveness of hip, knee, shoulder and ankle prostheses (measured as implant survival), and support regions and hospitals when recall of patients is needed because of problems reported on specific implants.

What information is collected?

The information collected includes Hospital Discharge Data (HDD) integrated with an additional Minimum Data Set (MDS) - specific for each joint - about the procedure, the operated body side and the implanted device identification data. In 2017, more than 67,366 operations (about 34% of the national volume) were collected from 277 hospitals, representing the

35% of all the structures performing joint arthroplasties in Italy.

Personal data are treated by RIAP in compliance with the current European legislation on privacy (EU Regulation 2016/679). Clinical, health and demographic data are treated applying criteria ensuring the highest confidentiality, in compliance with the security regulations for digital and paper-based archives.

How is RIAP organized?

RIAP is a federation of regional registries coordinated by ISS. Through a web interface, the surgeons collect the MDS, which is successively linked to the HDD by the regional coordinating centre. The latter is responsible for the transmission of the linked data to ISS. Currently, participation of regions and structures is on a voluntary basis. Work is in progress to define the Regulation that will make participation in the Registry mandatory, as by law enacted (DPCM 3/3/2017 and L145/2018).

A distinctive feature of the RIAP model is its transferability into areas beyond arthroplasty, especially where the replacement interventions are mainly carried out in structures that fall within the information flow of Hospital Discharge Data (flusso delle Schede di Dimissione Ospedaliera, SDO).

Why a registry, and why a national registry?

Prosthesis implantation can be the solution for disabling joint diseases both in elderly persons and in younger people. In Italy, like in many countries, arthroplasties are constantly growing. A national registry allows assessing the outcomes of primary and revision procedures, based on patient's specificity, and intervention and implanted device characteristics. If needed, there must be the possibility to recall all the implanted patients, even if they were operated in a different region from the one they live in. This is the reason why the Registry must have national coverage.

How is the implanted device identified and characterized?

To identify each implanted device, RIAP made the RIAP-DM Dictionary available to operators. It is a database containing data supplied by manufacturers, including single-device specific data. The information contained in the RIAP-DM Dictionary is checked and matched against the information from the National Database of medical devices of the Ministry of Health.

RIAP is now starting a collaboration with the National Joint Registry for England, Wales, Northern Ireland and the Isle of Man, to utilize

its component database and classification, recently upgraded in cooperation with the EndoprothesenRegister Deutschland (EPRD).

Here: <http://riap.iss.it/riap/en/activities/reports/> you can consult the Report summaries of years 2014-2017.

RIAP in 2017-2018: progress and key achievements

Highlights

- **In 2017-2018 we made RIAP yet more operational. We added data on ankle replacement following that of knee, hip and shoulder.**
- **We introduced patients' pseudonymisation to guarantee privacy as required.**
- **We improved quality control procedures. 91% of cases passed QC this year.**
- **The HOOS questionnaire was translated and adapted to serve as a tool for Italian surgeons.**
- **We established working contacts with the National Joint Registry for England, Wales, Northern Ireland and the Isle of Man (NJR) that will allow us to exchange best practices and to participate in their common component database recently upgraded in cooperation with the Endoprothesen Register Deutschland (EPRD).**
- **RIAP experience was used by the Ministry of Health to launch the Italian breast implants registry.**
- **Last but not the least, we optimized RIAP communication assets - the Annual report and the website. This development will continue in 2019.**

Between 2017 and 2018, in collaboration with the Italian Foot and Ankle Society (Società Italiana della Caviglia e del Piede, SICP), we completed the list of the variables selected for the ankle joint (MDS, additional to the HDD) and implemented the data collection form in our online platform, RaDaR 2. **Ankle data collection is available to registered operators since February 2019.**

In 2017, **the procedure of patient's ID pseudonymisation was introduced** in order to guarantee full privacy of data treatment. In compliance with the current legislation on privacy, the SHA-256 procedure allows to associate the patient with the specific alphanumeric string making it possible to track the "anonymized" patient and the implanted device over time and space.

We also updated the Informed Consent form and the RIAP Information Note based on the provisions of the **new European Regulation on the Protection of Personal Data** (Reg. EU 2016/679)

We plan to apply the pseudonymisation function retrospectively to the data already transmitted starting from 2013.

Data Quality Control (QC) remains high on the RIAP agenda. Thanks largely to the feedback sent in 2017 to the participating institutions, **the rate of cases that passed the QC has exceeded 91% this year**. It is highly important that the regional coordination centres continue to report the results of the QC to each structure, in order to monitor any compilation errors and further improve the quality of collected data. Still, it was not possible to completely confront the data on interventions admitted to the analysis with those analysed in 2016 because of variations in the QC procedure.

Regarding the identification of implanted devices, the database developed by RIAP (**the RIAP-DM Dictionary**) has proved to be an essential tool. The level of quality compliance resulted high. 92.7% of all the product codes of the implanted devices received by the Registry within 2017 have been recognized by the RIAP-DM Dictionary. **The Dictionary currently includes over 65,000 product codes for 101 manufacturers sent by 37 companies**. The data of the Dictionary are regularly compared with the homologous information contained in the BD / RDM (Banca Dati-Repertorio

dei Dispositivi Medici del Ministero della salute) and the feedback is sent to the manufacturers, with the reporting of any misalignments between the two databases. The goal of the Dictionary is to reach 100% coverage. It will therefore be useful to analyse the product codes collected but not identified by the Dictionary (7.3%), to understand if these are transcription errors of the codes or manufacturers / devices not yet included in the Dictionary.

In 2017, RIAP contributed to the inclusion of new CND categories for the acetabular component into the Ministerial decree DM 13/3/2017. The aim is that manufacturers correctly classify and reclassify their devices, so that the analysis will benefit from it in the coming years.

In March 2018, we organized an international workshop to discuss the potential collaboration with the National Joint Registry for England, Wales, Northern Ireland and the Isle of Man (NJR).

As soon as this collaboration starts, we will be able to **participate in the Component database developed and updated by the NJR in collaboration with the Endoprothesenregister Deutschland (EPRD)**, thus creating a unified international database for orthopaedic

prostheses implanted in the United Kingdom, Germany and Italy. In this way the manufacturers and distributors should provide the requested information only once, streamlining their processes, and all interested parties could benefit from the use of a shared and internationally verified database.

In 2018, in cooperation with the Autonomous Province of Trento, who promoted this activity, we made **a survey to know the organizational and operational criteria followed by the regional registries participating in RIAP** in implementing the local data collection. Aim of the survey was to **define a framework as a reference for the regions that have to start a regional registry, improve data collection flow, quality and completeness of data collected**. The representatives of 12 out of 13 registers participating in the RIAP responded to the survey. A first analysis highlighted the heterogeneity of the different organizational systems and the need of human resources dedicated to the registry activities.

To provide the Italian surgeons with a tool to measure the outcomes of hip prosthesis interventions, we made the translation and cultural adaptation in Italian of the questionnaire **Hip disability and Osteoarthritis Outcome Score (HOOS)**. The questionnaire is available

(<http://riap.iss.it/riap/it/strumenti/questionario-hoos/>).

Related activities in 2018

The experience of RIAP was of use for the development of a proof of concept: a test platform to support the launch of a pilot study for the Registry of breast implants, coordinated by the Ministry of Health.

2018 has brought important **new features to the RIAP communication assets**: its annual report and the website. The Annual report from this year on will be entirely dedicated to the activities of the Registry, while the analysis of the HDD will from now on be published in another volume, that of ISTISAN series by the Italian national institute of Health. The 2018 RIAP report is therefore more agile, with only two chapters instead of five. They describe the RIAP structure and activities up to December 2018, and the data collection and analysis methods, respectively.

On the website (riap.iss.it) of the Registry, navigation was made more intuitive, new sections were added. Yet new sections are to come, dedicated to the participating regions, institutions, and patients.

Key findings from the annual report 2018

In 2018, nine regions (Lombardy, Tuscany, Marche, Abruzzo, Apulia, Basilicata, Calabria, Sicily, and newly added Campania), two autonomous provinces (Bolzano, Trento) and two hospital structures ("Santa Maria della Misericordia" of Udine and "Santa Corona" of Pietra Ligure) submitted to RIAP their data on procedures performed in 2017.

In 2017 RIAP collected data on 67,366 interventions. After the quality control, 92.2% and 91.4% of the received records, respectively, were admitted to the interventions analysis and to the devices analysis (See *Figure 2.1 for more detail*). Data collection on shoulder replacements started on 1/1/2017 in Campania, Apulia and Autonomous Province of Bolzano.

The overall data completeness of RIAP was 65.6%. Thanks to the enrolment of Campania, which began collecting data on 1 January 2017 and reached about 90% completeness in one year, **overall completeness increased by 5 percentage points compared to 2016.** Overall, in 2017 the estimated number of replacements performed in Italy was around 197,392 of which RIAP data represented 34.1% vs 32.5% of 2016 (See *Tables 2.1, 2.2*

and *Appendix 2B*). Higher variability of completeness was observed over years in those regions where the recording of data is not compulsory.

Hip

Of 38,460 interventions collected, 35,759 passed the QC for interventions analysis. Total hip replacements represent 72.8% of analysed cases, partial hip replacements - 22.1%, and revisions - 5.1% (See *Tables 2.3 - 2.8*). 35,233 passed the QC for devices analysis (fixation type, materials of bearing surfaces, type of stem). (See *Tables 2.9 - 2.13, Figures 2.2, 2.3*).

Knee

Of 28,023 interventions collected, 25,522 passed the QC for interventions analysis. 84.4% of primary interventions recorded were total knee replacements, while 15.6% were single-compartmental. (See *Tables 2.14 - 2.19*). 25,496 passed the QC for devices analysis (fixation type, tibial tray type). (See *Tables 2.20-2.22*).

Shoulder

Of 883 interventions collected, 854 passed the QC for both interventions analysis and devices analysis. 83.4% of the interventions were total replacements, 13.6% were partial replacements and 3% were revisions (See *Tables 2.23*

- 2.29 for analysis of interventions and Table 2.30 for fixation modes).

Challenges

There are two major goals to reach: 100% of data completeness and improvement of data quality.

One of the features of the Italian National Health System is that Regions are responsible for the health services planning and organization, in a situation of absolute autonomy. Currently the data completeness varies from region to region, being higher in the regions where data recording is compulsory or where surgeons are highly motivated to contribute to RIAP.

An important challenge is to make RIAP a nationwide and 100% complete registry. For this, it is crucial to finalize the Regulation required by law (DPCM 3/3/2017) and to support the Regions in accomplishing what is stated by law (L145/2018 makes it compulsory for the regions to feed the national Registry and the detailed procedures will be defined by the Regulation). Campania and Apulia linked the reimbursement of interventions costs (DRG) to the registration of the surgery. This brought regional data completeness to val-

ues higher than 90% over a year. It is of high importance that all the regions with low data completeness link the reimbursement of interventions costs to the registration of the performed procedure.

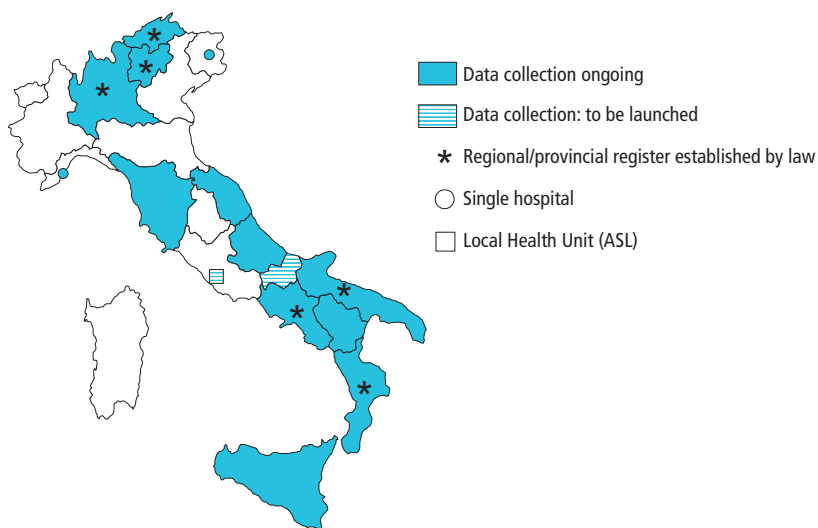
Currently, the procedures for data collection and transmission across the Regions are heterogeneous and sometimes do not fully adhere to the standards and layout defined by RIAP. It is our aim to implement automatized QC with immediate feedback function for the Regional data operators. This will be another important measure to improve the quality of data.

Future development and plans for 2019

The upcoming activities of RIAP will be aimed at making data collection operational throughout the national territory.

A special commitment will be dedicated to the drafting of the launch of the Implantable Prosthesis Register (RIPI, Registro italiano delle protesi impiantabili) in order to make it operational as defined by the DPCM 3/3/2017. In 2019, the RIAP Scientific Committee will study the needs of all parties and start working on the data access policies.

Figure 1.1. Participation in RIAP



We will continue raising stakeholder awareness about the importance of recording the replacement surgeries. Decision makers at regional level and surgeons will be further informed about the importance and usefulness of RIAP in order to make their region adhere to the Registry.

An important project development would be to re-engineer IT infrastructure in order to include and automate the QC processes and to provide participants with faster feedback regarding the data submitted.

We intend to increase the coverage and completeness values, improve the data quality, and apply the patients' pseudonymisation algorithm to the data collected in previous years so as to enlarge the observation period across which to monitor the implants.

In 2019 the Molise region intends to start providing data to RIAP, and in Lazio region a pilot study is planned to involve the hospitals of Local Health Unit Roma 1 (ASL Roma 1).

Collaborations

For 2019 we expect important development in our collaboration with NJR. Recently, the NJR has upgraded its component database and classification, in cooperation with the German Registry (EPRD) with a view to it shortly being utilised by RIAP. In this way, a unified international database for orthopaedic prostheses is going to be organized to simplify the data collection, the traceability and evaluation of the devices implanted in the hospital structures of three participating countries.

The contribution of the manufacturers will be crucial for the implementation of the extended database. In Italy, collaboration with the industry through Assobiomedica has to be intensified. Classification and traceability of devices will be increasingly important in light of new European regulation EU 2017/745. In this situation, it is our aim to further collaborate with the Italian Ministry of Health to contribute to updating the national Classification of Medical Devices (CND) in the part of joint prostheses.

Table 2.1. Coverage and completeness, by participating institution and by joint (year 2017)

Participating authority	Joint	Participating hospitals	Coverage (*)	Collected procedures	Completeness (**)
Regions		N	%	N	%
Lombardy	Hip	103	100.0	22,810	94.3
	Knee	106	100.0	16,217	94.7
AP Bolzano	Hip	11	100.0	1,405	97.5
	Knee	10	90.9	961	94.3
	Shoulder	5	55.6	27	40.3
AP Trento	Hip	8	100.0	1,189	93.1
	Knee	8	100.0	688	92.5
Tuscany	Hip	1	2.2	98	1.1
	Knee	1	2.2	98	1.2
Marche	Hip	8	44.4	703	28.4
	Knee	9	50.0	845	44.0
Campania	Hip	68	94.4	5,519	89.1
	Knee	64	95.5	3,444	91.9
	Shoulder	34	85.0	416	93.3
Apulia	Hip	45	100.0	4,794	99.8
	Knee	42	100.0	3,554	100.0
	Shoulder	33	100.0	440	100.0
Basilicata	Hip	1	16.7	110	17.6
	Knee	1	16.7	104	37.0
Calabria	Hip	10	45.5	747	39.3
	Knee	8	38.1	965	63.7
Sicily	Hip	8	10.7	701	12.2
	Knee	7	9.9	896	17.3
Subtotal (regions)	Hip	263	65.6	38,076	65.7
	Knee	256	65.5	27,772	64.3
	Shoulder	72	87.8	883	92.7

(continued)

Table 2.1. (continued)

Participating authority	Joint	Participating hospitals	Coverage (*)	Collected procedures	Completeness (**)
Single hospitals		N	%	N	%
Santa Maria della Misericordia Hospital (Udine)	Hip	1	-	158	100.0
	Knee	1	-	126	97.7
Santa Corona Hospital (Pietra Ligure, Savona)	Hip	1	-	226	89.0
	Knee	1	-	125	100.0
Subtotal (single hospitals)	Hip	2	-	384	93.2
	Knee	2	-	251	98.8
Total number of procedures admitted to quality control	Hip	265	-	38,460	65.9
	Knee	258	-	28,023	64.5
	Shoulder	72	-	883	92.7
	ALL			67,366	65.6
Abruzzo (^)	Hip	1	-	38	-
	Knee	1	-	15	-
Total, collected procedures	ALL			67,419	-

(*) Coverage: ratio between hospitals participating in RIAP and hospitals performing arthroplasty surgeries, based on data from HDD

(**) Completeness: ratio between procedures collected by RIAP and procedures performed by all hospitals in the Region, based on data from HDD

(^) Abruzzo filled the MDS data on RaDaR platform, but did not link the data on HDD

Table 2.2. RIAP completeness (years 2016 and 2017). Comparison between RIAP and HDD data, by joint

	2016			2017		
	HDD	RIAP	Completeness	HDD (estimate)	RIAP	Completeness (estimate)
	N	N	%	N	N	%
Joint	180,616	58,731	32.5	197,392	67,366	34.1
Hip	105,401	33,208	31.5	108,056	38,460	35.6
Knee	75,215	25,523	33.9	80,326	28,023	34.9
Shoulder	-	-	-	9,010	883	9.8

Table 2.3. Hip. Number of procedures analyzed, by procedure type

	N	%
Procedure type	35,759	
Total replacement	26,049	72.8
- elective	23,034	88.4
- emergency	3,015	11.6
Partial replacement	7,915	22.1
Revision	1,795	5.0
Partial revision	1,476	82.2
Total revision	273	15.2
Removal of prosthesis	46	2.6

Table 2.4. Hip. Number of procedures by type of hospital, by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Type of hospital	23,034		3,015		7,915		1,795		35,759	
Public hospitals	9,960	43.2	2,477	82.2	6,646	84.0	959	53.4	20,042	56.0
Private hospitals, accredited	12,850	55.8	536	17.7	1,250	15.8	824	45.9	15,460	43.3
Private hospitals, non accredited	224	1.0	2	0.1	19	0.2	12	0.7	257	0.7

(*) Total or partial revision, removal of prosthesis, conversion from partial to total prosthesis, spacer revision

Table 2.5. Hip. Number of procedures by patient gender and age group, by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Gender	23,034		3,015		7,915		1,795		35,759	
Male	10,696	46.4	864	28.7	2,141	27.0	724	40.3	14,425	40.3
Female	12,338	53.6	2,151	71.3	5,774	73.0	1,071	59.7	21,334	59.7
Age group by gender										
Male	10,696		864		2,141		724		14,425	
Mean age	65		70		83		69		68	
Standard deviation	12		13		9		12		13	
<45	592	5.5	28	3.2	7	0.3	21	2.9	648	4.5
45 - 54	1,495	14.0	78	9.0	11	0.5	70	9.7	1,654	11.5
55 - 64	2,496	23.3	141	16.3	45	2.1	112	15.5	2,794	19.4
65 - 74	3,298	30.8	241	27.9	186	8.7	189	26.1	3,914	27.1
75 - 84	2,127	19.9	237	27.4	819	38.3	221	30.5	3,404	23.6
≥ 85	203	1.9	116	13.4	1,009	47.1	48	6.6	1,376	9.5
n/a (**)	485	4.5	23	2.7	64	3.0	63	8.7	635	4.4
Female	12,338		2,151		5,774		1,071		21,334	
Mean age	69		73		84		73		74	
Standard deviation	11		10		7		11		12	
<45	315	2.6	14	0.7	7	0.1	11	1.0	347	1.6
45 - 54	958	7.8	76	3.5	20	0.3	56	5.2	1,110	5.2
55 - 64	2,219	18.0	282	13.1	56	1.0	135	12.6	2,692	12.6
65 - 74	4,124	33.4	731	34.0	364	6.3	270	25.2	5,489	25.7
75 - 84	3,724	30.2	707	32.9	2,317	40.1	407	38.0	7,155	33.5
≥ 85	489	4.0	280	13.0	2,872	49.7	131	12.2	3,772	17.7
n/a (**)	509	4.1	61	2.8	138	2.4	61	5.7	769	3.6

(*) Total or partial revision, removal of prosthesis, conversion from partial to total prosthesis, spacer revision

(**) AP Bolzano data have not been included because not available

Table 2.6. Hip. Number of procedures by operated side, surgical approach and fixation, by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Operated side	23,034		3,015		7,915		1,795		35,759	
Right	12,573	54.6	1,523	50.5	4,008	50.6	963	53.6	19,067	53.3
Left	10,025	43.5	1,488	49.4	3,889	49.1	824	45.9	16,226	45.4
Bilateral	436	1.9	4	0.1	18	0.2	8	0.4	466	1.3
Surgical approach	23,034		3,015		7,915		1,795		35,759	
Anterior	3,992	17.3	155	5.1	346	4.4	112	6.2	4,605	12.9
Anterolateral	2,385	10.4	590	19.6	1,696	21.4	250	13.9	4,921	13.8
Lateral	4,293	18.6	921	30.5	2,743	34.7	465	25.9	8,422	23.6
Posterolateral	12,083	52.5	1,342	44.5	3,113	39.3	957	53.3	17,495	48.9
Other	281	1.2	7	0.2	17	0.2	11	0.6	316	0.9

(*) Total or partial revision, removal of prosthesis, conversion from partial to total prosthesis, spacer revision

Table 2.7. Hip. Number of primary procedures by indication for surgery and previous procedure, by procedure type

	Total replacement				Partial replacement		TOTAL	
	elective		emergency		N	%	N	%
	N	%	N	%				
Indication for surgery	23,034		3,015		7,915		33,964	
Primary osteoarthritis	20,968	91.0			148	1.9	21,116	62.2
Post-traumatic osteoarthritis	340	1.5			42	0.5	382	1.1
Rheumatoid arthritis	77	0.3			1	0.0	78	0.2
Neoplasia	35	0.2			40	0.5	75	0.2
Aseptic necrosis of femoral head	877	3.8			18	0.2	895	2.6
Congenital dislocation/hip dysplasia	602	2.6			4	0.1	606	1.8
Perthes disease or epiphysiolysis	55	0.2			5	0.1	60	0.2
Fractured neck of femur	0	0.0	3,015	100.0	7,634	96.4	10,649	31.4
Septic coxitis	4	0.0			0	0.0	4	0.0
Pseudoarthrosis neck fracture related	30	0.1			13	0.2	43	0.1
Other	46	0.2			10	0.1	56	0.2
Previous procedure	23,034		3,015		7,915		33,964	
None	21,353	92.7	2,830	93.9	7,333	92.6	31,516	92.8
Osteosynthesis	287	1.2	49	1.6	43	0.5	379	1.1
Osteotomy	91	0.4	0	0.0	1	0.0	92	0.3
Arthrodesis	13	0.1	0	0.0	0	0.0	13	0.0
Other	1,290	5.6	136	4.5	538	6.8	1,964	5.8

Table 2.8. Hip. Number of revision procedures by indication for surgery and previous procedure

	Revision (*)	
	N	%
Indication for surgery	1,795	
Pain	113	6.3
Lysis	36	2.0
Wear	116	6.5
Implant fracture	88	4.9
Prosthesis dislocation	227	12.6
Periprosthetic fracture	239	13.3
Infection	140	7.8
Previous prosthesis removal	30	1.7
Aseptic loosening, cup	395	22.0
Aseptic loosening, stem	187	10.4
Aseptic loosening, total	192	10.7
Disease progression	1	0.1
Other	31	1.7
Previous procedure	1,795	
Total hip replacement	1,436	80.0
Revision of hip replacement	81	4.5
Spacer implantation or prosthesis removal	134	7.5
Partial hip replacement	111	6.2
Other	33	1.8

(*) Total or partial revision, removal of prosthesis, conversion from partial to total replacement, spacer revision

Table 2.9. Hip. Number of procedures analyzed, by device

	N	%
Procedure type	35,233	
Total replacement	26,025	73.9
- elective	23,010	88.4
- emergency	3,015	11.6
Partial replacement	7,415	21.0
Revision	1,793	5.1

Table 2.10. Hip. Number of procedures by type of fixation, by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Fixation	23,010		3,015		7,415		1,793		35,233	
Cemented (stem + cup)	706	3.1	130	4.3	0	0.0	25	1.4	861	2.4
Reverse hybrid (uncemented stem and cemented cup)	169	0.7	116	3.8	0	0.0	32	1.8	317	0.9
Only cemented cup	0	0.0	0	0.0	0	0.0	40	2.2	40	0.1
Hybrid (cemented stem and uncemented cup)	694	3.0	143	4.7	0	0.0	9	0.5	846	2.4
Uncemented (stem + cup)	18,083	78.6	1,739	57.7	0	0.0	261	14.6	20,083	57.0
Only uncemented cup	2	0.0	0	0.0	0	0.0	82	4.6	84	0.2
Only cemented stem	1	0.0	1	0.0	2,500	33.7	19	1.1	2,521	7.2
Only uncemented stem	0	0.0	3	0.1	2,731	36.8	109	6.1	2,843	8.1
Fixation declared "not applicable" for cup and stem even if the component is present	159	0.7	21	0.7	74	1.0	100	5.6	354	1.0
Procedures not admitted to the analysis of the fixation mode	3,196	13.9	862	28.6	2,110	28.5	1,116	62.2	7,284	20.7

(*)Total or partial revision, removal of prosthesis, conversion from partial to total replacement, spacer revision

Table 2.11. Hip. Number of total replacement procedures by type of bearing, by procedure type

	Total replacement				TOTAL	
	elective		emergency		N	%
	N	%	N	%		
Bearing type (head/insert)	23,010		3,015		26,025	
Ceramics-Polyethylene	12,610	54.8	1,253	41.6	13,863	53.3
Ceramics-Ceramics	4,047	17.6	252	8.4	4,299	16.5
Metal-Polyethylene	2,108	9.2	542	18.0	2,650	10.2
Ceramics-Metal	98	0.4	21	0.7	119	0.5
Metal-Metal	98	0.4	8	0.3	106	0.4
Metal-Ceramics	27	0.1	2	0.1	29	0.1
Procedures that do not report the implantation of a head and an insert	4,022	17.5	937	31.1	4,959	19.1

Table 2.12. Hip. Number of revision procedures by type of bearing

Type of bearing (head/insert)	Revision (*)	
	N	%
Type of bearing (head/insert)	1,793	
Ceramics-Polyethylene	472	26.3
Metal-Polyethylene	275	15.3
Ceramics-Ceramics	62	3.5
Metal-Metal	19	1.1
Ceramics-Metal	15	0.8
Metal-Ceramics	3	0.2
Procedures that do not report the implantation of a head and an insert	947	52.8

(*) Total or partial revision, removal of prosthesis, conversion from partial to total replacement, spacer revision

Table 2.13. Hip. Number of total replacement procedures by stem type, by procedure type

	Total replacement				TOTAL	
	elective		emergency		N	%
	N	%	N	%		
Stem type	23,010		3,015		26,025	
Uncemented	18,023	78.3	1,973	65.4	19,996	76.8
Modular	1,107	6.1	263	13.3	1,370	6.9
Non-modular	16,916	93.9	1,710	86.7	18,626	93.1
Straight	12,342	73.0	1,437	84.0	13,779	74.0
Anatomical	1,881	11.1	164	9.6	2,045	11.0
Conservative	2,693	15.9	109	6.4	2,802	15.0
Cemented	1,352	5.9	370	12.3	1,722	6.6
Modular	47	3.5	17	4.6	64	3.7
Non-modular	1,305	96.5	353	95.4	1,658	96.3
Straight	1,214	93.0	339	96.0	1,553	93.7
Anatomical	72	5.5	13	3.7	85	5.1
Conservative	19	1.5	1	0.3	20	1.2
Other stem type / Stem type not reported	3,635	15.8	672	22.3	4,307	16.5

Table 2.14. Knee. Number of procedures analyzed, by procedure type

	N	%
Procedure type	25,522	
Primary	24,463	95.9
total	20,656	84.4
unicompartmental	3,807	15.6
Revision	1,059	4.1
Partial revision	233	22.0
Total revision	767	72.4
Removal of prosthesis	41	3.9
Primary patella implant on existing prosthesis	18	1.7

Table 2.15. Knee. Number of procedures by type of hospital, by procedure type

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Type of hospital	20,656		3,807		1,059		25,522	
Public hospitals	8,849	42.9	964	25.3	445	42.0	10,258	40.2
Private hospitals, accredited	11,468	55.5	2,794	73.4	612	57.8	14,874	58.3
Private hospitals, non accredited	339	1.6	49	1.3	2	0.2	390	1.5

(*) Total or partial revision, removal of prosthesis, primary patella implant on existing prosthesis. spacer revision

Table 2.16. Knee. Number of procedures by patient gender and age group, by procedure type

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Gender	20,656		3,807		1,059		25,522	
Male	6,437	31.2	1,364	35.8	313	29.6	8,114	31.8
Female	14,219	68.8	2,443	64.2	746	70.4	17,408	68.2
Age group by gender								
Male	6,437		1,364		313		8,114	
Mean age	70		67		69		69	
Standard deviation	9		9		11		9	
<45	58	0.9	12	0.9	6	1.9	76	0.9
45 - 54	299	4.6	113	8.3	26	8.3	438	5.4
55 - 64	1,111	17.3	356	26.1	47	15.0	1,514	18.7
65 - 74	2,666	41.4	536	39.3	112	35.8	3,314	40.8
75 - 84	1,924	29.9	275	20.2	77	24.6	2,276	28.1
≥ 85	105	1.6	15	1.1	11	3.5	131	1.6
n/a (**)	274	4.3	57	4.2	34	10.9	365	4.5
Female	14,219		2,443		746		17,408	
Mean age	71		69		71		71	
Standard deviation	8		9		9		8	
<45	41	0.3	13	0.5	9	1.2	63	0.4
45 - 54	386	2.7	172	7.0	25	3.4	583	3.3
55 - 64	2,232	15.7	507	20.8	117	15.7	2,856	16.4
65 - 74	6,181	43.5	1,006	41.2	262	35.1	7,449	42.8
75 - 84	4,650	32.7	632	25.9	254	34.0	5,536	31.8
≥ 85	266	1.9	34	1.4	25	3.4	325	1.9
n/a (**)	463	3.3	79	3.2	54	7.2	596	3.4

(*) Total or partial revision, removal of prosthesis, primary patella implant on existing prosthesis, spacer revision

(**) AP Bolzano data have not been included because not available

Table 2.17. Knee. Number of procedures by operated side and surgical approach, by procedure type

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Operated side	20,656		3,807		1,059		25,522	
Right	11,032	53.4	1,983	52.1	564	53.3	13,579	53.2
Left	9,460	45.8	1,700	44.7	493	46.6	11,653	45.7
Bilateral	164	0.8	124	3.3	2	0.2	290	1.1
Surgical approach	20,656		3,807		1,059		25,522	
Medial parapatellar	18,192	88.1	2,735	71.8	923	87.2	21,850	85.6
Lateral parapatellar	423	2.0	212	5.6	21	2.0	656	2.6
Mid-vastus	1,075	5.2	269	7.1	46	4.3	1,390	5.4
Minimally invasive mid-vastus	461	2.2	482	12.7	30	2.8	973	3.8
Quad-sparing	7	0.0	49	1.3	2	0.2	58	0.2
Sub-vastus	213	1.0	15	0.4	9	0.8	237	0.9
Minimally invasive sub-vastus	42	0.2	23	0.6	2	0.2	67	0.3
V Quadriceps	1	0.0	2	0.1	6	0.6	9	0.0
Tibial tuberosity osteotomy	11	0.1	3	0.1	6	0.6	20	0.1
Other	231	1.1	17	0.4	14	1.3	262	1.0

(*) Total or partial revision, removal of prosthesis, primary patella implant on existing prosthesis, spacer revision

Table 2.18. Knee. Number of primary procedures, by indication for surgery and previous procedure

	Primary				TOTAL	
	total		unicompartmental		N	%
	N	%	N	%		
Indication for surgery	20,656		3,807		24,463	
Primary osteoarthritis	19,703	95.4	3,512	92.3	23,215	94.9
Post-traumatic osteoarthritis	238	1.2	25	0.7	263	1.1
Rheumatoid arthritis	110	0.5	2	0.1	112	0.5
Neoplasia	20	0.1	0	0.0	20	0.1
Osteonecrosis	103	0.5	125	3.3	228	0.9
Other	482	2.3	143	3.8	625	2.6
Previous procedure	20,656		3,807		24,463	
None	18,723	90.6	3,521	92.5	22,244	90.9
Arthrodesis	11	0.1	3	0.1	14	0.1
Osteotomy	141	0.7	11	0.3	152	0.6
Arthroscopy	478	2.3	170	4.5	648	2.6
Other	1,303	6.3	102	2.7	1,405	5.7

Table 2.19. Knee. Number of revision procedures, by indication for surgery and previous procedure

	Revision (*)	
	N	%
Indication for surgery	1,059	
Aseptic loosening of several components	294	27.8
Aseptic loosening of femur	57	5.4
Aseptic loosening of tibia	107	10.1
Aseptic loosening of patella	7	0.7
Wear	23	2.2
Dislocation	28	2.6
Instability	54	5.1
Periprosthetic fracture	15	1.4
Implant fracture	17	1.6
Fractured spacer	3	0.3
Infection	200	18.9
Stiffness	24	2.3
Disease progression	23	2.2
Pain	175	16.5
Other	32	3.0
Previous procedure	1,059	
Primary total	678	64.0
Primary unicompartmental	161	15.2
Revision of knee replacement	82	7.7
Spacer	83	7.8
Other	55	5.2

(*) Total or partial revision, removal of prosthesis, primary patella implant on existing prosthesis, spacer revision

Table 2.20 Knee. Number of procedures analyzed for the implanted device, by procedure type

	N	%
Procedure type	25,496	
Primary	24,440	95.9
- total	20,637	84.4
- unicompartmental	3,803	15.6
Revision	1,056	4.1

Table 2.21. Knee. Number of procedures by type of fixation, by procedure type

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Fixation	20,637		3,803		1,056		25,496	
Patella not implanted	17,223	83.5	3,291	86.5	383	36.3	20,897	82.0
Cemented (femoral and tibial components)	12,368	71.8	2,390	72.6	254	66.3	15,012	71.8
Cemented femoral component and uncemented tibial component	293	1.7	141	4.3	23	6.0	457	2.2
Only cemented femoral component	2	0.0	1	0.0	9	2.3	12	0.1
Uncemented femoral component and cemented tibial component	646	3.8	256	7.8	37	9.7	939	4.5
Uncemented	3,914	22.7	503	15.3	9	2.3	4,426	21.2
Only uncemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Only cemented tibial component	0	0.0	0	0.0	15	3.9	15	0.1
Only uncemented tibial component	0	0.0	0	0.0	4	1.0	4	0.0
Fixation declared "not applicable" for both femoral and tibial components	0	0.0	0	0.0	32	8.4	32	0.2
Patella implanted (cemented)	1,572	7.6	12	0.3	123	11.6	1,707	6.7
Cemented (femoral and tibial components)	1,526	97.1	10	83.3	79	64.2	1,615	94.6
Cemented femoral component and uncemented tibial component	13	0.8	0	0.0	0	0.0	13	0.8
Only cemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Uncemented femoral component and cemented tibial component	29	1.8	0	0.0	1	0.8	30	1.8
Uncemented	3	0.2	0	0.0	0	0.0	3	0.2
Only uncemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Only cemented tibial component	0	0.0	0	0.0	2	1.6	2	0.1
Only uncemented tibial component	0	0.0	0	0.0	0	0.0	0	0.0
Only patella	1	0.1	2	16.7	41	33.3	44	2.6

(continued)

Table 2.21. (continued)

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Patella implanted (uncemented)	336	1.6	4	0.1	25	2.4	365	1.4
Cemented (femoral and tibial components)	136	40.5	4	100.0	8	32.0	148	40.5
Cemented femoral component and uncemented tibial component	1	0.3	0	0.0	0	0.0	1	0.3
Only cemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Uncemented femoral component and cemented tibial component	8	2.4	0	0.0	0	0.0	8	2.2
Uncemented	191	56.8	0	0.0	17	68.0	208	57.0
Only uncemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Only cemented tibial component	0	0.0	0	0.0	0	0.0	0	0.0
Only uncemented tibial component	0	0.0	0	0.0	0	0.0	0	0.0
Only patella	0	0.0	0	0.0	0	0.0	0	0.0
Procedures not admitted to the analysis of the fixation mode	1,506	7.3	496	13.0	525	49.7	2,527	9.9

(*) Total or partial revision, removal of prosthesis, primary patella implant on existing prosthesis, spacer revision

Table 2.22. Knee. Number of primary procedures by type of tibial tray

	N	%
Type of tibial tray	20,637	
Mobile bearing	5,888	28.5
Cemented	4,174	70.9
Uncemented	1,558	26.5
Cementable	156	2.6
Fixed	11,094	53.8
Cemented	10,674	96.2
Uncemented	393	3.5
Cementable	27	0.2
Not specified	3,655	17.7

Table 2.23. Shoulder. Number of procedures analyzed, by procedure type

	N	%
Procedure type	854	
Total replacement	712	83.4
- elective	514	72.2
- emergency	198	27.8
Partial replacement	116	13.6
Revision	26	3.0

Table 2.24. Shoulder. Number of procedures by prosthesis type implanted in the total replacement

	N	%
Type of prosthesis implanted in the total replacement (*)	366	
Elective	295	80.6
- anatomical	15	5.1
- coating	0	0.0
- reverse	247	83.7
- interposition	33	11.2
Emergency	71	19.4
- anatomical	5	7.0
- coating	0	0.0
- reverse	66	93.0
- interposition	0	0.0

(*) Data available for 366 procedures

Table 2.25. Shoulder. Number of procedures by type of hospital, by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Type of hospital	514		198		116		26		854	
Public hospitals	385	74.9	169	85.4	78	67.2	21	80.8	653	76.5
Private hospitals, accredited	129	25.1	29	14.6	38	32.8	5	19.2	201	23.5
Private hospitals, non accredited	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

(*) Total or partial revision, removal of prosthesis, spacer revision

Table 2.26. Shoulder. Number of procedures by patient gender and age group, by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Gender	514		198		116		26		854	
Male	143	27.8	32	16.2	36	31.0	7	26.9	218	25.5
Female	371	72.2	166	83.8	80	69.0	19	73.1	636	74.5
Age group by gender										
Male	143		32		36		7		218	
Mean age	69		69		62		66		68	
Standard deviation	8		13		14		5		10	
<45	0	0.0	2	6.3	4	11.1	0	0.0	6	2.8
45 - 54	7	4.9	2	6.3	7	19.4	0	0.0	16	7.3
55 - 64	32	22.4	7	21.9	9	25.0	2	28.6	50	22.9
65 - 74	69	48.3	5	15.6	9	25.0	5	71.4	88	40.4
75 - 84	33	23.1	16	50.0	4	11.1	0	0.0	53	24.3
≥ 85	2	1.4	0	0.0	3	8.3	0	0.0	5	2.3
Female	371		166		80		19		636	
Mean age	72		74		71		74		73	
Standard deviation	7		7		10		6		8	
<45	2	0.5	0	0.0	1	1.3	0	0.0	3	0.5
45 - 54	8	2.2	1	0.6	3	3.8	0	0.0	12	1.9
55 - 64	34	9.2	14	8.4	16	20.0	2	10.5	66	10.4
65 - 74	167	45.0	71	42.8	29	36.3	6	31.6	273	42.9
75 - 84	157	42.3	71	42.8	24	30.0	11	57.9	263	41.4
≥ 85	3	0.8	9	5.4	7	8.8	0	0.0	19	3.0

(*) Total or partial revision, prosthesis removal, spacer revision

Table 2.27. Shoulder. Number of procedures by operated side and surgical approach, by procedure type

	Total replacement				Partial replacement		Revisions (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Operated side	514		198		116		26		854	
Right	369	71.8	104	52.5	62	53.4	16	61.5	551	64.5
Left	145	28.2	94	47.5	54	46.6	10	38.5	303	35.5
Bilateral	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Surgical approach	514		198		116		26		854	
Deltopectoral	463	90.1	184	92.9	86	74.1	25	96.2	758	88.8
Transdeltoidea	40	7.8	9	4.5	17	14.7	1	3.8	67	7.8
Other	11	2.1	5	2.5	13	11.2	0	0.0	29	3.4

(*) Total or partial revision, prosthesis removal, spacer revision

Table 2.28. Shoulder. Number of primary procedures by indication for surgery and previous procedure

	Total replacement				Partial replacement		TOTAL	
	elective		emergency		N	%	N	%
	N	%	N	%				
Cause	514		198		116		828	
Eccentric osteoarthritis	348	67.7	0	0.0	10	8.6	358	43.2
Concentric osteoarthritis	61	11.9	0	0.0	37	31.9	98	11.8
Rheumatoid arthritis	8	1.6	0	0.0	0	0.0	8	1.0
Neoplasia	2	0.4	0	0.0	0	0.0	2	0.2
Osteonecrosis	11	2.1	0	0.0	3	2.6	14	1.7
Fracture	0	0.0	198	100.0	38	32.8	236	28.5
Previous fracture	17	3.3	0	0.0	2	1.7	19	2.3
Other	67	13.0	0	0.0	26	22.4	93	11.2
Previous	514		198		116		828	
None	494	96.1	197	99.5	114	98.3	805	97.2
Osteosynthesis	3	0.6	0	0.0	1	0.9	4	0.5
Arthrotomy	1	0.2	0	0.0	0	0.0	1	0.1
Arthrodesis	0	0.0	0	0.0	0	0.0	0	0.0
Arthroscopy	12	2.3	0	0.0	0	0.0	12	1.4
Other	4	0.8	1	0.5	1	0.9	6	0.7

Table 2.29. Shoulder. Number of revision procedures by indication for surgery and previous procedure

	Revision (*)	
	N	%
Indication for surgery	26	
Instability	4	15.4
Lysis	0	0.0
Glenoid erosion	2	7.7
Prosthesis breakage	1	3.8
Dislocation	1	3.8
Periprosthetic fracture	1	3.8
Infection	4	15.4
Prosthesis removal outcomes	0	0.0
Aseptic mobilisation	9	34.6
Disease progression	0	0.0
Pain	1	3.8
Other	3	11.5
Previous procedure	26	
Primary	11	42.3
Removal	12	46.2
Shoulder replacement revision	1	3.8
Other	2	7.7

(*) Total or partial revision, prosthesis removal, spacer revision

Table 2.30. Shoulder. Number of procedures by type of fixation, by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Fixation	514		198		116		26		854	
Cemented (glenoid + stem)	10	1.9	5	2.5	0	0.0	0	0.0	15	1.8
Reverse hybrid (cemented glenoid and uncemented stem)	3	0.6	0	0.0	0	0.0	0	0.0	3	0.4
Only cemented glenoid	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Hybrid (uncemented glenoid and cemented stem)	27	5.3	23	11.6	0	0.0	0	0.0	50	5.9
Uncemented (glenoid + stem)	220	42.8	43	21.7	5	4.3	5	19.2	273	32.0
Only uncemented glenoid	1	0.2	0	0.0	0	0.0	1	3.8	2	0.2
Only stem cementeted	1	0.2	0	0.0	2	1.7	0	0.0	3	0.4
Only stem uncemented	1	0.2	0	0.0	20	17.2	1	3.8	22	2.6
Fixation declared "not applicable" for glenoid and Stem	32	6.2	0	0.0	14	12.1	2	7.7	48	5.6
Data on the fixation mode not available	219	42.6	127	64.1	75	64.7	17	65.4	438	51.3

(*) Total or partial revision, prosthesis removal, spacer revision

Note: Some data may be the result of coding error, as in the case of partial replacement procedures that do not involve the implantation of the glenoid component

Figure 1.2. Information flow

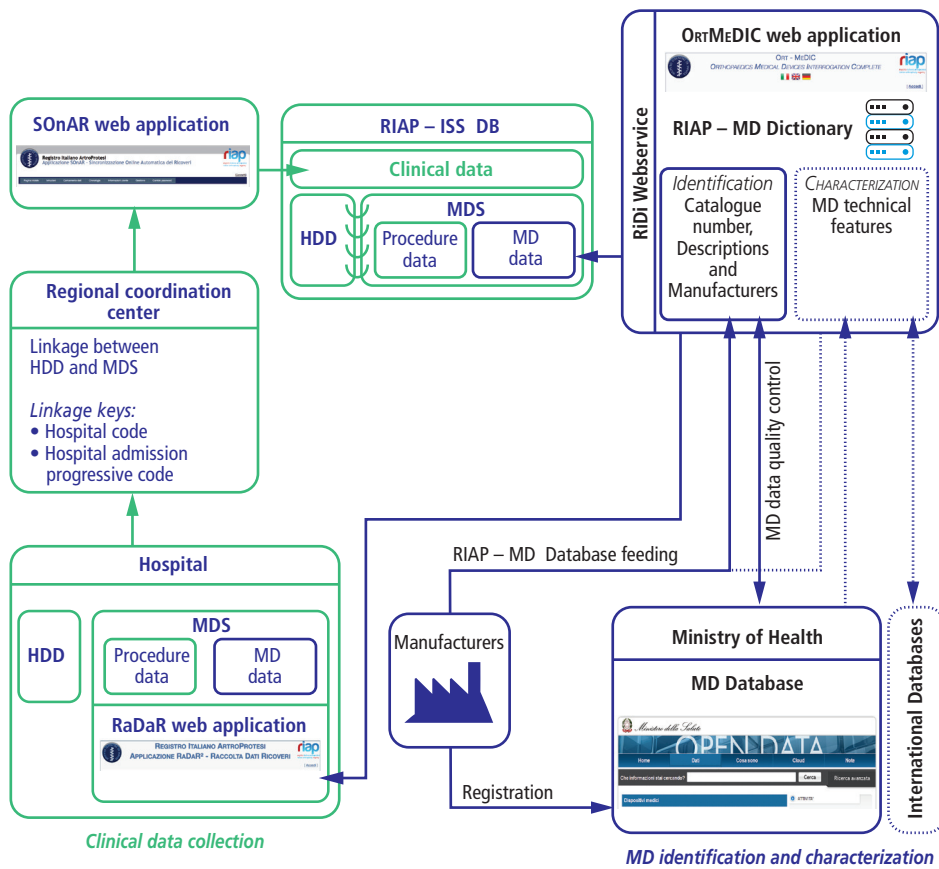


Figure 2.1. Flowchart of the RIAP data quality control process

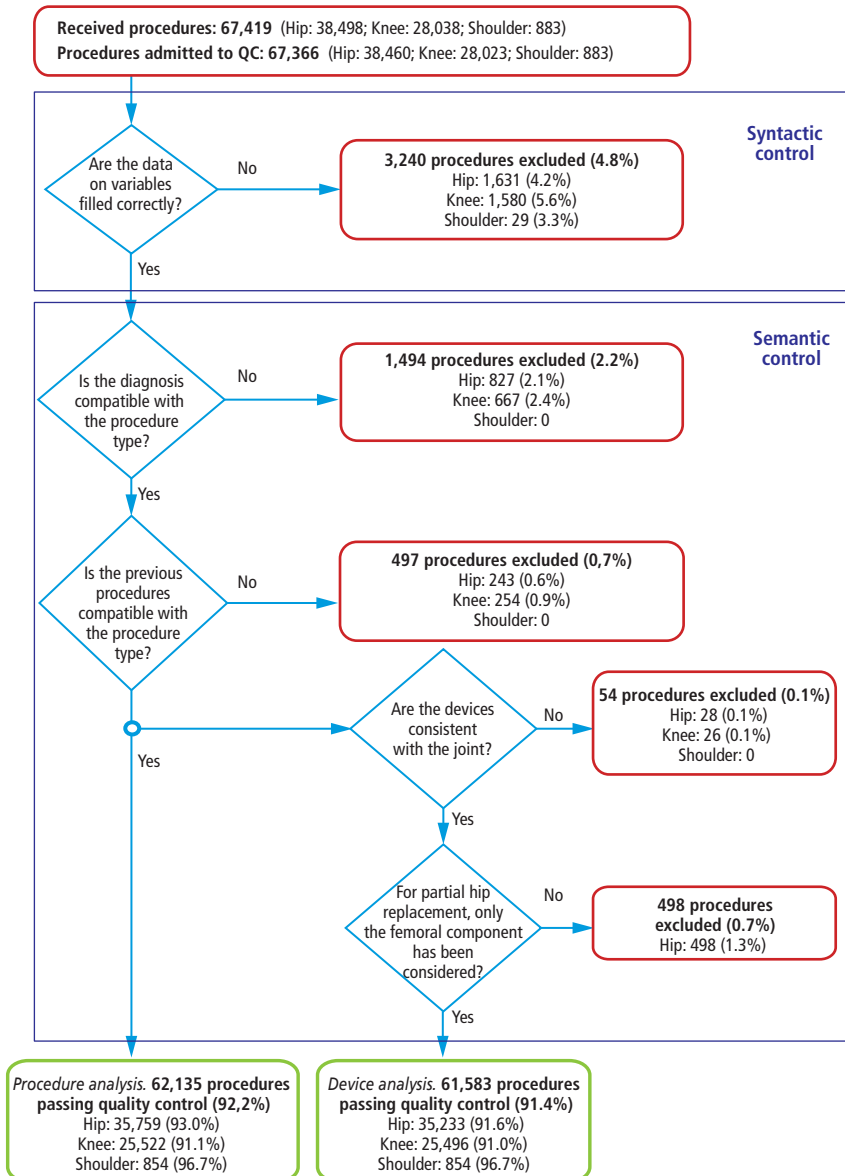
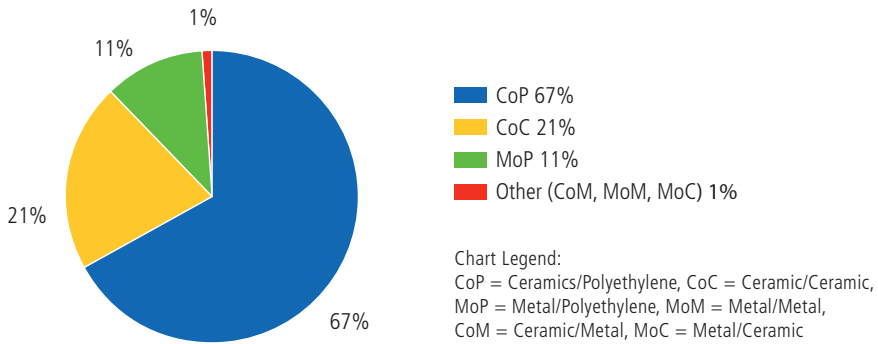
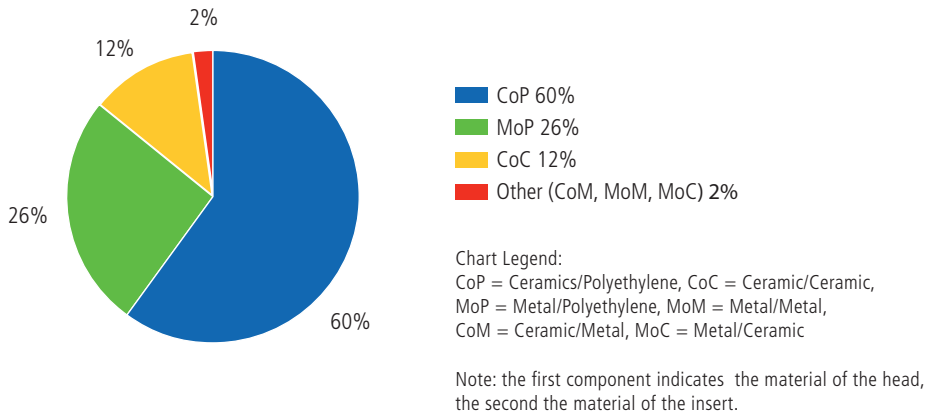


Figure 2.2. Hip. Types of bearing. Total replacement (elective procedures)



Note: the first component indicates the material of the head, the second the material of the insert.

Figure 2.3. Hip. Types of bearing. Total replacement (emergency)



Code ICD-9-CM	Procedure	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Hip	72,575	76,653	78,859	82,844	84,961	87,260	88,249	89,074	89,949
81.51	Total hip replacement	45,792	48,793	51,311	54,442	55,599	57,612	58,650	58,786	59,528
	<i>Total hip replacement in election</i>	39,144	41,396	43,419	45,764	46,561	48,157	49,104	49,289	49,923
81.52	Partial hip replacement	20,768	21,358	21,020	21,657	22,402	22,418	22,326	23,069	22,542
00.85 (*)	Resurfacing	-	-	-	-	-	-	-	-	273
(**)	Revision	6,015	6,502	6,528	6,745	6,960	7,230	7,273	7,219	7,606
	Knee	28,056	32,704	37,703	43,093	46,257	50,651	55,123	57,706	58,628
81.54	Total knee replacement	26,787	31,039	35,799	40,904	43,785	47,986	52,116	54,395	54,778
(***)	Revision	1,269	1,665	1,904	2,189	2,472	2,665	3,007	3,311	3,850
	Shoulder	1,539	1,673	1,851	2,259	2,506	2,879	3,239	3,409	3,757
81.80	Total shoulder replacement	695	798	934	1,239	1,455	1,688	2,036	2,175	2,515
	<i>Total shoulder replacement in election</i>	405	503	634	868	1,080	1,331	1,620	1,773	2,073
81.81	Partial shoulder replacement	844	875	917	1,020	1,051	1,191	1,203	1,234	1,242
	Total	102,170	111,030	118,413	128,196	133,724	140,790	146,611	150,189	152,334

(*) Average annual increase

(*) New code introduced on 1st January 2009

(**) Code: 00.70, 00.71, 00.72, 00.73 (introduced on 1st January 2009) and 81.53 (Hip replacement revision not specified)

(***) Code: 00.80, 00.81, 00.82, 00.83, 00.84 (introduced on 1st January 2009) and 81.55 (Knee replacement revision not otherwise specified)

Code ICD-9-CM	Procedure	2010	2011	2012	2013	2014	2015	2016	% (°)	Estimate 2017 [^]
	Hip	92,040	92,908	95,039	97,347	99,471	102,378	105,401	2.5	108,056
81.51	Total hip replacement	59,764	60,712	62,361	64,056	66,045	68,891	72,208	3.1	
	<i>Total hip replacement in election</i>	<i>50,394</i>	<i>51,422</i>	<i>52,940</i>	<i>54,624</i>	<i>56,561</i>	<i>58,596</i>	<i>61,869</i>	3.1	
81.52	Partial hip replacement	23,953	24,177	24,324	24,998	25,313	25,326	25,055	1.3	
00.85 (*)	Resurfacing	404	122	52	44	44	107	147	-8.5	
(**)	Revision	7,919	7,897	8,302	8,249	8,069	8,054	7,991	1.9	
	Knee	60,761	60,973	63,214	64,763	67,365	70,105	75,215	6.8	80,326
81.54	Total knee replacement	56,808	56,977	58,979	60,261	62,886	65,259	70,076	6.6	
(***)	Revision	3,953	3,996	4,235	4,502	4,479	4,846	5,139	9.8	
	Shoulder	4,298	4,655	5,145	5,853	6,588	7,187	8,068	11.7	9,010
81.80	Total shoulder replacement	2,965	3,444	3,793	4,421	5,307	5,954	6,876	16.5	
	<i>Total shoulder replacement in election</i>	<i>2,355</i>	<i>2,784</i>	<i>3,011</i>	<i>3,464</i>	<i>4,089</i>	<i>4,463</i>	<i>5,213</i>	18.6	
81.81	Partial shoulder replacement	1,333	1,211	1,352	1,432	1,281	1,233	1,192	2.3	
	Total	157,099	158,536	163,398	167,963	173,424	179,670	188,684	4.2	197,392

([^]) The values for 2017 were obtained by extrapolation, applying to the 2016 figure the average annual increase calculated in the period 2001-2016. This information was used to calculate the completeness of RIAP on a national level. The processing was performed by RIAP group using the HDD data that the Ministry of Health sends annually to the Italian hospitals.

(°) Average annual increase

(*) New code introduced on 1st January 2009

(**) Code: 00.70, 00.71, 00.72, 00.73 (introduced on 1st January 2009) and 81.53 (Hip replacement revision not specified)

(***) Code: 00.80, 00.81, 00.82, 00.83, 00.84 (introduced on 1st January 2009) and 81.55 (Knee replacement revision not otherwise specified)