2017

ITALIAN ARTHROPLASTY REGISTRY PROJECT Fourth Report

Italian Arthroplasty Registry Project

BETTER DATA QUALITY FOR BETTER PATIENT SAFETY

Fourth Report 2017

Addendum

English version of Tables and Figures

First edition: February 2018
Excerpt from: Progetto Registro Italiano ArtroProtesi. Quarto Report.
Potenziare la qualità dei dati per migliorare la sicurezza dei pazienti. 2017.
Il Pensiero Scientifico Editore
Via San Giovanni Valdarno 8, 00138 Roma
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www.pensiero.it – www.vapensiero.info
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Layout: Doppiosegno s.n.c. Roma
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Please cite as follows:
Marina Torre, Paola Laricchiuta, Ilaria Luzi, Stefania Ceccarelli, Eugenio Carrani, Mascia Masciocchi, Letizia Sampaolo. Italian Arthroplasty Registry Project. Better data quality for better patient safety. Fourth Report 2017 – Addendum. Roma: Il Pensiero Scientifico Editore, 2018.

Executive Summary

Introduction

The Italian Arthroplasty Registry (RIAP) is a federation of regional registries coordinated by the Istituto Superiore di Sanità (ISS). The registry project started in 2006. Today it is a wide network of stakeholders collaborating for an efficient, high-quality data collection at a national level. Its high-inclusive Scientific Steering Committee includes ISS, Ministry of Health and Regional representatives – who also provide data to be included in the Registry -, clinicians, manufacturers, and patients.

The monitoring of the implantable device performance and the quick identification of potentially affected patients in case of device recall are the main aims of the Registry, whose accomplishment rely on an efficient data collection. This is the reason why since the very beginning the Registry coverage and completeness and the Regions involvement have been considered a priority. The same goes for the quality of the collected data that over the years have been submitted to a stringent quality check. In addition, the team has kept on pursuing interaction with health care providers and decision makers to promote the role and value of a national arthroplasty registry.

RIAP's activities are consistent with the aims of the Decree of the President of the Council of Ministers (DPCM) that was approved on March 3, 2017, as an important policy measure meant to solicit and give birth to a national registry of implantable devices. Specifically, the Decree establishes 31 surveillance systems and 15 registers, including the register of implantable prostheses (national and regional), to fulfill the law no. 221 of 17 December 2012. Following the Decree implementation, the Regions will determine the regional reference centre that will guarantee the administrative, technical and IT management of the registry and the data ownership. Based on the Decree, the choice should take into account any local centre already existing on the territory; therefore, the RIAP network can represent a valuable resource to the purpose.

Fourth RIAP Report. Objectives and structure

The Fourth RIAP Report continues the series of the project annual reports. Its purpose is to:

- Describe the activities carried out during 2016 and until the time of the Report publication to further develop data collection and dissemination of the RIAP project;
- Present the results of the analysis per-

formed of the national Hospital Discharge Data (HDD) on hip, knee, shoulder, and - for the first time – ankle arthroplasty; and
- Inform about the results of the analysis of the RIAP data relating to (i) type of procedure, (ii) details of the surgical procedure (including any previous procedure and the reasons to perform it), (iii) characteristics of devices (hip and knee prostheses) used during procedures performed in hospitals located in the participating Regions and Autonomous Provinces.

The full version of the Fourth Report is only available in Italian at http://www.iss.it/riap. As usual, it is divided into five chapters, followed by Appendices:

- Chapter 1 describes the state-of-the-art of the project;
- Chapter 2 focuses on the RIAP-MD Database further development and evolution;
- Chapter 3 gives an account of the Regional Representatives' participation in the RIAP project and highlights the perceived strengths, weaknesses and perspectives of the project; and
- Chapters 4 and 5 report the results of the analysis of data from HDD and RIAP databases.

Analysis of HDD and RIAP data

Methods

HDD

The ISS yearly gets a subset of the national HDD database to perform statistical and epidemiological analysis in public health. HDD come from regional data that once collected are checked against consistency by the Ministry of Health, and the whole process takes almost two years. This implies that the latest available data the ISS gets every year are from two years prior to the current.

In this report, the HDD 2001-2015 were analyzed to observe the time trend of:

- The frequency of all joint replacement procedures;
- The incidence of the principal procedures[1] for joint replacement by type (elective and emergency primary replacement , revision) and by joint (hip, knee, shoulder, ankle);
- The age-specific incidence of the principal procedures for elective primary total prosthetic replacement by joint (hip, knee, shoulder, ankle).

[1] "Principal procedure" refers to the procedure performed during the hospitalization that is most closely related to the principal diagnosis and that involves the greatest burden of healthcare and resources.

The HDD 2015 were analyzed to get descriptive statistics assessing the frequency of:

- All joint replacement procedures by type (elective and emergency primary total replacement, primary partial replacement, revision) and by joint (hip, knee, shoulder, ankle) to assess the national, regional and hospital volumes of activity;
- The principal procedure by joint (hip, knee, shoulder, ankle), by region and in relation to patient demographic characteristics, principal diagnosis, mode of hospital discharge, length of stay, and financial burden.

Finally, HDD 2015 were used to describe the inter-regional mobility by calculating the attraction and escape percentage indices.

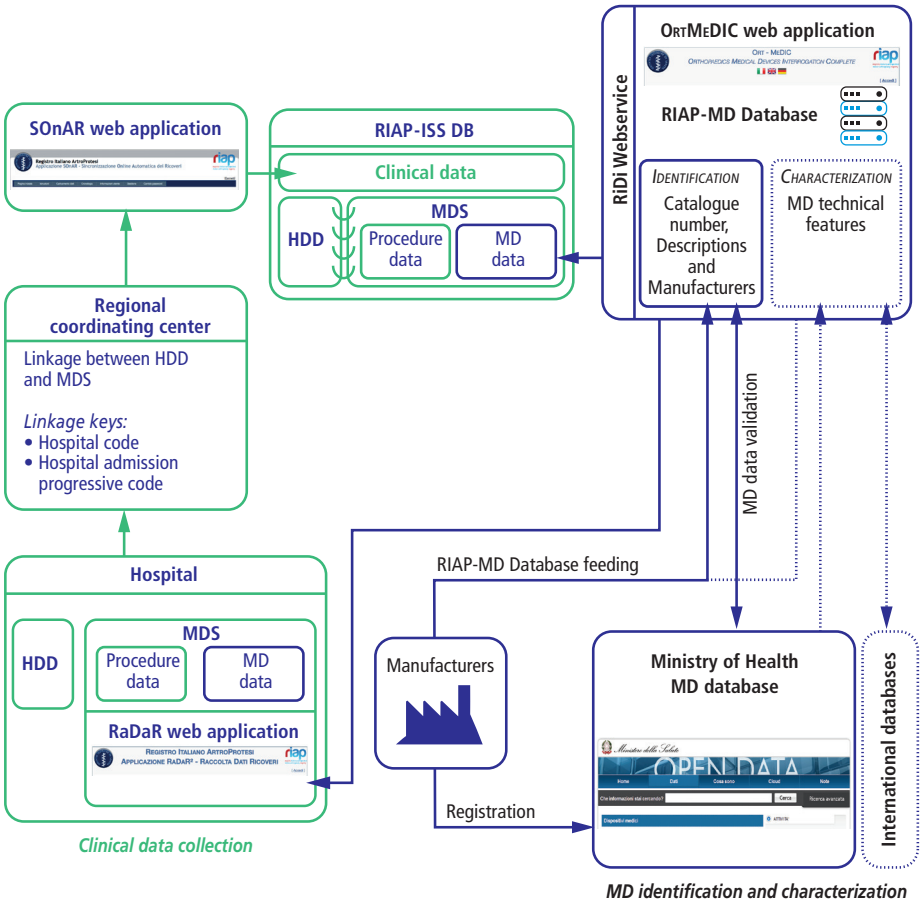
RIAP

The RIAP data collection is set on an ad hoc informative model designed on two different data streams, hospitalization and MD identification and characterization (Figure 1).

1) Hospitalization. The collection includes HDD data plus values from a set of additional variables (Minimum Data Set, MDS), such as operated side, type of procedure, primary or revision diagnosis, previous procedure on the same joint, surgical approach, fixation, device identifier (Manufacturer, Catalogue number, Lot number). The regional coordination centre links HDD and MDS data and sends the linked data to ISS, through the SOnAR web application. Currently, these activities are performed yearly for the report publication, as soon as HDD data of the previous year are checked against consistency by each region. However, before being included in the analysis, data sent to the ISS are submitted for a Quality Control (QC) process that is built upon a check, which is both syntactic and semantic. The syntactic check aims at ascertaining if the value of each variable is congruent with the range of admissible values for that variable. Instead, based on preset rules, the semantic check aims at verifying if the chosen values for the variables are internally and reciprocally consistent.

2) MD identification and characterization. To identify the implanted MD, the product code collected through the MDS is linked to data contained in the RIAP-MD Database. The latter was set up in 2011 and since then constantly updated by manufacturers. It contains the following information: manufacturer, catalogue number, description, device category, brand name and registration number in the Ministry of Health MD database. Data contained in the RIAP-MD Database are regularly submitted

Flow diagram of the RIAP data collection model



to a QC process which compares data sent by manufacturers with data contained in the Ministry of Health MD database, to highlight possible discrepancies. Each manufacturer is provided with a QC feedback of the data sent to improve the quality of the recorded data.

The device characterization attributes to each device a set of technical features which are used for comparative analyses. Currently, the RIAP-MD Database does not include such attributes; efforts will be devoted to implement this part of the data stream in cooperation with other existing international registry initiatives.

The RIAP data collection process is reviewed according to two indicators that are widely used at international level: coverage and completeness (regional and hospital).

The descriptive statistics included in the present Report are based on data referred to hip and knee procedures performed in 2016 in the regions (n=10) and single hospitals (n=2) participating in RIAP (elective and emergency primary total replacement, primary partial replacement, revision). They describe the distribution of the variable values collected through MDS relating to clinical information (operated side, type of procedure, primary or revision diagnosis, previous procedure on the same joint, surgical approach, fixation), and the characteristics of the implanted devices.

Results

HDD

In 2015, a total of 181,738 joint replacement procedures were performed (+3.7% than 2014), with 56.3% hip replacements, 38.6% knee replacements, 3.9%, 0.3% and 0.9% respectively shoulder, ankle and other joint replacements (Table 4.1). From 2001 to 2015, the average annual increase of the total number of procedures was 4.1% (Table 4.1, Figure 4.1), a pattern found also when the number of procedures is related to the number of residents, especially for elective primary replacement procedures (Figures 4.2-4.5). The incidence risk of these procedures per 100,000 residents showed an increase for all considered joints and age classes (Figures 4.6-4.9).

As to the volumes of procedures, around a half of the hospitals performing primary total hip or knee procedures are in the lower volume class i.e. ≤50 procedures/year (hip: 46%, Table 4.3, Figure 4.10; knee: 53%, Table 4.13, Figure 4.12). For total shoulder replacements, 67% of hospitals perform less than 10 procedures per year (Table 4.23, Figure 4.14), while for ankle arthroplasty, the percentage of hospital in the low volume class i.e. ≤2 procedures/year is 69% (Table 4.33, Figure 4.16).

The absolute number of procedures for hip, knee and shoulder arthroplasty is greater for women than for men. Elective procedures are more frequent for both, if aged 65-74. In the age class <65, the proportion of men who un-

dergo a procedure is higher than the proportion of women (hip: 41.9% vs 27.1%; knee: 23.8% vs 19.9%; shoulder: 23.1% vs 10.1%). In the ≥75 age class the proportion of operated men is lower than the proportion of operated women (hip: 24.7% vs 37.6%; knee: 32.2% vs 35.6%; shoulder: 30.9% vs 44.7%) (Tables 4.6, 4.16, 4.26). Instead, the ankle data show a higher number of procedures performed on men. In this case the most frequent age class is <45 for men, and 55-64 for women (Table 4.35).

According to 2014 results, also in 2015 the data show a great variability among regions in the length of hospital stay (in days) for hip, knee and shoulder procedures (Tables 4.9-4.10, 4.19-4.20, 4.29-4.30). A great variability is also observed in the length of stay for ankle procedures (Table 4.38).

The interregional mobility for total primary elective hip, knee and shoulder procedures involves all regions, with an increasing trend in the indices of attraction and escape, following two opposite directions respectively: South to North for the attraction, North to South for the escape (Figures 4.17-4.19).

RIAP

In the Regions (n=10) and single hospitals (n=2) participating in RIAP in 2016, the mean coverage was 56.8% for hip and 58.6% for knee; the data completeness was 60.9% (2.2% - 99.6%) for hip and 59.4% (0.7% - 100%) for knee. The hospital data completeness percentages differ for both hip (4% - 100%) and knee (0.7% - 100%) and reach higher values, close or equal to 100%, in the Regions where a regional registry is already active (Table 5.1).

The total number of unique collected records was 58,731. Among these, 33,208 referred to hip procedures and 25,523 to knee procedures. Once submitted to the QC process, only 51,919 records (88.4%) were acquired and included in the analysis (29,795 hip; 22,124 knee) (Figure 5.1). Data collected by RIAP represent about 33% of the national volume.

The comparison of the distribution between 2016 RIAP data and the HDD 2015 shows that RIAP reports a higher proportion of both hip and knee primary elective procedures and a lower proportion of revision and emergency hip procedures (Tables 5.2, 5.9). As to the distribution by gender, RIAP data 2016 are consistent with the HDD 2015, showing that a greater number of procedures was performed on women than on men (Tables 5.4, 5.11 and 4.6, 4.16).

With reference to hip and knee elective procedures, the most populated age class for

both genders is 65-74. In the <65 age group, a higher number of men compared to women underwent surgery (hip: 40.8% vs 26.3%; knee: 22.2% vs 17.3%). Instead, in the age group ≥75, procedures on men are fewer (hip: 22.6% vs 35.8%; knee: 32.3% vs 37.0%) (Tables 5.4., 5.11). The majority of elective hip and knee procedures are performed in private hospitals accredited by the National Healthcare System. On the contrary, emergency surgery procedures are mainly performed in public hospitals. Osteoarthritis is confirmed to be the prevailing primary diagnosis. About 90% of the patients that are operated for the first time have not gone through any previous procedure on the same joint (Tables 5.3, 5.10).

As to revision procedures, the aseptic loosening is the prevailing cause (hip 43.4%, knee 33.3%). For hip revision, other common causes include luxation (11.9%), periprosthetic fracture (10.1%), implant wear and failure (8.8%), infection (7.7%). Knee revision causes include infection (27.1%), pain (15.9%), implant wear and failure (4.9%), and instability (3.8%) (Tables 5.8, 5.15).

In all hip arthroplasties (primary and revision), the posterolateral surgical approach is prevalent (51.3%). The preferred fixation method used in primary total replacements is the uncemented for both elective (82.7%) and emergency (66.6%) procedures (Table 5.6).

In all knee procedures (total, unicondylar, revision), the medial parapatellar is the most common surgical approach (86.0%) and the cemented fixation of tibial and femoral components is the most frequent (58.2%). In 91.0% of the total primary replacements the patella is not resurfaced (Table 5.13).

Future developments

Future developments of RIAP relate to the registry data completeness and coverage, the QC process and the international collaboration.

A considerable increase in the registry data completeness[2] and coverage[3] is predictable due to a number of new circumstances, as described below.

[2] Completeness is defined as "Number of registered procedures in RIAP in a specific region / Number of performed procedures in the HDD of all hospitals in the same region" (Adapted from van Steenbergen NL, et al. More than 95% completeness of reported procedures in the population-based Dutch Arthroplasty Register. External validation of 311,890 procedures. Acta Orthopaedica 2015; 86 (4): 498–505).

[3] Coverage is defined as "Number of participating hospitals in RIAP in a specific region / Number of hospitals performing hip and or knee arthroplasty surgeries in the same region (Adapted from van Steenbergen NL, et al. More than 95% completeness of reported procedures in the population-based Dutch Arthroplasty Register. External validation of 311,890 procedures. Acta Orthopaedica 2015; 86 (4): 498–505).

- In 2017, Campania region has started to contribute to RIAP by collecting data on hip, knee and shoulder arthroplasties (about 10,000 procedures per year). The data collection is compulsory according to the provisions of a regional decree issued at the end of 2016.
- RIAP is progressively extending its collection to data on shoulder procedures. Data from Apulia (from 2010) and Autonomous Province Bolzano (from 2017) will be provided to RIAP. Moreover, in 2018, the shoulder data collection will be extended to the other participating Regions.
- Based on the positive judgement expressed by the ISS Ethics Committee in July 2017, it will be possible to include also data referring to procedures performed in the past years, even if at the time of intervention the RIAP informed consent was not administered and recorded.
- Also in 2018 it will be possible to enroll single units/hospitals, even if belonging to non-participating Regions, to contribute to the Registry data collection.
- From 2018 the data related to ankle procedures will be collected and made available. To the purpose, a set of variables additional to those included in the HDD has already been defined and added to the RaDaR web application designed for the MDS data collection and HDD linkage.

Currently, the QC is carried out semi-automatically. Indeed, there is still a phase in which an operator is needed to prepare the data to be submitted to the automated check. In the near future, the whole process will be automated. Consequently, the due feedback to the Regions about the accuracy of the transmitted data will be readily available.

Finally, the cooperation at international level with other Registries currently is and will be pursued in the conviction that the greater the international collaboration, the better the quality and efficacy of implanted device registries.

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CHAPTER 5 - Joint replacement procedures: RIAP data analysis

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Table 4.1. Joint replacement procedures in Italy

ICD-9-CM Code	Procedure	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	% (°)
	Hip	**72,575**	**76,653**	**78,859**	**82,844**	**84,961**	**87,260**	**88,249**	**89,074**	**89,949**	**92,040**	**92,908**	**95,039**	**97,347**	**99,471**	**102,378**	***2.5***
81.51	Total hip replacement	45,792	48,793	51,311	54,442	55,599	57,612	58,650	58,786	59,528	59,764	60,712	62,361	64,056	66,045	68,891	*3.0*
	Total hip replacement (elective)	*39.144*	*41.396*	*43.419*	*45.764*	*46.561*	*48.157*	*49.104*	*49.289*	*49.923*	*50.394*	*51.422*	*52.940*	*54.624*	*56.561*	*58.596*	*2.9*
81.52	Partial hip replacement	20,768	21,358	21,020	21,657	22,402	22,418	22,326	23,069	22,542	23,953	24,177	24,324	24,998	25,313	25,326	*1.4*
00.85(*)	Hip resurfacing	-	-	-	-	-	-	-	-	273	404	122	52	44	44	107	*-14.5*
(**)	Revision of hip replacement	6,015	6,502	6,528	6,745	6,960	7,230	7,273	7,219	7,606	7,919	7,897	8,302	8,249	8,069	8,054	*2.1*
	Knee	**28,056**	**32,704**	**37,703**	**43,093**	**46,257**	**50,651**	**55,123**	**57,706**	**58,628**	**60,761**	**60,973**	**63,214**	**64,763**	**67,365**	**70,105**	***6.8***
81.54	Total knee replacement	26,787	31,039	35,799	40,904	43,785	47,986	52,116	54,395	54,778	56,808	56,977	58,979	60,261	62,886	65,259	6,6
(***)	Revision of knee replacement	1,269	1,665	1,904	2,189	2,472	2,665	3,007	3,311	3,850	3,953	3,996	4,235	4,502	4,479	4,846	*10.0*
	Shoulder	**1,539**	**1,673**	**1,851**	**2,259**	**2,506**	**2,879**	**3,239**	**3,409**	**3,757**	**4,298**	**4,655**	**5,145**	**5,853**	**6,588**	**7,187**	***11.6***
81.80	Total shoulder replacement	695	798	934	1,239	1,455	1,688	2,036	2,175	2,515	2,965	3,444	3,793	4,421	5,307	5,954	*16.6*
	Total shoulder replacement (elective)	*405*	*503*	*634*	*868*	*1.080*	*1.331*	*1.620*	*1.773*	*2.073*	*2.355*	*2.784*	*3.011*	*3.464*	*4.089*	*4.463*	*18.7*
81.81	Partial shoulder replacement	844	875	917	1,020	1,051	1,191	1,203	1,234	1,242	1,333	1,211	1,352	1,432	1,281	1,233	*2.7*
	Ankle	**96**	**116**	**150**	**175**	**178**	256	**267**	**282**	**254**	**251**	**296**	**313**	**330**	**389**	**492**	***12.4***
81.56	Total ankle replacement	96	116	150	175	178	256	267	282	254	251	296	313	330	389	492	*12.4*
	Other joints	**775**	**872**	**912**	**1,219**	**1,762**	1,785	**1,648**	**1,414**	**1,411**	**1,372**	**1,443**	**1,361**	**1,390**	**1,451**	**1,576**	***5.2***
81.57	Replacement of joint of foot and toe	336	409	435	489	649	673	736	720	571	614	608	483	507	526	615	*4.4*
81.59	Revision of joint replacement of lower extremity, not elsewhere classified	219	189	183	363	707	599	383	153	201	133	111	90	103	103	102	*-5.3*
81.73	Total wrist replacement	45	45	46	50	63	86	74	75	61	54	76	84	69	54	55	*1.4*
81.84	Total elbow replacement	92	147	163	214	250	321	320	316	411	404	438	451	478	499	526	*13.3*
81.97	Revision of joint replacement of upper extremity	83	82	85	103	93	106	135	150	167	167	210	253	233	269	278	*9.0*
	Total	**103,041**	**112,018**	**119,475**	**129,590**	**135,664**	**142,831**	**148,526**	**151,885**	**153,999**	**158,722**	**160,275**	**165,072**	**169,683**	**175,264**	**181,738**	***4.1***

(°) Annual growth rate

(*) ICD-9-CM codes introduced on January 1st, 2009

(**) ICD-9CM codes 00.70, 00.71, 00.72, 00.73 (introduced on January 1st, 2009) and 81.53 (Revision of hip replacement not otherwise specified)

(***) ICD-9-CM codes 00.80, 00.81, 00.82, 00.83, 00.84 (introduced on January 1st, 2009) and 81.55 (Revision of knee replacement not otherwise specified)

Table 4.2. Hip. Number of procedures by region and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Revision		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Italy	**58,700**	***57.3***	**10,298**	***10.1***	**25,326**	***24.7***	**8,054**	***7.9***	**102,378**	***100.0***
Piedmont	5,236	*8.9*	854	*8.3*	1,933	*7.6*	742	*9.2*	8,765	*8.6*
Aosta Valley	175	*0.3*	13	*0.1*	83	*0.3*	17	*0.2*	288	*0.3*
Lombardy	13,736	*23.4*	1,255	*12.2*	5,058	*20.0*	1,934	*24.0*	21,983	*21.5*
AP Bolzano	1,100	*1.9*	84	*0.8*	205	*0.8*	134	*1.7*	1,523	*1.5*
AP Trento	681	*1.2*	63	*0.6*	274	*1.1*	86	*1.1*	1,104	*1.1*
Veneto	6,307	*10.7*	864	*8.4*	2,303	*9.1*	685	*8.5*	10,159	*9.9*
Friuli Venezia Giulia	1,709	*2.9*	165	*1.6*	764	*3.0*	212	*2.6*	2,850	*2.8*
Liguria	1,599	*2.7*	742	*7.2*	575	*2.3*	295	*3.7*	3,211	*3.1*
Emilia-Romagna	4,977	*8.5*	612	*5.9*	1,746	*6.9*	783	*9.7*	8,118	*7.9*
Tuscany	5,249	*8.9*	822	*8.0*	2,111	*8.3*	807	*10.0*	8,989	*8.8*
Umbria	855	*1.5*	116	*1.1*	525	*2.1*	110	*1.4*	1,606	*1.6*
Marche	1,205	*2.1*	382	*3.7*	662	*2.6*	161	*2.0*	2,410	*2.4*
Lazio	4,738	*8.1*	1,036	*10.1*	2,158	*8.5*	580	*7.2*	8,512	*8.3*
Abruzzi	1,332	*2.3*	308	*3.0*	604	*2.4*	160	*2.0*	2,404	*2.4*
Molise	170	*0.3*	20	*0.2*	155	*0.6*	24	*0.3*	369	*0.4*
Campania	2,888	*4.9*	961	*9.3*	1,451	*5.7*	393	*4.9*	5,693	*5.6*
Apulia	2,193	*3.7*	642	*6.2*	1,548	*6.1*	307	*3.8*	4,690	*4.6*
Basilicata	331	*0.6*	67	*0.7*	233	*0.9*	43	*0.5*	674	*0.7*
Calabria	801	*1.4*	260	*2.5*	640	*2.5*	94	*1.2*	1,795	*1.8*
Sicily	2,564	*4.4*	866	*8.4*	1,711	*6.8*	378	*4.7*	5,519	*5.4*
Sardinia	854	*1.5*	166	*1.6*	587	*2.3*	109	*1.4*	1,716	*1.7*

Table 4.3. Hip. Primary total replacement. Number of hospitals by region and class of volume

	Class of volume					
	1-50	51-100	101-200	201-300	>300	TOTAL
Italy	**353**	**196**	**140**	**49**	**26**	**764**
Piedmont	12	16	15	6	3	**52**
Aosta Valley	0	2	0	0	0	**2**
Lombardy	40	35	21	9	10	**115**
AP Bolzano	2	3	4	1	0	**10**
AP Trento	4	0	3	1	0	**8**
Veneto	14	10	17	5	5	**51**
Friuli Venezia Giulia	2	3	8	2	0	**15**
Liguria	3	3	4	2	2	**14**
Emilia-Romagna	28	17	11	3	2	**61**
Tuscany	15	17	9	7	3	**51**
Umbria	5	6	3	0	0	**14**
Marche	9	4	4	2	0	**19**
Lazio	50	20	11	4	1	**86**
Abruzzi	10	7	4	1	0	**22**
Molise	5	1	0	0	0	**6**
Campania	48	14	9	2	0	**73**
Apulia	25	10	7	2	0	**44**
Basilicata	5	1	2	0	0	**8**
Calabria	14	3	2	1	0	**20**
Sicily	46	20	4	1	0	**71**
Sardinia	16	4	2	0	0	**22**

Table 4.4. Hip. Revision. Number of hospitals by region and class of volume

	Class of volume				
	1-10	11-25	26-50	>50	TOTAL
Italy	**438**	**153**	**53**	**22**	**666**
Piedmont	23	19	6	2	**50**
Aosta Valley	1	1	0	0	**2**
Lombardy	58	25	9	10	**102**
AP Bolzano	4	3	0	1	**8**
AP Trento	3	2	1	0	**6**
Veneto	21	17	9	0	**47**
Friuli Venezia Giulia	3	6	3	0	**12**
Liguria	6	4	1	2	**13**
Emilia-Romagna	37	9	7	1	**54**
Tuscany	25	6	9	4	**44**
Umbria	7	5	0	0	**12**
Marche	12	4	1	0	**17**
Lazio	52	11	4	1	**68**
Abruzzi	12	7	0	0	**19**
Molise	4	1	0	0	**5**
Campania	47	8	0	1	**56**
Apulia	31	10	1	0	**42**
Basilicata	5	1	0	0	**6**
Calabria	15	1	1	0	**17**
Sicily	55	9	1	0	**65**
Sardinia	17	4	0	0	**21**

Table 4.5. Hip. Number of hospital discharges by ICD-9-CM code and procedure type

		N	%
ICD-9-CM code	**Procedure type**	**98,986**	
81.51/00.85	**Total hip replacement**	**67,620**	***68.3***
	Total hip replacement (elective)	57,584	*85.2*
	Total hip replacement (emergency)	10,036	*14.8*
81.52	**Partial hip replacement**	**24,522**	***24.8***
	Revision	**6,844**	***6.9***
81.53	Revision of hip replacement, not otherwise specified	2,826	*41.3*
00.70	Revision of hip replacement, both acetabular and femoral components	1,157	*16.9*
00.71	Revision of hip replacement, acetabular component	1,334	*19.5*
00.72	Revision of hip replacement, femoral component	834	*12.2*
00.73	Revision of hip replacement, acetabular liner and/or femoral head only	693	*10.1*

Table 4.6. Hip. Number of hospital discharges by patient gender and age, and by procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Revision		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Number of hospital discharges	**57,584**		**10,036**		**24,522**		**6,844**		**98,986**	
Gender										
Males	26,427	*45.9*	2,740	*27.3*	6,619	*27.0*	2,592	*37.9*	**38,378**	*38.8*
Females	31,157	*54.1*	7,296	*72.7*	17,903	*73.0*	4,252	*62.1*	**60,608**	*61.2*
Average age by gender										
Male										
Mean age	65,3		72,6		83,3		69,9		**69,2**	
Standard deviation	11,9		12,2		8,6		12,4		**13,3**	
Median age	67		74		84		72		**71**	
Interquartile range	58-74		66-82		80-89		63-79		**61-79**	
Female										
Mean age	69,6		74,2		84,2		73,2		**74,7**	
Standard deviation	10,8		9,8		7,1		11,1		**11,6**	
Median age	71		75		85		75		**76**	
Interquartile range	64-77		68-81		80-89		67-81		**68-83**	
Age group by gender										
Male										
<45	1,463	*5.5*	59	*2.2*	38	*0.6*	98	*3.8*	**1,658**	*4.3*
45 - 54	3,510	*13.3*	190	*6.9*	49	*0.7*	231	*8.9*	**3,980**	*10.4*
55 - 64	6,111	*23.1*	381	*13.9*	131	*2.0*	404	*15.6*	**7,027**	*18.3*
65 - 74	8,817	*33.4*	769	*28.1*	492	*7.4*	791	*30.5*	**10,869**	*28.3*
75 - 84	6,033	*22.8*	893	*32.6*	2,605	*39.4*	853	*32.9*	**10,384**	*27.1*
≥ 85	493	*1.9*	448	*16.4*	3,304	*49.9*	215	*8.3*	**4,460**	*11.6*
Female										
<45	738	*2.4*	24	*0.3*	12	*0.1*	71	*1.7*	**845**	*1.4*
45 - 54	2,225	*7.1*	226	*3.1*	57	*0.3*	212	*5.0*	**2,720**	*4.5*
55 - 64	5,477	*17.6*	873	*12.0*	204	*1.1*	526	*12.4*	**7,080**	*11.7*
65 - 74	11,011	*35.3*	2,428	*33.3*	1,118	*6.2*	1,197	*28.2*	**15,754**	*26.0*
75 - 84	10,378	*33.3*	2,667	*36.6*	7,196	*40.2*	1,724	*40.5*	**21,965**	*36.2*
≥ 85	1,328	*4.3*	1,078	*14.8*	9,316	*52.0*	522	*12.3*	**12,244**	*20.2*

Table 4.7. Hip. Number of hospital discharges by procedure type and diagnosis (ICD-9-CM category code), and by gender

	Males		Females		TOTAL	
	N	%	N	%	N	% cum
Primary total replacement	**29,167**		**38,453**		**67,620**	
Osteoarthrosis	25,071	*86.0*	29,389	*76.4*	54,460	*80.5*
Fracture of neck of femur	2,710	*9.3*	7,227	*18.8*	9,937	*95.2*
Other disorders of bone and cartilage	897	*3.1*	995	*2.6*	1,892	*98.0*
Fracture of other and unspecified parts of femur	92	*0.3*	216	*0.6*	308	*98.5*
Complications peculiar to certain specified procedures	56	*0.2*	130	*0.3*	186	*98.8*
Late effects of musculoskeletal and connective tissue injuries	59	*0.2*	103	*0.3*	162	*99.0*
Other and unspecified disorders of joint	58	*0.2*	70	*0.2*	128	*99.2*
Other congenital anomalies of limbs	35	*0.1*	81	*0.2*	116	*99.4*
Other and unspecified arthropathies	43	*0.1*	44	*0.1*	87	*99.5*
Fracture of pelvis	34	*0.1*	18	*0.0*	52	*99.6*
Other diagnoses (freq <0.1% on total)	111	*0.4*	177	*0.5*	288	*100.0*
Not available data	1	*0.0*	3	*0.0*	4	*100.0*
Primary partial replacement	**6,619**		**17,903**		**24,522**	
Fracture of neck of femur	6,160	*93.1*	16,990	*94.9*	23,150	*94.4*
Fracture of other and unspecified parts of femur	172	*2.6*	327	*1.8*	499	*96.4*
Other disorders of bone and cartilage	81	*1.2*	178	*1.0*	259	*97.5*
Osteoarthrosis	87	*1.3*	134	*0.7*	221	*98.4*
Late effects of musculoskeletal and connective tissue injuries	23	*0.3*	59	*0.3*	82	*98.7*
Complications peculiar to certain specified procedures	23	*0.3*	57	*0.3*	80	*99.1*
Secondary malignant neoplasm of other specified sites	17	*0.3*	23	*0.1*	40	*99.2*
Other diagnoses (freq <0.1% on total)	56	*0.8*	132	*0.7*	188	*100.0*
Not available data	0	*0.0*	3	*0.0*	3	*100.0*

Follow

Table 4.7. Follow

	Males		Females		TOTAL	
	N	%	N	%	N	% cum
Revision	**2,592**		**4,252**		**6,844**	
Complications peculiar to certain specified procedures	2,316	*89.4*	3,767	*88.6*	6,083	*88.9*
Fracture of other and unspecified parts of femur	46	*1.8*	103	*2.4*	149	*91.1*
Fracture of neck of femur	40	*1.5*	84	*2.0*	124	*92.9*
Organ or tissue replaced by other means	42	*1.6*	64	*1.5*	106	*94.4*
Osteoarthrosis	35	*1.4*	63	*1.5*	98	*95.9*
Other orthopedic aftercare	14	*0.5*	26	*0.6*	40	*96.4*
Developmental dislocation of joint, pelvic region and thigh	13	*0.5*	24	*0.6*	37	*97.0*
Other disorders of bone and cartilage	8	*0.3*	18	*0.4*	26	*97.4*
Other and unspecified disorders of joint	16	*0.6*	8	*0.2*	24	*97.7*
Other complications of procedures not elsewhere classified	8	*0.3*	13	*0.3*	21	*98.0*
Other derangement of joint	9	*0.3*	12	*0.3*	21	*98.3*
Late effects of musculoskeletal and connective tissue injuries	3	*0.1*	14	*0.3*	17	*98.6*
Disorders of muscle, ligament, and fascia	7	*0.3*	7	*0.2*	14	*98.8*
Fracture of pelvis	1	*0.0*	9	*0.2*	10	*98.9*
Arthropathy associated with infections	5	*0.2*	2	*0.0*	7	*99.0*
Osteomyelitis, periostitis, and other infections involving bone	4	*0.2*	3	*0.1*	7	*99.1*
Septicemia	3	*0.1*	4	*0.1*	7	*99.2*
Bacterial infection in conditions classified elsewhere and of unspecified site	3	*0.1*	2	*0.0*	5	*99.3*
Some adverse effects not classified elsewhere	2	*0.1*	2	*0.0*	4	*99.4*
Other diagnoses (freq <0.1% on total)	17	*0.7*	27	*0.6*	44	*100.0*

Table 4.8. Hip. Number of hospital discharges by mode of discharge and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Revision		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Mode of discharge	**57,584**		**10,036**		**24,522**		**6,844**		**98,986**	
Dead	70	*0.1*	110	*1.1*	728	*3.0*	80	*1.2*	988	*1.0*
Ordinary discharge	30,267	*52.6*	5,591	*55.7*	12,891	*52.6*	3,649	*53.3*	52,398	*52.9*
Discharge to a residential health care	732	*1.3*	581	*5.8*	2,008	*8.2*	219	*3.2*	3,540	*3.6*
Discharge to hospital at home	61	*0.1*	31	*0.3*	47	*0.2*	5	*0.1*	144	*0.1*
Discharge against medical advice	89	*0.2*	50	*0.5*	113	*0.5*	15	*0.2*	267	*0.3*
Transfer to an acute admission unit of a different hospital	1,300	*2.3*	387	*3.9*	1,160	*4.7*	199	*2.9*	3,046	*3.1*
Transfer in the same hospital	13,828	*24.0*	976	*9.7*	1,751	*7.1*	1,360	*19.9*	17,915	*18.1*
Transfer to an inpatient rehabilitation hospital	11,031	*19.2*	2,109	*21.0*	5,325	*21.7*	1,259	*18.4*	19,724	*19.9*
Discharge to a nursing home	206	*0.4*	201	*2.0*	499	*2.0*	58	*0.8*	964	*1.0*

Table 4.9. Hip. Length of stay (in days) by region and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Revision	
Number of hospital discharges	**57,584**		**10,036**		**24,522**		**6,844**	
	Mean	***S.D.***	**Mean**	***S.D.***	**Mean**	***S.D.***	**Mean**	***S.D.***
Italy	**8.1**	***4.8***	**12.2**	***6.9***	**12.9**	***7.5***	**13.3**	***12.2***
Piedmont	8.2	*4.1*	13.8	*7.2*	14.5	*7.9*	15.2	*14.6*
Aosta Valley	7.2	*4.0*	13.8	*2.2*	12.4	*4.8*	14.9	*10.2*
Lombardy	7.3	*5.4*	11.6	*8.1*	12.8	*7.7*	11.0	*9.2*
AP Bolzano	8.4	*3.1*	9.7	*4.5*	11.9	*9.1*	13.8	*9.5*
AP Trento	6.1	*2.5*	9.1	*6.0*	9.3	*5.1*	10.9	*9.2*
Veneto	9.1	*4.9*	13.9	*7.6*	15.5	*8.8*	14.8	*10.0*
Friuli Venezia Giulia	8.5	*3.7*	13.0	*5.1*	13.8	*6.2*	13.7	*8.9*
Liguria	8.0	*8.3*	13.0	*8.3*	15.4	*7.4*	14.1	*11.5*
Emilia-Romagna	9.1	*4.0*	11.9	*5.7*	12.6	*7.0*	14.0	*14.2*
Tuscany	7.8	*3.0*	10.2	*4.2*	10.9	*5.2*	11.0	*6.1*
Umbria	7.8	*3.1*	11.7	*5.0*	11.3	*5.4*	13.3	*9.4*
Marche	10.0	*6.9*	15.1	*6.4*	14.5	*6.6*	12.6	*7.0*
Lazio	7.9	*4.4*	11.2	*8.7*	12.3	*7.9*	14.9	*19.7*
Abruzzi	7.9	*3.8*	11.6	*4.8*	11.6	*5.3*	13.1	*11.4*
Molise	8.2	*4.5*	16.4	*5.9*	15.7	*4.8*	21.6	*17.3*
Campania	8.8	*4.3*	12.9	*6.3*	12.6	*5.7*	15.4	*14.0*
Apulia	8.2	*4.4*	11.5	*5.0*	12.0	*6.0*	13.5	*10.2*
Basilicata	8.9	*7.3*	10.9	*5.2*	9.9	*4.2*	11.7	*8.6*
Calabria	8.4	*5.1*	10.5	*4.6*	11.1	*5.1*	14.4	*9.2*
Sicily	7.6	*4.2*	11.1	*6.1*	11.9	*8.8*	13.5	*12.8*
Sardinia	9.7	*8.4*	13.8	*6.9*	14.9	*12.5*	25.7	*22.6*

Table 4.10. Hip. Length of postoperative stay (in days) by region and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Revision	
Number of hospital discharges	**57,584**		**10,036**		**24,522**		**6,844**	
Number of used records*	***57,498***		***10,033***		***24,521***		***6,844***	
	Media	***D,S,***	**Media**	***D,S,***	**Media**	***D,S,***	**Media**	***D,S,***
Italy	**6.9**	***4.4***	**8.8**	***5.8***	**9.6**	***6.6***	**10.0**	***9.1***
Piedmont	7.1	*3.8*	10.6	*6.1*	11.4	*7.1*	12.0	*12.6*
Aosta Valley	6.0	*3.8*	10.5	*2.4*	10.7	*4.4*	10.4	*7.2*
Lombardy	6.2	*5.2*	8.4	*6.2*	9.6	*6.5*	8.5	*7.5*
AP Bolzano	7.4	*3.0*	8.0	*3.8*	9.7	*8.7*	11.5	*8.2*
AP Trento	5.2	*2.3*	6.6	*5.0*	7.1	*4.4*	8.3	*7.6*
Veneto	8.0	*4.5*	11.0	*6.6*	12.7	*8.1*	12.0	*8.2*
Friuli Venezia Giulia	7.5	*3.0*	10.4	*4.9*	11.3	*5.4*	11.2	*6.9*
Liguria	6.6	*7.9*	10.0	*7.5*	12.4	*6.7*	10.2	*8.7*
Emilia-Romagna	7.8	*3.6*	9.4	*4.9*	10.2	*6.3*	10.8	*10.0*
Tuscany	6.7	*2.8*	7.8	*3.5*	8.4	*4.4*	8.6	*4.8*
Umbria	6.6	*3.0*	8.0	*3.9*	7.9	*4.7*	9.9	*8.5*
Marche	9.1	*5.5*	10.8	*6.1*	11.8	*5.9*	9.9	*4.8*
Lazio	6.3	*3.6*	8.2	*7.8*	8.8	*6.6*	10.5	*12.8*
Abruzzi	6.4	*3.3*	7.6	*4.0*	7.7	*4.5*	8.9	*8.2*
Molise	5.8	*3.1*	12.3	*6.3*	10.1	*4.0*	13.1	*8.7*
Campania	6.5	*3.9*	7.1	*4.0*	7.0	*4.1*	9.4	*8.7*
Apulia	6.6	*3.6*	7.7	*4.0*	8.2	*4.9*	9.2	*7.9*
Basilicata	7.6	*7.2*	6.5	*2.8*	6.6	*3.3*	9.0	*8.0*
Calabria	7.1	*4.6*	6.9	*3.3*	6.6	*4.1*	11.1	*8.4*
Sicily	6.0	*3.5*	7.6	*4.5*	8.3	*7.9*	9.5	*10.0*
Sardinia	8.4	*7.4*	10.3	*6.1*	10.9	*10.9*	16.4	*12.7*

*Ninety records for which it was not possible to calculate the length of postoperative stay were excluded from the analysis

Table 4.11. Hip. Number of hospital discharges by hospitalization burden and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Revision		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Hospitalization burden	**57,584**		**10,036**		**24,522**		**6,844**		**98,986**	
National Health System	54,592	*94.8*	9,778	*97.4*	24,231	*98.8*	6,569	*96.0*	95,170	*96.1*
Patient's contribution for the accommodation payment	1,021	*1.8*	35	*0.3*	59	*0.2*	86	*1.3*	1,201	*1.2*
Reimbursement	106	*0.2*	17	*0.2*	3	*0.0*	10	*0.1*	136	*0.1*
Solvent	1,406	*2.4*	97	*1.0*	104	*0.4*	120	*1.8*	1,727	*1.7*
Surgeon's fee charged to patient	153	*0.3*	14	*0.1*	24	*0.1*	9	*0.1*	200	*0.2*
Surgeon's fee and accomodation charged to patient	188	*0.3*	20	*0.2*	26	*0.1*	25	*0.4*	259	*0.3*
Foreigners charged to National Health System	20	*0.0*	52	*0.5*	33	*0.1*	6	*0.1*	111	*0.1*
Indigent foreigners charged to National Health System	21	*0.0*	4	*0.0*	1	*0.0*	0	*0.0*	26	*0.0*
Indigent foreigners charged to the Ministry of the Interior	69	*0.1*	6	*0.1*	3	*0.0*	7	*0.1*	85	*0.1*
Other	7	*0.0*	13	*0.1*	37	*0.2*	12	*0.2*	69	*0.1*
Not correctly coded	1	*0.0*	0	*0.0*	1	*0.0*	0	*0.0*	2	*0.0*

Table 4.12. Knee. Number of procedures by region and procedure type

	Total replacement		Revision		TOTAL	
	N	%	N	%	N	%
Italy	**65,259**	***93.1***	**4,846**	***6.9***	**70,105**	***100.0***
Piedmont	4,636	*7.1*	413	*8.5*	5,049	*7.2*
Aosta Valley	128	*0.2*	9	*0.2*	137	*0.2*
Lombardy	14,095	*21.6*	1,266	*26.1*	15,361	*21.9*
AP Bolzano	891	*1.4*	61	*1.3*	952	*1.4*
AP Trento	592	*0.9*	24	*0.5*	616	*0.9*
Veneto	7,460	*11.4*	485	*10.0*	7,945	*11.3*
Friuli Venezia Giulia	1,694	*2.6*	97	*2.0*	1,791	*2.6*
Liguria	1,552	*2.4*	155	*3.2*	1,707	*2.4*
Emilia-Romagna	4,188	*6.4*	441	*9.1*	4,629	*6.6*
Tuscany	6,622	*10.2*	560	*11.6*	7,182	*10.2*
Umbria	1,341	*2.1*	64	*1.3*	1,405	*2.0*
Marche	1,518	*2.3*	85	*1.8*	1,603	*2.3*
Lazio	4,739	*7.3*	277	*5.7*	5,016	*7.2*
Abruzzi	1,903	*2.9*	65	*1.3*	1,968	*2.8*
Molise	239	*0.4*	8	*0.2*	247	*0.4*
Campania	3,024	*4.6*	152	*3.1*	3,176	*4.5*
Apulia	3,125	*4.8*	170	*3.5*	3,295	*4.7*
Basilicata	391	*0.6*	24	*0.5*	415	*0.6*
Calabria	1,177	*1.8*	63	*1.3*	1,240	*1.8*
Sicily	4,489	*6.9*	350	*7.2*	4,839	*6.9*
Sardinia	1,455	*2.2*	77	*1.6*	1,532	*2.2*

Table 4.13. Knee. Primary total replacement. Number of hospitals by region and class of volume

	Class of volume					
	1-50	51-100	101-200	201-300	>300	TOTAL
Italy	**403**	**162**	**110**	**40**	**39**	**754**
Piedmont	22	11	11	4	3	**51**
Aosta Valley	1	1	0	0	0	**2**
Lombardy	54	29	15	8	10	**116**
AP Bolzano	4	2	3	1	0	**10**
AP Trento	2	4	2	0	0	**8**
Veneto	17	12	11	3	6	**49**
Friuli Venezia Giulia	4	5	6	0	1	**16**
Liguria	7	3	3	0	2	**15**
Emilia-Romagna	42	13	4	2	2	**63**
Tuscany	19	10	9	5	7	**50**
Umbria	3	7	3	1	0	**14**
Marche	11	7	1	1	1	**21**
Lazio	48	12	16	1	1	**78**
Abruzzi	14	4	1	0	3	**22**
Molise	5	0	1	0	0	**6**
Campania	46	17	3	3	0	**69**
Apulia	29	3	8	3	1	**44**
Basilicata	5	1	2	0	0	**8**
Calabria	14	2	0	2	1	**19**
Sicily	41	17	8	4	1	**71**
Sardinia	15	2	3	2	0	**22**

Table 4.14. Knee. Revision. Number of hospitals by region and class of volume

	Class of volume				
	1-10	11-25	26-50	>50	TOTAL
Italy	**456**	**91**	**22**	**11**	**580**
Piedmont	30	11	2	0	**43**
Aosta Valley	2	0	0	0	**2**
Lombardy	71	13	9	5	**98**
AP Bolzano	7	1	0	0	**8**
AP Trento	6	0	0	0	**6**
Veneto	32	9	3	2	**46**
Friuli Venezia Giulia	11	3	0	0	**14**
Liguria	9	2	1	1	**13**
Emilia-Romagna	39	8	1	1	**49**
Tuscany	24	11	5	2	**42**
Umbria	10	1	0	0	**11**
Marche	13	2	0	0	**15**
Lazio	44	7	0	0	**51**
Abruzzi	9	3	0	0	**12**
Molise	5	0	0	0	**5**
Campania	39	1	0	0	**40**
Apulia	29	5	0	0	**34**
Basilicata	4	1	0	0	**5**
Calabria	11	2	0	0	**13**
Sicily	44	10	1	0	**55**
Sardinia	17	1	0	0	**18**

Table 4.15. Knee. Number of hospital discharges by ICD-9-CM code and procedure type

		N	%
ICD-9-CM code	**Procedure type**	**68,449**	
81.54	**Total knee replacement**	**64,293**	***93.9***
	Revision	**4,156**	***6.1***
81.55	Revision of knee replacement, not otherwise specified	1,592	*38.3*
00.80	Revision of knee replacement, total (all components)	1,739	*41.8*
00.81	Revision of knee replacement, tibial component	259	*6.2*
00.82	Revision of knee replacement, femoral component	96	*2.3*
00.83	Revision of knee replacement, patellar component	248	*6.0*
00.84	Revision of total knee replacement, tibial insert	222	*5.3*

Table 4.16. Knee. Number of hospital discharges by patient gender and age, and by procedure type

	Total replacement		Revision		TOTAL	
	N	%	N	%	N	%
Number of hospital discharges	**64,293**		**4,156**		**68,449**	
Gender						
Males	20,651	*32.1*	1,333	*32.1*	**21,984**	*32.1*
Females	43,642	*67.9*	2,823	*67.9*	**46,465**	*67.9*
Average age by gender						
Male						
Mean age	69.5		68.7		**69.5**	
Standard deviation	9.2		11.6		**9.4**	
Median age	71		71		**71**	
Interquartile range	65-76		64-77		**65-76**	
Female						
Mean age	70.7		70.8		**70.7**	
Standard deviation	8.1		9.0		**8.1**	
Median age	72		72		**72**	
Interquartile range	66-76		66-77		**66-76**	
Age group by gender						
Male						
<45	319	*1.5*	42	*3.2*	**361**	*1.6*
45 - 54	947	*4.6*	98	*7.4*	**1,045**	*4.8*
55 - 64	3,660	*17.7*	216	*16.2*	**3,876**	*17.6*
65 - 74	9,081	*44.0*	512	*38.4*	**9,593**	*43.6*
75 - 84	6,311	*30.6*	438	*32.9*	**6,749**	*30.7*
≥ 85	333	*1.6*	27	*2.0*	**360**	*1.6*
Female						
<45	211	*0.5*	25	*0.9*	**236**	*0.5*
45 - 54	1,381	*3.2*	114	*4.0*	**1,495**	*3.2*
55 - 64	7,052	*16.2*	436	*15.4*	**7,488**	*16.1*
65 - 74	19,455	*44.6*	1,177	*41.7*	**20,632**	*44.4*
75 - 84	14,799	*33.9*	991	*35.1*	**15,790**	*34.0*
≥ 85	744	*1.7*	80	*2.8*	**824**	*1.8*

Table 4.17. Knee. Number of hospital discharges by procedure type and diagnosis (ICD-9-CM category code), and by gender

	Males		Females		TOTAL	
	N	%	N	%	N	% cum
Total replacement	**20,651**		**43,642**		**64,293**	
Osteoarthrosis	19,867	*96.2*	42.400	*97.2*	62,267	*96.8*
Other acquired deformities of limbs	333	*1.6*	610	*1.4*	943	*98.3*
Other disorders of bone and cartilage	83	*0.4*	194	*0.4*	277	*98.7*
Complications peculiar to certain specified procedures	49	*0.2*	94	*0.2*	143	*99.0*
Internal derangement of knee	57	*0.3*	39	*0.1*	96	*99.1*
Other and unspecified disorders of joint	32	*0.2*	60	*0.1*	92	*99.3*
Osteochondropathies	45	*0.2*	34	*0.1*	79	*99.4*
Other and unspecified arthropathies	33	*0.2*	35	*0.1*	68	*99.5*
Other derangement of joint	24	*0.1*	24	*0.1*	48	*99.6*
Malignant neoplasm of bone and articular cartilage	20	*0.1*	21	*0.0*	41	*99.6*
Fracture of the femoral neck	11	*0.1*	23	*0.1*	34	*99.7*
Other diagnoses (freq <0.1% on total)	97	*0.5*	108	*0.2*	205	*100.0*
Revision	**1,333**		**2,823**		**4,156**	
Complications peculiar to certain specified procedures	1,135	*85.1*	2,405	*85.2*	3,540	*85.2*
Osteoarthrosis	61	*4.6*	164	*5.8*	225	*90.6*
Organ or tissue replaced by other means	33	*2.5*	62	*2.2*	95	*92.9*
Other orthopedic aftercare	19	*1.4*	43	*1.5*	62	*94.4*
Other and unspecified disorders of joint	13	*1.0*	39	*1.4*	52	*95.6*
Other derangement of joint	20	*1.5*	30	*1.1*	50	*96.8*
Internal derangement of knee	6	*0.5*	20	*0.7*	26	*97.4*
Other and unspecified arthropathies	5	*0.4*	9	*0.3*	14	*97.8*
Arthropathy associated with infections	5	*0.4*	8	*0.3*	13	*98.1*
Fracture of other and unspecified parts of femur	4	*0.3*	9	*0.3*	13	*98.4*
Osteomyelitis, periostitis, and other infections involving bone	7	*0.5*	5	*0.2*	12	*98.7*
Other complications of procedures not elsewhere classified	3	*0.2*	5	*0.2*	8	*98.9*
Other disorders of bone and cartilage	4	*0.3*	3	*0.1*	7	*99.1*
Dislocation of knee	3	*0.2*	2	*0.1*	5	*99.2*
Malignant neoplasm of bone and articular cartilage	3	*0.2*	2	*0.1*	5	*99.3*

Follow

Table 4.17. Follow

	Males		Females		TOTAL	
	N	%	N	%	N	% cum
Other disorders of synovium, tendon, and bursa	1	0.1	2	0.1	3	99.4
Fitting and adjustment of other device	0	0.0	3	0.1	3	99.4
Sprains and strains of knee and leg	3	0.2	0	0.0	3	99.5
Fracture of the femoral neck	0	0.0	3	0.1	3	99.6
Fracture of tibia and fibula	0	0.0	3	0.1	3	99.7
Other diagnoses (freq <0.1% on total)	8	0.6	6	0.2	14	100.0

Table 4.18. Knee. Number of hospital discharges by mode of discharge and procedure type

	Total replacement		Revision		TOTAL	
	N	%	N	%	N	%
Mode of discharge	**64,293**		**4,156**		**68,449**	
Dead	20	*0.0*	5	*0.1*	25	*0.0*
Ordinary discharge	33,461	*52.0*	2,289	*55.1*	35,750	*52.2*
Discharge to a residential health care	501	*0.8*	32	*0.8*	533	*0.8*
Discharge to hospital at home	54	*0.1*	1	*0.0*	55	*0.1*
Discharge against medical advice	58	*0.1*	2	*0.0*	60	*0.1*
Transfer to an acute admission unit of a different hospital	1,151	*1.8*	70	*1.7*	1,221	*1.8*
Transfer in the same hospital	16,598	*25.8*	1,060	*25.5*	17,658	*25.8*
Transfer to an inpatient rehabilitation hospital	12,270	*19.1*	683	*16.4*	12,953	*18.9*
Discharge to a nursing home	180	*0.3*	14	*0.3*	194	*0.3*

Table 4.19. Knee. Length of stay (in days) by region and procedure type

	Total replacement		Revision	
Number of hospital discharges	**64,293**		**4,156**	
	Mean	***S.D.***	**Mean**	***S.D.***
Italy	**7.6**	***3.7***	**9.7**	***7.5***
Piedmont	7.6	*3.5*	9.7	*6.8*
Aosta Valley	5.7	*3.9*	5.1	*3.7*
Lombardy	6.8	*3.5*	7.8	*5.4*
AP Bolzano	9.2	*3.4*	11.3	*5.5*
AP Trento	6.4	*2.6*	9.2	*7.2*
Veneto	8.0	*4.0*	10.8	*7.8*
Friuli Venezia Giulia	8.3	*3.5*	10.9	*5.6*
Liguria	7.4	*4.6*	11.0	*10.0*
Emilia-Romagna	9.0	*3.6*	12.2	*9.5*
Tuscany	7.8	*2.6*	9.1	*6.1*
Umbria	7.1	*2.8*	9.1	*4.4*
Marche	9.3	*3.5*	10.9	*6.6*
Lazio	7.4	*3.8*	9.6	*7.2*
Abruzzi	7.4	*3.1*	7.8	*6.2*
Molise	6.1	*3.2*	18.9	*7.3*
Campania	8.3	*3.6*	13.5	*12.5*
Apulia	7.5	*3.1*	10.5	*7.3*
Basilicata	8.0	*2.9*	10.7	*6.9*
Calabria	8.1	*4.2*	10.6	*12.1*
Sicily	6.9	*3.4*	8.6	*5.9*
Sardinia	8.4	*6.5*	13.2	*12.2*

Table 4.20. Knee. Length of postoperative stay (in days) by region and procedure type

	Total replacement		Revision	
Number of hospital discharges	**64,293**		**4,156**	
Number of used records*	***64,226***		***4,155***	
	Mean	***S.D.***	**Mean**	***S.D.***
Italy	**6.5**	***3.5***	**7.9**	***6.0***
Piedmont	6.6	*3.5*	8.5	*6.4*
Aosta Valley	4.7	*3.9*	4.1	*3.2*
Lombardy	5.8	*3.4*	6.5	*4.8*
AP Bolzano	8.2	*3.4*	10.0	*5.4*
AP Trento	5.6	*2.6*	7.4	*5.0*
Veneto	7.1	*3.8*	9.2	*6.4*
Friuli Venezia Giulia	7.4	*3.1*	9.7	*5.3*
Liguria	6.3	*4.5*	9.4	*9.7*
Emilia-Romagna	7.9	*3.5*	9.4	*5.7*
Tuscany	6.7	*2.5*	7.7	*4.2*
Umbria	6.0	*2.7*	7.7	*4.2*
Marche	8.5	*3.4*	9.8	*6.4*
Lazio	5.9	*3.3*	7.3	*6.0*
Abruzzi	6.0	*2.8*	5.7	*4.2*
Molise	4.5	*2.4*	10.8	*3.5*
Campania	6.2	*2.9*	9.8	*10.8*
Apulia	6.2	*2.5*	7.9	*4.9*
Basilicata	6.8	*2.7*	9.0	*6.8*
Calabria	6.9	*4.0*	8.5	*9.7*
Sicily	5.6	*3.6*	6.5	*4.3*
Sardinia	7.3	*6.1*	10.9	*10.5*

*Sixty-eight records for which it was not possible to calculate the length of postoperative stay were excluded from the analysis

Table 4.21. Knee. Number of hospital discharges by hospitalization burden and procedure type

	Total replacement		Revision		TOTAL	
	N	%	N	%	N	%
Hospitalization burden	**64.293**		**4,156**		**68,449**	
National Health System	62.116	*96.6*	4,021	*96.8*	66,137	*96.6*
Patient's contribution for the accommodation payment	985	*1.5*	76	*1.8*	1,061	*1.6*
Reimbursement	96	*0.1*	5	*0.1*	101	*0.1*
Solvent	898	*1.4*	42	*1.0*	940	*1.4*
Surgeon's fee charged to patient	69	*0.1*	2	*0.0*	71	*0.1*
Surgeon's fee and accomodation charged to patient	58	*0.1*	6	*0.1*	64	*0.1*
Foreigners charged to National Health System	18	*0.0*	2	*0.0*	20	*0.0*
Indigent foreigners charged to National Health System	15	*0.0*	0	*0.0*	15	*0.0*
Indigent foreigners charged to the Ministry of the Interior	33	*0.1*	2	*0.0*	35	*0.1*
Other	5	*0.0*	0	*0.0*	5	*0.0*

Table 4.22. Shoulder. Number of procedures by region and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		TOTAL	
	N	%	N	%	N	%	N	%
Italy	**4,463**	***62.1***	**1,491**	***20.7***	**1,233**	***17.2***	**7,187**	***100.0***
Piedmont	357	*8.0*	126	*8.5*	56	*4.5*	539	*7.5*
Aosta Valley	5	*0.1*	0	*0.0*	0	*0.0*	5	*0.1*
Lombardy	844	*18.9*	300	*20.1*	292	*23.7*	1.436	*20.0*
AP Bolzano	20	*0.5*	8	*0.5*	10	*0.8*	38	*0.5*
AP Trento	32	*0.7*	10	*0.7*	20	*1.6*	62	*0.9*
Veneto	458	*10.3*	187	*12.5*	254	*20.6*	899	*12.5*
Friuli Venezia Giulia	115	*2.6*	23	*1.5*	24	*2.0*	162	*2.3*
Liguria	109	*2.4*	24	*1.6*	23	*1.9*	156	*2.2*
Emilia-Romagna	614	*13.8*	150	*10.1*	82	*6.7*	846	*11.8*
Tuscany	443	*9.9*	50	*3.4*	67	*5.4*	560	*7.8*
Umbria	81	*1.8*	40	*2.7*	55	*4.5*	176	*2.5*
Marche	111	*2.5*	66	*4.4*	19	*1.5*	196	*2.7*
Lazio	412	*9.2*	113	*7.6*	97	*7.9*	622	*8.7*
Abruzzi	98	*2.2*	58	*3.9*	20	*1.6*	176	*2.5*
Molise	7	*0.2*	6	*0.4*	4	*0.3*	17	*0.2*
Campania	222	*5.0*	70	*4.7*	55	*4.5*	347	*4.8*
Apulia	199	*4.5*	105	*7.0*	62	*5.0*	366	*5.1*
Basilicata	22	*0.5*	1	*0.1*	4	*0.3*	27	*0.4*
Calabria	47	*1.1*	25	*1.7*	11	*0.9*	83	*1.2*
Sicily	234	*5.2*	110	*7.4*	49	*4.0*	393	*5.5*
Sardinia	33	*0.7*	19	*1.3*	29	*2.4*	81	*1.1*

Table 4.23. Shoulder. Primary total replacement. Number of hospitals by region and class of volume

	Class of volume					
	1-4	5-9	10-14	15-24	≥25	TOTAL
Italy	**249**	**118**	**61**	**57**	**66**	**551**
Piedmont	13	12	7	7	4	**43**
Aosta Valley	2	0	0	0	0	**2**
Lombardy	43	21	11	10	13	**98**
AP Bolzano	6	0	1	0	0	**7**
AP Trento	3	3	0	1	0	**7**
Veneto	8	9	8	10	9	**44**
Friuli Venezia Giulia	3	5	2	1	1	**12**
Liguria	10	1	0	1	1	**13**
Emilia-Romagna	21	12	5	7	9	**54**
Tuscany	11	7	1	1	8	**28**
Umbria	3	2	1	5	0	**11**
Marche	5	8	1	0	3	**17**
Lazio	28	12	4	5	6	**55**
Abruzzi	8	4	4	1	1	**18**
Molise	4	1	0	0	0	**5**
Campania	23	6	2	0	5	**36**
Apulia	16	4	7	2	3	**32**
Basilicata	1	1	1	0	0	**3**
Calabria	5	2	1	2	0	**10**
Sicily	26	6	5	3	3	**43**
Sardinia	10	2	0	1	0	**13**

Table 4.24. Shoulder. Primary partial replacement. Number of hospitals by region and class of volume

	Class of volume					
	1-4	5-9	10-14	15-24	≥25	TOTAL
Italy	**231**	**45**	**16**	**12**	**4**	**308**
Piedmont	23	1	1	0	0	**25**
Aosta Valley	0	0	0	0	0	**0**
Lombardy	36	12	4	3	1	**56**
AP Bolzano	4	0	0	0	0	**4**
AP Trento	5	0	1	0	0	**6**
Veneto	18	5	5	5	1	**34**
Friuli Venezia Giulia	4	1	1	0	0	**6**
Liguria	4	1	1	0	0	**6**
Emilia-Romagna	19	1	0	1	1	**22**
Tuscany	19	2	0	1	0	**22**
Umbria	4	2	0	0	1	**7**
Marche	7	1	0	0	0	**8**
Lazio	29	8	0	0	0	**37**
Abruzzi	4	2	0	0	0	**6**
Molise	3	0	0	0	0	**3**
Campania	14	3	0	1	0	**18**
Apulia	9	5	1	0	0	**15**
Basilicata	3	0	0	0	0	**3**
Calabria	3	1	0	0	0	**4**
Sicily	16	0	2	0	0	**18**
Sardinia	7	0	0	1	0	**8**

Table 4.25. Shoulder. Number of hospital discharges by procedure type

		N	%
ICD-9-CM code	**Procedure type**	**6,935**	
81.80	**Total shoulder replacement**	**5,812**	***83.8***
	Total replacement (elective)	4,369	*75.2*
	Total replacement (emergency)	1,443	*24.8*
81.81	**Partial shoulder replacement**	**1,123**	***16.2***

Table 4.26. Shoulder. Number of hospital discharges by patient gender and age, and by procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		TOTAL	
	N	%	N	%	N	%	N	%
Number of hospital discharges	**4,369**	**63.0**	**1,443**	**20.8**	**1,123**	**16.2**	**6,935**	
Gender								
Males	1,276	*29.2*	230	*15.9*	456	*40.6*	1,962	*28.3*
Females	3,093	*70.8*	1.213	*84.1*	667	*59.4*	4,973	*71.7*
Average age by gender								
Male								
Mean age	69.2		70.7		63.0		67.9	
Standard deviation	9.5		10.4		12.9		10.9	
Median age	71		72		64		70	
Interquartile range	65-76		65-78		57-72		63-75	
Female								
Mean age	72.9		74.5		70.2		72.9	
Standard deviation	7.1		7.3		11.6		8.0	
Median age	74		75		72		74	
Interquartile range	69-77		70-79		65-78		69-78	
Age group by gender								
Male								
<45	30	*2.4*	5	*2.2*	37	*8.1*	72	*3.7*
45 - 54	77	*6.0*	11	*4.8*	58	*12.7*	146	*7.4*
55 - 64	187	*14.7*	36	*15.7*	137	*30.0*	360	*18.3*
65 - 74	588	*46.1*	84	*36.5*	144	*31.6*	816	*41.6*
75 - 84	380	*29.8*	79	*34.3*	71	*15.6*	530	*27.0*
≥ 85	14	*1.1*	15	*6.5*	9	*2.0*	38	*1.9*
Female								
<45	13	*0.4*	1	*0.1*	21	*3.1*	35	*0.7*
45 - 54	46	*1.5*	11	*0.9*	26	*3.9*	83	*1.7*
55 - 64	255	*8.2*	105	*8.7*	114	*17.1*	474	*9.5*
65 - 74	1,395	*45.1*	434	*35.8*	242	*36.3*	2,071	*41.6*
75 - 84	1,316	*42.5*	565	*46.6*	229	*34.3*	2,110	*42.4*
≥ 85	68	*2.2*	97	*8.0*	35	*5.2*	200	*4.0*

Table 4.27. Shoulder. Number of hospital discharges by procedure type and diagnosis (ICD-9-CM category code), and by gender

	Males		Females		TOTAL	
	N	%	N	%	N	% cum
Total replacement	**1,506**		**4,306**		**5,812**	
Osteoarthrosis	877	*58.2*	2,319	*53.9*	3,196	*55.0*
Fracture of humerus	226	*15.0*	1,190	*27.6*	1,416	*79.4*
Other disorders of synovium, tendon, and bursa	110	*7.3*	156	*3.6*	266	*83.9*
Other and unspecified arthropathies	54	*3.6*	123	*2.9*	177	*87.0*
Complications peculiar to certain specified procedures	43	*2.9*	80	*1.9*	123	*89.1*
Peripheral enthesopathies and allied syndromes	53	*3.5*	64	*1.5*	117	*91.1*
Other disorders of bone and cartilage	31	*2.1*	81	*1.9*	112	*93.0*
Other and unspecified disorders of joint	23	*1.5*	65	*1.5*	88	*94.5*
Late effects of musculoskeletal and connective tissue injuries	21	*1.4*	58	*1.3*	79	*95.9*
Other derangement of joint	17	*1.1*	47	*1.1*	64	*97.0*
Fracture of scapula	5	*0.3*	34	*0.8*	39	*97.7*
Dislocation of shoulder	8	*0.5*	29	*0.7*	37	*98.3*
Other orthopedic aftercare	7	*0.5*	13	*0.3*	20	*98.7*
Sprains and strains of shoulder and upper arm	7	*0.5*	9	*0.2*	16	*98.9*
Organ or tissue replaced by other means	6	*0.4*	2	*0.0*	8	*99.1*
Malignant neoplasm of bone and articular cartilage	4	*0.3*	3	*0.1*	7	*99.2*
Arthropathy associated with infections	3	*0.2*	3	*0.1*	6	*99.3*
Crystal arthropathies	1	*0.1*	3	*0.1*	4	*99.4*
Other complications of procedures not elsewhere classified	0	*0.0*	3	*0.1*	3	*99.4*
Osteomyelitis, periostitis, and other infections involving bone	2	*0.1*	1	*0.0*	3	*99.5*
Secondary malignant neoplasm of other specified sites	1	*0.1*	2	*0.0*	3	*99.5*
Other diagnoses (freq <0.1% on total)	7	*0.5*	21	*0.5*	28	*100.0*
Partial replacement	**456**		**667**		**1,123**	
Fracture of humerus	126	*27.6*	310	*46.5*	436	*38.8*
Osteoarthrosis	108	*23.7*	155	*23.2*	263	*62.2*
Other disorders of synovium, tendon, and bursa	109	*23.9*	91	*13.6*	200	*80.1*
Peripheral enthesopathies and allied syndromes	26	*5.7*	20	*3.0*	46	*84.1*
Other disorders of bone and cartilage	8	*1.8*	22	*3.3*	30	*86.8*

Follow

Table 4.27. Follow

	Males		Females		TOTAL	
	N	%	N	%	N	% cum
Complications peculiar to certain specified procedures	11	2.4	18	2.7	29	89.4
Dislocation of shoulder	16	3.5	7	1.0	23	91.5
Other and unspecified disorders of joint	5	1.1	9	1.3	14	92.7
Other and unspecified arthropathies	9	2.0	3	0.4	12	93.8
Malignant neoplasm of bone and articular cartilage	9	2.0	3	0.4	12	94.8
Fracture of neck of femur	2	0.4	6	0.9	8	95.5
Other derangement of joint	4	0.9	3	0.4	7	96.2
Late effects of musculoskeletal and connective tissue injuries	4	0.9	3	0.4	7	96.8
Secondary malignant neoplasm of other specified sites	2	0.4	4	0.6	6	97.3
Sprains and strains of shoulder and upper arm	2	0.4	2	0.3	4	97.7
Fracture of radius and ulna	2	0.4	1	0.1	3	98.0
Other acquired deformities of limbs	0	0.0	2	0.3	2	98.1
Fracture of scapula	0	0.0	2	0.3	2	98.3
Osteomyelitis, periostitis, and other infections involving bone	2	0.4	0	0.0	2	98.5
Malignant neoplasm of connective and other soft tissue	2	0.4	0	0.0	2	98.7
Other benign neoplasm of connective and other soft tissue	1	0.2	0	0.0	1	98.8
Other orthopedic aftercare	1	0.2	0	0.0	1	98.8
Rheumatoid arthritis and other inflammatory polyarthropathies	0	0.0	1	0.1	1	98.9
Fracture of pelvis	1	0.2	0	0.0	1	99.0
Fracture of ankle	1	0.2	0	0.0	1	99.1
Fracture of clavicle	1	0.2	0	0.0	1	99.2
Bacterial infection in conditions classified elsewhere and of unspecified site	0	0.0	1	0.1	1	99.3
Transient cerebral ischemia	1	0.2	0	0.0	1	99.4
Organ or tissue replaced by other means	1	0.2	0	0.0	1	99.5
Flat foot	0	0.0	1	0.1	1	99.6
Symptoms involving cardiovascular system	0	0.0	1	0.1	1	99.6
Injury to spleen	1	0.2	0	0.0	1	99.7
Benign neoplasm of bone and articular cartilage	0	0.0	1	0.1	1	99.8
Neoplasm of uncertain behavior of other and unspecified sites and tissues	0	0.0	1	0.1	1	99.9
Neoplasms of unspecified nature	1	0.2	0	0.0	1	100.0

Table 4.28. Shoulder. Number of hospital discharges by mode of discharge and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		TOTAL	
	N	%	N	%	N	%	N	%
Mode of discharge	**4,369**		**1,443**		**1,123**		**6,935**	
Dead	1	*0.0*	1	*0.1*	2	*0.2*	4	*0.1*
Ordinary discharge	4,086	*93.5*	1,333	*92.4*	1,065	*94.8*	6,484	*93.5*
Discharge to a residential health care	9	*0.2*	17	*1.2*	7	*0.6*	33	*0.5*
Discharge to hospital at home	0	*0.0*	2	*0.1*	2	*0.2*	4	*0.1*
Discharge against medical advice	4	*0.1*	6	*0.4*	1	*0.1*	11	*0.2*
Transfer to an acute admission unit of a different hospital	31	*0.7*	13	*0.9*	6	*0.5*	50	*0.7*
Transfer in the same hospital	177	*4.1*	18	*1.2*	12	*1.1*	207	*3.0*
Transfer to an inpatient rehabilitation hospital	61	*1.4*	48	*3.3*	22	*2.0*	131	*1.9*
Discharge to a nursing home	0	*0.0*	5	*0.3*	6	*0.5*	11	*0.2*

Table 4.29. Shoulder. Length of stay (in days) by region and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement	
Number of hospital discharges	**4,369**		**1,443**		**1,123**	
	Mean	***S.D.***	**Mean**	***S.D.***	**Mean**	***S.D.***
Italy	**5.4**	***3.4***	**9.5**	***6.0***	**6.5**	***6.3***
Piedmont	5.6	*2.6*	7.2	*4.9*	7.0	*8.7*
Aosta Valley	9.4	*6.2*	-	-	-	-
Lombardy	5.2	*2.5*	8.9	*5.7*	6.8	*7.0*
AP Bolzano	6.4	*2.3*	11.1	*5.5*	9.5	*3.0*
AP Trento	5.3	*1.8*	8.8	*2.3*	8.1	*7.7*
Veneto	6.1	*4.0*	10.9	*6.1*	3.7	*4.5*
Friuli Venezia Giulia	5.9	*8.1*	10.4	*4.8*	8.1	*15.4*
Liguria	2.9	*1.7*	11.5	*7.0*	8.8	*3.9*
Emilia-Romagna	5.2	*2.8*	8.7	*5.3*	7.0	*5.3*
Tuscany	4.7	*1.5*	7.4	*4.0*	7.2	*4.4*
Umbria	4.8	*1.9*	9.1	*6.6*	5.0	*3.1*
Marche	3.2	*1.8*	7.3	*4.9*	11.8	*12.0*
Lazio	5.7	*2.9*	10.8	*8.9*	7.4	*4.9*
Abruzzi	5.7	*2.3*	10.7	*6.5*	6.9	*3.8*
Molise	7.3	*1.6*	13.8	*4.4*	8.5	*2.1*
Campania	7.0	*6.4*	11.7	*6.5*	5.7	*4.0*
Apulia	5.7	*3.4*	10.0	*4.9*	7.4	*5.1*
Basilicata	5.2	*1.6*	11.0	-	4.5	*3.5*
Calabria	6.1	*2.8*	7.3	*3.7*	9.0	*7.5*
Sicily	5.5	*2.7*	10.1	*5.1*	7.4	*4.4*
Sardinia	6.9	*3.5*	12.2	*5.6*	8.4	*3.7*

Table 4.30. Shoulder. Length of postoperative stay (in days) by region and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement	
Number of hospital discharges	**4,369**		**1,443**		**1,123**	
	Mean	***S.D.***	**Mean**	***S.D.***	**Mean**	***S.D.***
Italy	**4.3**	***2.3***	**5.5**	***4.1***	**4.2**	***4.4***
Piedmont	4.6	*2.5*	4.8	*2.6*	5.3	*7.4*
Aosta Valley	6.0	*1.9*	-	-	-	-
Lombardy	4.4	*2.1*	5.5	*4.1*	4.7	*5.0*
AP Bolzano	5.7	*1.9*	8.4	*5.1*	7.0	*1.9*
AP Trento	4.5	*1.7*	6.0	*2.5*	5.0	*4.3*
Veneto	5.3	*3.7*	6.8	*4.8*	2.9	*4.8*
Friuli Venezia Giulia	4.7	*3.3*	6.7	*4.1*	4.0	*2.6*
Liguria	2.5	*1.3*	6.9	*5.6*	5.5	*2.3*
Emilia-Romagna	4.3	*1.9*	5.2	*3.9*	4.4	*2.4*
Tuscany	3.7	*1.4*	4.8	*2.4*	4.7	*2.8*
Umbria	3.6	*1.8*	4.7	*4.1*	3.6	*2.1*
Marche	3.0	*1.6*	4.8	*3.4*	8.2	*11.0*
Lazio	4.1	*1.8*	5.5	*5.4*	4.3	*2.4*
Abruzzi	4.7	*1.7*	6.5	*6.2*	4.4	*1.8*
Molise	6.0	*1.4*	6.2	*1.6*	5.3	*1.3*
Campania	3.9	*2.4*	5.1	*4.0*	3.5	*2.8*
Apulia	4.1	*2.4*	4.9	*2.7*	3.8	*2.5*
Basilicata	4.1	*1.6*	3.0	*–.*	3.5	*3.5*
Calabria	4.9	*2.9*	4.5	*2.8*	6.7	*4.8*
Sicily	4.0	*1.9*	5.3	*2.6*	4.1	*2.1*
Sardinia	5.4	*2.8*	5.6	*2.0*	4.4	*1.6*

Table 4.31. Shoulder. Number of hospital discharges by hospitalization burden and procedure type

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		TOTAL	
	N	%	N	%	N	%	N	%
Hospitalization burden	**4,369**		**1,443**		**1,123**		**6,935**	
National Health System	4,206	*96.3*	1,407	*97.5*	1,092	*97.2*	6,705	*96.7*
Patient's contribution for the accommodation payment	90	*2.1*	5	*0.3*	15	*1.3*	110	*1.6*
Reimbursement	4	*0.1*	0	*0.0*	1	*0.1*	5	*0.1*
Solvent	47	*1.1*	19	*1.3*	13	*1.2*	79	*1.1*
Surgeon's fee charged to patient	6	*0.1*	1	*0.1*	0	*0.0*	7	*0.1*
Surgeon's fee and accomodation charged to patient	10	*0.2*	4	*0.3*	1	*0.1*	15	*0.2*
Foreigners charged to National Health System	4	*0.1*	5	*0.3*	1	*0.1*	10	*0.1*
Indigent foreigners charged to National Health System	0	*0.0*	2	*0.1*	0	*0.0*	2	*0.0*
Indigent foreigners charged to the Ministry of the Interior	2	*0.0*	0	*0.0*	0	*0.0*	2	*0.0*

Table 4.32. Ankle. Number of procedures by region and procedure type

	Total ankle replacement	
	N	%
Italy	**492**	
Piedmont	9	*1.8*
Aosta Valley	0	*0.0*
Lombardy	189	*38.4*
AP Bolzano	3	*0.6*
AP Trento	15	*3.1*
Veneto	49	*10.0*
Friuli Venezia Giulia	3	*0.6*
Liguria	4	*0.8*
Emilia-Romagna	152	*30.9*
Tuscany	10	*2.0*
Umbria	7	*1.4*
Marche	3	*0.6*
Lazio	24	*4.9*
Abruzzi	1	*0.2*
Molise	1	*0.2*
Campania	7	*1.4*
Apulia	6	*1.2*
Basilicata	0	*0.0*
Calabria	2	*0.4*
Sicily	7	*1.4*
Sardinia	0	*0.0*

Table 4.33. Ankle. Primary total replacement. Number of hospitals by region and class of volume

	Class of volume			
	1-2	3-4	≥5	TOTAL
Italy	**74**	**15**	**19**	**108**
Piedmont	5	1	0	**6**
Aosta Valley	0	0	0	**0**
Lombardy	18	4	7	**29**
AP Bolzano	2	0	0	**2**
AP Trento	1	0	1	**2**
Veneto	5	2	4	**11**
Friuli Venezia Giulia	2	0	0	**2**
Liguria	1	1	0	**2**
Emilia-Romagna	10	1	5	**16**
Tuscany	6	1	0	**7**
Umbria	1	2	0	**3**
Marche	3	0	0	**3**
Lazio	8	1	1	**10**
Abruzzi	1	0	0	**1**
Molise	1	0	0	**1**
Campania	7	0	0	**7**
Apulia	1	0	1	**2**
Basilicata	0	0	0	**0**
Calabria	1	0	0	**1**
Sicily	1	2	0	**3**
Sardinia	0	0	0	**0**

Table 4.34. Ankle. Number of hospital discharges by procedure type

		N
ICD-9-CM code	**Procedure type**	
81.56	**Total ankle replacement**	**481**

Table 4.35. Ankle. Number of hospital discharges by patient gender and age, and by procedure type

	Total ankle replacement	
	N	%
Number of hospital discharges	**481**	
Gender		
Males	267	*55.5*
Females	214	*44.5*
Average age by gender		
Male		
Mean age	51,4	
Standard deviation	16,3	
Median age	51	
Interquartile range	38-65	
Female		
Mean age	56,1	
Standard deviation	16,2	
Median age	56,5	
Interquartile range	46-69	
Age group by gender		
Male		
<45	93	*34.8*
45 - 54	52	*19.5*
55 - 64	53	*19.9*
65 - 74	45	*16.9*
75 - 84	24	*9.0*
≥ 85	0	*0.0*
Female		
<45	47	*22.0*
45 - 54	45	*21.0*
55 - 64	51	*23.8*
65 - 74	45	*21.0*
75 - 84	24	*11.2*
≥ 85	2	*0.9*

Table 4.36. Ankle. Number of hospital discharges by procedure type and diagnosis (ICD-9-CM category code), and by gender

	Males		Females		TOTAL	
	N	%	N	%	N	% cum
Total ankle replacement	**267**		**214**		**481**	
Osteoarthrosis	195	*73.0*	172	*80.4*	367	*76.3*
Other derangement of joint	20	*7.5*	7	*3.3*	27	*81.9*
Other and unspecified arthropathies	12	*4.5*	5	*2.3*	17	*85.4*
Late effects of musculoskeletal and connective tissue injuries	11	*4.1*	5	*2.3*	16	*88.8*
Osteochondropathies	7	*2.6*	7	*3.3*	14	*91.7*
Other and unspecified disorders of joint	6	*2.2*	4	*1.9*	10	*93.8*
Arthropathy associated with other disorders classified elsewhere	6	*2.2*	0	*0.0*	6	*95.0*
Complications peculiar to certain specified procedures	2	*0.7*	4	*1.9*	6	*96.3*
Other disorders of bone and cartilage	3	*1.1*	1	*0.5*	4	*97.1*
Fracture of neck of femur	0	*0.0*	3	*1.4*	3	*97.7*
Other acquired deformities of limbs	2	*0.7*	0	*0.0*	2	*98.1*
Other orthopedic aftercare	0	*0.0*	1	*0.5*	1	*98.3*
Arthropathy associated with infections	0	*0.0*	1	*0.5*	1	*98.5*
Fracture of vertebral column without mention of spinal cord injury	1	*0.4*	0	*0.0*	1	*98.8*
Fracture of tibia and fibula	1	*0.4*	0	*0.0*	1	*99.0*
Fracture of other and unspecified parts of femur	0	*0.0*	1	*0.5*	1	*99.2*
Fracture of one or more tarsal and metatarsal bones	0	*0.0*	1	*0.5*	1	*99.4*
Gout	1	*0.4*	0	*0.0*	1	*99.6*
Acute myocardial infarction	0	*0.0*	1	*0.5*	1	*99.8*
Flat foot	0	*0.0*	1	*0.5*	1	*100.0*

Table 4.37. Ankle. Number of hospital discharges by mode of discharge and procedure type

	Total ankle replacement	
	N	%
Mode of discharge	**481**	
Dead	0	0.0
Ordinary discharge	471	97.9
Discharge to a residential health care	0	0.0
Discharge to hospital at home	0	0.0
Discharge against medical advice	0	0.0
Transfer to an acute admission unit of a different hospital	1	0.2
Transfer in the same hospital	4	0.8
Transfer to an inpatient rehabilitation hospital	5	1.0
Discharge to a nursing home	0	0.0

Table 4.38. Ankle. Length of total and postoperative stay (in days) by region and procedure type

	Total ankle replacement			
Number of hospital discharges	**481**			
	Total stay		**Postoperative stay**	
	Mean	***S.D.***	**Mean**	***S.D.***
Italy	**4.6**	***4.4***	**3.6**	***2.9***
Piedmont	5.4	*2.8*	4.9	*2.5*
Aosta Valley	-	-	-	-
Lombardy	4.5	*3.0*	3.8	*2.7*
AP Bolzano	3.3	*2.3*	3.0	*1.7*
AP Trento	3.0	*1.3*	2.5	*1.2*
Veneto	5.1	*4.2*	4.5	*3.5*
Friuli Venezia Giulia	4.3	*2.1*	4.0	*2.0*
Liguria	7.5	*4.4*	6.3	*3.9*
Emilia-Romagna	4.0	*5.7*	2.7	*1.8*
Tuscany	7.5	*7.2*	6.8	*7.6*
Umbria	2.9	*1.2*	2.1	*0.9*
Marche	4.0	*3.5*	3.3	*3.2*
Lazio	4.3	*3.2*	3.9	*2.9*
Abruzzi	2.0	-	2.0	-
Molise	11.0	-	5.0	-
Campania	11.6	*9.8*	7.4	*7.7*
Apulia	7.8	*3.0*	5.3	*1.0*
Basilicata	-	-	-	-
Calabria	6.5	*0.7*	5.5	*0.7*
Sicily	4.7	*1.5*	3.7	*1.5*
Sardinia	-	-	-	-

Table 4.39. Ankle. Number of hospital discharges by hospitalization burden and procedure type

	Total ankle replacement	
	N	%
Hospitalization burden	**481**	
National Health System	450	*93.6*
Patient's contribution for the accommodation payment	1	*0.2*
Reimbursement	2	*0.4*
Solvent	28	*5.8*
Surgeon's fee charged to patient	0	*0.0*
Surgeon's fee and accomodation charged to patient	0	*0.0*
Foreigners charged to National Health System	0	*0.0*
Indigent foreigners charged to National Health System	0	*0.0*
Indigent foreigners charged to the Ministry of the Interior	0	*0.0*
Other	0	*0.0*

Table 5.1. Number of participating hospitals and coverage and number of collected procedures and completeness, by participant and operated joint (2016)

Participant	Joint	Participating hospitals	*Coverage (*)*	Collected procedure	*Completeness (**)*
Regions		**N**	***%***	**N**	***%***
Lombardy	Hip	106	*100.0*	23,521	*96.1*
	Knee	109	*100.0*	17,872	*96.0*
AP Bolzano	Hip	8	*80.0*	1,368	*94.3*
	Knee	8	*80.0*	865	*90.0*
AP Trento	Hip	8	*100.0*	1,114	*93.6*
	Knee	8	*100.0*	661	*90.2*
Tuscany	Hip	1	*2.2*	358	*4.0*
	Knee	1	*2.2*	175	*2.3*
Marche	Hip	9	*45.0*	802	*33.8*
	Knee	9	*50.0*	875	*49.6*
Abruzzi	Hip	2	*10.0*	54	*2.2*
	Knee	2	*9.5*	14	*0.7*
Apulia	Hip	40	*100.0*	3,536	*74.1*
	Knee	41	*100.0*	2,676	*74.4*
Basilicata	Hip	2	*33.3*	225	*34.5*
	Knee	2	*33.3*	223	*52.5*
Calabria	Hip	9	*45.0*	724	*38.3*
	Knee	9	*50.0*	811	*57.4*
Sicily	Hip	12	*16.2*	827	*14.9*
	Knee	12	*17.1*	958	*18.1*
s/Total Regions	**Hip**	**197**	***56.3***	**32,529**	***60.4***
	Knee	**201**	***57.9***	**25,130**	***59.1***
Single hospitals					
"Santa Maria della Misericordia" Hospital (UD)	Hip	1	-	123	*89,8*
	Knee	1	-	129	*90,2*
"Santa Corona" Hospital (Pietra Ligure, SV)	Hip	1	-	556	*99,6*
	Knee	1	-	264	*100,0*
s/Total Single hospitals	**Hip**	**2**	**-**	**679**	***97,7***
	Knee	**2**	**-**	**393**	***96,6***
TOTAL	**Hip**	**199**	**-**	**33.208**	***60,9***
	Knee	**203**	**-**	**25.523**	***59,4***

(*) Coverage: Number of participating hospitals / Number of hospitals performing arthroplasty surgeries based on data from HDD
(**) Completeness: Number of collected procedures / Number of performed procedures by all hospitals in the Region (based on data from HDD)

Table 5.2. Hip. Number of procedures by procedure type. Comparison between 2015 HDD and 2016 RIAP data

	HDD (2015)		RIAP (2016)	
	N	%	N	%
Procedure type	**102,378**		**29,795 (*)**	
Total replacement	68,998	*67.4*	21,556	*72.3*
Total replacement (elective)	*58,703*	*85.1*	*19,617*	*91.0*
Total replacement (emergency)	*10,295*	*14.9*	*1,939*	*9.0*
Partial replacement	25,326	*24.7*	6,701	*22.5*
Revision	8,054	*7.9*	1,538	*5.2*
Total revision	-	-	1,068	*69.4*
Partial revision	-	-	164	*10.7*
Removal of prosthesis	-	-	304	*19.8*
Conversion from partial to total replacement	-	-	1	*0.1*
Spacer revision	-	-	1	*0.1*

(*) Data passed the quality control checks (see figure 5.1)

Table 5.3. Hip. Number of procedures by type of provider and procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency							
	N	%	N	%	N	%	N	%	N	%
Type of provider	**19,617**		**1,939**		**6,701**		**1,538**		**29,795**	
Public hospitals	7,394	*37.7*	1,521	*78.4*	5,399	*80.6*	691	*44.9*	15,005	*50.4*
Private hospitals, accredited	12,060	*61.5*	414	*21.4*	1,288	*19.2*	834	*54.2*	14,596	*49.0*
Private hospitals, not accredited	163	*0.8*	4	*0.2*	14	*0.2*	13	*0.8*	194	*0.7*

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

Table 5.4. Hip. Number of procedures by patient gender and age group, and by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency							
	N	%	N	%	N	%	N	%	N	%
Gender	**19,617**		**1,939**		**6,701**		**1,538**		**29,795**	
Males	9,090	*46.3*	524	*27.0*	1,770	*26.4*	610	*39.7*	**11,994**	*40.3*
Females	10,527	*53.7*	1,415	*73.0*	4,931	*73.6*	928	*60.3*	**17,801**	*59.7*
Age group by gender										
Male	**9,090**		**524**		**1,770**		**610**		**11,994**	
<45	501	*5.5*	10	*1.9*	18	*1.0*	28	*4.6*	557	*4.6*
45 - 54	1,212	*13.3*	55	*10.5*	22	*1.2*	56	*9.2*	1,345	*11.2*
55 - 64	1,999	*22.0*	68	*13.0*	61	*3.4*	98	*16.1*	2,226	*18.6*
65 - 74	2,849	*31.3*	149	*28.4*	131	*7.4*	149	*24.4*	3,278	*27.3*
75 - 84	1,890	*20.8*	164	*31.3*	695	*39.3*	165	*27.0*	2,914	*24.3*
≥ 85	163	*1.8*	54	*10.3*	792	*44.7*	41	*6.7*	1,050	*8.8*
n/a(**)	476	*5.2*	24	*4.6*	51	*2.9*	73	*12.0*	624	*5.2*
Female	**10,527**		**1,415**		**4,931**		**928**		**17,801**	
<45	237	*2.3*	9	*0.6*	8	*0.2*	22	*2.4*	276	*1.6*
45 - 54	709	*6.7*	53	*3.7*	9	*0.2*	41	*4.4*	812	*4.6*
55 - 64	1,820	*17.3*	183	*12.9*	49	*1.0*	108	*11.6*	2,160	*12.1*
65 - 74	3,508	*33.3*	493	*34.8*	287	*5.8*	255	*27.5*	4,543	*25.5*
75 - 84	3,312	*31.5*	468	*33.1*	1,932	*39.2*	365	*39.3*	6,077	*34.1*
≥ 85	452	*4.3*	145	*10.2*	2,526	*51.2*	72	*7.8*	3,195	*17.9*
n/a (**)	489	*4.6*	64	*4.5*	120	*2.4*	65	*7.0*	738	*4.1*

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

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

Table 5.5. Hip. Patient age by gender and procedure type

	Total replacement		Partial replacement	Revision (*)	TOTAL
	elective	emergency			
Male (**)					
Mean age	65	71	82	69	68
Standard deviation	12	12	10	13	13
Median age	67	72	84	71	69
1st quartile	57	64	78	59	59
3rd quartile	74	78	88	79	78
Female (**)					
Mean age	70	73	84	73	74
Standard deviation	11	10	7	11	12
Median age	71	74	85	75	76
1st quartile	63	67	80	67	67
3rd quartile	77	79	89	80	82

(*) Total or partial revision, removal of prosthesis, conversion from partial to total replacement, spacer revision
(**) AP Bolzano data have not been included because age data is not available

Table 5.6. Hip. Number of procedures by operated side, surgical approach and fixation, and by procedure type

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency							
	N	%	N	%	N	%	N	%	N	%
Operated side	**19,617**		**1,939**		**6,701**		**1,538**		**29,795**	
Right	10,651	*54.3*	959	*49.5*	3,312	*49.4*	802	*52.1*	15,724	*52.8*
Left	8,448	*43.1*	974	*50.2*	3,357	*50.1*	720	*46.8*	13,499	*45.3*
Bilateral	518	*2.6*	6	*0.3*	32	*0.5*	16	*1.0*	572	*1.9*
Surgical approach	**19,617**		**1,939**		**6,701**		**1,538**		**29,795**	
Anterior	3,523	*18.0*	123	*6.3*	266	*4.0*	111	*7.2*	4,023	*13.5*
Anterolateral	2,001	*10.2*	384	*19.8*	1,402	*20.9*	196	*12.7*	3,983	*13.4*
Lateral	3,203	*16.3*	465	*24.0*	2,173	*32.4*	370	*24.1*	6,211	*20.8*
Posterolateral	10,691	*54.5*	949	*48.9*	2,791	*41.7*	842	*54.7*	15,273	*51.3*
Other	199	*1.0*	18	*0.9*	69	*1.0*	19	*1.2*	305	*1.0*
Fixation (**)	**19,617**		**1,939**		**6,701**		**1,538**		**29,795**	
Cemented (stem + cup)	614	*3.1*	80	*4.1*	7	*0.1*	19	*1.2*	720	*2.4*
Reverse hybrid (uncemented stem and cemented cup)	126	*0.6*	46	*2.4*	6	*0.1*	34	*2.2*	212	*0.7*
Only cemented cup	200	*1.0*	19	*1.0*	10	*0.1*	111	*7.2*	340	*1.1*
Hybrid (cemented stem and uncemented cup)	378	*1.9*	104	*5.4*	69	*1.0*	18	*1.2*	569	*1.9*
Uncemented (stem + cup)	16,225	*82.7*	1,291	*66.6*	184	*2.7*	241	*15.7*	17,941	*60.2*
Only uncemented cup	810	*4.1*	92	*4.7*	117	*1.7*	455	*29.6*	1,474	*4.9*
Only cemented stem	74	*0.4*	74	*3.8*	2,782	*41.5*	58	*3.8*	2,988	*10.0*
Only uncemented stem	770	*3.9*	179	*9.2*	2,800	*41.8*	280	*18.2*	4,029	*13.5*
Fixation declared "not applicable" for cup and stem	420	*2.1*	54	*2.8*	726	*10.8*	322	*20.9*	1,522	*5.1*

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

(**) Due to incorrect coding, some data might be inconsistent with the procedure type (e.g. cup implant in partial replacement)

Table 5.7. Hip. Number of primary procedures by indication for surgery and previous procedure

	Total replacement				Partial replacement		TOTAL	
	elective		emergency					
	N	%	N	%	N	%	N	%
Indication for surgery	**19,617**		**1,939**		**6,701**		**28,257**	
Primary osteoarthritis	17,544	*89.4*			194	*2.9*	17,738	*62.8*
Post-traumatic osteoarthritis	337	*1.7*			42	*0.6*	379	*1.3*
Rheumatoid arthritis	72	*0.4*			0	*0.0*	72	*0.3*
Neoplasia	38	*0.2*			17	*0.3*	55	*0.2*
Aseptic necrosis of femoral head	802	*4.1*			10	*0.1*	812	*2.9*
Congenital dislocation/hip dysplasia	579	*3.0*			3	*0.0*	582	*2.1*
Perthes disease or epiphysiolysis	30	*0.2*			8	*0.1*	38	*0.1*
Fractured neck of femur	0	*0.0*	1,939	*100.0*	6,347	*94.7*	8,286	*29.3*
Septic coxitis	1	*0.0*			0	*0.0*	1	*0.0*
Pseudoarthrosis neck fracture related	17	*0.1*			7	*0.1*	24	*0.1*
Other	197	*1.0*			73	*1.1*	270	*1.0*
Previous procedure	**19,617**		**1,939**		**6,701**		**28,257**	
None	18,009	*91.8*	1,737	*89.6*	6,118	*91.3*	25,864	*91.5*
Osteosynthesis	260	*1.3*	54	*2.8*	55	*0.8*	369	*1.3*
Osteotomy	92	*0.5*	0	*0.0*	0	*0.0*	92	*0.3*
Arthrodesis	2	*0.0*	0	*0.0*	5	*0.1*	7	*0.0*
Other	1,254	*6.4*	148	*7.6*	523	*7.8*	1,925	*6.8*

Table 5.8. Hip. Number of revision procedures by indication for surgery and previous procedure

	Revision (*)	
	N	%
Indication for surgery	**1,538**	
Pain	105	*6.8*
Lysis	43	*2.8*
Wear	111	*7.2*
Implant fracture	23	*1.5*
acetabulum	1	*4.3*
acetabular insert	12	*52.2*
head	3	*13.0*
modular neck	4	*17.4*
stem	2	*8.7*
spacer	1	*4.3*
Prosthesis dislocation	183	*11.9*
Periprosthetic fracture	156	*10.1*
Infection	119	*7.7*
Previous prosthesis removal	21	*1.4*
Aseptic loosening	669	*43.5*
cup	365	*54.6*
stem	156	*23.3*
total	148	*22.1*
Disease progression	2	*0.1*
Other	106	*6.9*
Previous procedure	**1,538**	
Total hip replacement	1,239	*80.6*
Revision	44	*2.9*
Spacer or prosthesis removal	132	*8.6*
Partial hip replacement	90	*5.9*
Other	33	*2.1*

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

Table 5.9. Knee. Number of procedures by procedure type. Comparison between 2015 HDD and 2016 RIAP data

	HDD (2015)		RIAP (2016)	
	N	%	N	%
Procedure type	**70,105**		**22,124***	
Primary	**65,259**	***93.1***	**21,733**	***98.2***
Total	-	-	17,865	*82.2*
Unicompartmental	-	-	3,868	*17.8*
Revision	**4,846**	***6.9***	**391**	***1.8***
Total revision	-	-	78	*19.9*
Partial revision	-	-	283	*72.4*
Patella implant on already implanted total prosthesis	-	-	8	*2.0*
Removal of prosthesis	-	-	18	*4.6*
Spacer revision	-	-	4	1.0

(*) Data passed the quality control checks (see figure 5.1)

Table 5.10. Knee. Number of procedures by type of provider and procedure type

	Primary				Revision (*)		TOTAL	
	total		unicompartmental					
	N	%	N	%	N	%	N	%
Type of provider	**17,865**	***100.0***	**3,868**	***100.0***	**391**	***100.0***	**22,124**	***100.0***
Public hospitals	5,743	*32.1*	858	*22.2*	165	*42.2*	6,766	*30.6*
Private hospitals, accredited	11,831	*66.2*	2,992	*77.4*	205	*52.4*	15,028	*67.9*
Private hospitals, not accredited	291	*1.6*	18	*0.5*	21	*5.4*	330	*1.5*

(*) Total or partial revision, patella implant on already implanted total prosthesis, removal of prosthesis, spacer revision

Table 5.11 Knee. Number of procedures by patient gender and age group, and by procedure type

	Primary				Revision (*)		TOTAL	
	total		unicompartmental					
	N	%	N	%	N	%	N	%
Gender	**17,865**		**3,868**		**391**		**22,124**	
Males	5,712	*32.0*	1,319	*34.1*	139	*35.5*	**7,170**	*32.4*
Females	12,153	*68.0*	2,549	*65.9*	252	*64.5*	**14,954**	*67.6*
Age group by gender								
Male	**5,712**		**1,319**		**139**		**7,170**	
<45	61	*1.1*	21	*1.6*	1	*0.7*	83	*1.2*
45 - 54	268	*4.7*	124	*9.4*	15	*10.8*	407	*5.7*
55 - 64	935	*16.4*	311	*23.6*	23	*16.5*	1,269	*17.7*
65 - 74	2,332	*40.8*	484	*36.7*	48	*34.5*	2,864	*39.9*
75 - 84	1,743	*30.5*	308	*23.4*	22	*15.8*	2,073	*28.9*
≥ 85	101	*1.8*	20	*1.5*	6	*4.3*	127	*1.8*
n/a (**)	272	*4.8*	51	*3.9*	24	*17.3*	347	*4.8*
Female	**12,153**		**2,549**		**252**		**14,954**	
<45	52	*0.4*	25	*1.0*	0	*0.0*	77	*0.5*
45 - 54	370	*3.0*	185	*7.3*	7	*2.8*	562	*3.8*
55 - 64	1,695	*13.9*	600	*23.5*	25	*9.9*	2,320	*15.5*
65 - 74	5,125	*42.2*	1,014	*39.8*	87	*34.5*	6,226	*41.6*
75 - 84	4,273	*35.2*	633	*24.8*	88	*34.9*	4,994	*33.4*
≥ 85	220	*1.8*	37	*1.5*	7	*2.8*	264	*1.8*
n/a (**)	418	*3.4*	55	*2.2*	38	*15.1*	511	*3.4*

(*) Total or partial revision, patella implant on already implanted total prosthesis, removal of prosthesis, spacer revision
(**) AP Bolzano data have not been included because not available

Table 5.12. Knee. Patient age by gender and procedure type

	Primary		Revision (*)	TOTAL
	total	unicompartmental		
Males (**)				
Mean age	70	67	67	69
Standard deviation	9	10	11	9
Median age	71	68	68	70
1st quartile	65	61	60	64
3rd quartile	76	75	74	76
Females (**)				
Mean age	71	68	72	71
Standard deviation	8	9	8	8
Median age	72	69	73	72
1st quartile	67	62	68	66
3rd quartile	77	75	78	77

(*) Total or partial revision, patella implant on already implanted total prosthesis, removal of prosthesis, spacer revision
(**) AP Bolzano data have not been included because age data is not available

Table 5.13. Knee. Number of procedures by operated side, surgical approach and fixation, and by procedure type

	Primary				Revision (*)		TOTAL	
	total		unicompartmental					
	N	%	N	%	N	%	N	%
Operated side	**17,865**		**3,868**		**391**		**22,124**	
Right	9,538	*53.4*	1,992	*51.5*	216	*55.2*	11,746	*53.1*
Left	8,125	*45.5*	1,742	*45.0*	175	*44.8*	10,041	*45.4*
Bilateral	202	*1.1*	134	*3.5*	0	*0.0*	337	*1.5*
Surgical approach	**17,865**		**3,868**		**391**		**22,124**	
Medial parapatellar	15,671	*87.7*	3,003	*77.6*	342	*87.5*	19,016	*86.0*
Lateral parapatellar	434	*2.4*	174	*4.5*	9	*2.3*	617	*2.8*
Mid-vastus	846	*4.7*	177	*4.6*	13	*3.3*	1,036	*4.7*
Minimally invasive Mid-Vastus	378	*2.1*	378	*9.8*	13	*3.3*	769	*3.5*
Quad-sparing	11	*0.1*	61	*1.6*	0	*0.0*	72	*0.3*
Sub-Vastus	169	*0.9*	24	*0.6*	1	*0.3*	194	*0.9*
Minimally invasive Sub-Vastus	27	*0.2*	18	*0.5*	0	*0.0*	45	*0.2*
V Quadriceps	2	*0.0*	0	*0.0*	0	*0.0*	2	*0.0*
Tibial tuberosity osteotomy	33	*0.2*	2	*0.1*	5	*1.3*	40	*0.2*
Other	294	*1.6*	31	*0.8*	8	*2.0*	333	*1.5*
Fixation	**17,865**		**3,868**		**391**		**22,124**	
Patella not implanted	**16,263**	***91.0***	**3,825**	***98.9***	**323**	***82.6***	**20,411**	***92.3***
Cemented (femoral and tibial components)	9,943	*61.1*	1,791	*46.8*	153	*47.4*	11,887	*58.2*
Cemented femoral component and uncemented tibial component	114	*0.7*	22	*0.6*	1	*0.3*	137	*0.7*
Only cemented femoral component	760	*4.7*	687	*18.0*	37	*11.5*	1,484	*7.3*
Uncemented femoral component and cemented tibial component	348	*2.1*	38	*1.0*	2	*0.6*	388	*1.9*
Uncemented	3,152	*19.4*	436	*11.4*	13	*4.0*	3,601	*17.6*
Only uncemented femoral component	298	*1.8*	158	*4.1*	5	*1.5*	461	*2.3*
Only cemented tibial component	730	*4.5*	507	*13.3*	35	*10.8*	1,272	*6.2*
Only uncemented tibial component	418	*2.6*	95	*2.5*	5	*1.5*	518	*2.5*
Fixaction declared "not applicable" for both femoral and tibial components	500	*3.1*	91	*2.4*	72	*22.3*	663	*3.2*

(*) Total or partial revision, patella implant on already implanted total prosthesis, removal of prosthesis, spacer revision

Follow

Table 5.13. Follow

	Primary				Revision (*)		TOTAL	
	total		unicompartmental					
	N	%	N	%	N	%	N	%
Patella implanted (using cement)	**1,115**	***6.2***	**33**	***0.9***	**58**	***14.8***	**1,206**	***5.5***
Cemented (femoral and tibial components)	1,054	*94.5*	9	*27.3*	28	*48.3*	1,091	*90.5*
Cemented femoral component and uncemented tibial component	9	*0.8*	0	*0.0*	0	*0.0*	9	*0.7*
Only cemented femoral component	13	*1.2*	6	*18.2*	2	*3.4*	21	*1.7*
Uncemented femoral component and cemented tibial component	4	*0.4*	0	*0.0*	0	*0.0*	4	*0.3*
Uncemented	8	*0.7*	0	*0.0*	0	*0.0*	8	*0.7*
Only uncemented femoral component	0	*0.0*	0	*0.0*	0	*0.0*	0	*0.0*
Only cemented tibial component	3	*0.3*	0	*0.0*	2	*3.4*	5	*0.4*
Only uncemented tibial component	0	*0.0*	0	*0.0*	0	*0.0*	0	*0.0*
Only patella	24	*2.2*	18	*54.5*	26	*44.8*	68	*5.6*
Patella implanted (not using cement)	**487**	***2.7***	**10**	***0.3***	**10**	***2.6***	**507**	***2.3***
Cemented (femoral and tibial components)	195	*40.0*	3	*30.0*	2	*20.0*	200	*39.4*
Cemented femoral component and uncemented tibial component	21	*4.3*	0	*0.0*	0	*0.0*	21	*4.1*
Only cemented femoral component	3	*0.6*	2	*20.0*	0	*0.0*	5	*1.0*
Uncemented femoral component and cemented tibial component	10	*2.1*	0	*0.0*	2	*20.0*	12	*2.4*
Uncemented	202	*41.5*	0	*0.0*	2	*20.0*	204	*40.2*
Only uncemented femoral component	16	*3.3*	0	*0.0*	0	*0.0*	16	*3.2*
Only cemented tibial component	0	*0.0*	0	*0.0*	0	*0.0*	0	*0.0*
Only uncemented tibial component	34	*7.0*	1	*10.0*	0	*0.0*	35	*6.9*
Only patella	6	*1.2*	4	*40.0*	4	*40.0*	14	*2.8*

(*) Total or partial revision, patella implant on already implanted total prosthesis, removal of prosthesis, spacer revision

Table 5.14. Knee. Number of primary procedures by indication for surgery and previous procedure

	Primary				TOTAL	
	total		unicompartmental			
	N	%	N	%	N	%
Indication for surgery	**17,865**		**3,868**		**21,733**	
Primary osteoarthritis	17,011	*95.2*	3,640	*94.1*	20,651	*95.0*
Post-traumatic osteoarthritis	200	*1.1*	29	*0.7*	229	*1.1*
Rheumatoid arthritis	94	*0.5*	3	*0.1*	97	*0.4*
Neoplasia	19	*0.1*	1	*0.0*	20	*0.1*
Osteonecrosis	71	*0.4*	100	*2.6*	171	*0.8*
Other	470	*2.6*	95	*2.5*	565	*2.6*
Previous procedure	**17,865**		**3,868**		**21,733**	
None	15,694	*87.8*	3,558	*92.0*	19,252	*88.6*
Osteotomy	1	*0.0*	2	*0.1*	3	*0.0*
Arthroscopy	134	*0.8*	14	*0.4*	148	*0.7*
Arthrodesis	425	*2.4*	148	*3.8*	573	*2.6*
Other	1,611	*9.0*	146	*3.8*	1,757	*8.1*

Table 5.15. Knee. Number of revision procedures by indication for surgery and previous procedure

	Revision (*)	
	N	%
Indication for surgery	**391**	
Aseptic loosening	130	*33.2*
more components	66	*50.8*
femur	17	*13.1*
tibia	46	*35.4*
patella	1	*0.8*
Wear	14	*3.6*
Dislocation	7	*1.8*
Instability	15	*3.8*
Periprosthetic fracture	4	*1.0*
Implant fracture	3	*0.8*
Fractured spacer	2	*0.5*
Infection	106	*27.1*
Stiffness	9	*2.3*
Disease progression	11	*2.8*
Pain	62	*15.9*
Other	28	*7.2*
Previous procedure	**391**	
Primary total, patella not implanted	97	*24.8*
Primary total, patella implanted	42	*10.7*
Primary medial unicondylar	19	*4.9*
Primary lateral unicondylar	3	*0.8*
Primary patellofemoral	2	*0.5*
Primary, medial and lateral bicondylar	1	*0.3*
Revision of knee replacement	75	*19.2*
Spacer	99	*25.3*
Other	53	*13.6*

(*) Total or partial revision, patella implant on already implanted total prosthesis, removal of prosthesis, spacer revision

Table 5.16. Hip. Number of components used by type of component and procedure type

	Total replacement				Partial replacement				Revision (*)		TOTAL	
	elective		emergency		not using bipolar cup		using bipolar cup					
	N	%	N	%	N	%	N	%	N	%	N	%
CUP	**16,130**		**1,322**						**530**		**17,982**	
For primary procedure	**15,140**	***93.9***	**1,274**	***96.4***	**-**	**-**	**-**	**-**	**405**	***76.4***	**16,819**	***93.5***
Cemented	488	*3.2*	74	*5.8*	-	-	-	-	85	*21.0*	647	*3.8*
metal	300	*61.5*	66	*89.2*	-	-	-	-	34	*40.0*	400	*61.8*
polyethylene	157	*32.2*	6	*8.1*	-	-	-	-	47	*55.3*	210	*32.5*
other	31	*6.4*	2	*2.7*	-	-	-	-	4	*4.7*	37	*5.7*
Cementless	14,616	*96.5*	1,193	*93.6*	-	-	-	-	312	*77.0*	16,121	*95.8*
metal	13,525	*92.5*	1,089	*91.3*	-	-	-	-	281	*90.1*	14,895	*92.4*
other	1,091	*7.5*	104	*8.7*	-	-	-	-	31	*9.9*	1,226	*7.6*
Hip resurfacing acetabular cups	36	*0.2*	7	*0.5*	-	-	-	-	8	*2.0*	51	*0.3*
For revision	**990**	***6.1***	**48**	***3.6***	**-**	**-**	**-**	**-**	**137**	***25.8***	**1,175**	***6.5***
Cemented	5	*0.5*	2	*4.2*	-	-	-	-	4	*2.9*	11	*0.9*
Cementless	985	*99.5*	46	*95.8*	-	-	-	-	133	*97.1*	1,164	*99.1*
INSERT	**16,130**		**1,322**		**79**		**796**		**657**		**18,981**	
Polyethylene	12,266	*76.0*	1,104	*83.5*	74	*93.7*	793	*99.6*	578	*88.0*	14,815	*78.1*
Ceramic	3,758	*23.3*	195	*14.8*	2	*2.5*	0	*0.0*	60	*9.1*	4,015	*21.2*
Metal	106	*0.7*	23	*1.7*	3	*3.8*	3	*0.4*	19	*2.9*	154	*0.8*
STEM	**16,130**		**1,322**		**422**		**4,496**		**352**		**22,575**	
For primary procedure	**15,863**	***98.3***	**1,293**	***97.8***	**419**	***99.3***	**4,349**	***96.7***	**162**	***46.0***	**22,086**	***97.8***
Cemented	886	*5.6*	181	*14.0*	265	*63.2*	2,303	*53.0*	38	*23.5*	3,673	*16.6*
non-modular straight	750	*84.7*	166	*91.7*	247	*93.2*	2,038	*88.5*	32	*84.2*	3,233	*88.0*
non-modular anatomical	62	*7.0*	6	*3.3*	9	*3.4*	217	*9.4*	2	*5.3*	296	*8.1*
prim	36	*4.1*	6	*3.3*	7	*2.6*	43	*1.9*	4	*10.5*	96	*2.6*
conservative	38	*4.3*	3	*1.7*	2	*0.8*	5	*0.2*	0	*0.0*	48	*1.3*

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

Follow

Table 5.16. Follow

	Total replacement				Partial replacement				Revision (*)		TOTAL	
	elective		emergency		not using bipolar cup		using bipolar cup					
	N	%	N	%	N	%	N	%	N	%	N	%
Cementless	14,977	94.4	1,112	86.0	154	36.8	2,044	47.0	124	76.5	18,411	83.4
non-modular straight	10,127	67.6	807	72.6	145	94.2	1,709	83.6	75	60.5	12,863	69.9
non-modular anatomical	1,678	11.2	101	9.1	5	3.2	187	9.1	21	16.9	1,992	10.8
modular	992	6.6	151	13.6	2	1.3	116	5.7	21	16.9	1,282	7.0
conservative	2,180	14.6	53	4.8	2	1.3	32	1.6	7	5.6	2,274	12.4
Hip resurfacing femoral components	0	0.0	0	0.0	0	0.0	2	0.0	0	0.0	2	0.0
For revision	**266**	**1.6**	**29**	**2.2**	**3**	**0.7**	**141**	**3.1**	**188**	**53.4**	**627**	**2.8**
Cemented	7	2.6	2	6.9	0	0.0	2	1.4	12	6.4	23	3.7
Cementless	259	97.4	27	93.1	3	100.0	139	98.6	176	93.6	604	96.3
Large resections (tumour)	**1**	**0.0**	**0**	**0.0**	**0**	**0.0**	**6**	**0.1**	**2**	**0.6**	**9**	**0.0**
HEAD	**16,130**		**1,322**		**422**		**4,496**		**883**		**23,253**	
For partial prosthesis	888	5.5	31	2.3	163	38.6	385	8.6	47	5.3	1,514	6.5
Ceramic	830	93.5	22	71.0	23	14.1	158	41.0	19	40.4	1,052	69.5
Metal	58	6.5	9	29.0	140	85.9	227	59.0	28	59.6	462	30.5
For total prosthesis	15,242	94.5	1,291	97.7	259	61.4	4,111	91.4	836	94.7	21,739	93.5
Ceramic	13,445	88.2	1,006	77.9	27	10.4	310	7.5	605	72.4	15,393	70.8
Metal	1,797	11.8	285	22.1	232	89.6	3,801	92.5	231	27.6	6,346	29.2

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

Table 5.17. Hip. Number of procedures by bearing surface and procedure type

	Total replacement				Revision (*)		TOTAL	
	elective		emergency					
	N	%	N	%	N	%	N	%
Bearing surface (head/insert)	**16,130**		**1,322**		**542**		**17,994**	
Ceramic-ceramic	3,730	*23.1*	185	*14.0*	49	*9.0*	3,964	*22.0*
Ceramic-metal	78	*0.5*	12	*0.9*	4	*0.7*	94	*0.5*
Ceramic-polyethylene	10,467	*64.9*	831	*62.9*	300	*55.4*	11,598	*64.5*
Metal-ceramic	28	*0.2*	10	*0.8*	3	*0.6*	41	*0.2*
Metal-metal	28	*0.2*	11	*0.8*	12	*2.2*	51	*0.3*
Metal-polyethylene	1,799	*11.2*	273	*20.7*	174	*32.1*	2,246	*12.5*

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

Table 5.18. Knee. Number of components used by type of component and procedure type

	Primary				Revision (*)		TOTAL	
	total		unicompartmental					
	N	%	N	%	N	%	N	%
Femoral component	**13,603**		**2,063**		**50**		**15,716**	
For bicondylar prosthesis	12,871	*94.6*	77	*3.7*	20	*40.0*	12,968	*82.5*
cemented	10,912	*84.8*	59	*76.6*	20	*100.0*	10,991	*84.8*
cementless	1,381	*10.7*	12	*15.6*	0	*0.0*	1,393	*10.7*
cementable	578	*4.5*	6	*7.8*	0	*0.0*	584	*4.5*
For unicondylar prosthesis	514	*3.8*	1,985	*96.2*	0	*0.0*	2,499	*15.9*
For revision prosthesis	218	*1.6*	1	*0.0*	30	*60.0*	249	*1.6*
Tibial insert	**13,045**		**1,515**		**86**		**14,646**	
For bicondylar prosthesis	12,159	*93.2*	67	*4.4*	39	*45.3*	12,265	*83.7*
mobile	3,277	*27.0*	21	*31.3*	22	*56.4*	3,320	*27.1*
fixed	8,882	*73.0*	46	*68.7*	17	*43.6*	8,945	*72.9*
For unicondylar prosthesis	419	*3.2*	1,444	*95.3*	8	*9.3*	1,871	*12.8*
For revision prosthesis	467	*3.6*	4	*0.3*	39	*45.3*	510	*3.5*
mobile	116	*24.8*	0	*0.0*	19	*48.7*	135	*26.5*
fixed	351	*75.2*	4	*100.0*	20	*51.3*	375	*73.5*

(*) Total or partial revision, patella implant on already implanted total prosthesis, removal of prosthesis, spacer revision

Follow

Table 5.18. Follow

	Primary				Revision (*)		TOTAL	
	total		unicompartmental					
	N	%	N	%	N	%	N	%
Tibial component	**13,603**		**2,074**		**57**		**15,734**	
For bicondylar prosthesis	**11,894**	***87.4***	**71**	***3.4***	**25**	***43.9***	**11,990**	***76.2***
cemented	10,546	*88.7*	57	*80.3*	24	*96.0*	10,627	*88.6*
mobile	2,683	*25.4*	10	*17.5*	9	*37.5*	2,702	*25.4*
fixed	7,863	*74.6*	47	*82.5*	15	*62.5*	7,925	*74.6*
cementless	1,131	*9.5*	11	*15.5*	0	*0.0*	1,142	*9.5*
mobile	868	*76.7*	10	*90.9*	0		878	*76.9*
fixed	263	*23.3*	1	*9.1*	0		264	*23.1*
cementable mobile	217	*1.8*	3	*4.2*	1	*4.0*	221	*1.8*
mobile	199	*91.7*	0	*0.0*	1	*100.0*	200	*90.5*
fixed	18	*8.3*	3	*100.0*	0	*0.0*	21	*9.5*
For unicondylar prosthesis	**633**	***4.7***	**2,001**	***96.5***	**2**	***3.5***	**2,636**	***16.8***
For revision	**1,076**	***7.9***	**2**	***0.1***	**30**	***52.6***	**1,108**	***7.0***
mobile	44	*4.1*	0	*0.0*	13	*43.3*	57	*5.1*
fixed	1,032	*95.9*	2	*100.0*	17	*56.7*	1,051	*94.9*
Patellar component	**1,462**		**9**		**65**		**1,536**	

(*) Total or partial revision, patella implant on already implanted total prosthesis, removal of prosthesis, spacer revision

Figure 4.1. Time trend of elective primary joint replacements

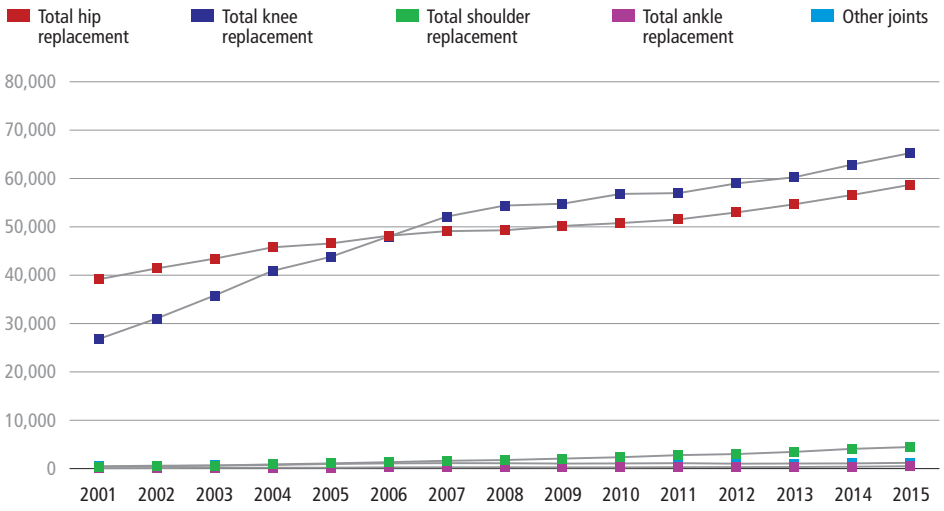

Figure 4.2. Hip. Incidence per 100,000 residents by procedure type

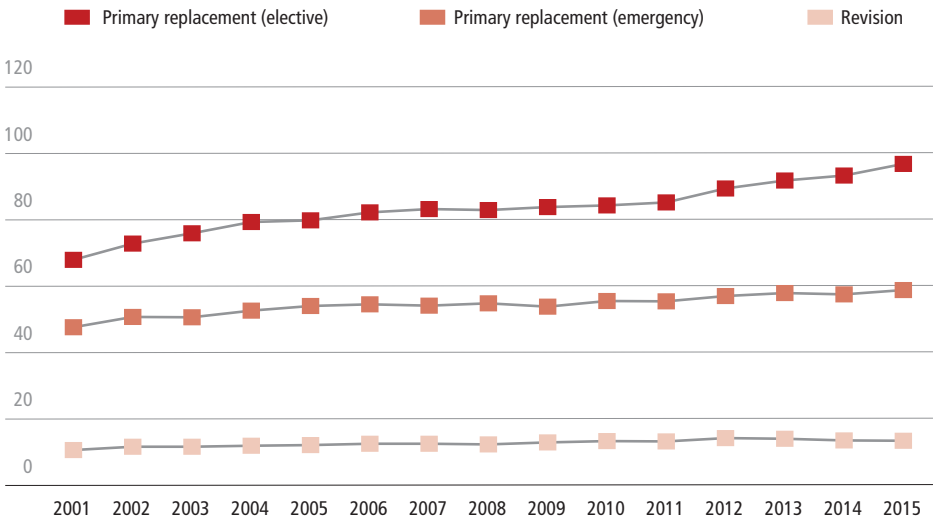

Figure 4.3. Knee. Incidence per 100,000 residents by procedure type

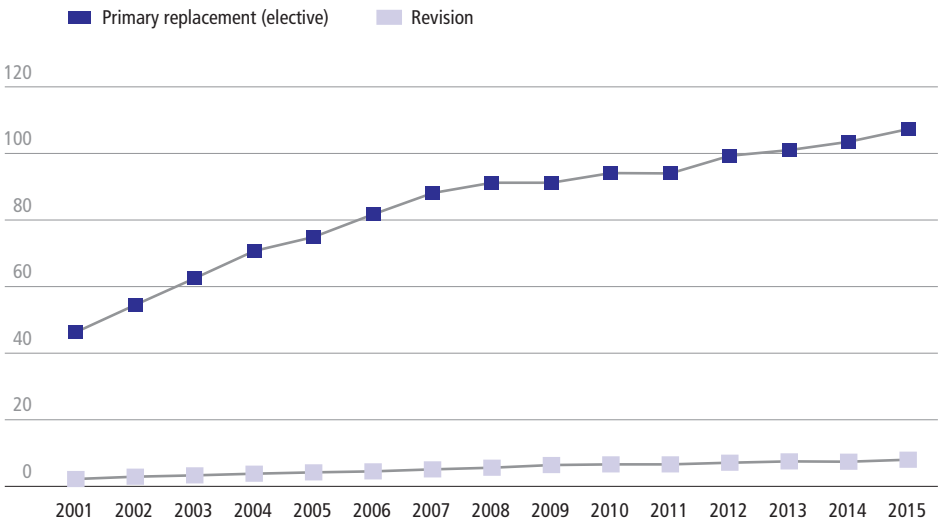

Figure 4.4. Shoulder. Incidence per 100,000 residents by procedure type

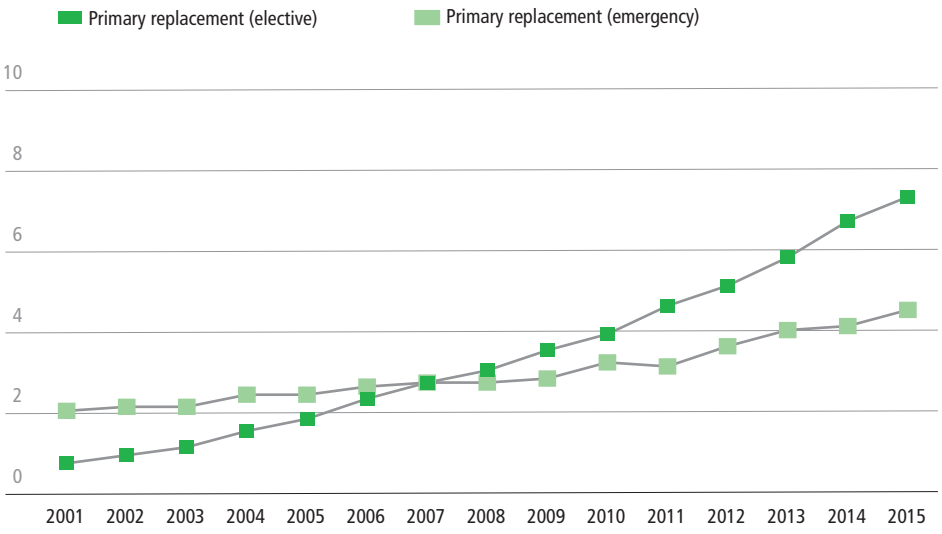

Figure 4.5. Ankle. Incidence per 100,000 residents by procedure type

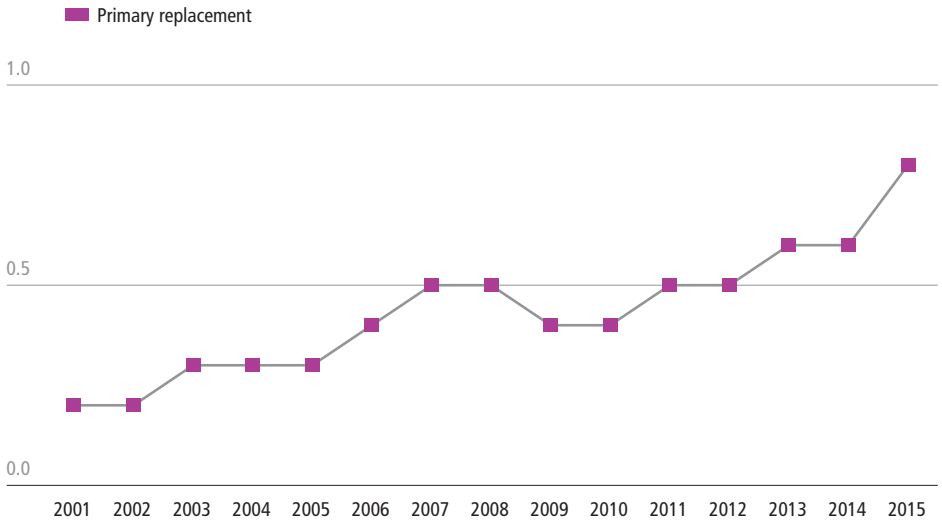

Figure 4.6. Hip. Hospital discharges by elective total replacement. Age-specific incidence per 100,000 residents

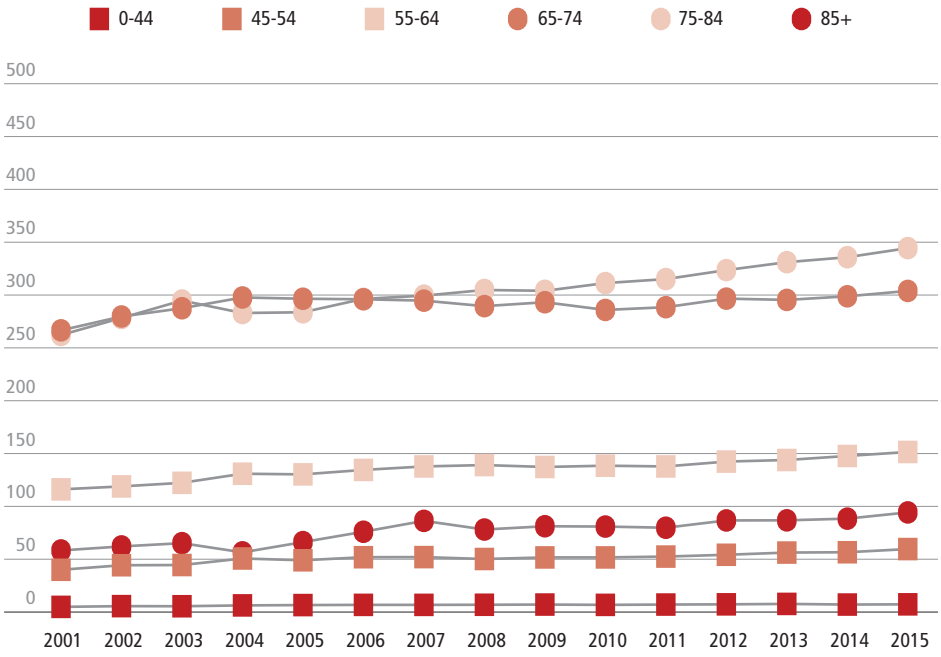

Figure 4.7. Knee. Hospital discharges by total replacement. Age-specific incidence per 100,000 residents

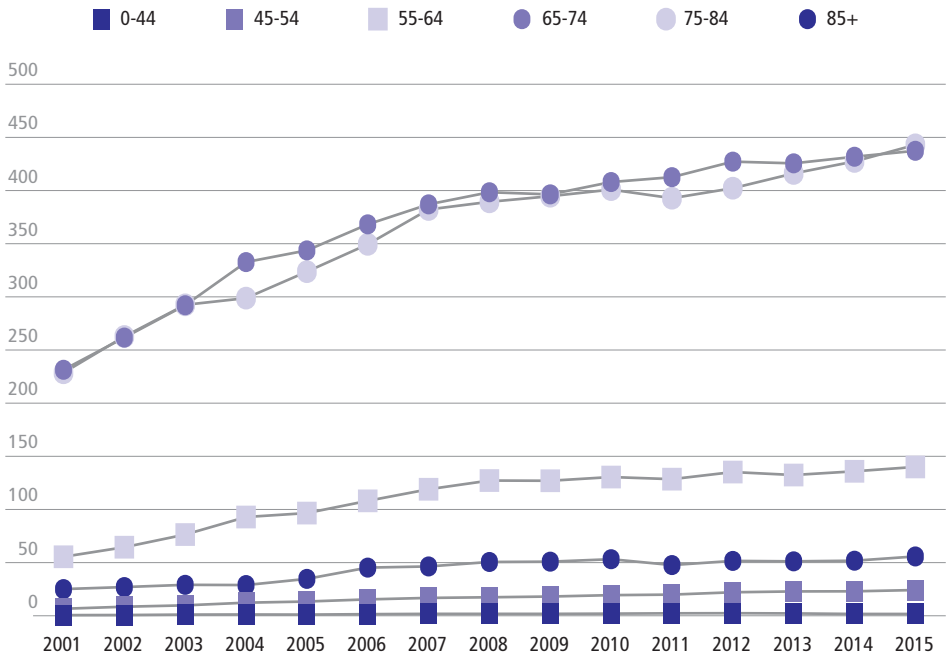

Figure 4.8. Shoulder. Hospital discharges by elective total replacement. Age-specific incidence per 100,000 residents

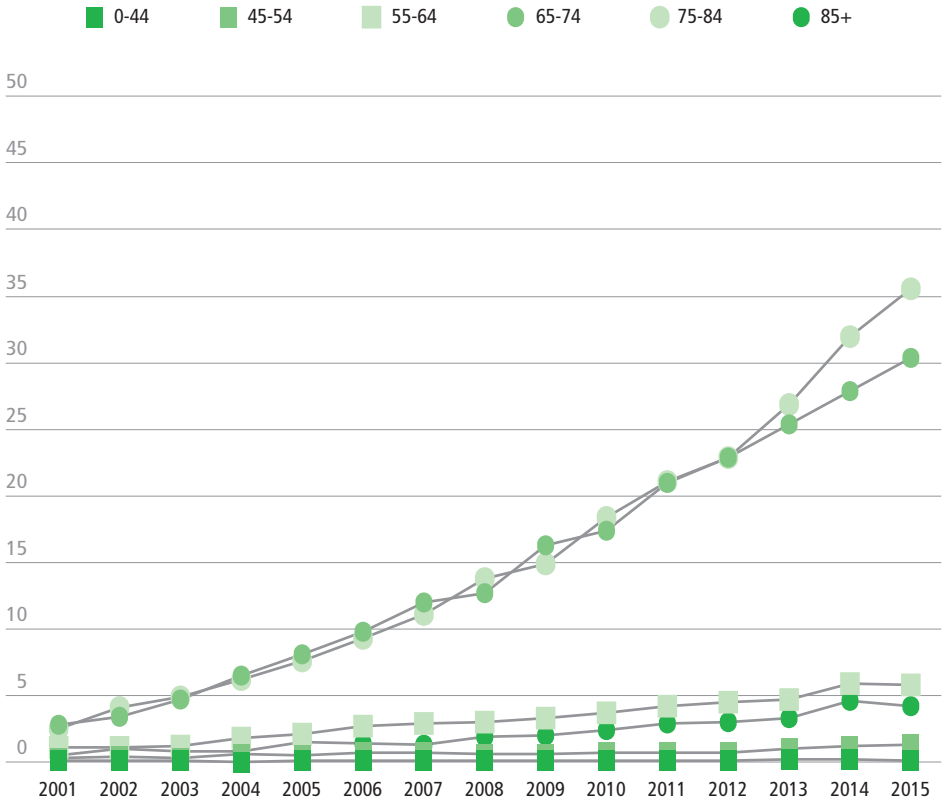

Figure 4.9. Ankle. Hospital discharges by total replacement. Age-specific incidence per 100,000 residents

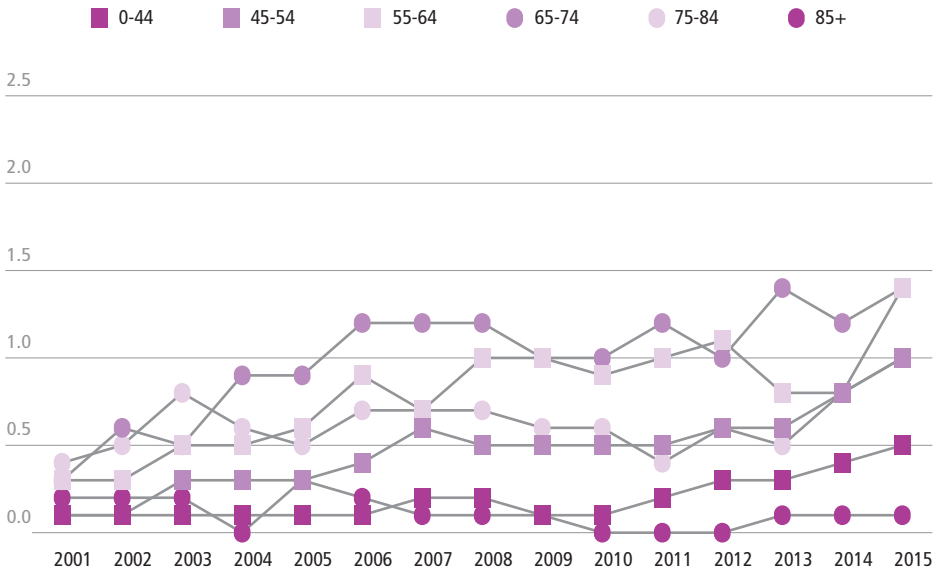

Figure 4.10. Hip. Primary total replacement. Percentage of hospitals by region and volume of activity

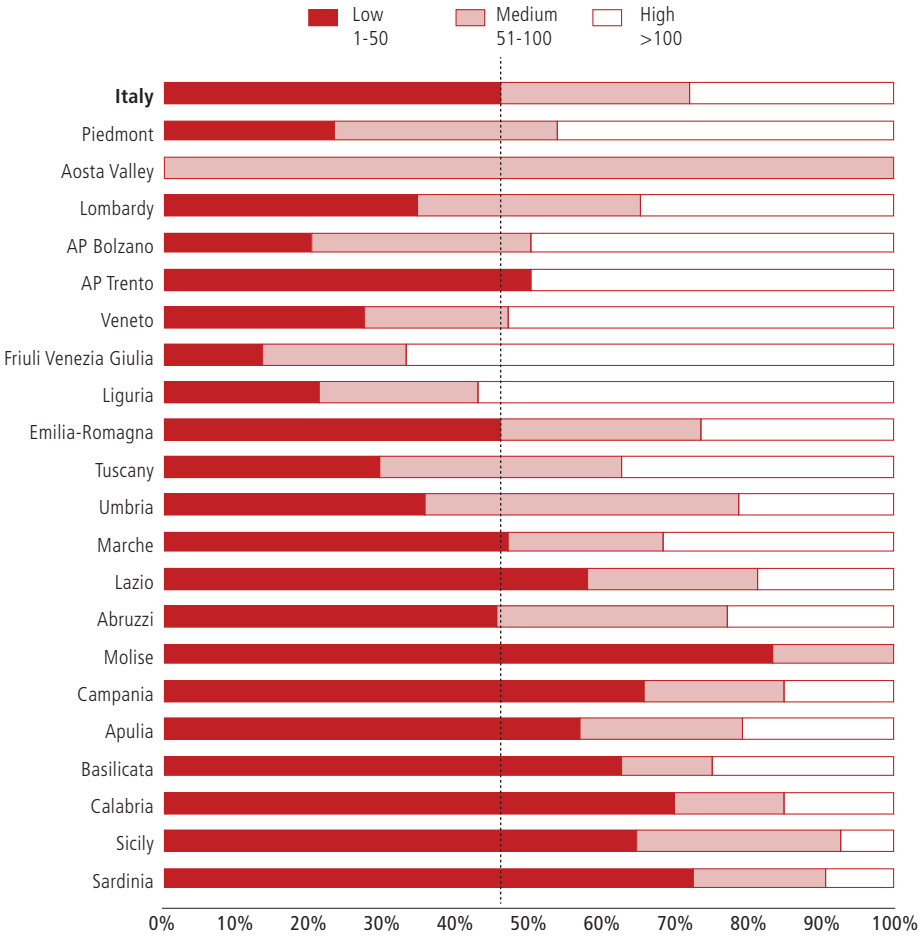

Figure 4.11. Hip. Revision. Percentage of hospitals by region and volume of activity

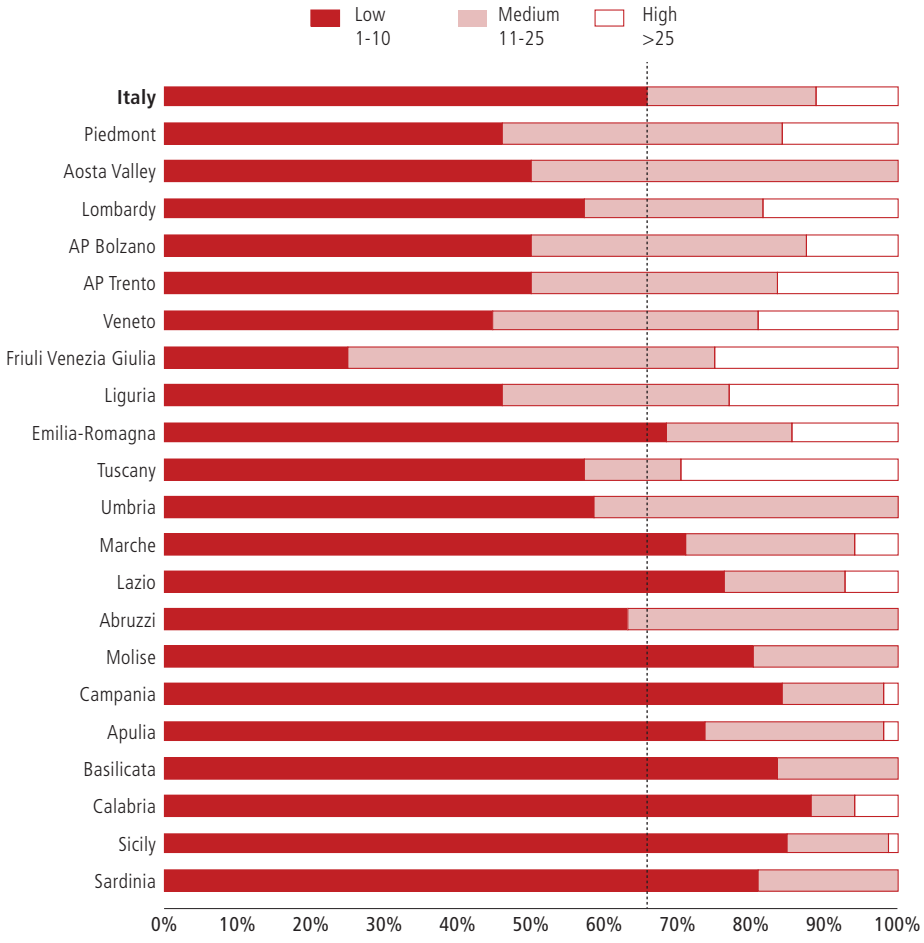

Figure 4.12. Knee. Primary total replacement. Percentage of hospitals by region and volume of activity

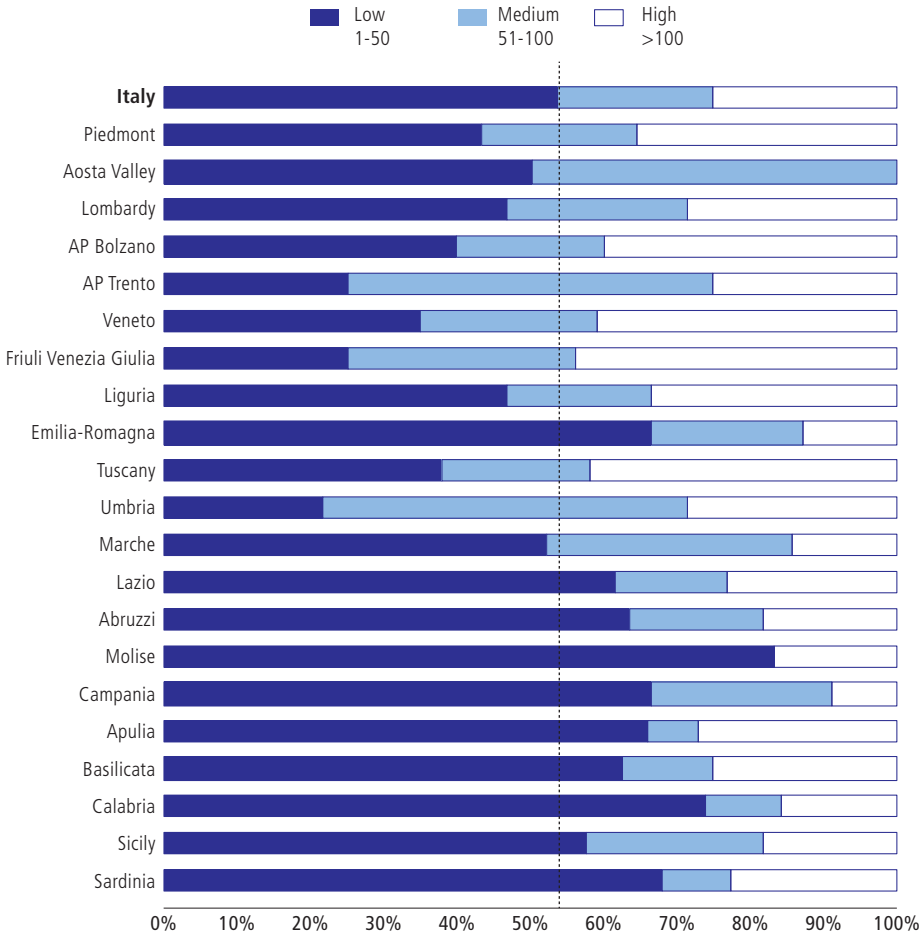

Figure 4.13. Knee. Revision. Percentage of hospitals by region and volume of activity

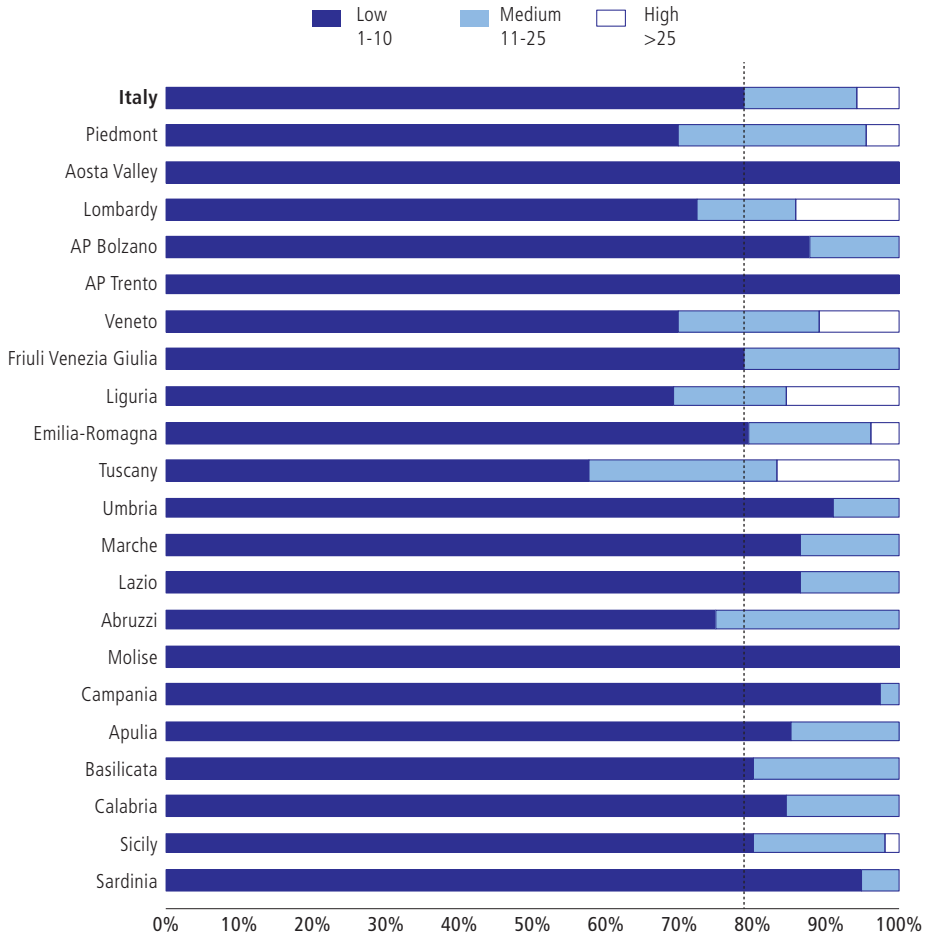

Figure 4.14. Shoulder. Primary total replacement. Percentage of hospitals by region and volume of activity

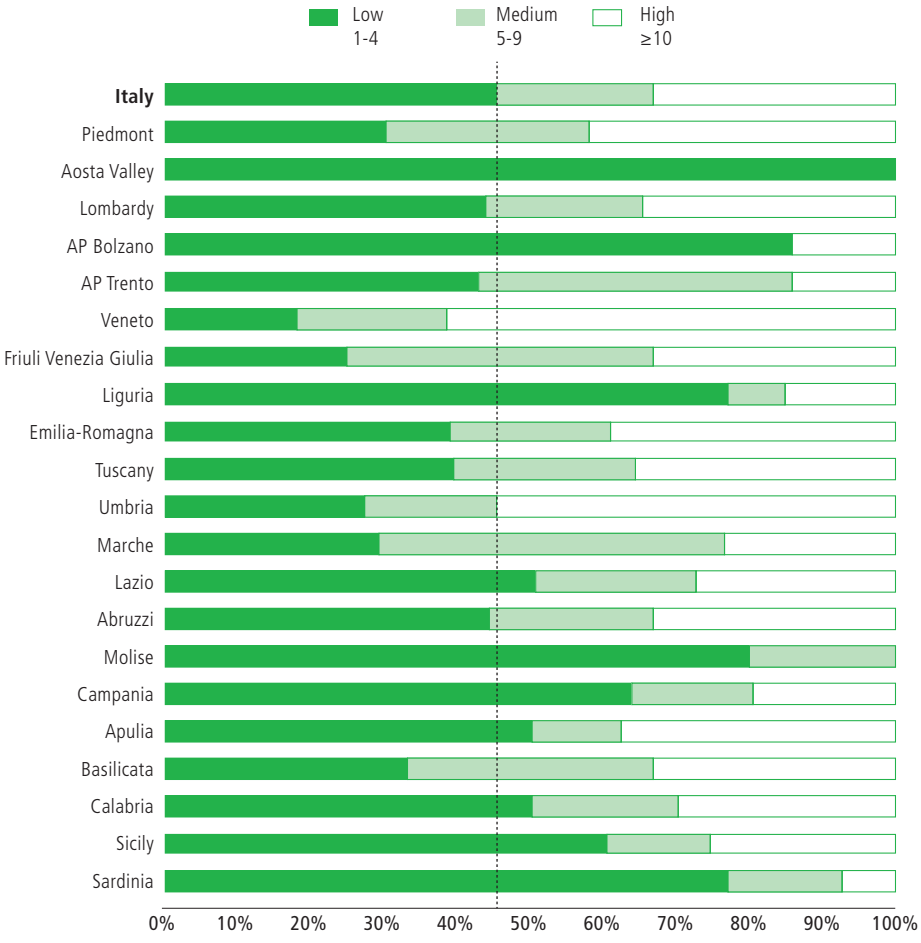

Figure 4.15. Shoulder. Primary partial replacement. Percentage of hospitals by region and volume of activity

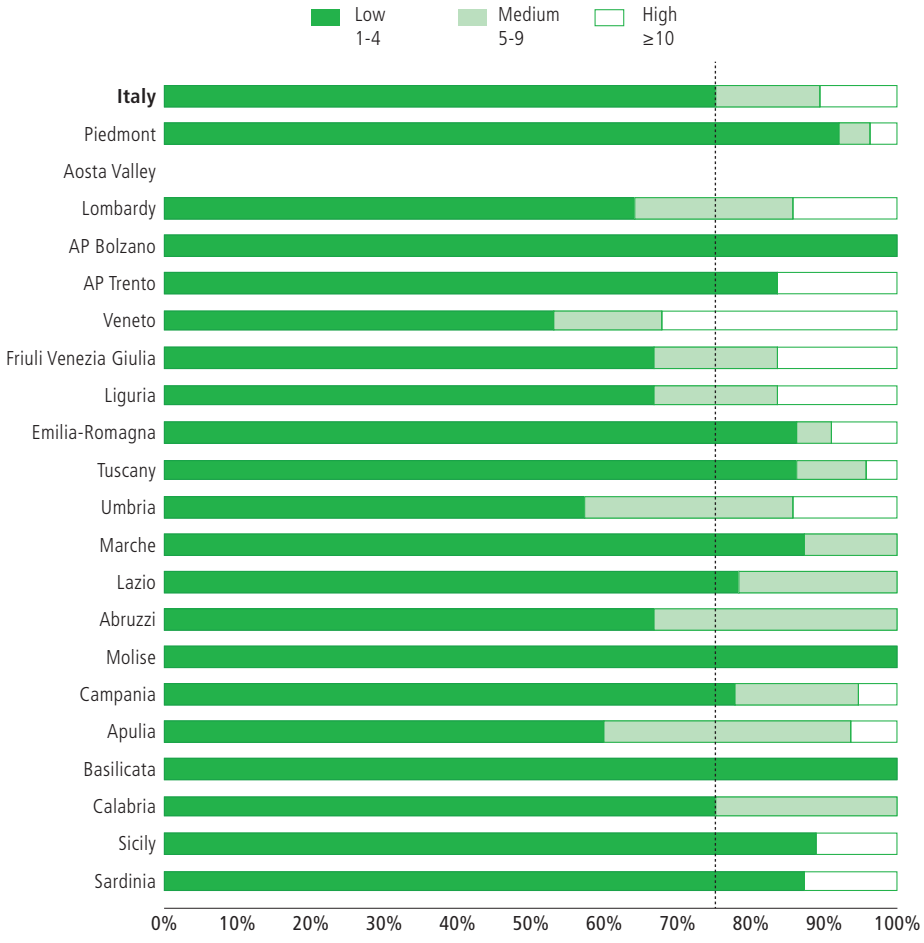

Figure 4.16. Ankle. Primary total replacement. Percentage of hospital by region and volume of activity

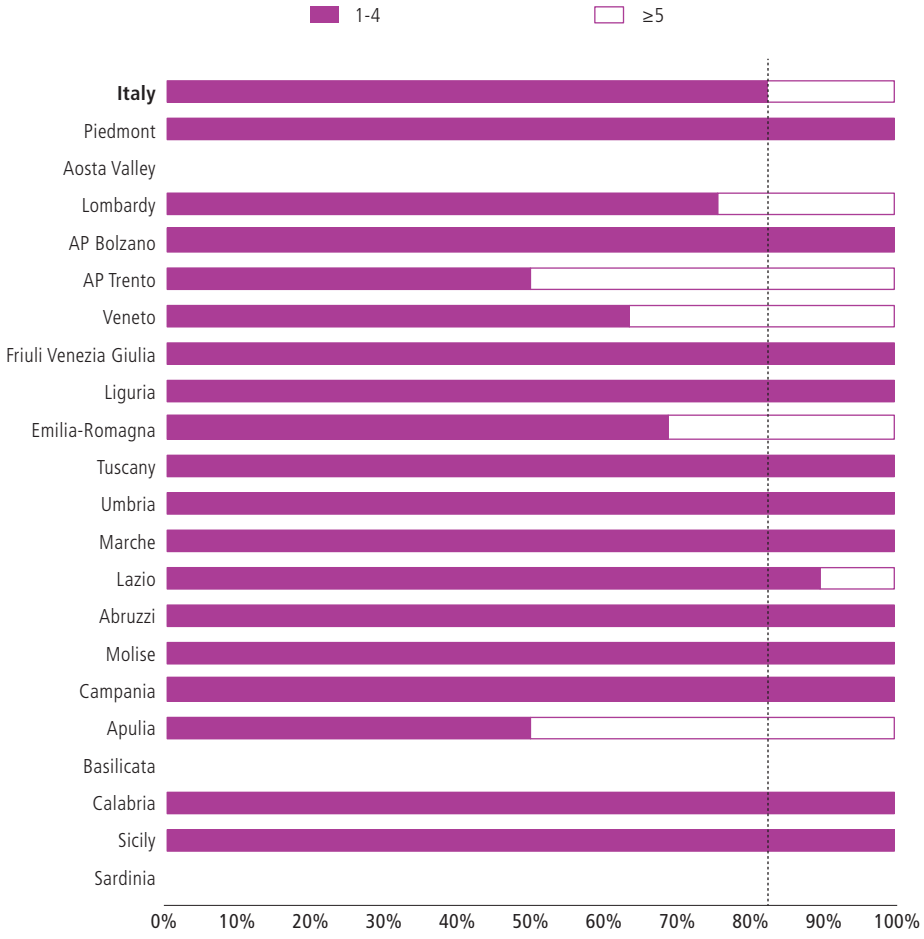

Figure 4.17. Hip. Elective total replacement. Inter-regional mobility indices (%): a) attraction index, b) escape index

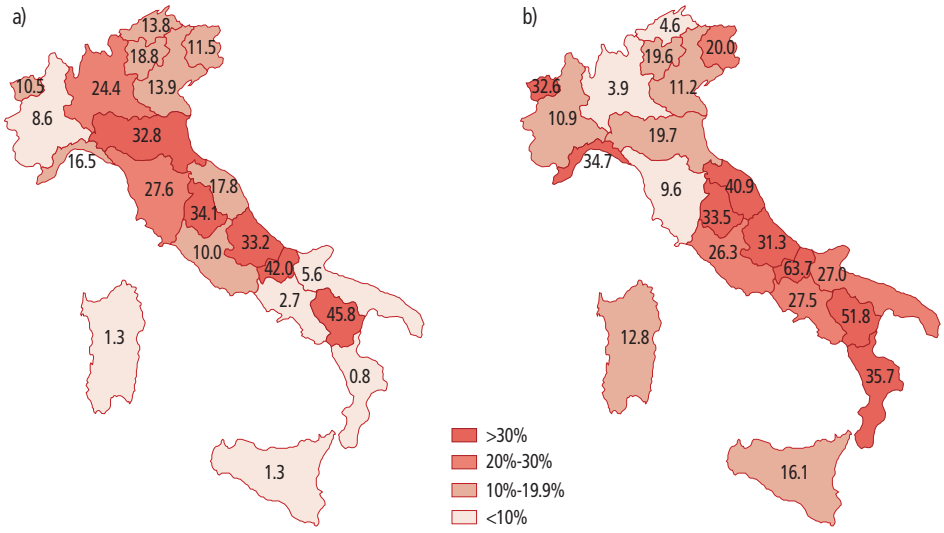

Figure 4.18. Knee. Total replacement. Inter-regional mobility indices (%): a) attraction index, b) escape index

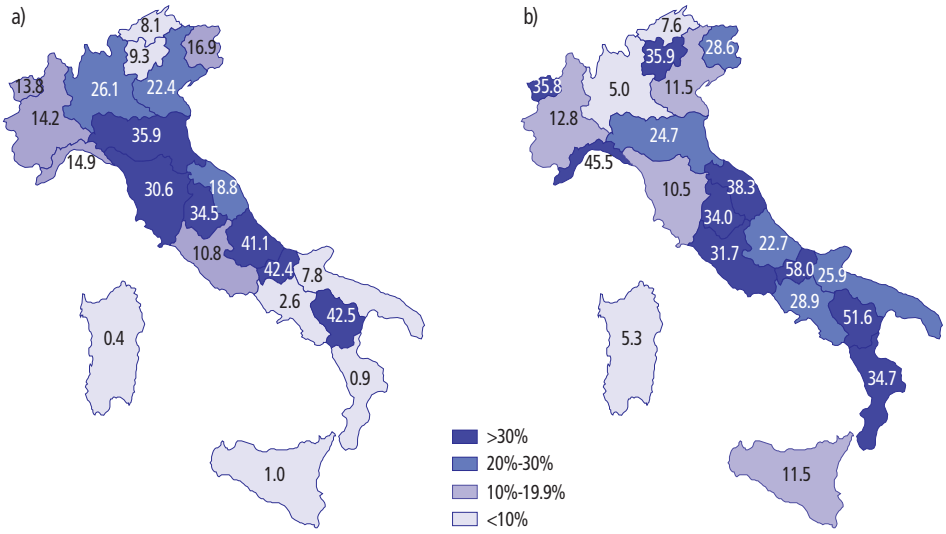

Figure 4.19. Shoulder. Elective total replacement. Inter-regional mobility indices (%): a) attraction index, b) escape index

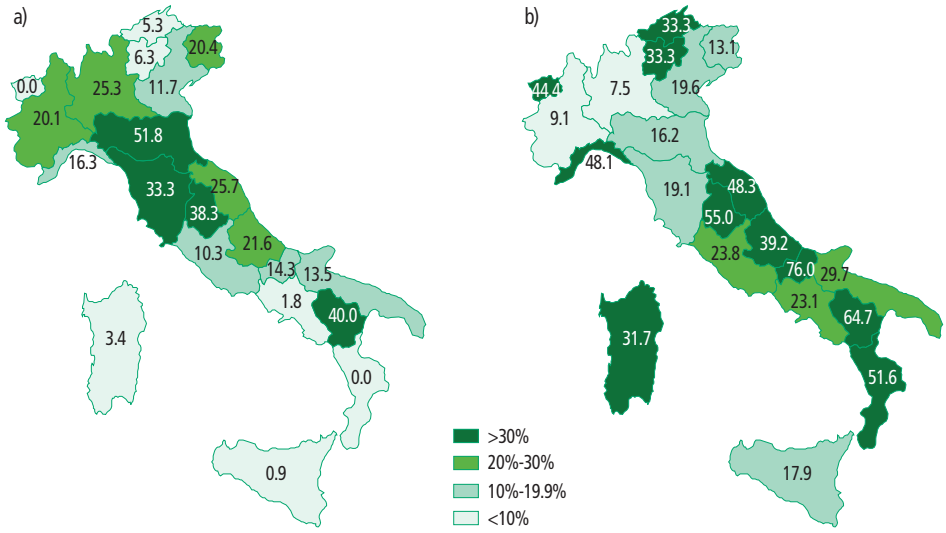

Figure 4.20. Ankle. Total replacement. Inter-regional mobility indices (%): a) attraction index, b) escape index

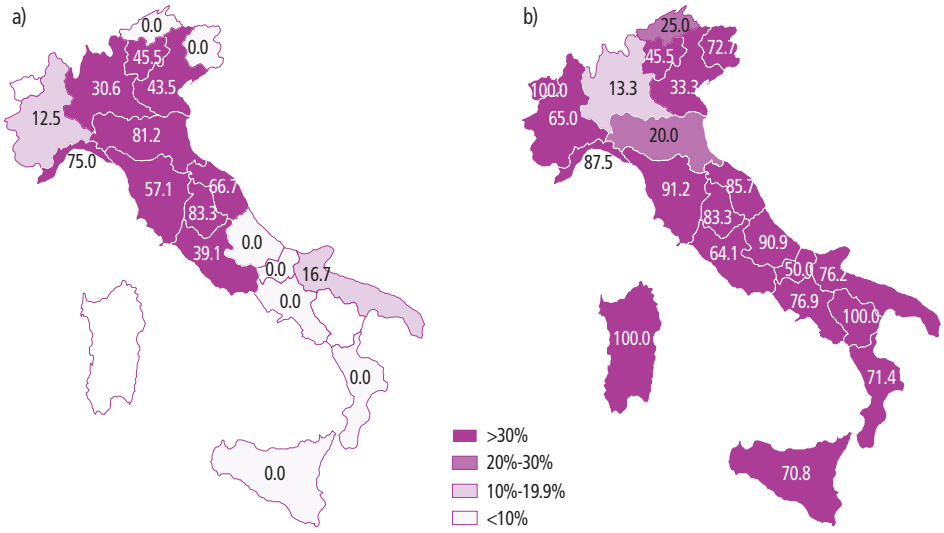

Figure 5.1. Flowchart of the RIAP data quality control process