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Annual Report

ITALIAN ARTHROPLASTY REGISTRY



Italian Arthroplasty Registry

Addendum to the
Annual Report 2021

English version of Tables and Figures

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Tables of contents

RIAP: the most important things to know	9
RIAP in 2021	12

Index of Tables and Figures

Table 2.1. Number of participating hospitals and <i>coverage</i> and number of RIAP procedures admitted to quality control and <i>completeness</i> and accuracy of data on procedures and devices by participating institution and by joint (year 2020)	24
Table 2.2. RIAP <i>completeness</i> (years 2019 and 2020). Comparison with 2019 and 2020 Hospital Discharge Data (HDD) by joint	26
Table 2.3. Hip. Number of procedures included in procedure analysis and <i>completeness</i> by procedure type	27
Table 2.4. Hip. Number of procedures by hospital type and by procedure type	28
Table 2.5. Hip. Number of procedures by gender and age group and by procedure type	29
Table 2.6. Hip. Number of procedures by side and surgical approach and by procedure type	30
Table 2.7. Hip. Number of primary procedures by indication for surgery and type of previous surgery and by procedure type	31
Table 2.8. Hip. Number of revisions by indication for surgery and type of previous surgery	32
Table 2.9. Hip. Number of procedures included in device analysis by procedure type	33
Table 2.10. Hip. Number of procedures by fixation and by procedure type	34
Table 2.11. Hip. Number of total replacement procedures by bearing type and by procedure type	35
Table 2.12. Hip. Number of revision by bearing type	36
Table 2.13. Hip. Number of total replacements by stem type and by procedure type	37
Table 2.14. Knee. Number of procedures included in procedure analysis and <i>completeness</i> by procedure type	38
Table 2.15. Knee. Number of procedures by hospital type and by procedure type	39
Table 2.16. Knee. Number of procedures by patient gender and age group and by procedure type	40
Table 2.17. Knee. Number of procedures by side and surgical approach and by procedure type	41

Table 2.18. Knee. Number of primary procedures by indication for surgery and type of previous surgery and by procedure type	42
Table 2.19. Knee. Number of revision by indication for surgery and type of previous surgery	43
Table 2.20. Knee. Number of procedures included in device analysis by procedure type	44
Table 2.21. Knee. Number of procedures by fixation and by procedure type	45
Table 2.22. Knee. Number of primary procedures by type of tibial tray	47
Table 2.23. Shoulder. Number of procedures included in procedure analysis and completeness by procedure type	48
Table 2.24. Shoulder. Number of total replacements by type of implanted prosthesis	49
Table 2.25. Shoulder. Number of procedures by hospital type and by procedure type	50
Table 2.26. Shoulder. Number of procedures by gender and age group and by procedure type	51
Table 2.27. Shoulder. Number of procedures by side and surgical approach and by procedure type	52
Table 2.28. Shoulder. Number of primary procedures by indication for surgery and type of previous surgery and by procedure type	53
Table 2.29. Shoulder. Number of revision by indication for surgery and type of previous surgery	54
Table 2.30. Shoulder. Number of procedures included in device analysis by procedure type	55
Table 2.31. Shoulder. Number of procedures by fixation and by procedure type	56
Figure 1.1. RIPI architecture and data flow diagram	22
Figure 1.2. Participation in the RIAP (as of 31/12/2021)	23
Figure 2.1. Flowchart of the RIAP data quality control process: procedures	57
Figure 2.2. Flowchart of the RIAP data quality control process for device analysis	58
Figure 2.3. Hip. Types of bearing. Total replacement (elective procedures)	59
Figure 2.4. Hip. Types of bearing. Total replacement (emergency)	60

Appendix 2A. Joint replacements in Italy. Hospital Discharge Data analysis 2019-2020

Table 1.	Joint replacements (primary and revision procedures) in Italy. 2001-2020	62
Table 2.	Hip. Number of primary and revision procedures by region of admission and by procedure type. 2019-2020	64
Table 3.	Hip. Primary total replacement. Number of hospitals performing primary and revision procedures by region of admission and by class of volume. 2019 and 2020	66
Table 4.	Hip. Revision. Number of hospitals performing primary and revision procedures by region of admission and by class of volume. 2019 and 2020	68
Table 5.	Hip. Percent distribution of hospital discharges by patient gender and age group and by procedure type. 2019 and 2020	69
Table 6.	Hip. Percent distribution of hospital discharges by discharge type and by procedure type. 2019 and 2020	70
Table 7.	Knee. Number of procedures by region of admission and by procedure type. 2019-2020	78
Table 8.	Knee. Primary total replacement. Number of hospitals by region of admission and by class of volume. 2019 and 2020	80
Table 9.	Knee. Revision. Number of hospitals by region of admission and by class of volume. 2019 and 2020	82
Table 10.	Knee. Percent distribution of hospital discharges by patient gender and age group and by procedure type. 2019 and 2020	83
Table 11.	Knee. Percent distribution of hospital discharges by discharge type and by procedure type. 2019 and 2020	84
Table 12.	Shoulder. Number of procedures by region of admission and by procedure type. 2019-2020	89
Table 13.	Shoulder. Total replacement. Number of hospitals by region of admission and by class of volume. 2019 and 2020	91
Table 14.	Shoulder. Partial replacement. Number of hospitals by region of admission and by class of volume. 2019 and 2020	93
Table 15.	Shoulder. Percent distribution of hospital discharges by patient gender and age group and by procedure type. 2019 and 2020	95
Table 16.	Shoulder. Percent distribution of hospital discharges by discharge type and by procedure type. 2019 and 2020	96

Table 17.	Ankle. Total replacement. Number of procedures by region of admission and by procedure type. 2019-2020	104
Table 18.	Ankle. Total replacement. Number of hospitals by region of admission and by class of volume. 2019 and 2020	105
Table 19.	Ankle. Total replacement. Percent distribution of hospital discharges by patient gender and age group and by procedure type. 2019 and 2020	107
Table 20.	Ankle. Total replacement. Percent distribution of hospital discharges by discharge type and by procedure type. 2019 and 2020	108
Figure 1.	Hip. Elective total replacement. Inter-regional mobility (attraction and escape indices) in 2019 (a) and in 2020 (b)	71
Figure 2.	Hip. Elective total and partial replacement (primary and revision procedures). Incidence rate by region. 2019-2020	72
Figure 3.	Hip. Elective total and partial replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020	73
Figure 4.	Hip. Emergency total and partial replacement (primary and revision procedures). Incidence rate by region. 2019-2020	74
Figure 5.	Hip. Emergency total and partial replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020	75
Figure 6.	Hip. Elective total and partial replacement. National incidence/hospitalisation rate. 2001-2020	76
Figure 7.	Hip. Emergency total and partial replacement. National incidence/hospitalisation rate. 2001-2020	77
Figure 8.	Knee. Total replacement. Inter-regional mobility (attraction and escape indices) in 2019 (a) and in 2020 (b)	85
Figure 9.	Knee. Total replacement (primary and revision procedures). Incidence rate by region. 2019-2020	86
Figure 10.	Knee. Total replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020	87
Figure 11.	Knee. Total replacement (primary and revision procedures). Incidence/hospitalisation rate. 2001-2020	88
Figure 12.	Shoulder. Elective total replacement. Inter-regional mobility (attraction and escape indices) in 2019 (a) and in 2020 (b)	97

Figure 13. Shoulder. Elective total and partial replacement (primary and revision procedures). Incidence rate by region. 2019-2020	98
Figure 14. Shoulder. Elective total and partial replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020	99
Figure 15. Shoulder. Emergency total and partial replacement (primary and revision procedures). Incidence rate by region. 2019-2020	100
Figure 16. Shoulder. Emergency total and partial replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020	101
Figure 17. Shoulder. Elective total and partial replacement (primary and revision procedures). National incidence and hospitalisation rate. 2001-2020	102
Figure 18. Shoulder. Emergency total and partial replacement (primary and revision procedures). National incidence and hospitalisation rate. 2001-2020	103
Figure 19. Ankle. Total replacement (primary and revision procedures). Incidence rate by region. 2019-2020	109
Figure 20. Ankle. Total replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020	110
Figure 21. Ankle. Total replacement (primary and revision procedures). Incidence/hospitalisation rate by region. 2001-2020	111

This summary provides a brief overview of the main findings described in the 2021 RIAP Annual Report and contains the most relevant tables and figures summarizing collected data.

The whole Report is available only in Italian (you can find it [here](#)).

The Technical Appendix includes an analysis of the most recent national Hospital Discharge Data available (2019 and 2020).

RIAP: the most important things to know

Why a Registry, and why a National Registry?

Joint replacement is a recognised solution for the treatment of disabling joint diseases.

In Italy, like in many other countries, the number of patients undergoing arthroplasty is constantly growing. A national registry allows to assess the outcomes of both primary and revision procedures in order to monitor safety and performance of implants and to collect useful information on type of procedure and features of implanted device. It also allows recalling patients, including those undergoing surgery in a different Region from the one they live in, in case of implant failure or risks. These are some of the reasons why contribution to Registry should be mandatory, thus ensuring a complete national coverage.

What is RIAP?

The Italian Arthroplasty Registry (Registro Italiano ArtroProtesi, RIAP) was set up in 2006 within the framework of a collaboration between the Italian Ministry of Health, Directorate for Medical Devices and Pharmaceutical Services (Direzione Generale dei Dispositivi Medici e del Servizio Farmaceutico, DGDMF),

and the Italian National Institute of Health (Istituto Superiore di Sanità, ISS) with the aim of establishing a national data collection system to help monitor the safety and survival of joint prostheses.

At the end of 2021, RIAP was the largest database of its kind in Italy and one of the registries included in the National Implantable Prostheses Registry (Registro Nazionale delle Protesi Impiantabili, RIPI). The aim of RIPI is to systematically collect data of all procedures related to the implantation of joint prostheses, spinal devices, implantable cardioverter defibrillators, pacemakers and, in the near future, also artificial heart valves and implantable hearing devices (Figure 1.2). According to the Italian Prime Minister Decree (DPCM 3/3/2017), RIPI is established at the ISS and accomplishes what required by the EU Medical Device Regulation 2017/745 (MDR), that came into effect on May 26, 2021. As soon as the Regulation foreseen by the DPCM comes into force, data collection will become mandatory at the national level.

What are the goals?

RIAP has been primarily built to reach two objectives: to assess long-term effectiveness and safety of hip, knee, shoulder and ankle joint prostheses by measuring the implant survival rate, and to support Regions and hospitals in

recalling patients in case of a prosthesis-related adverse event. Therefore, patients undergoing surgery in centres participating in RIAP are registered and followed-up over time to detect the eventual failure of the implanted device. Currently, data collected by RIAP allows to implement survival analysis in some participating Regions. In case of recall from the market of a specific device, RIAP can provide the participating Regions with the list of pseudonyms identifying patients operated in the Region and interested by the recall.

What information is collected?

The information collected includes Hospital Discharge Data (HDD, in Italian: Schede di Dimissione Ospedaliera - SDO) supplemented by an additional Minimum Dataset (MDS) including technical aspects of surgery, operated side and information allowing identification and description of the implanted device for each of the joints.

All patient personal data are processed and handled by the RIAP in line with General Data Protection Regulation (EU-GDPR 2016/679). Currently, pending the entry into force of the Regulation, the informed consent by the patient is needed. Clinical, health and demographic data are processed in a manner that ensures the highest levels of confidentiality, in

compliance with security requirements for digital and paper-based archiving systems.

How is RIAP organised?

RIAP is a federation of regional registries that voluntarily participate in data collection. They are centrally coordinated by the ISS, thus ensuring standard procedures for data collection, submission and processing. Using a web-based data entry interface, the surgeons collect and submit the minimum dataset to the Regional Coordinating Centre, which is responsible for linking MDS to the HDD for each procedure. Once the datasets have been linked, they are submitted to the ISS for research and analysis purposes. Currently, contribution to the Registry is on a voluntary basis, which hampers the achievement of high *completeness* rates and the record of all prostheses implanted at national level.

The RIAP model can be extended to other fields beyond arthroplasty, especially where implant procedures are mainly carried out in centres of the National Health System that are required to provide HDD.

How is the implanted device identified and characterised?

A key element of the RIAP flow is the RIAP-DM Dictionary that supports health operators

when registering the implanted device. The RIAP-DM Dictionary is a database containing information provided by implant manufacturers allowing identification and characterization of each implanted device. Data contained in the RIAP-DM Dictionary, accessible by all

health operators, are regularly updated and validated using the National Database of Medical Devices of the Ministry of Health.

[Here](#) you can find the Report summaries (Addendum) of years 2014-2020.

RIAP in 2021

Highlights

- The cross-regional study aimed at evaluating the effect of the interruption of elective surgery due to COVID-19 pandemic on the volume of joint replacement procedures was published in the ISS Covid Report "*Impact of COVID-19 pandemic emergency on joint arthroplasties in seven Italian Regions. Version of March 17, 2021.*" (in Italian).
- The results of this study prompted the RIAP team to launch a study aimed at exploring the perceptions and feelings of patients whose joint replacement surgery was postponed due to COVID-19 pandemic.
- RIAP activity results were systematically disseminated and the Registry's participation in international projects/networks was actively promoted.
- Enrollment of missing Regions was continuously encouraged. On March 1, 2021, the Sicily Region adhered to the RIAP by issuing a decree (Health Councilor's Decree no.174) making participation in the RIAP mandatory.
- The activities required to launch the registries of spinal implants and cardioverter-defibrillators and pacemakers based on the RIAP model were carried on. The proposal to include the Registry of implantable hearing devices within the RIPI was explored.
- The database of implantable devices, the RIAP-DM Dictionary, was regularly updated thanks to the contribution of implant manufacturers. At the same time, an agreement with the UK National Joint Registry (NJR) was signed in order to connect the RIAP-DM Dictionary with the NJR Component Library, a large database of joint prostheses that the NJR has already shared with the German Arthroplasty Registry (Endoprothesen Register Deutschland, EPRD).
- Data flow infrastructure and tools to support data collection were updated and improved (Figure 1.2).
- For the first time, implant survival was analysed using data from the registries of the Autonomous Provinces of Bolzano and Trento, which have a high percentage of completeness and a follow-up period of more than 5 years.
- The RIAP team continued to support the Italian Ministry of Health by managing and updating the online data collection platform of the National Registry of Breast Implants (Registro Nazionale delle Protesi Mammarie, RNPM).

Key achievements

The year 2021, although the COVID-19 pandemic was still raging, has been a year of ongoing activities and also of new achievements and updated procedures for the RIAP research group with the continued aim of improving safety and clinical outcomes for the benefit of patients and the orthopaedic healthcare sector.

Here is a summary of the main activities and achievements of 2021:

RIAP as a reference to develop other RIPI research lines. Over the last three years, the RIAP model has been applied to develop the methodological framework of two other registries included in RIPI: the Italian Spinal Implants Registry (Registro Italiano Dispositivi Implantabili per chirurgia Spinale, RIDIS) and the Italian Implantable Cardioverter-defibrillator and Pacemaker Registry (Registro Italiano Defibrillatori e Pacemaker, RIDEP). During the year 2021, RIDIS and RIDEP technical committees, set up in March 2020, met regularly to define i) the model for data collection; ii) the information to be collected in addition to those included in the HDD; iii) the structure of the specific DM Dictionary. For both registries, clinical variables to include in the MDS supplementary to HDD were selected, comparison with data from similar national and international regis-

tries was carried on and a first draft of device taxonomy was developed and approved by manufactures.

In addition, within the RIDIS, the possibility of a collaboration with **EUROSPINE** team was explored to develop an international database of spinal surgery implantable devices following the example of the collaboration with the NJR.

Last but not least, in 2021, upon request from the ISS President, a meeting with the President of the Otorhinolaryngological Italian Society (Società Italiana di Otorinolaringologia e Chirurgia Cervico-Facciale, SIOeChCF) was held to explore the possibility to implement, within the RIPI, the Registry of implantable hearing devices starting from the setting up of a technical committee.

As for the Italian Registry of Artificial Heart Valves (Registro Italiano Valvole Cardiache, RIVAC), in the year 2021 a first exploration of HDD for the years 2001-2019 showed an important increase in the volume of procedures: from around 13.000 in 2001 to around 28.000 in 2019. Also, the Diagnosis-Related Groups (DRGs) associated to the selected procedures were identified and the economic burden of procedures was estimated. These preliminary

data were published in an article on the National Epidemiological Bulletin (Bollettino Epidemiologico Nazionale, BEN).

RIAP Dictionary update and collaboration with NJR. The RIAP-DM Dictionary was regularly updated over 2021 thanks to the collaboration of the RIAP team with both manufacturers sending their medical device catalogues and health operators reporting medical devices not yet registered. In particular, for each catalogue, a feedback on quality of data was provided after comparison with same data from the Database of Medical Devices of the Ministry of Health. At the end of the year 2021 the DM Dictionary included around 80.000 product codes provided by 40 manufacturers, of which more than 50% were bar-coded to improve and facilitate data entry.

On 10 June 2021, an agreement between the ISS and the NJR was signed. It enables the RIAP and all participating registries to access and use the NJR Component Library and the implant manufacturers to enter technical attributes of medical devices in order to identify and characterise orthopaedic prostheses implanted and registered by the RIAP not yet included in the Library.

Updating of web applications, design of the new IT platform and first survival analyses. Web applications developed to support MDS collection and data transfer from RIAP participating institutions to the ISS are regularly updated on the basis of proposals emerging from the RIAP Scientific Committee. In 2021, the re-engineering of these applications was planned using a safety model in compliance with privacy rules. The aim is to integrate all services necessary to collect and transfer data, to perform quality controls and to provide feedback to users.

Also, the project plan of a new IT platform was concluded. This new platform will include RaDaR and SOnAR IT platforms, already used to collect and transfer RIAP data, into a single platform able to integrate all data flows from different registries included in the RIPI framework. All technical documents produced were shared with the IT group to allow for formalization in XML/XSD formats. The documents are available on the RIAP website.

For the first time, implant survival analyses on data collected by the registries of the Autonomous Provinces of Bolzano and Trento over a period longer than 5 years were performed.

Collaboration with the Ministry of Health.

In 2021 the RIAP team continued to work in collaboration with the Italian Ministry of Health. In particular, the RIAP team continued to manage and update the online data collection platform of the National Registry of Breast Implants (Registro Nazionale degli Impianti Protesici Mammari, RNPM) available to users since March 2020 and realized within the pilot study ended on 31 August 2021, pending its integration in the National Health Information System (Nuovo Sistema Informativo Sanitario, NSIS) of the Ministry of Health. The RIAP team also developed the technical Annex to the Regulation describing the architecture of the RNPM online platform.

RIPI Regulation. In 2021 the ISS President settled an ISS Working group to draft the Regulation foreseen by the DPCM 3/3/2017.

The working group started to work on the Regulation following the one developed by the Ministry of Health for the RNPM and a first preliminary draft was produced. In addition, the strong debate around patient privacy led to a revision of the Informed Consent for RIAP data collection.

Preliminary results obtained by the working group were described in the article "A

far-reaching Regulation for the Italian National Registry of Implantable Prostheses: a possible model for other health registries" published in April 2021 in the ISS Annals.

Participation in the international projects and networks, dissemination of results and enrollment of missing Regions.

The visibility of the RIAP at the international level was increased thanks to the participation in the ISAR 2021 Annual Congress (eight abstracts submitted) and by strengthening the collaboration with the Network of Orthopaedic Registries of Europe (NORE), aimed at supporting the implementation of registries in European countries. In 2021 the RIAP participated in the NORE meetings and contributed to update the *NORE interactive map* with data extracted from HDD on hip, knee and shoulder procedures in Italy. In addition, the RIAP participated in a study promoted by NORE on gender differences in the risk of revision for infection involving nine national registries. Analyses were performed on combined data from Trento and Bolzano registries, which met the criteria for participation.

RIAP is a partner of the "Coordinating Research and Evidence for Medical Devices" (CORE-MD) Project financed within the HORIZON 2020 Framework Programme. Its main aim is to re-

view and develop methodologies to improve clinical assessment and evaluate performance of high-risk medical devices (cardiovascular, orthopedic and diabetes treatment devices) in order to support the European Commission in the application of the MDR, also by focusing on the development of systematic literature reviews.

The RIAP team continued communication and dissemination activities both at national and international levels tailored to its most important audiences such as orthopaedic surgeons, patients, manufacturers, health operators, health authorities, students and the general public. These stakeholders were reached through RIAP and RIPI websites; scientific publications, including the 2020 RIAP Annual Report; two RIAP Scientific Committee meetings (held in videoconference); participation in scientific conferences, including the organization of special sessions; the use of ISS social media channels. In particular, the number of RIAP website users in 2021 increased by 18% compared to previous year. Activities carried out by institutions involved in RIAP were highlighted at the dedicated news webpages. Noteworthy is the *content on demand* broadcasted at the SIOT Congress 2021 *"RIAP (Registro Italiano Artroprotesi). Real World Data. I registri come strumento di analisi dell'impatto del COVID*

sulla chirurgia ortopedica // Registries as a tool to analyse the COVID impact on orthopaedic surgery". This video-content was produced in collaboration with the Evidence-Based Orthopaedics Working Group (Gruppo di Lavoro Ortopedia Basata sulle Prove di Efficacia, GLOBE) with the aim of drawing attention to the role of registries as a key source of epidemiological data. Last but not least, in 2021 two video presentations with the involvement of institutional speakers and experts were produced and published. The first presents and explains RIAP *"Il Registro Italiano ArtroProtesi (RIAP): apripista nel monitorare i dispositivi impiantabili"* and the second is dedicated to RIPI *"Registro Italiano delle Protesi Impiantabili (RIPI): uno strumento strategico per la tutela della salute del paziente"*.

Pending the entry into force of the RIPI Regulation, the RIAP team continued to promote the enrollment of missing Regions through targeted information and communication activities with the aim of enhancing data completeness. On March 1, 2021, the Sicily Region adhered to the RIAP by issuing a decree (Health Councilor's Decree no.174) establishing that if data were not provided to the RIAP all expenses related to hip, knee, shoulder and ankle arthroplasty would not have been reimbursed to accredited health structures. Sicily

has thus followed the example of Campania and Apulia Regions where local legislations made sending data to the RIAP mandatory. The next RIAP Report will include analyses of impact of Sicily Region legislation on data collection.

Qualitative observational study on patients' perceptions after postponement of surgery due to Covid-19. To face the COVID-19 emergency, between March and May 2020 all deferrable elective surgeries were postponed in almost all hospitals across Italy and then performed at a reduced pace until the end of 2020. Surgical volume significantly dropped. Tens of thousands of patients, mostly suffering from osteoarthritis in need of a prosthesis implantation (hip, knee, shoulder or ankle), experienced a period of a few months of uncertainty.

This gave the RIAP research group an idea to explore patients lived experiences in that situation.

The APMARR patient association and eight orthopaedic surgeons that are members of or collaborate with the RIAP Scientific Committee were involved in the recruitment of participants. The latter were also involved in the development of study hypothesis and design.

Semi-structured telephone interviews were conducted with 26 patients that experienced a delay (also voluntary) of arthroplasty surgery. A preliminary data analysis showed in the majority of patients a common feeling of uncertainty and insecurity accompanied by other feelings caused by prolonged waiting such as anxiety, anger, impotence, fear of intervention or of contagion, but also hope, serenity, confidence. The procedure-related strategies adopted by the patients varied from quiet expectation to fear-induced voluntary rescheduling. At the time of publication of this Addendum, the final results of the study were in the preparatory phase.

Key findings from the 2021 Annual Report ANALYSIS OF THE RIAP DATA

In 2021 RIAP collected and admitted to quality control (QC) data on 52,187 joint replacement procedures (30,980 hip procedures; 20,060 knee procedures; 1,147 shoulder procedures) performed in 2020 in eight Regions (Lombardy, Tuscany, Marche, Abruzzo, Campania, Apulia, Basilicata, Sicily), two Autonomous Provinces (Bolzano, Trento) and four centres from non-participating Regions ("Policlinico Città di Alessandria" of Alessandria; "PO Universitario Santa Maria della Misericordia" of Udine; "Villa Aurora" e "Casa di Cura San Feliciano" of Rome, ASL 1) (Table 2.1, Figure

1.2). Overall, these data accounted for 34.4% of national volume (34.9% for hip, 36.5% for knee, 11,3% for shoulder) (Table 2.2).

Compared to 2019, a decrease in number of collected data was observed (-31.0%), in particular -25.2% for hip and -39.2% for knee, due mainly to COVID containment measures. Data on ankle procedures in 2020 were not collected. According to the National Outcomes Programme (Piano Nazionale Esiti, PNE), which confirmed the results published in the ISS Covid Report "Impact of COVID-19 pandemic emergency on joint arthroplasties in seven Italian Regions", the reduction of implant procedures due to COVID can be estimated around 18% for hip and 27% for knee approximately.

In participating Regions, coverage was 60.4% for hip, 64.1% for knee, 48.6% for shoulder. Completeness was 59.9% (61.7% for hip, 58.2% for knee and 45.8% for shoulder) with an overall decreasing trend in all participating Regions (-5,3%). More in detail, completeness for hip decreased by 4.2%, for knee by 7.3%. On the contrary, completeness for shoulder increased by 0.7%.

After quality control (QC), 95.9% of collected data were eligible for procedure analysis and 93.5% for device analysis. Analysis on devices

was performed using CND classification codes describing the implanted device.

Hip: 30,980 procedures were collected and admitted to quality control, of which 29,681 were eligible for procedure analysis. Primary procedures accounts for 94.7% of analysed procedures, revisions 5.3%. Total hip replacements accounts for 74.9% of primary procedures, partial hip replacements 25.1%. 29,233 (94.4% of records passing CQ for procedures) were admitted to device analysis after quality control (fixation type, bearing surface combinations, stem type). (Tables 2.3 -2.13, Figures 2.3, 2.4).

Knee: 20,060 procedures were collected and admitted to quality control, of which 19,402 were eligible for procedure analysis. Primary procedures accounts for 94.6% of analysed procedures, revisions 5.4%. Total knee replacements accounts for 81.6% of primary procedures, unicondylar knee replacements 18.4%. 18,957 procedures (94.5% of records passing CQ for procedures) were admitted to device analysis after quality control (fixation type, tibial tray type). (Tables 2.14-2.22).

Shoulder: 1,147 procedures were collected and admitted to quality control, of which 979 were eligible for procedure analysis. Primary

procedures accounts for 97.4% of analysed procedures, revisions for 2.6%. Total shoulder replacements accounts for 95.6% of primary procedures, partial shoulder replacements for 4.4%. 581 procedures (50.7% of records passing CQ for procedures) were admitted to device analysis after quality control (*Tables 2.23 - 2.31*).

ANALYSIS OF THE DATA FROM THE NATIONAL HOSPITAL DISCHARGE DATABASE

It is widely recognized that HDD represents a rich source of information to perform statistical and epidemiological analyses in public health and assess the current RIAP completeness at both national and regional level.

To provide the reader with an overview of the volume of primary and revision arthroplasties, the 2021 Annual Report contains a specific section (*Appendix 2A*) showing data related to hip, knee, shoulder and ankle replacements extracted from most recent HDD available to ISS (2019 and 2020) and broken down, for each joint, by region and type of intervention, patient data (sex, age), type of discharge and interregional mobility (the latter is non available for ankle replacements). The *Appendix 2A* also shows temporal changes in the volume of replacements over 20 years of observation (2001-2020).

For the first time, the 2021 Annual Report provides: for the analyses on RIAP data, accuracy values for both procedures and implanted devices by participating institution and by joint in order to check the reliability of collected data (*Table 2.1*); for the analyses on Hospital Discharge Records, incidence and hospitalisation rates by region and their temporal changes over 2001-2020 (*Appendix 2A Figures 2-7; 9-11; 13-18; 19-21*).

Incidence and hospitalisation rates confirm the strong decrease of orthopedic surgeries in 2020 due to the COVID-19 pandemic.

In the majority of centres, accuracy values are equal or near to 100% for the interventions while lower for the devices. The same occurs with accuracy values for shoulder, which are, on average, lower than to those for hip and knee. The reasons behind the much lower levels of accuracy with respect to the national median values and to the high completeness rates in Apulia Region need to be further explored.

HDD were browsed using the ICD9-CM procedure codes of interest for RIAP (hip, knee, shoulder and ankle primary and revision procedures) listed in *Table 1*. All procedures performed during hospitalisation were included. Hip and shoulder replacements were further

classified on the basis of the associated diagnosis; emergency surgeries were defined as interventions performed when a fracture is diagnosed (ICD9-CM codes 820.XX and 812.XX). Interregional mobility for each joint, except for ankle, was measured using the attraction and escape indices computed considering only the ICD9-CM code registered in the so-called "primary procedure". Incidence and hospitalisation rates are calculated for both elective and emergency primary procedures for which patient home region was available, with no distinction made between total and partial replacements.

Challenges

RIAP represents a landmark for all parties interested in arthroplasty. In 2021, RIAP was officially recognised to play a strategic role as a forerunner to further develop the network of medical device registries included in the RIPI "umbrella" structure.

The RIAP activities will continue within the RIPI framework. The development of registries of other medical devices highly relevant for public health in Italy will benefit from the extensive experience of the RIAP working group.

In 2021, a slight improvement in data quality for both quality control and for admission to intervention and device analyses was ob-

served, thanks to the further advancements in the automation of data extraction and QC process. This prompts the RIAP team to further improve procedures in order to provide an increasingly rapid feedback to RIAP participants on quality of data they submit and make all RIAP procedures eligible for analysis.

The quality and completeness of the RIAP-DM Dictionary is expected to improve substantially thanks to the agreement with NJR, which allows RIAP and similar registries worldwide to consult the Global Library fed by a large number of manufactures and distributors of medical devices. This will give users the possibility to access broader information on medical devices and their barcodes and to improve comparability across the majority of registries globally.

The development of device taxonomies for both RIDEP and RIDIS, approved by manufacturers, will not only be crucial to develop medical device dictionaries specific for each registry but also for the future update of the National Medical Device Nomenclature (Classificazione Nazionale dei Dispositivi Medici, CND) and for comparison with other registries and nomenclatures at international level.

Data published in ISS COVID Report "Impact of COVID-19 pandemic emergency on

joint arthroplasties in seven Italian Regions” showed a rapid restart of surgeries after June 2020 in order to recover those procedures postponed or canceled during the period of suspension. For this reason, in next years, a full recovery of pre-pandemic performance is expected.

The final results of the aforementioned qualitative observational study on patients’ perceptions after postponement of surgery due to Covid-19 will be published and it is hoped that it can pave the way to the use of other research strategies, also quantitative, to assess the quality of care services and their impact on patient quality of life.

Future developments and plans

Data collected in 2020 showed a strong decrease in orthopaedic procedures with respect to previous years due to the temporary suspension of non-urgent elective surgery since the outbreak of COVID-19 pandemic in March 2020.

The reduction in *completeness* values can likely be ascribed to the shortage of time for surgeons to enter data into the register during

the second half of 2020 as the hospital system intensified work to reduce the backlog of orthopaedic surgeries that had been suspended between March and June 2020. Other reason might be the decline in enthusiasm among healthcare operators in the Regions where participation in RIAP is voluntary.

Despite the hard work of the RIAP team in fostering participation in the Registry and the recent involvement of the Sicily Region, completeness and quality of data still vary considerably across the Regions participating in the RIAP. Efforts should continue at the regional level to increase participation in the RIAP pending the publication of the Regulation, which is the major goal of the RIPI working group for the near future. The first draft of the Regulation will be further developed in collaboration with the ISS Data Protection Officer (DPO) and the DGDMF of the Ministry of Health.

The publication of the RIPI Regulation, which will make data collection mandatory, is the only way for the Registry to function properly and to reach the highest levels of completeness necessary to safeguard patients undergoing surgeries, as established by the MDR.

Figure 1.1. RIPI architecture and data flow diagram

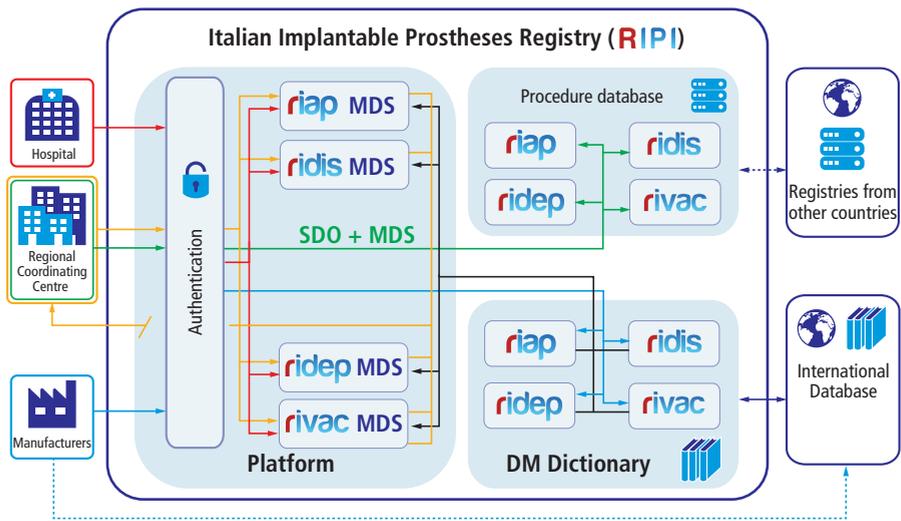


Figure 1.2. Participation in the RIAP (as of 31/12/2021)

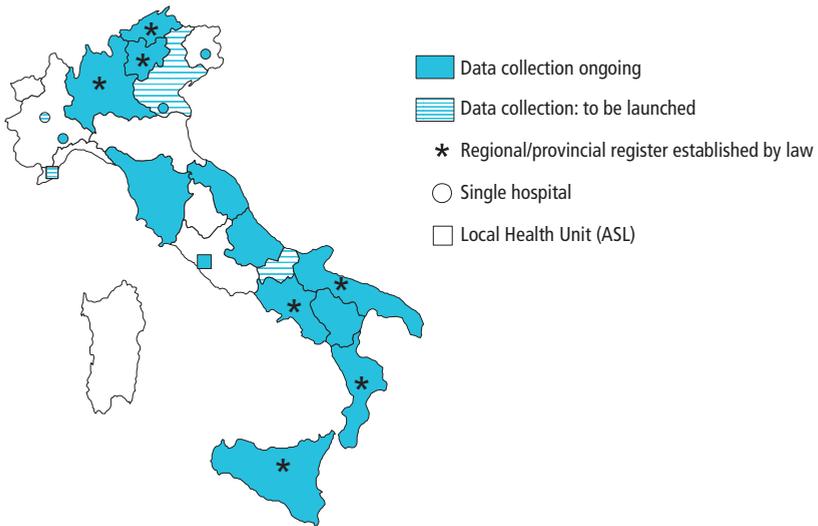


Table 2.1. Number of participating hospitals and coverage and number of RIAP procedures admitted to quality control and completeness and accuracy of data on procedures and devices by participating institution and by joint (year 2020)

Participating institution	Joint	Participating hospitals	Coverage (*)	RIAP procedures	Completeness (**)	Accuracy of data (procedure) (^)	Accuracy of data (device) (^^)
Region		N	%	N	%	%	%
Lombardy	Hip	102	96.2	17,235	94.9	94.9	94.2
	Knee	101	96.2	11,377	94.8	95.9	95.5
AP Bolzano	Hip	12	100.0	1,028	92.4	99.9	99.8
	Knee	12	100.0	603	95.1	100.0	99.0
	Shoulder	5	62.5	48	81.4	100.0	95.8
AP Trento	Hip	8	100.0	1,138	98.2	98.3	97.3
	Knee	8	100.0	571	96.9	96.0	94.2
Tuscany	Hip	3	6.8	726	8.6	71.9	71.6
	Knee	3	6.8	325	4.8	76.9	76.6
Marche	Hip	11	57.9	1,083	46.5	92.3	91.0
	Knee	11	64.7	523	30.7	98.7	96.9
	Shoulder	9	56.3	68	26.3	92.6	80.9
Abruzzo	Hip	2	10.5	127	5.6	100.0	100.0
	Knee	2	10.5	76	4.3	100.0	100.0
	Shoulder	1	5.9	2	0.8	100.0	100.0
Campania	Hip	52	68.4	3,867	64.2	100.0	98.8
	Knee	48	70.6	2,445	72.7	100.0	99.2
	Shoulder	34	66.7	516	66.9	100.0	84.5
Apulia	Hip	39	100.0	4,612	99.2	97.9	92.7
	Knee	38	100.0	3,035	99.8	97.8	97.7
	Shoulder	33	100.0	472	99.6	65.5	0.6
Basilicata	Hip	1	50.0	81	18.1	100.0	100.0
	Knee	1	50.0	7	7.1	100.0	100.0
Sicily	Hip	9	12.7	641	11.2	97.3	95.9
	Knee	8	11.8	780	18.0	98.8	53.8
	Shoulder	4	7.7	29	4.1	100.0	93.1
Subtotal (Regions)	Hip	239	60.4	30,538	62.1	95.8	94.3
	Knee	232	64.1	19,742	58.8	96.7	94.5
	Shoulder	86	48.6	1,135	45.8	85.2	50.1

(continued)

Table 2.1. (continued)

Participating institution	Joint	Participating hospitals	Coverage (*)	RIAP procedures	Completeness (**)	Accuracy of data (procedure) (^)	Accuracy of data (device) (^^)
Single hospital		N	%	N	%		
Clinica Città di Alessandria	Hip	1	-	193	61.7	98.4	97.9
	Knee	1	-	190	47.5	97.9	96.8
PO Universitario Santa Maria della Misericordia Udine	Hip	1	-	94	27.2	100.0	98.9
	Knee	1	-	55	90.2	100.0	89.1
	Shoulder	1	-	4	40.0	100.0	100.0
Casa di cura San Feliciano Rome	Hip	1	-	61	39.9	100.0	100.0
	Knee	1	-	41	17.6	100.0	100.0
	Shoulder	1	-	8	40.0	100.0	100.0
Villa Aurora Rome	Hip	1	-	94	49.0	100.0	100.0
	Knee	1	-	32	22.4	100.0	100.0
Subtotal (Hospitals)	Hip	4	-	442	44.1	99.3	98.9
	Knee	4	-	318	38.0	98.7	96.2
	Shoulder	2	-	12	40.0	100.0	100.0
Total number of procedures admitted to quality control		N	%	N	%		
	Hip	243	-	30,980	61.7	95.8	94.4
	Knee	236	-	20,060	58.2	96.7	94.5
	Shoulder	88	-	1,147	45.8	85.4	50.7
	ALL JOINTS	243		52,187	59.9	95.9	93.5

(*) Coverage: ratio between number of hospitals participating in RIAP and number of hospitals performing arthroplasties according to HDD

(**) Completeness: ratio between number of procedures collected by RIAP and number of procedures recorded in HDD from participating institutions

^ Accuracy of data on procedures: ratio between number of procedures included in procedure analysis and number of procedures collected by RIAP and linked to HDD

^^ Accuracy of data on devices: ratio between number of procedures included in device analysis and number of procedures collected by RIAP and linked to HDD

Table 2.2. RIAP completeness (years 2019 and 2020). Comparison with 2019 and 2020 Hospital Discharge Data (HDD) by joint

Joint	2019			2020		
	HDD	RIAP	Completeness (*)	HDD	RIAP	Completeness (*)
	N	N	%	N	N	%
All	220,136	75,679	34.4	177,146	52,187	29.5
Hip	118,653	41,432	34.9	99,071	30,980	31.3
Knee	90,322	32,984	36.5	68,755	20,060	29.2
Shoulder	11,161	1,263	11.3	9,320	1,147	12.3
Ankle	747	0	0.0	847	3	0.4

(*) *Completeness*: ratio between number of procedures collected by RIAP and number of procedures recorded in HDD at national level

Table 2.3. Hip. Number of procedures included in procedure analysis and *completeness* by procedure type

	N	%	<i>Completeness</i> (*) %
Procedure type	29,681		59.2
Primary	28,104	94.7	60.8
Total replacement	21,060	74.9	
- elective	17,820	84.6	
- emergency	3,240	15.4	
Partial replacement	7,044	25.1	
Revision	1,577	5.3	40.2
Partial revision (**)	1,079	68.4	
Total revision	207	13.1	
Removal (***)	291	18.5	

(*) *Completeness*: ratio between number of procedures collected by RIAP and number of procedures recorded in HDD by participating centres

(**) Includes conversion from endoprosthesis to arthroprosthesis

(***) Includes removal, removal with spacer implantation, spacer replacement

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

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Hospital type	17,820		3,240		7,044		1,577		29,681	
Public hospitals	4,581	25.7	2,184	67.4	5,404	76.7	616	39.1	12,785	43.1
Private hospitals, accredited	13,092	73.5	1,054	32.5	1,639	23.3	953	60.4	16,738	56.4
Private hospitals, not accredited	147	0.8	2	0.1	1	0.0	8	0.5	158	0.5

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

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

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Gender	17,820		3,240		7,044		1,577		29,681	
Male	8,511	47.8	963	29.7	1,873	26.6	649	41.2	11,996	40.4
Female	9,309	52.2	2,277	70.3	5,171	73.4	928	58.8	17,685	59.6
Age group by gender										
Male	8,511		963		1,873		649		11,996	
Mean age	64		71		83		69		68	
Standard deviation	12		12		8		13		13	
<45	466	5.5	21	2.2	8	0.4	26	4.0	521	4.3
45 - 54	1,309	15.4	85	8.8	10	0.5	59	9.1	1,463	12.2
55 - 64	2,266	26.6	157	16.3	38	2.0	132	20.3	2,593	21.6
65 - 74	2,625	30.8	289	30.0	143	7.6	178	27.4	3,235	27.0
75 - 84	1,629	19.1	280	29.1	725	38.7	187	28.8	2,821	23.5
≥ 85	216	2.5	131	13.6	949	50.7	67	10.3	1,363	11.4
Female	9,309		2,277		5,171		928		17,685	
Mean age	69		74		84		73		74	
Standard deviation	11		10		8		12		12	
<45	202	2.2	11	0.5	16	0.3	12	1.3	241	1.4
45 - 54	742	8.0	60	2.6	25	0.5	47	5.1	874	4.9
55 - 64	1,843	19.8	271	11.9	61	1.2	142	15.3	2,317	13.1
65 - 74	3,351	36.0	749	32.9	334	6.5	245	26.4	4,679	26.5
75 - 84	2,698	29.0	793	34.8	2,023	39.1	337	36.3	5,851	33.1
≥ 85	473	5.1	393	17.3	2,712	52.4	145	15.6	3,723	21.1

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

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

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Side	17,820		3,240		7,044		1,577		29,681	
Right	9,359	52.5	1,650	50.9	3,578	50.8	833	52.8	15,420	52.0
Left	7,764	43.6	1,572	48.5	3,425	48.6	729	46.2	13,490	45.4
Bilateral	697	3.9	18	0.6	41	0.6	15	1.0	771	2.6
Surgical approach	17,820		3,240		7,044		1,577		29,681	
Anterior	3,394	19.0	188	5.8	585	8.3	122	7.7	4,289	14.5
Anterolateral	1,918	10.8	537	16.6	1,673	23.8	220	14.0	4,348	14.6
Lateral	2,750	15.4	1,000	30.9	2,199	31.2	314	19.9	6,263	21.1
Posterolateral	9,384	52.7	1,475	45.5	2,517	35.7	903	57.3	14,279	48.1
Other	374	2.1	40	1.2	70	1.0	18	1.1	502	1.7

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

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

	Total replacement				Partial replacement		TOTAL	
	elective		emergency		N	%	N	%
	N	%	N	%				
Indication for surgery	17,820		3,240		7,044		28,104	
Primary osteoarthritis	15,698	88.1	0	0.0	150	2.1	15,848	56.4
Post-traumatic osteoarthritis	323	1.8	0	0.0	41	0.6	364	1.3
Rheumatoid arthritis	41	0.2	0	0.0	0	0.0	41	0.1
Neoplasia	37	0.2	0	0.0	42	0.6	79	0.3
Aseptic necrosis of femoral head	993	5.6	0	0.0	19	0.3	1,012	3.6
Congenital hip dislocation or dysplasia outcomes	346	1.9	0	0.0	5	0.1	351	1.2
Perthes disease or epiphysiolysis	43	0.2	0	0.0	6	0.1	49	0.2
Fractured of neck and/or of femur	0	0.0	3,240	100.0	6,709	95.2	9,949	35.4
Septic coxitis outcomes	7	0.0	0	0.0	0	0.0	7	0.0
Pseudoarthrosis caused by neck fracture	33	0.2	0	0.0	14	0.2	47	0.2
Other	299	1.7	0	0.0	58	0.8	357	1.3
Previous surgery	17,820		3,240		7,044		28,104	
None	16,606	93.2	3,040	93.8	6,367	90.4	26,013	92.6
Osteosynthesis	278	1.6	25	0.8	39	0.6	342	1.2
Osteotomy	48	0.3	0	0.0	0	0.0	48	0.2
Arthrodesis	2	0.0	1	0.0	0	0.0	3	0.0
Other	886	5.0	174	5.4	638	9.1	1,698	6.0

Table 2.8. Hip. Number of revisions by indication for surgery and type of previous surgery

	Revision (*)	
	N	%
Indication for surgery	1,577	
Pain	74	4.7
Lysis	46	2.9
Wear	108	6.8
Implant fracture	56	3.6
Prosthesis dislocation	265	16.8
Periprosthetic fracture	231	14.6
Infection	173	11.0
Previous prosthesis removal outcomes	23	1.5
Aseptic loosening, cup	241	15.3
Aseptic loosening, stem	162	10.3
Aseptic loosening, total	102	6.5
Disease progression	3	0.2
High concentration of metal ions	3	0.2
Spacer fracture	1	0.1
Other	89	5.6
Previous surgery	1,577	
Total hip replacement	1,196	75.8
Revision of hip replacement	84	5.3
Spacer implant or prosthesis removal (**)	142	9.0
Partial hip replacement	135	8.6
Other	20	1.3

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

(**) Includes removal, removal with spacer implant, spacer replacement

Table 2.9. Hip. Number of procedures included in device analysis by procedure type

	N	%
Procedure type	29,233	
Primary	27,675	94.7
Total replacement	20,792	75.1
- elective	17,567	84.5
- emergency	3,225	15.5
Partial replacement	6,883	24.9
Revision	1,558	5.3
Partial revision (*)	1,070	68.7
Total revision	202	13.0
Removal of prosthesis (**)	286	18.4

(*) Includes conversion from endoprosthesis to arthroprosthesis

(**) Includes removal, removal with spacer implantation spacer replacement

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

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Fixation	17,567		3,225		6,883		1,558		29,233	
Cemented (stem + cup)	819	4.7	150	4.7	0	0.0	60	3.9	1,029	3.5
Reverse hybrid (uncemented stem and cemented cup)	169	1.0	156	4.8	0	0.0	90	5.8	415	1.4
Only cemented cup	0	0.0	0	0.0	0	0.0	61	3.9	61	0.2
Hybrid (cemented stem and uncemented cup)	636	3.6	158	4.9	0	0.0	41	2.6	835	2.9
Uncemented (stem + cup)	15,943	90.8	2,761	85.6	0	0.0	882	56.6	19,586	67.0
Only uncemented cup	0	0.0	0	0.0	0	0.0	143	9.2	143	0.5
Only cemented stem	0	0.0	0	0.0	2,498	36.3	29	1.9	2,527	8.6
Only uncemented stem	0	0.0	0	0.0	4,385	63.7	161	10.3	4,546	15.6
Fixation declared "not applicable" for cup and stem	0	0.0	0	0.0	0	0.0	91	5.8	91	0.3

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

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

	Total replacement				TOTAL	
	elective		emergency		N	%
	N	%	N	%		
Bearing type (head/insert)	17,567		3,225		20,792	
Ceramics-Ceramics	2,404	13.7	234	7.3	2,638	12.7
Ceramics-Metal	156	0.9	67	2.1	223	1.1
Ceramics-Polyethylene	12,169	69.3	1,930	59.8	14,099	67.8
Metal-Ceramics	7	0.0	2	0.1	9	0.0
Metal-Metal	89	0.5	39	1.2	128	0.6
Metal-Polyethylene	1,339	7.6	583	18.1	1,922	9.2
Procedures not reporting the implantation of a head and an insert	1,403	8.0	370	11.5	1,773	8.5

Table 2.12. Hip. Number of revision by bearing type

	Revision (*)	
	N	%
Bearing type (head/insert)	1,558	
Ceramics-Ceramics	31	2.0
Ceramics-Metal	33	2.1
Ceramics-Polyethylene	553	35.5
Metal-Ceramics	0	0.0
Metal-Metal	20	1.3
Metal-Polyethylene	233	15.0
Procedures not reporting the implantation of a head and an insert	688	44.2

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

Table 2.13. Hip. Number of total replacements by stem type and by procedure type

	Total replacement				TOTAL	
	elective		emergency		N	%
	N	%	N	%		
Stem type	17,567		3,225		20,792	
Uncemented	15,589	88.7	2,585	80.2	18,174	87.4
Modular	517	3.3	278	10.8	795	4.4
Non-modular	15,072	96.7	2,307	89.2	17,379	95.6
Straight	12,138	80.5	2,158	93.5	14,296	82.3
Anatomical	544	3.6	79	3.4	623	3.6
Conservative	2,390	15.9	70	3.0	2,460	14.2
Cemented	720	4.1	377	11.7	1,097	5.3
Modular	12	1.7	19	5.0	31	2.8
Non-modular	708	98.3	358	95.0	1,066	97.2
Straight	666	94.1	325	90.8	991	93.0
Anatomical	29	4.1	28	7.8	57	5.3
Conservative	13	1.8	5	1.4	18	1.7
Other stem type / Stem type not reported	1,258	7.2	263	8.2	1,521	7.3

Table 2.14. Knee. Number of procedures included in procedure analysis and *completeness* by procedure type

	N	%	<i>Completeness</i> (*) (%)
Procedure type	19,402		56,3
Primary	18,350	94.6	58.7
- total	14,969	81.6	
- unicompartmental	3,381	18.4	
Revision	1,052	5.4	33.3
Partial revision	238	22.6	
Total revision	771	73.3	
Prosthesis removal, spacer replacement	36	3.4	
Primary patella implant on existing prosthesis	7	0.7	

(*) *Completeness*: ratio between number of procedures collected by RIAP and number of procedures recorded in HDD by participating institutions

(**) Includes removal, removal with spacer implantation, spacer replacement

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

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Hospital type	14,969		3,381		1,052		19,402	
Public hospitals	3,476	23.2	415	12.3	228	21.7	4,119	21.2
Private hospitals, accredited	11,433	76.4	2,940	86.9	822	78.1	15,195	78.3
Private hospitals, not accredited	60	0.4	26	0.8	2	0.2	88	0.5

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

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

	Primary				Revision (*)		TOTAL	
	total		unicompartmental					
	N	%	N	%	N	%	N	%
Gender	14,969		3,381		1,052		19,402	
Male	5,064	33.8	1,288	38.1	354	33.7	6,706	34.6
Female	9,905	66.2	2,093	61.9	698	66.3	12,696	65.4
Age group by gender								
Male	5,064		1,288		354		6,706	
Mean age	69		66		68		68	
Standard deviation	9		10		10		9	
<45	33	0.7	22	1.7	4	1.1	59	0.9
45 - 54	262	5.2	116	9.0	35	9.9	413	6.2
55 - 64	1,149	22.7	361	28.0	76	21.5	1,586	23.7
65 - 74	2,079	41.1	518	40.2	121	34.2	2,718	40.5
75 - 84	1,446	28.6	254	19.7	108	30.5	1,808	27.0
≥85	95	1.9	17	1.3	10	2.8	122	1.8
Female	9,905		2,093		698		12,696	
Mean age	70		68		70		70	
Standard deviation	8		9		9		8	
<45	35	0.4	12	0.6	3	0.4	50	0.4
45 - 54	321	3.2	146	7.0	31	4.4	498	3.9
55 - 64	1,649	16.6	495	23.7	126	18.1	2,270	17.9
65 - 74	4,456	45.0	895	42.8	288	41.3	5,639	44.4
75 - 84	3,251	32.8	513	24.5	224	32.1	3,988	31.4
≥85	193	1.9	32	1.5	26	3.7	251	2.0

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

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

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Side	14,969		3,381		1,052		19,402	
Right	7,952	53.1	1,626	48.1	565	53.7	10,143	52.3
Left	6,776	45.3	1,455	43.0	483	45.9	8,714	44.9
Bilateral	241	1.6	300	8.9	4	0.4	545	2.8
Surgical approach	14,969		3,381		1,052		19,402	
Medial parapatellar	13,166	88.0	2,243	66.3	904	85.9	16,313	84.1
Lateral parapatellar	284	1.9	136	4.0	28	2.7	448	2.3
Mid-vastus	886	5.9	496	14.7	82	7.8	1,464	7.5
Minimally invasive mid-vastus	207	1.4	402	11.9	20	1.9	629	3.2
Quad-sparing	35	0.2	38	1.1	1	0.1	74	0.4
Sub-vastus	188	1.3	24	0.7	1	0.1	213	1.1
Minimally invasive sub-vastus	7	0.0	10	0.3	0	0.0	17	0.1
V Quadriceps	1	0.0	0	0.0	3	0.3	4	0.0
Tibial tuberosity osteotomy	4	0.0	0	0.0	2	0.2	6	0.0
Other	191	1.3	32	0.9	11	1.0	234	1.2

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

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

	Primary				TOTAL	
	total		unicompartmental		N	%
	N	%	N	%		
Indication for surgery	14,969		3,381		18,350	
Primary osteoarthritis	14,174	94.7	3,019	89.3	17,193	93.7
Post-traumatic osteoarthritis	253	1.7	30	0.9	283	1.5
Rheumatoid arthritis	75	0.5	1	0.0	76	0.4
Neoplasia	2	0.0	0	0.0	2	0.0
Osteonecrosis	87	0.6	130	3.8	217	1.2
Other	378	2.5	201	5.9	579	3.2
Previous surgery	14,969		3,381		18,350	
None	13,740	91.8	3,061	90.5	16,801	91.6
Arthrodesis	11	0.1	0	0.0	11	0.1
Osteotomy	102	0.7	13	0.4	115	0.6
Arthroscopy	370	2.5	202	6.0	572	3.1
Osteosynthesis	85	0.6	18	0.5	103	0.6
Other	661	4.4	87	2.6	748	4.1

Table 2.19. Knee. Number of revision by indication for surgery and type of previous surgery

	Revision (*)	
	N	%
Indication for surgery	1,052	
Aseptic loosening of several components	268	25.5
Aseptic loosening of femur	32	3.0
Aseptic loosening of tibia	100	9.5
Aseptic loosening of patella	2	0.2
Wear	32	3.0
Dislocation	19	1.8
Instability	55	5.2
Periprosthetic fracture	24	2.3
Implant fracture	15	1.4
Fractured spacer	0	0.0
Infection	231	22.0
Stiffness	25	2.4
Disease progression	10	1.0
Pain	158	15.0
Other	81	7.7
Previous surgery	1,052	
Primary total	663	63.0
Primary unicompartmental	179	17.0
Revision of knee replacement	64	6.1
Spacer	117	11.1
Other	29	2.8

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

Table 2.20. Knee. Number of procedures included in device analysis by procedure type

	N	%
Procedure type	18,957	
Primary	17,956	94.7
- total	14,616	81.4
- unicompartmental	3,340	18.6
Revision	1,001	5.3
Partial revision	231	23.1
Total revision	732	73.1
Removal, spacer replacement (*)	32	3.2
Primary patella implant on existing prosthesis	6	0.6

(*) Includes removal, removal with spacer implantation, spacer replacement

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

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Fixation	14,616		3,340		1,001		18,957	
Patella not implanted	12,600	86.2	3,060	91.6	375	37.5	16,035	84.6
Cemented (femoral and tibial components)	9,231	73.3	2,294	75.0	290	77.3	11,815	73.7
Cemented femoral component and uncemented tibial component	235	1.9	93	3.0	13	3.5	341	2.1
Only cemented femoral component	0	0.0	0	0.0	10	2.7	10	0.1
Uncemented femoral component and cemented tibial component	406	3.2	110	3.6	2	0.5	518	3.2
Uncemented	2,728	21.7	563	18.4	9	2.4	3,300	20.6
Only uncemented femoral component	0	0.0	0	0.0	1	0.3	1	0.0
Only cemented tibial component	0	0.0	0	0.0	15	4.0	15	0.1
Only uncemented tibial component	0	0.0	0	0.0	9	2.4	9	0.1
Fixation declared "not applicable" for both femoral and tibial components	0	0.0	0	0.0	26	6.9	26	0.2
Patella implanted (cemented)	1,442	9.9	257	7.7	169	16.9	1,868	9.9
Cemented (femoral and tibial components)	1,377	95.5	231	89.9	125	74.0	1,733	92.8
Cemented femoral component and uncemented tibial component	10	0.7	20	7.8	6	3.6	36	1.9
Only cemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Uncemented femoral component and cemented tibial component	33	2.3	1	0.4	3	1.8	37	2.0
Uncemented	22	1.5	4	1.6	10	5.9	36	1.9
Only uncemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Only cemented tibial component	0	0.0	0	0.0	3	1.8	3	0.2
Only uncemented tibial component	0	0.0	0	0.0	1	0.6	1	0.1
Only patella	0	0.0	1	0.4	21	12.4	22	1.2

(continued)

Table 2.21. (continued)

	Primary				Revision (*)		TOTAL	
	total		unicompartmental		N	%	N	%
	N	%	N	%				
Patella implanted (uncemented)	574	3.9	23	0.7	457	45.7	1,054	5.6
Cemented (femoral and tibial components)	353	61.5	8	34.8	205	44.9	566	53.7
Cemented femoral component and uncemented tibial component	9	1.6	4	17.4	15	3.3	28	2.7
Only cemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Uncemented femoral component and cemented tibial component	45	7.8	2	8.7	28	6.1	75	7.1
Uncemented	167	29.1	9	39.1	208	45.5	384	36.4
Only uncemented femoral component	0	0.0	0	0.0	0	0.0	0	0.0
Only cemented tibial component	0	0.0	0	0.0	0	0.0	0	0.0
Only uncemented tibial component	0	0.0	0	0.0	0	0.0	0	0.0
Only patella	0	0.0	0	0.0	1	0.2	1	0.1

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

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

	N	%
Type of tibial tray	14,616	
Mobile bearing	2,984	20.4
Cemented	2,282	76.5
Uncemented	530	17.8
Cementable	172	5.8
Fixed	8,020	54.9
Cemented	7,409	92.4
Uncemented	485	6.0
Cementable	126	1.6
Missing	3,612	24.7

Table 2.23. Shoulder. Number of procedures included in procedure analysis and *completeness* by procedure type

	N	%	<i>Completeness</i> (*) (%)
Procedure type	979		39.1
Primary	954	97,4	39.8
Total replacement	912	95,6	
- elective	565	62,0	
- emergency	347	38,0	
Partial replacement	42	4,4	
Revision (**)	25	2,6	23.3

(*) *Completeness*: ratio between number of procedures collected by RIAP and number of procedures recorded in HDD by participating institutions

(**) Includes total or partial revision, removal, removal with spacer implantation, spacer replacement

Table 2.24. Shoulder. Number of total replacements by type of implanted prosthesis

	N	%
Type of prosthesis implanted in the total replacement	912	
Elective	565	62,0
- anatomical	32	5.7
- resurfacing	0	0.0
- reverse	474	83.9
- interposition	59	10.4
Emergency	347	38,0
- anatomical	9	2.6
- resurfacing	0	0.0
- reverse	338	97.4
- interposition	0	0.0

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

	Total replacement				Partial replacement		Revision (*)		TOTAL	
	elective		emergency		N	%	N	%	N	%
	N	%	N	%						
Hospital type	565		347		42		25		979	
Public hospitals	99	17.5	231	66.6	28	66.7	13	52.0	371	37.9
Private hospitals, accredited	463	82.0	116	33.4	14	33.3	12	48.0	605	61.8
Private hospitals, non-accredited	3	0.5	0	0.0	0	0.0	0	0.0	3	0.3

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

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

	Primary						Revision (*)		TOTAL	
	Total replacement				Partial replacement					
	elective		emergency							
	N	%	N	%	N	%				
Gender	565		347		42		25		979	
Male	165	29.2	61	17.6	11	26.2	14	56.0	251	25.6
Female	400	70.8	286	82.4	31	73.8	11	44.0	728	74.4
Age group by gender										
Male	165		61		11		14		251	
Mean age	67		68		63		64		67	
Standard deviation	10		12		18		13		11	
<45	5	3.0	2	3.3	2	18.2	1	7.1	10	4.0
45 - 54	11	6.7	5	8.2	2	18.2	3	21.4	21	8.4
55 - 64	41	24.8	13	21.3	1	9.1	4	28.6	59	23.5
65 - 74	69	41.8	17	27.9	3	27.3	2	14.3	91	36.3
75 - 84	37	22.4	21	34.4	1	9.1	4	28.6	63	25.1
≥85	2	1.2	3	4.9	2	18.2	0	0.0	7	2.8
Female	400		286		31		11		728	
Mean age	72		74		74		73		73	
Standard deviation	7		7		9		8		8	
<45	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
45 - 54	8	2.0	2	0.7	0	0.0	0	0.0	10	1.4
55 - 64	49	12.3	23	8.0	3	9.7	2	18.2	77	10.6
65 - 74	176	44.0	106	37.1	11	35.5	2	18.2	295	40.5
75 - 84	154	38.5	130	45.5	14	45.2	7	63.6	305	41.9
≥85	13	3.3	25	8.7	3	9.7	0	0.0	41	5.6

(*) Total or partial revision, conversion to endoprosthesis to arthroprosthesis, removal, removal with spacer implantation, spacer replacement

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

	Primary						Revision (*)		TOTAL	
	Total replacement				Partial replacement		N	%	N	%
	elective		emergency							
	N	%	N	%	N	%	N	%	N	%
Side	565		347		42		25		979	
Right	366	64.8	182	52.4	26	61.9	16	64.0	590	60.3
Left	199	35.2	165	47.6	16	38.1	9	36.0	389	39.7
Bilateral	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Surgical approach	565		347		42		25		979	
Deltpectoral	464	82.1	341	98.3	41	97.6	23	92.0	869	88.8
Trans-deltoid	83	14.7	5	1.4	1	2.4	1	4.0	90	9.2
Other	18	3.2	1	0.3	0	0.0	1	4.0	20	2.0

(*) Includes total or partial revision, removal, removal with spacer implantation, spacer replacement

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

	Primary						TOTAL	
	Total replacement				Partial replacement		N	%
	elective		emergency		N	%		
	N	%	N	%	N	%	N	%
Indication for surgery	565		347		42		954	
Eccentric osteoarthritis	300	53.1	0	0.0	6	14.3	306	32.1
Concentric osteoarthritis	74	13.1	0	0.0	3	7.1	77	8.1
Rheumatoid arthritis	4	0.7	0	0.0	0	0.0	4	0.4
Neoplasia	0	0.0	0	0.0	0	0.0	0	0.0
Osteonecrosis	10	1.8	0	0.0	1	2.4	11	1.2
Fracture	0	0.0	347	100.0	26	61.9	373	39.1
Previous fracture	22	3.9	0	0.0	3	7.1	25	2.6
Other	155	27.4	0	0.0	3	7.1	158	16.6
Previous surgery	565		347		42		954	
None	530	93.8	2	0.6	41	97.6	573	60.1
Osteosynthesis	10	1.8	1	0.3	0	0.0	11	1.2
Arthrotomy	3	0.5	0	0.0	0	0.0	3	0.3
Arthrodesis	1	0.2	0	0.0	0	0.0	1	0.1
Arthroscopy	18	3.2	344	99.1	0	0.0	362	37.9
Other	3	0.5	0	0.0	1	2.4	4	0.4

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

	Revision (*)	
	N	%
Indication for surgery	25	
Instability	3	12,0
Dislocation	4	16,0
Periprosthetic fracture	2	8,0
Infection	6	24,0
Aseptic mobilisation	7	28,0
Pain	1	4,0
Other	2	8,0
Previous surgery	25	
Primary	20	80,0
Removal with spacer implantation	4	16,0
Shoulder replacement revision	1	4,0

(*) Includes total or partial revision, removal, removal with spacer implantation, spacer replacement

Table 2.30. Shoulder. Number of procedures included in device analysis by procedure type

	N	%
Procedure type	581	
Primary	560	96.4
Total replacement	554	98,9
- elective	383	69.1
- emergency	171	30.9
Partial replacement	6	1,1
Revision (*)	21	3.6

(*) Includes total or partial revision, removal, removal with spacer implantation, spacer replacement

Table 2.31. Shoulder. Number of procedures by fixation and by procedure type

							Revision (*)		TOTAL	
	Total replacement				Partial replacement		N	%	N	%
	elective		emergency		N	%				
	N	%	N	%			N	%	N	%
Fixation	383		171		6		21		581	
Cemented (glenoid + stem)	9	2.3	15	8.8	0	0.0	1	4.8	25	4.3
Reverse hybrid (cemented glenoid and uncemented stem)	4	1.0	0	0.0	0	0.0	0	0.0	4	0.7
Only cemented glenoid	0	0.0	0	0.0	5	83.3	0	0.0	5	0.9
Hybrid (uncemented glenoid and cemented stem)	19	5.0	35	20.5	0	0.0	1	4.8	55	9.5
Uncemented (glenoid + stem)	351	91.6	121	70.8	0	0.0	7	33.3	479	82.4
Only uncemented glenoid	0	0.0	0	0.0	1	16.7	3	14.3	4	0.7
Only cemented stem	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Only stem uncemented	0	0.0	0	0.0	0	0.0	5	23.8	5	0.9
Not applicable	0	0.0	0	0.0	0	0.0	4	19.0	4	0.7

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

Figure 2.1. Flowchart of the RIAP data quality control process: procedures

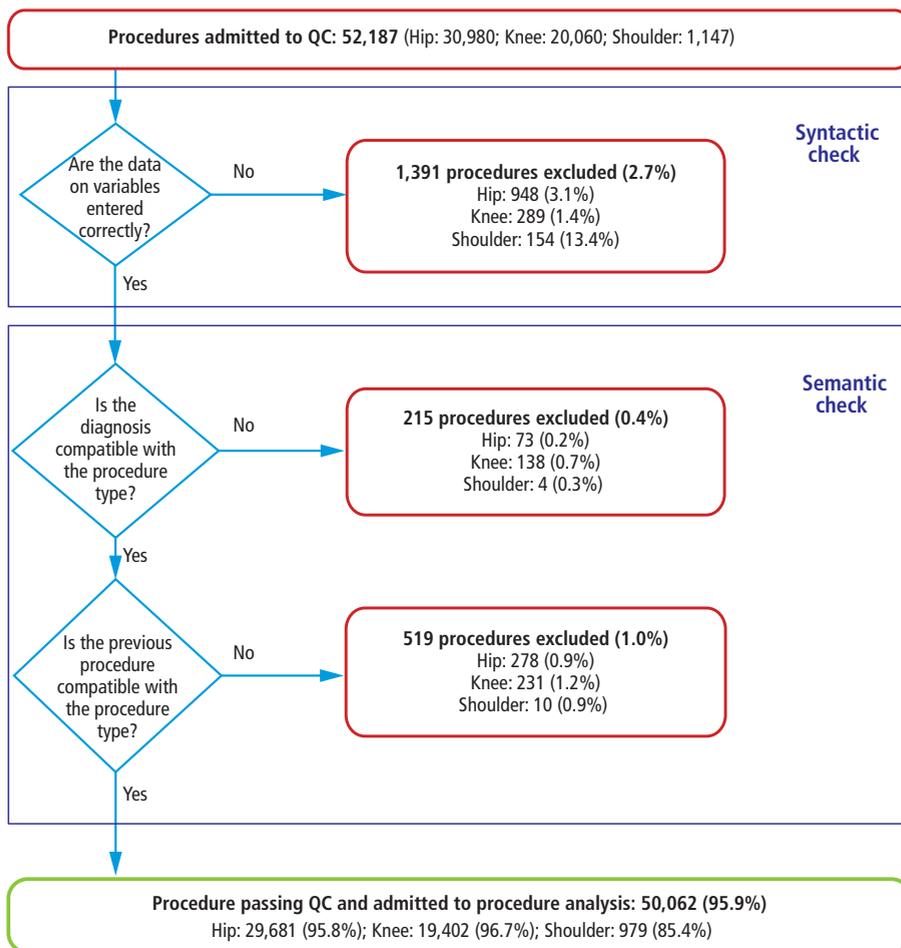


Figure 2.2. Flowchart of the RIAP data quality control process for device analysis

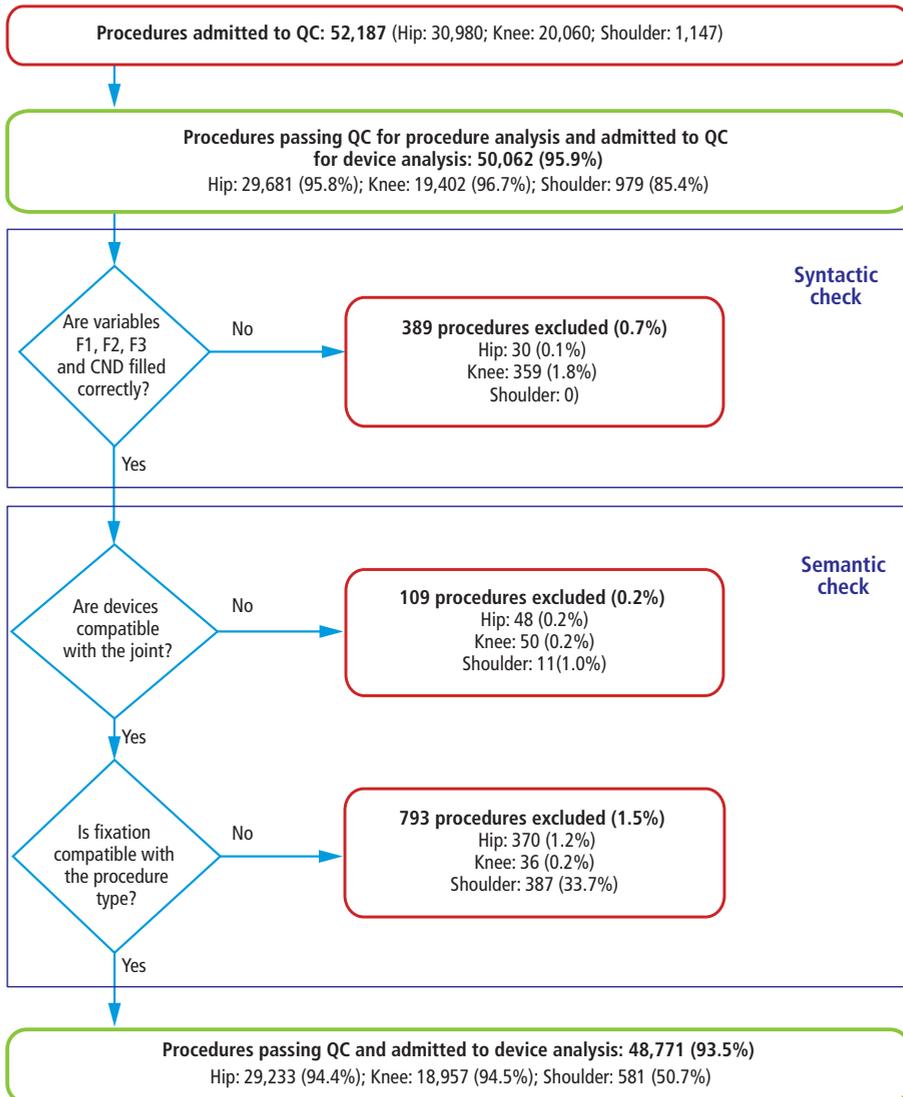


Figure 2.3. Hip. Types of bearing. Total replacement (elective procedures)

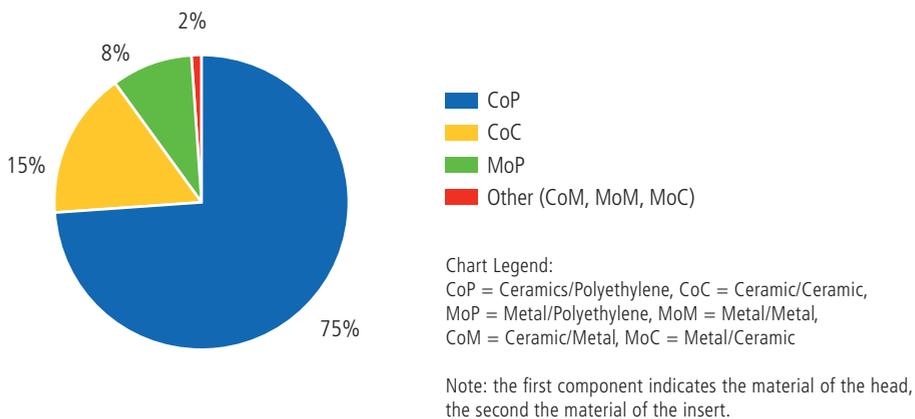
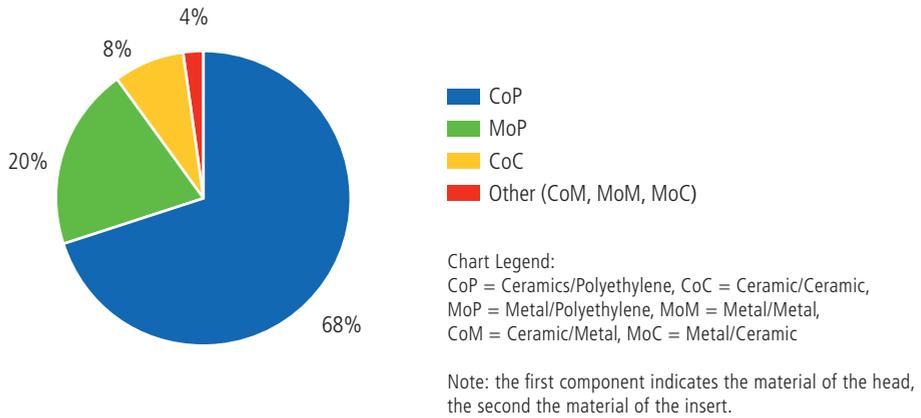


Figure 2.4. Hip. Types of bearing. Total replacement (emergency)



APPENDIX

Table 1. Joint replacements (primary and revision procedures) in Italy. 2001-2020

ICD-9-CM Code	Procedure	2001	2003	2005	2007
	Hip	74,408	80,999	87,499	91,077
81,51	Total hip replacement	46,850	52,541	57,112	60,425
	<i>Total hip replacement (elective)</i>	<i>40,060</i>	<i>44,505</i>	<i>47,908</i>	<i>50,684</i>
81,52	Partial hip replacement	21,394	21,753	23,227	23,119
00,85(*)	Hip resurfacing	0	0	0	0
(**)	Revision of hip replacement	6,164	6,705	7,160	7,533
	Knee	28,693	38,655	47,643	57,054
81,54	Total knee replacement	27,401	36,714	45,116	53,930
(***)	Revision of knee replacement	1,292	1,941	2,527	3,124
	Shoulder	1,559	1,866	2,517	3,255
81,80	Total shoulder replacement	709	948	1,462	2,048
	<i>Total shoulder replacement (elective)</i>	<i>417</i>	<i>644</i>	<i>1,085</i>	<i>1,629</i>
81,81	Partial shoulder replacement	850	918	1,055	1,207
	Ankle	95	147	179	268
81,56	Total ankle replacement	95	147	179	268
	Other joints	1,401	1,648	3,183	2,961
81,57	Foot and toe joint replacement	95	147	179	268
81,59	Revision of lower extremity joint replacement	736	870	1,668	1,570
81,73	Total wrist replacement	316	414	604	692
81,84	Total elbow replacement	214	173	672	365
81,97	Revision of upper extremity joint replacement	40	44	60	66
	Total	106,156	123,315	141,021	154,615

(°) Average annual increase

(*) New code introduced on 1st January 2009

(**) 81,53 code and new codes introduced since 1st January 2019: 00,70, 00,71, 00,72, 00,73

(***) 81,55 code and new codes introduced since 1st January 2019: 00,80, 00,81, 00,82, 00,83, 00,84

2009	2011	2013	2015	2017	2019	2020	% (°)
93,241	96,125	100,844	105,803	112,375	117,911	98,507	1.5
61,601	62,664	66,257	71,178	77,787	83,158	66,939	1.9
51.769	53.157	56.598	60.661	66.917	71.626	55.869	1.8
23,393	25,091	25,979	26,222	26,101	25,876	24,292	0.7
293	162	99	107	65	229	256	-1.2
7,954	8,208	8,509	8,296	8,422	8,648	7,020	0.7
61,079	63,749	67,634	73,191	81,271	89,210	67,826	4.6
57,004	59,472	62,910	68,091	75,668	82,815	62,606	4.4
4,075	4,277	4,724	5,100	5,603	6,395	5,220	7.6
3,783	4,684	5,795	7,145	9,101	10,989	9,195	9.8
2,537	3,478	4,441	5,970	7,862	9,767	8,184	13.7
2.092	2.815	3.479	4.474	5.921	7.347	5.758	14.8
1,246	1,206	1,354	1,175	1,239	1,222	1,011	0.9
256	298	330	482	600	767	593	10.1
256	298	330	482	600	767	593	10.1
2,355	2,365	2,231	2,644	2,671	2,856	2,179	2.4
256	298	330	482	600	767	593	10.1
1,332	1,349	1,300	1,479	1,489	1,568	1,283	3.0
521	543	440	530	468	415	234	-1.6
187	107	96	102	77	63	42	-8.2
59	68	65	51	37	43	27	-2.0
160,714	167,221	176,834	189,265	206,018	221,732	178,300	2.8

Table 2. Hip. Number of primary and revision procedures by region of admission and by procedure type. 2019-2020

Region of admission	Total replacement (elective)				Total replacement (emergency)			
	2019		2020		2019		2020	
	N	%	N	%	N	%	N	%
Piedmont	6,956	9.7	5,190	9.3	1,028	8.9	1,067	9.6
Aosta Valley	156	0.2	111	0.2	22	0.2	17	0.2
Lombardy	16,679	23.2	10,618	18.9	1,630	14.1	1,346	12.1
AP Bolzano	1,013	1.4	698	1.2	105	0.9	75	0.7
AP Trento	969	1.3	763	1.4	94	0.8	83	0.7
Veneto	7,276	10.1	6,207	11.1	802	7.0	869	7.8
Friuli Venezia Giulia	1,620	2.3	1,390	2.5	220	1.9	234	2.1
Liguria	1,188	1.7	484	0.9	674	5.8	632	5.7
Emilia-Romagna	8,530	11.9	7,029	12.5	846	7.3	894	8.1
Tuscany	6,064	8.4	5,116	9.1	909	7.9	856	7.7
Umbria	905	1.3	744	1.3	159	1.4	127	1.1
Marche	1,418	2.0	1,275	2.3	401	3.5	414	3.7
Lazio	5,636	7.8	4,831	8.6	1,146	9.9	1,082	9.8
Abruzzi	1,577	2.2	1,262	2.2	274	2.4	281	2.5
Molise	200	0.3	129	0.2	21	0.2	16	0.1
Campania	3,750	5.2	3,032	5.4	1,180	10.2	1,238	11.2
Apulia	2,555	3.6	2,506	4.5	545	4.7	473	4.3
Basilicata	195	0.3	120	0.2	58	0.5	71	0.6
Calabria	1,050	1.5	879	1.6	262	2.3	236	2.1
Sicily	3,190	4.4	2,911	5.2	926	8.0	884	8.0
Sardinia	920	1.3	808	1.4	237	2.1	197	1.8
Italy	71,847	100.0	56,103	100.0	11,539	100.0	11,092	100.0
% of national volume	60.9		57.0		9.8		11.3	

Partial replacement				Revision				Total			
2019		2020		2019		2020		2019		2020	
N	%	N	%	N	%	N	%	N	%	N	%
1,875	7.2	1,710	7.0	799	9.2	699	10.0	10,658	9.0	8,666	8.8
72	0.3	64	0.3	13	0.2	8	0.1	263	0.2	200	0.2
4,967	19.2	4,730	19.5	2,017	23.3	1,310	18.7	25,293	21.5	18,004	18.3
243	0.9	231	1.0	107	1.2	102	1.5	1,468	1.2	1,106	1.1
307	1.2	268	1.1	137	1.6	94	1.3	1,507	1.3	1,208	1.2
2,405	9.3	2,257	9.3	757	8.8	579	8.2	11,240	9.5	9,912	10.1
809	3.1	812	3.3	204	2.4	158	2.3	2,853	2.4	2,594	2.6
685	2.6	638	2.6	226	2.6	145	2.1	2,773	2.4	1,899	1.9
2,457	9.5	2,317	9.5	1,016	11.7	800	11.4	12,849	10.9	11,040	11.2
1,972	7.6	1,844	7.6	729	8.4	678	9.7	9,674	8.2	8,494	8.6
516	2.0	501	2.1	137	1.6	99	1.4	1,717	1.5	1,471	1.5
560	2.2	529	2.2	200	2.3	164	2.3	2,579	2.2	2,382	2.4
2,100	8.1	2,074	8.5	696	8.0	644	9.2	9,578	8.1	8,631	8.8
570	2.2	560	2.3	154	1.8	142	2.0	2,575	2.2	2,245	2.3
142	0.5	138	0.6	10	0.1	7	0.1	373	0.3	290	0.3
1,559	6.0	1,319	5.4	496	5.7	480	6.8	6,985	5.9	6,069	6.2
1,592	6.2	1,446	6.0	301	3.5	297	4.2	4,993	4.2	4,722	4.8
246	1.0	227	0.9	38	0.4	28	0.4	537	0.5	446	0.5
593	2.3	534	2.2	117	1.4	108	1.5	2,022	1.7	1,757	1.8
1,608	6.2	1,513	6.2	425	4.9	414	5.9	6,149	5.2	5,722	5.8
598	2.3	580	2.4	69	0.8	64	0.9	1,824	1.5	1,649	1.7
25,876	100.0	24,292	100.0	8,648	100.0	7,020	100.0	117,910	100.0	98,507	100.0
21.9		24.7		7.3		7.1		100.0		100.0	

Table 3. Hip. Primary total replacement. Number of hospitals performing primary and revision procedures by region of admission and by class of volume. 2019 and 2020

Region of admission	Class of volume					
	1-50		51-100		101-200	
	2019	2020	2019	2020	2019	2020
	N	N	N	N	N	N
Piedmont	9	18	9	13	17	11
Aosta Valley	0	1	1	1	1	0
Lombardy	25	48	36	28	22	17
AP Bolzano	4	6	5	3	1	3
AP Trento	1	2	2	3	4	2
Veneto	11	12	16	16	10	7
Friuli Venezia Giulia	1	2	6	6	6	4
Liguria	4	9	2	2	7	4
Emilia-Romagna	14	18	17	19	23	19
Tuscany	15	16	12	13	6	8
Umbria	4	6	4	4	5	3
Marche	8	7	2	6	5	5
Lazio	41	47	23	17	13	15
Abruzzi	7	9	7	6	3	2
Molise	3	4	1	1	1	0
Campania	46	49	14	13	9	8
Apulia	18	17	13	16	9	5
Basilicata	4	5	1	1	1	0
Calabria	11	15	5	3	2	2
Sicily	42	46	24	16	4	7
Sardinia	12	15	7	5	2	2
Italy	280	352	207	192	151	124
<i>% of national volume</i>	<i>37.3</i>	<i>47.1</i>	<i>27.6</i>	<i>25.7</i>	<i>20.1</i>	<i>16.6</i>

201-300		>300		Total			
2019	2020	2019	2020	2019		2020	
N	N	N	N	N	%	N	%
6	4	8	6	49	6.5	52	7.0
0	0	0	0	2	0.3	2	0.3
9	7	14	8	106	14.1	108	14.4
2	0	0	0	12	1.6	12	1.6
1	1	0	0	8	1.1	8	1.1
8	6	7	7	52	6.9	48	6.4
2	1	0	1	15	2.0	14	1.9
1	1	1	0	15	2.0	16	2.1
7	6	5	3	66	8.8	65	8.7
8	8	7	3	48	6.4	48	6.4
0	0	0	0	13	1.7	13	1.7
3	1	0	0	18	2.4	19	2.5
4	1	3	3	84	11.2	83	11.1
3	2	0	0	20	2.7	19	2.5
0	0	0	0	5	0.7	5	0.7
6	4	1	1	76	10.1	75	10.0
1	3	1	0	42	5.6	41	5.5
0	0	0	0	6	0.8	6	0.8
1	1	1	0	20	2.7	21	2.8
0	2	2	0	72	9.6	71	9.5
0	0	0	0	21	2.8	22	2.9
62	48	50	32	750	100.0	748	100.0
8.3	6.4	6.7	4.3	100.0		100.0	

Table 4. Hip. Revision. Number of hospitals performing primary and revision procedures by region of admission and by class of volume. 2019 and 2020

Region of admission	Class of volume												
	1-10		11-25		26-50		>50		Total				
	2019	2020	2019	2020	2019	2020	2019	2020	2019		2020		
	N	N	N	N	N	N	N	N	N	%	N	%	
Piedmont	22	25	16	22	8	1	1	1	1	47	7.1	49	7.6
Aosta Valley	1	1	1	0	0	0	0	0	0	2	0.3	1	0.2
Lombardy	53	65	35	23	10	5	5	3	103	15.5	96	14.8	
AP Bolzano	5	5	3	3	1	1	0	0	9	1.4	9	1.4	
AP Trento	5	6	2	0	1	1	0	0	8	1.2	7	1.1	
Veneto	25	28	17	12	7	5	0	0	49	7.4	45	7.0	
Friuli Venezia Giulia	7	7	5	5	2	1	0	0	14	2.1	13	2.0	
Liguria	11	12	5	3	0	1	1	0	17	2.6	16	2.5	
Emilia-Romagna	31	34	18	18	7	3	1	1	57	8.6	56	8.7	
Tuscany	20	18	11	15	8	5	2	2	41	6.2	40	6.2	
Umbria	7	8	4	3	1	0	0	0	12	1.8	11	1.7	
Marche	10	13	6	4	1	1	0	0	17	2.6	18	2.8	
Lazio	55	53	10	9	3	3	3	2	71	10.7	67	10.4	
Abruzzi	11	13	6	5	0	0	0	0	17	2.6	18	2.8	
Molise	2	2	0	0	0	0	0	0	2	0.3	2	0.3	
Campania	48	51	13	6	1	4	1	0	63	9.5	61	9.4	
Apulia	25	24	9	11	1	0	0	0	35	5.3	35	5.4	
Basilicata	4	6	2	0	0	0	0	0	6	0.9	6	0.9	
Calabria	15	15	1	0	1	1	0	0	17	2.6	16	2.5	
Sicily	55	52	5	5	1	3	1	0	62	9.3	60	9.3	
Sardinia	16	21	0	0	0	0	0	0	16	2.4	21	3.2	
Italy	428	459	169	144	53	35	15	9	665	100.0	647	100.0	
<i>% of national volume</i>	64.4	70.9	25.4	22.3	8.0	5.4	2.3	1.4	100.0		100.0		

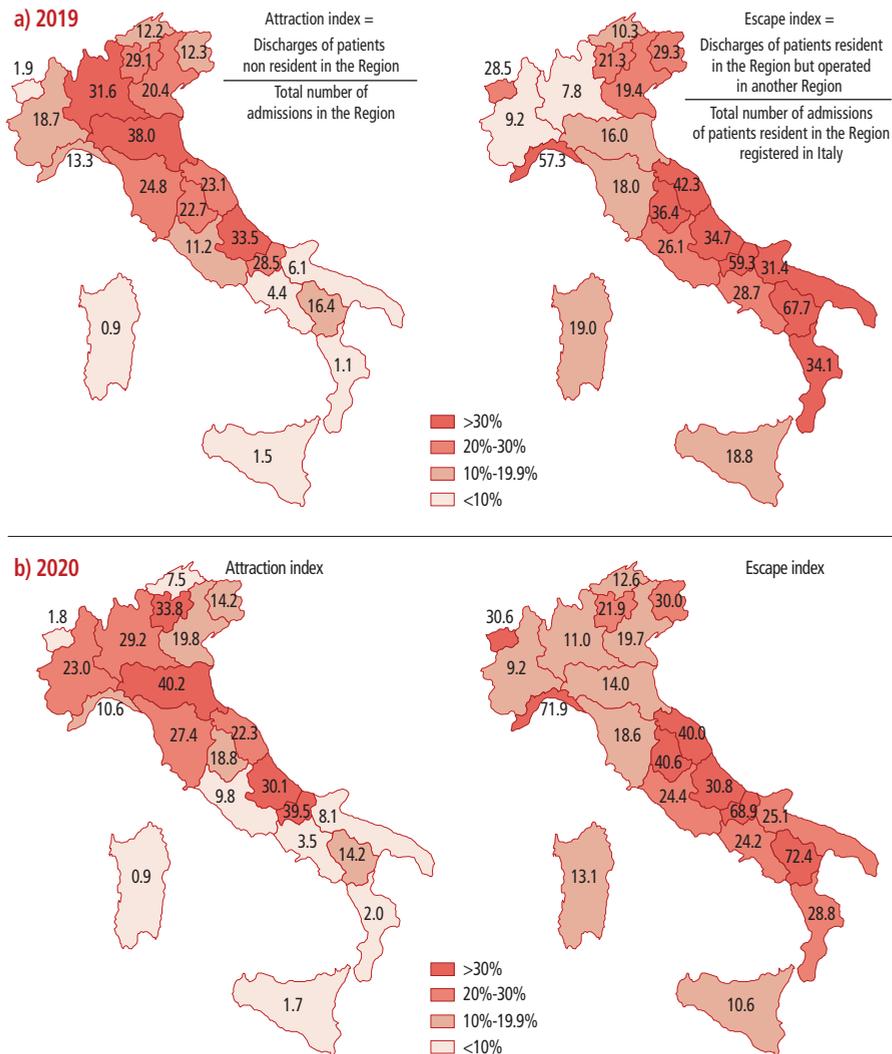
Table 5. Hip. Percent distribution of hospital discharges by patient gender and age group and by procedure type. 2019 and 2020

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Revision		Total	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
	%	%	%	%	%	%	%	%	%	%
Gender										
Male	46.8	47.4	28.1	28.4	28.0	27.9	39.6	39.1	40.3	39.9
Female	53.2	52.6	71.9	71.6	72.0	72.1	60.4	60.9	59.7	60.1
Age (male)										
Mean age	65,5	65,1	71,9	71,8	84,1	84,2	69,9	69,6	69,1	69,3
Standard deviation	11,8	11,8	11,9	20,2	8,0	8,1	12,6	12,8	13,2	14,2
Age group										
0-44	4.7	4.8	2.2	1.8	0.2	0.3	3.6	4.5	3.8	3.7
45-54	13.8	14.4	6.6	7.5	0.6	0.5	9.2	9.1	11.0	11.1
55-64	24.6	25.8	16.0	16.7	1.7	1.4	16.9	17.3	20.0	20.2
65-74	32.5	32.2	28.9	30.3	6.7	7.1	28.5	28.3	28.0	27.4
75-84	21.8	20.4	32.8	32.5	37.5	35.9	32.5	30.6	25.6	24.8
85+	2.6	2.4	13.6	11.2	53.4	54.7	9.2	10.3	11.6	12.8
Age (female)										
Mean age	69,8	69,7	73,6	73,9	84,8	84,8	74,2	74,9	74,6	75,1
Standard deviation	10,7	10,6	9,4	9,4	7,0	7,1	11	11,1	11,6	11,6
Age group										
0-44	2.1	1.8	0.4	0.3	0.1	0.1	1.4	1.1	1.3	1.0
45-54	7.0	7.2	3.0	2.7	0.2	0.4	4.8	3.8	4.5	4.3
55-64	18.4	19.0	12.8	12.4	0.8	0.9	11.0	12.0	12.5	12.2
65-74	35.0	36.0	34.6	34.6	5.4	5.7	26.3	26.4	26.5	26.1
75-84	32.8	31.2	37.7	37.9	38.3	37.3	41.4	37.7	35.4	34.3
85+	4.7	4.8	11.5	12.2	55.2	55.7	15.1	19.0	19.8	21.9

Table 6. Hip. Percent distribution of hospital discharges by discharge type and by procedure type. 2019 and 2020

Discharge type	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Revision		Total	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
	%	%	%	%	%	%	%	%	%	%
Deceased	0.1	0.1	0.9	1.0	3.1	3.7	1.1	1.5	0.9	1.2
Ordinary discharge	51.6	58.4	49.9	56.8	42.8	46.8	49.0	56.1	49.3	55.2
Discharge to a Residential Care Facility	1.6	1.3	6.4	5.5	10.9	9.6	4.8	4.4	4.3	4.1
Discharge with home health services	0.2	0.2	0.5	0.6	0.7	0.6	0.6	0.5	0.3	0.3
Discharge against medical advice	0.2	0.2	0.3	0.4	0.3	0.4	0.3	0.4	0.2	0.3
Transfer to an acute admission unit of a different hospital	1.8	1.1	3.5	2.1	3.9	3.2	2.7	2.2	2.5	1.8
Transfer in the same hospital	26.5	23.2	11.5	9.4	10.7	8.9	21.4	17.3	21.2	17.7
Transfer to an inpatient rehabilitation facility	17.2	14.9	24.5	21.1	23.9	22.4	18.0	15.6	19.5	17.5
Discharge with integrated home care	0.8	0.6	2.4	3.1	3.6	4.4	2.0	2.0	1.7	1.9

Figure 1. Hip. Elective total replacement. Inter-regional mobility (attraction and escape indices) in 2019 (a) and in 2020 (b)



NOTE: For Regions with low number of procedures (i.e. Umbria, Molise and Basilicata) inter-regional mobility indices might be biased

Figure 2. Hip. Elective total and partial replacement (primary and revision procedures). Incidence rate by region. 2019-2020

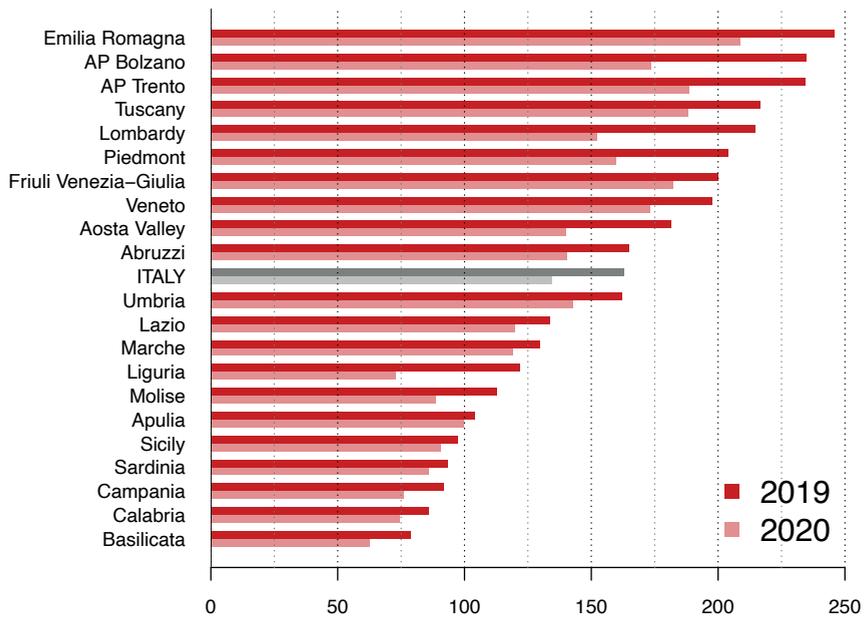


Figure 3. Hip. Elective total and partial replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020

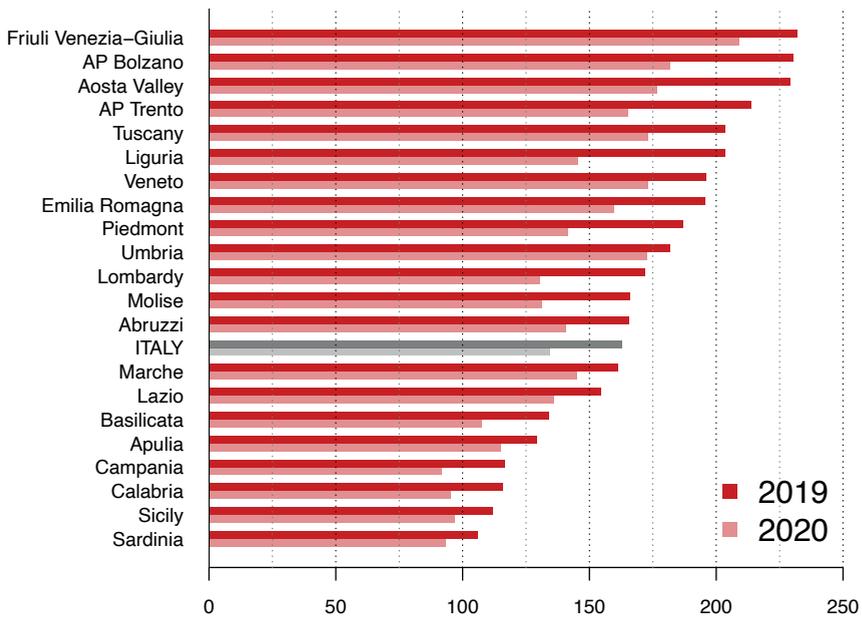


Figure 4. Hip. Emergency total and partial replacement (primary and revision procedures). Incidence rate by region. 2019-2020

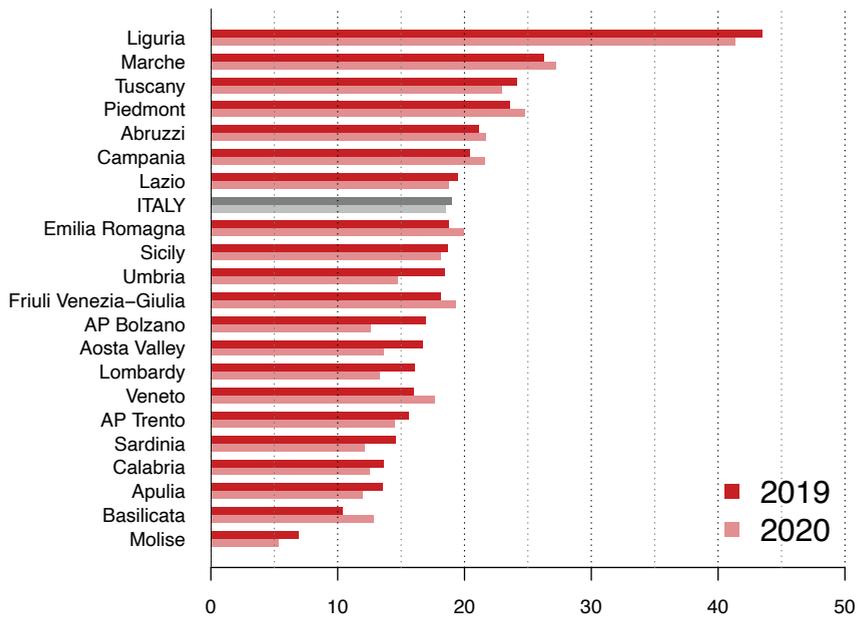


Figure 5. Hip. Emergency total and partial replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020

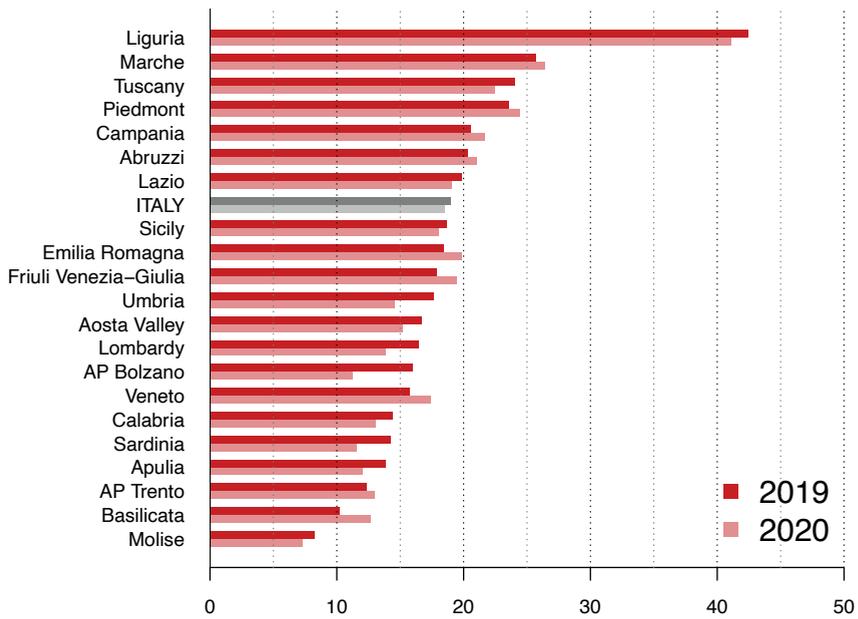


Figure 6. Hip. Elective total and partial replacement. National incidence/hospitalisation rate. 2001-2020

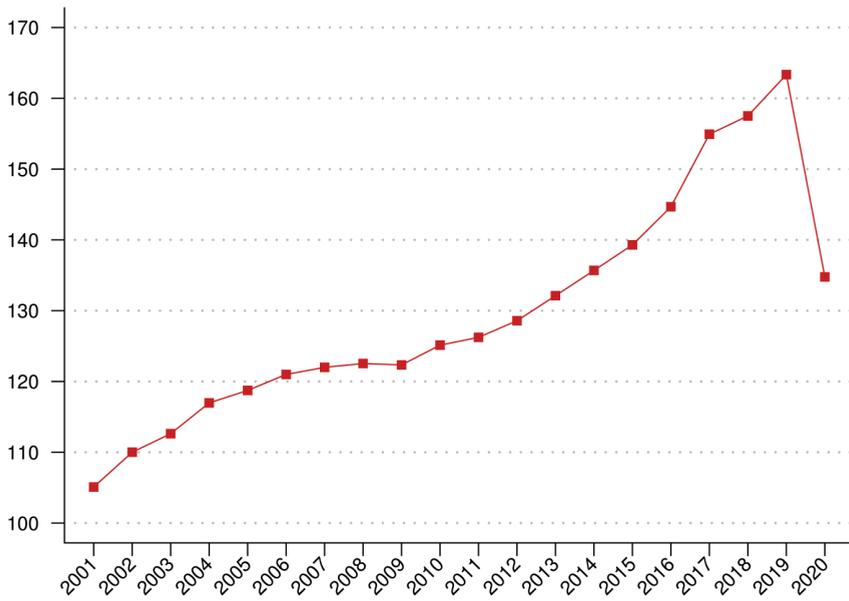


Figure 7. Hip. Emergency total and partial replacement. National incidence/hospitalisation rate. 2001-2020



Table 7. Knee. Number of procedures by region of admission and by procedure type. 2019-2020

Region of admission	Total replacement			
	2019		2020	
	N	%	N	%
Piedmont	6,665	8.0	5,055	8.1
Aosta Valley	170	0.2	114	0.2
Lombardy	18,132	21.9	10,796	17.2
AP Bolzano	886	1.1	570	0.9
AP Trento	748	0.9	564	0.9
Veneto	8,126	9.8	7,552	12.1
Friuli Venezia Giulia	1,899	2.3	1,531	2.4
Liguria	1,400	1.7	533	0.9
Emilia-Romagna	9,025	10.9	6,936	11.1
Tuscany	7,639	9.2	6,098	9.7
Umbria	1,471	1.8	1,133	1.8
Marche	1,789	2.2	1,636	2.6
Lazio	6,583	7.9	5,654	9.0
Abruzzi	2,031	2.5	1,672	2.7
Molise	256	0.3	170	0.3
Campania	4,307	5.2	3,122	5.0
Apulia	3,370	4.1	2,895	4.6
Basilicata	243	0.3	96	0.2
Calabria	1,612	1.9	1,206	1.9
Sicily	5,075	6.1	3,917	6.3
Sardinia	1,388	1.7	1,356	2.2
Italy	82,815	100.0	62,606	100.0
<i>% of national volume</i>	<i>92.8</i>		<i>92.3</i>	

Revision				Total			
2019		2020		2019		2020	
N	%	N	%	N	%	N	%
538	8.4	425	8.1	7,203	8.1	5,480	8.1
9	0.1	5	0.1	179	0.2	119	0.2
1,596	25.0	990	19.0	19,728	22.1	11,786	17.4
89	1.4	48	0.9	975	1.1	618	0.9
40	0.6	33	0.6	788	0.9	597	0.9
523	8.2	488	9.3	8,649	9.7	8,040	11.9
108	1.7	102	2.0	2,007	2.2	1,633	2.4
183	2.9	96	1.8	1,583	1.8	629	0.9
867	13.6	719	13.8	9,892	11.1	7,655	11.3
713	11.1	690	13.2	8,352	9.4	6,788	10.0
106	1.7	85	1.6	1,577	1.8	1,218	1.8
111	1.7	85	1.6	1,900	2.1	1,721	2.5
415	6.5	453	8.7	6,998	7.8	6,107	9.0
111	1.7	88	1.7	2,142	2.4	1,760	2.6
8	0.1	7	0.1	264	0.3	177	0.3
300	4.7	248	4.8	4,607	5.2	3,370	5.0
162	2.5	160	3.1	3,532	4.0	3,055	4.5
7	0.1	2	0.0	250	0.3	98	0.1
109	1.7	68	1.3	1,721	1.9	1,274	1.9
327	5.1	365	7.0	5,402	6.1	4,282	6.3
73	1.1	63	1.2	1,461	1.6	1,419	2.1
6,395	100.0	5,220	100.0	89,210	100.0	67,826	100.0
7.2		7.7		100.0		100.0	

Table 8. Knee. Primary total replacement. Number of hospitals by region of admission and by class of volume. 2019 and 2020

Region of admission	Class of volume					
	1-50		51-100		101-200	
	2019	2020	2019	2020	2019	2020
	N	N	N	N	N	N
Piedmont	17	30	11	7	6	2
Aosta Valley	0	1	1	1	1	0
Lombardy	38	65	27	12	17	15
AP Bolzano	6	8	2	1	4	3
AP Trento	1	3	4	3	3	2
Veneto	21	19	11	11	9	7
Friuli Venezia Giulia	5	9	3	1	5	1
Liguria	7	14	0	3	6	0
Emilia-Romagna	22	30	13	10	11	10
Tuscany	15	24	14	10	7	5
Umbria	1	4	7	6	5	3
Marche	8	8	6	5	1	1
Lazio	53	51	14	13	11	9
Abruzzi	9	13	6	1	1	1
Molise	4	4	0	0	1	1
Campania	42	45	15	12	7	9
Apulia	21	25	6	5	10	5
Basilicata	5	5	0	1	1	0
Calabria	10	8	2	4	3	2
Sicily	40	45	10	11	10	9
Sardinia	13	11	2	1	1	6
Italy	338	422	154	118	120	91
<i>% of national volume</i>	<i>46.4</i>	<i>58.8</i>	<i>21.1</i>	<i>16.4</i>	<i>16.5</i>	<i>12.7</i>

201-300		>300		Total			
2019	2020	2019	2020	2019		2020	
N	N	N	N	N	%	N	%
4	6	8	5	46	6.3	50	7.0
0	0	0	0	2	0.3	2	0.3
9	8	16	8	107	14.7	108	15.0
0	0	0	0	12	1.6	12	1.7
0	0	0	0	8	1.1	8	1.1
1	1	9	9	51	7.0	47	6.5
1	2	1	1	15	2.1	14	1.9
2	0	0	0	15	2.1	17	2.4
8	8	8	4	62	8.5	62	8.6
3	1	10	8	49	6.7	48	6.7
1	1	0	0	14	1.9	14	1.9
2	2	1	1	18	2.5	17	2.4
2	1	5	4	85	11.7	78	10.9
1	1	3	3	20	2.7	19	2.6
0	0	0	0	5	0.7	5	0.7
5	1	0	0	69	9.5	67	9.3
2	3	1	2	40	5.5	40	5.6
0	0	0	0	6	0.8	6	0.8
1	2	2	0	18	2.5	16	2.2
6	2	2	2	68	9.3	69	9.6
2	1	1	0	19	2.6	19	2.6
50	40	67	47	729	100.0	718	100.0
6.9	5.6	9.2	6.5	100.0		100	

Table 9. Knee. Revision. Number of hospitals by region of admission and by class of volume. 2019 and 2020

Region of admission	Class of volume											
	1-10		11-25		26-50		>50		Total			
	2019	2020	2019	2020	2019	2020	2019	2020	2019		2020	
	N	N	N	N	N	N	N	N	N	%	N	%
Piedmont	26	27	9	9	8	4	0	0	43	7.5	40	7.2
Aosta Valley	1	1	0	0	0	0	0	0	1	0.2	1	0.2
Lombardy	69	64	11	12	7	9	7	1	94	16.3	86	15.4
AP Bolzano	5	7	4	2	0	0	0	0	9	1.6	9	1.6
AP Trento	7	7	1	0	0	0	0	0	8	1.4	7	1.3
Veneto	31	33	10	10	3	1	1	1	45	7.8	45	8.1
Friuli Venezia Giulia	7	11	4	1	0	1	0	0	11	1.9	13	2.3
Liguria	11	10	3	1	0	1	1	0	15	2.6	12	2.2
Emilia-Romagna	33	35	18	14	3	5	3	1	57	9.9	55	9.9
Tuscany	22	28	8	1	6	5	2	4	38	6.6	38	6.8
Umbria	11	10	1	1	1	1	0	0	13	2.3	12	2.2
Marche	9	11	4	1	0	1	0	0	13	2.3	13	2.3
Lazio	43	47	7	6	2	4	1	1	53	9.2	58	10.4
Abruzzi	10	12	4	3	0	0	0	0	14	2.4	15	2.7
Molise	3	3	0	0	0	0	0	0	3	0.5	3	0.5
Campania	39	39	7	7	1	0	0	1	47	8.1	47	8.4
Apulia	29	26	4	3	0	1	0	0	33	5.7	30	5.4
Basilicata	2	2	0	0	0	0	0	0	2	0.3	2	0.4
Calabria	11	10	4	2	0	0	0	0	15	2.6	12	2.2
Sicily	40	38	9	9	1	1	0	0	50	8.7	48	8.6
Sardinia	11	11	2	1	0	0	0	0	13	2.3	12	2.2
Italy	420	432	110	83	32	34	15	9	577	100.0	558	100.0
% of national volume	72.8	77.4	19.1	14.9	5.5	6.1	2.6	1.6	100.0		100.0	

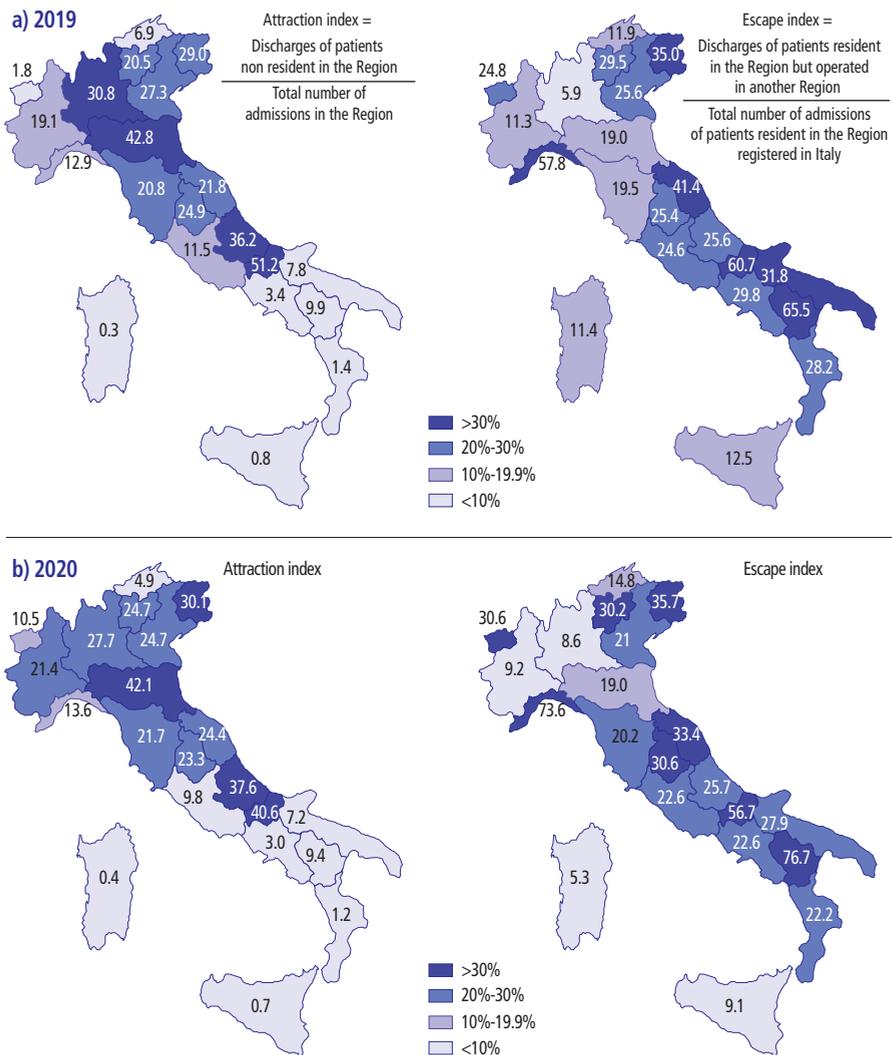
Table 10. Knee. Percent distribution of hospital discharges by patient gender and age group and by procedure type. 2019 and 2020

	Total replacement		Revision		Total	
	2019	2020	2019	2020	2019	2020
	%	%	%	%	%	%
Gender						
Male	33.7	35.0	33.4	33.8	33.7	34.9
Female	66.3	65.0	66.6	66.2	66.3	65.1
Age (male)						
Mean age	69,5	68,8	68,9	68,3	69,5	68,8
Standard deviation	10,8	9,4	11,2	11,1	10,8	9,6
Age group						
0-44	1.0	1.2	2.9	2.7	1.1	1.3
45-54	5.6	5.8	6.7	7.8	5.6	5.9
55-64	20.1	22.4	18.7	20.4	20.0	22.2
65-74	41.1	41.6	37.9	37.8	40.9	41.3
75-84	30.3	27.2	30.8	29.7	30.3	27.4
85+	1.9	1.8	3.0	1.6	2.0	1.8
Age (female)						
Mean age	70,8	70,8	70,8	70,8	70,8	70,6
Standard deviation	8,2	9,4	9,3	9,4	8,3	8,5
Age group						
0-44	0.4	0.4	1.0	0.7	0.4	0.4
45-54	3.4	3.7	4.1	4.2	3.4	3.7
55-64	16.7	17.7	16.8	17.2	16.7	17.7
65-74	43.7	43.6	41.1	41.1	43.6	43.4
75-84	33.6	32.4	33.0	33.0	33.6	32.5
85+	2.2	2.1	3.9	3.8	2.3	2.3

Table 11. Knee. Percent distribution of hospital discharges by discharge type and by procedure type. 2019 and 2020

Discharge type	Total replacement (elective)		Revision		Total	
	2019	2020	2019	2020	2019	2020
	%	%	%	%	%	%
Deceased	0.0	0.0	0.2	0.2	0.0	0.0
Ordinary discharge	49.0	55.1	50.1	57.4	49.1	55.4
Discharge to a Residential Care Facility	1.3	1.1	1.1	1.2	1.3	1.1
Discharge with home health services	0.1	0.1	0.2	0.2	0.1	0.1
Discharge against medical advice	0.1	0.1	0.1	0.2	0.1	0.1
Transfer to an acute admission unit of a different hospital	1.6	0.9	1.7	1.2	1.6	0.9
Transfer in the same hospital	30.9	26.9	30.2	23.7	30.8	26.7
Transfer to an inpatient rehabilitation facility	16.4	15.4	15.6	15.3	16.3	15.3
Discharge with integrated home care	0.5	0.4	0.8	0.6	0.6	0.4

Figure 8. Knee. Total replacement. Inter-regional mobility (attraction and escape indices) in 2019 (a) and in 2020 (b)



NOTE: For Regions with low number of procedures (i.e. Umbria, Molise and Basilicata) inter-regional mobility indices might be biased

Figure 9. Knee. Total replacement (primary and revision procedures). Incidence rate by region. 2019-2020

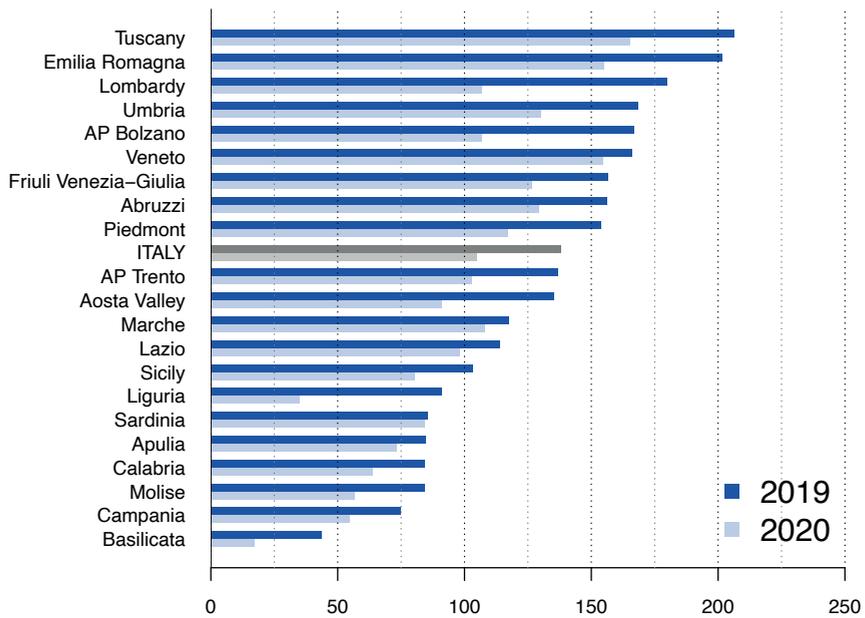


Figure 10. Knee. Total replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020

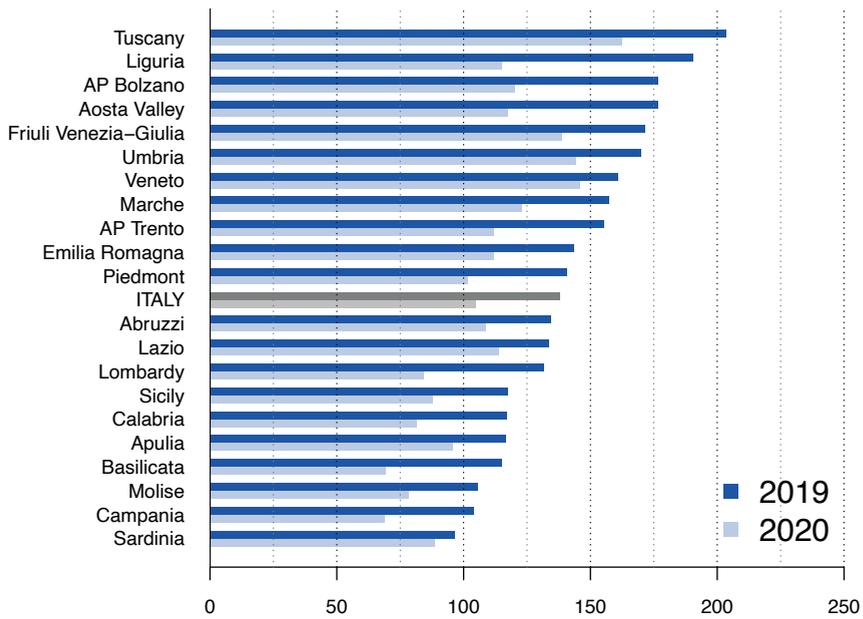


Figure 11. Knee. Total replacement (primary and revision procedures). Incidence/hospitalisation rate. 2001-2020

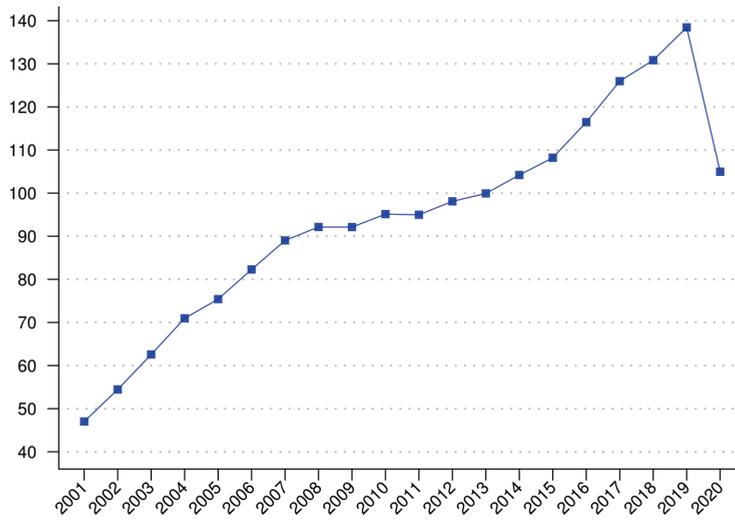


Table 12. Shoulder. Number of procedures by region of admission and by procedure type. 2019-2020

Region of admission	Total replacement (elective)				Total replacement (emergency)			
	2019		2020		2019		2020	
	N	%	N	%	N	%	N	%
Piedmont	744	10.1	604	10.5	176	7.3	196	8.1
Aosta Valley	6	0.1	8	0.1	1	0.0	2	0.1
Lombardy	1,208	16.4	702	12.2	465	19.2	391	16.1
AP Bolzano	37	0.5	36	0.6	11	0.5	13	0.5
AP Trento	45	0.6	26	0.5	28	1.2	24	1.0
Veneto	666	9.1	542	9.4	219	9.0	245	10.1
Friuli Venezia Giulia	130	1.8	92	1.6	51	2.1	64	2.6
Liguria	92	1.3	29	0.5	29	1.2	26	1.1
Emilia-Romagna	1,031	14.0	734	12.7	224	9.3	191	7.9
Tuscany	722	9.8	658	11.4	103	4.3	99	4.1
Umbria	106	1.4	90	1.6	40	1.7	39	1.6
Marche	151	2.1	165	2.9	95	3.9	80	3.3
Lazio	803	10.9	720	12.5	246	10.2	253	10.4
Abruzzi	215	2.9	171	3.0	55	2.3	60	2.5
Molise	10	0.1	3	0.1	6	0.2	7	0.3
Campania	511	7.0	443	7.7	178	7.4	190	7.8
Apulia	293	4.0	221	3.8	191	7.9	223	9.2
Basilicata	11	0.1	4	0.1	17	0.7	12	0.5
Calabria	71	1.0	71	1.2	32	1.3	44	1.8
Sicily	452	6.2	393	6.8	222	9.2	240	9.9
Sardinia	43	0.6	46	0.8	31	1.3	27	1.1
Italy	7,347	100.0	5,758	100.0	2,420	100.0	2,426	100.0
% of national volume	66.9		62.6		22.0		26.4	

Partial replacement				Total			
2019		2020		2019		2020	
N	%	N	%	N	%	N	%
41	3.4	36	3.6	961	8.7	836	9.1
0	0.0	0	0.0	7	0.1	10	0.1
107	8.8	81	8.0	1,780	16.2	1,174	12.8
13	1.1	4	0.4	61	0.6	53	0.6
8	0.7	4	0.4	81	0.7	54	0.6
387	31.7	284	28.1	1,272	11.6	1,071	11.6
49	4.0	25	2.5	230	2.1	181	2.0
1	0.1	5	0.5	122	1.1	60	0.7
82	6.7	74	7.3	1,337	12.2	999	10.9
67	5.5	59	5.8	892	8.1	816	8.9
76	6.2	80	7.9	222	2.0	209	2.3
20	1.6	26	2.6	266	2.4	271	2.9
91	7.4	88	8.7	1,140	10.4	1,061	11.5
22	1.8	24	2.4	292	2.7	255	2.8
6	0.5	5	0.5	22	0.2	15	0.2
145	11.9	114	11.3	834	7.6	747	8.1
56	4.6	30	3.0	540	4.9	474	5.2
1	0.1	5	0.5	29	0.3	21	0.2
4	0.3	3	0.3	107	1.0	118	1.3
36	2.9	53	5.2	710	6.5	686	7.5
10	0.8	11	1.1	84	0.8	84	0.9
1,222	100.0	1,011	100.0	10,989	100.0	9,195	100.0
11.1		11.0		100.0		100.0	

Table 13. Shoulder. Total replacement. Number of hospitals by region of admission and by class of volume. 2019 and 2020

Region of admission	Class of volume					
	1-4		5-9		10-14	
	2019	2020	2019	2020	2019	2020
	N	N	N	N	N	N
Piedmont	7	11	10	11	8	4
Aosta Valley	2	1	0	1	0	0
Lombardy	25	23	29	23	10	20
AP Bolzano	3	2	4	3	0	1
AP Trento	3	1	2	3	1	1
Veneto	6	9	9	5	10	9
Friuli Venezia Giulia	4	3	2	2	3	3
Liguria	7	10	5	5	1	0
Emilia-Romagna	15	11	13	15	8	8
Tuscany	12	15	10	4	2	4
Umbria	3	5	4	4	1	1
Marche	4	4	7	4	1	5
Lazio	35	29	16	13	7	6
Abruzzi	5	8	4	2	4	3
Molise	0	2	1	1	1	0
Campania	21	23	12	6	1	4
Apulia	7	9	9	8	1	8
Basilicata	0	1	3	2	1	0
Calabria	5	5	6	5	1	3
Sicily	22	22	14	14	9	3
Sardinia	4	6	4	2	0	2
Italy	190	200	164	133	70	85
<i>% of national volume</i>	<i>30.9</i>	<i>34.4</i>	<i>26.7</i>	<i>22.9</i>	<i>11.4</i>	<i>14.6</i>

15-24		>24		Total			
2019	2020	2019	2020	2019		2020	
N	N	N	N	N	%	N	%
9	10	8	6	42	6.8	42	7.2
0	0	0	0	2	0.3	2	0.3
16	12	19	10	99	16.1	88	15.1
1	1	0	0	8	1.3	7	1.2
1	1	1	0	8	1.3	6	1.0
10	7	13	12	48	7.8	42	7.2
4	3	1	1	14	2.3	12	2.1
1	0	1	0	15	2.4	15	2.6
6	11	15	9	57	9.3	54	9.3
3	6	11	8	38	6.2	37	6.4
2	1	2	2	12	2.0	13	2.2
3	2	2	2	17	2.8	17	2.9
5	8	11	10	74	12.1	66	11.3
1	1	4	3	18	2.9	17	2.9
0	0	0	0	2	0.3	3	0.5
3	8	11	6	48	7.8	47	8.1
10	5	3	4	30	4.9	34	5.8
0	0	0	0	4	0.7	3	0.5
2	2	0	0	14	2.3	15	2.6
2	5	8	7	55	9.0	51	8.8
0	1	1	0	9	1.5	11	1.9
79	84	111	80	614	100.0	582	100.0
12.9	14.4	18.1	13.7	100.0		100.0	

Table 14. Shoulder. Partial replacement. Number of hospitals by region of admission and by class of volume. 2019 and 2020

Region of admission	Class of volume					
	1-4		5-9		10-14	
	2019	2020	2019	2020	2019	2020
	N	N	N	N	N	N
Piedmont	14	12	1	1	1	1
Aosta Valley	0	0	0	0	0	0
Lombardy	34	43	3	2	2	0
AP Bolzano	5	2	0	0	0	0
AP Trento	4	2	0	0	0	0
Veneto	16	17	10	10	6	1
Friuli Venezia Giulia	6	6	5	2	0	0
Liguria	1	2	0	0	0	0
Emilia-Romagna	24	23	3	3	2	0
Tuscany	9	11	3	2	0	0
Umbria	4	2	1	2	0	1
Marche	4	4	0	0	1	0
Lazio	21	25	3	2	1	0
Abruzzi	6	6	1	1	0	1
Molise	2	0	0	1	0	0
Campania	18	15	1	3	0	1
Apulia	13	11	0	2	1	0
Basilicata	1	0	0	1	0	0
Calabria	2	3	0	0	0	0
Sicily	18	16	1	2	0	1
Sardinia	7	6	0	0	0	0
Italy	209	206	32	34	14	6
<i>% of national volume</i>	<i>77.7</i>	<i>79.2</i>	<i>11.9</i>	<i>13.1</i>	<i>5.2</i>	<i>2.3</i>

15-24		>24		Total			
2019	2020	2019	2020	2019		2020	
N	N	N	N	N	%	N	%
0	0	0	0	16	5.9	14	5.4
0	0	0	0	0	0.0	0	0.0
0	0	0	0	39	14.5	45	17.3
0	0	0	0	5	1.9	2	0.8
0	0	0	0	4	1.5	2	0.8
2	4	3	2	37	13.8	34	13.1
0	0	0	0	11	4.1	8	3.1
0	0	0	0	1	0.4	2	0.8
0	1	0	0	29	10.8	27	10.4
0	0	1	1	13	4.8	14	5.4
2	1	1	1	8	3.0	7	2.7
0	1	0	0	5	1.9	5	1.9
1	2	0	0	26	9.7	29	11.2
0	0	0	0	7	2.6	8	3.1
0	0	0	0	2	0.7	1	0.4
2	0	1	1	22	8.2	20	7.7
1	0	0	0	15	5.6	13	5.0
0	0	0	0	1	0.4	1	0.4
0	0	0	0	2	0.7	3	1.2
0	0	0	0	19	7.1	19	7.3
0	0	0	0	7	2.6	6	2.3
8	9	6	5	269	100.0	260	100.0
3.0	3.5	2.2	1.9	100.0		100.0	

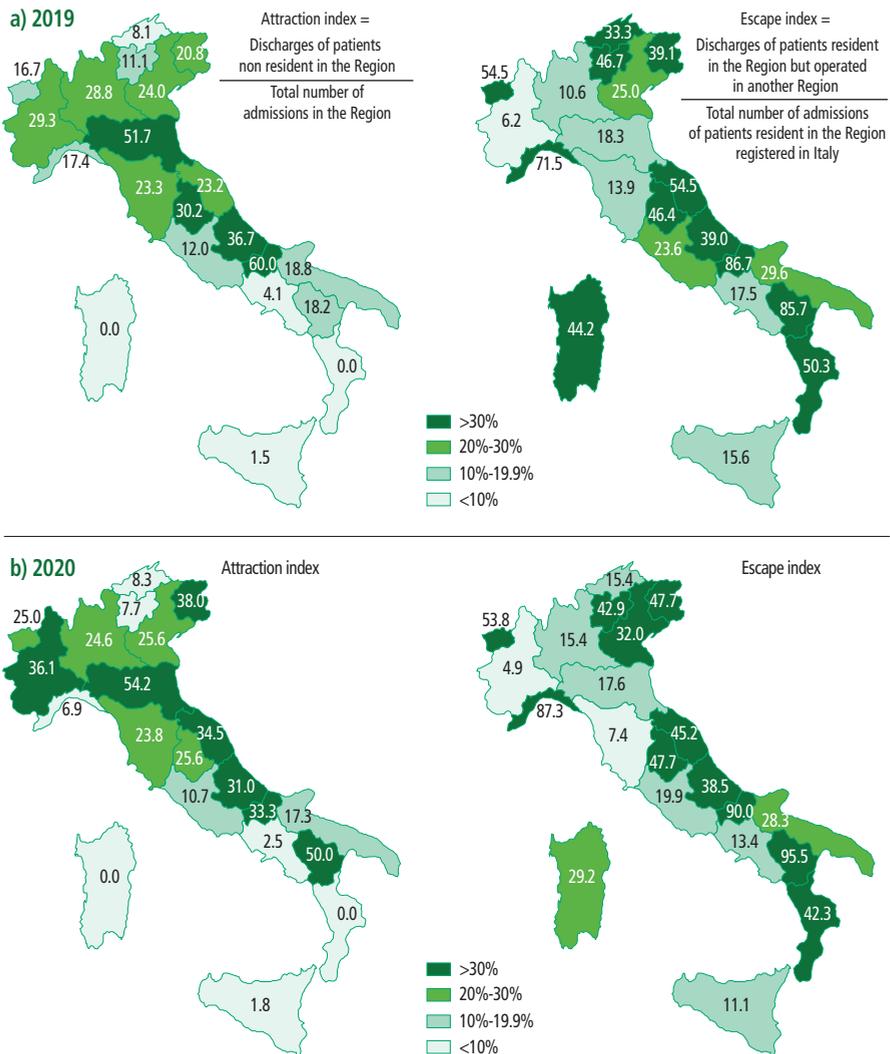
Table 15. Shoulder. Percent distribution of hospital discharges by patient gender and age group and by procedure type. 2019 and 2020

	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Total	
	2019	2020	2019	2020	2019	2020	2019	2020
	%	%	%	%	%	%	%	%
Gender								
Male	31.2	31.5	16.4	16.5	46.0	44.6	29.6	29.0
Female	68.8	68.5	83.6	83.5	54.0	55.4	70.4	71.0
Age (male)								
Mean age	68,8	68,5	72,6	70,7	63,0	62,9	68,3	67,9
Standard deviation	9,5	9,7	9,2	10,6	12,0	12,3	10,3	10,6
Age group								
0-44	2.1	2.2	0.3	1.8	6.6	5.3	2.6	2.7
45-54	6.1	6.1	3.0	7.0	13.7	18.0	7.0	8.2
55-64	20.0	20.6	15.9	18.0	30.8	30.4	21.3	21.9
65-74	41.8	42.6	32.8	31.8	32.6	29.8	39.1	38.8
75-84	28.8	27.2	41.2	35.8	14.8	13.8	27.9	26.2
85+	1.3	1.4	6.8	5.5	1.4	2.7	2.0	2.2
Age (female)								
Mean age	73,1	72,9	75,1	74,9	68,9	68,9	73,3	73,2
Standard deviation	7,2	7,6	7,1	7,3	10,8	10,3	7,7	8,0
Age group								
0-44	0.3	0.4	0.3	0.0	1.5	1.1	0.3	0.4
45-54	1.4	1.4	1.4	0.5	7.9	6.1	1.7	1.6
55-64	9.4	10.3	9.4	7.7	22.9	27.0	10.1	10.9
65-74	43.7	43.0	43.7	36.4	35.1	33.5	40.7	40.2
75-84	42.6	41.5	42.6	47.1	27.5	27.0	42.9	42.0
85+	2.6	3.3	2.6	8.1	5.2	5.4	4.2	5.0

Table 16. Shoulder. Percent distribution of hospital discharges by discharge type and by procedure type. 2019 and 2020

Discharge type	Total replacement (elective)		Total replacement (emergency)		Partial replacement		Total	
	2019	2020	2019	2020	2019	2020	2019	2020
	%	%	%	%	%	%	%	%
Deceased	0.0	0.1	0.2	0.3	0.1	0.1	0.1	0.1
Ordinary discharge	95.8	95.4	89.8	92.0	94.7	96.0	94.2	94.8
Discharge to a Residential Care Facility	0.3	0.2	2.1	1.2	0.8	1.0	0.7	0.5
Discharge with home health services	0.4	0.3	1.8	0.4	0.6	0.3	0.8	0.3
Discharge against medical advice	0.2	0.3	0.2	0.4	0.3	0.2	0.2	0.3
Transfer to an acute admission unit of a different hospital	0.2	0.2	0.8	0.5	0.7	0.3	0.4	0.3
Transfer in the same hospital	1.7	1.8	1.7	1.2	1.1	0.7	1.6	1.5
Transfer to an inpatient rehabilitation facility	1.3	1.6	2.3	2.6	1.5	1.1	1.6	1.8
Discharge with integrated home care	0.1	0.1	1.1	1.4	0.2	0.3	0.4	0.4

Figure 12. Shoulder. Elective total replacement. Inter-regional mobility (attraction and escape indices) in 2019 (a) and in 2020 (b)



NOTE: For Regions with low number of procedures (i.e. Umbria, Molise and Basilicata) inter-regional mobility indices might be biased

Figure 13. Shoulder. Elective total and partial replacement (primary and revision procedures). Incidence rate by region. 2019-2020

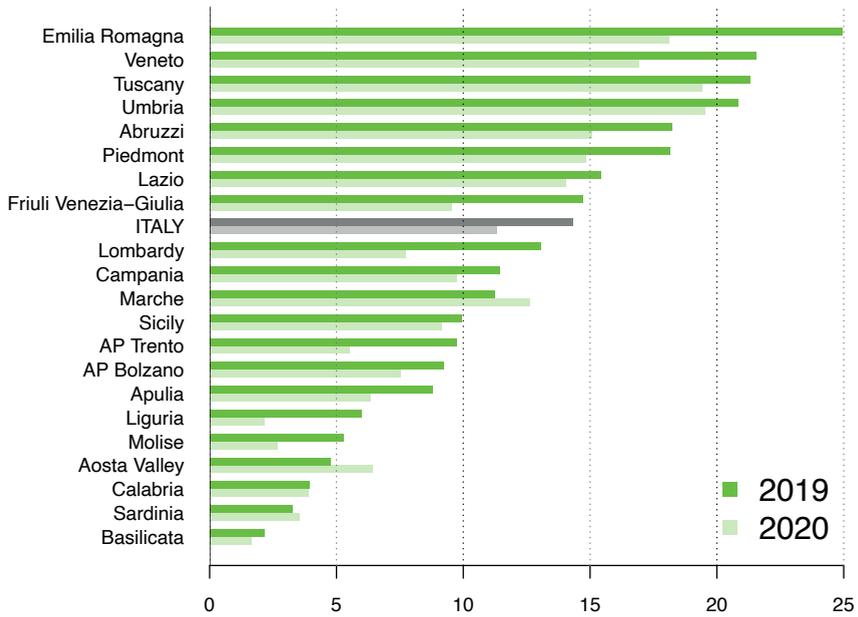


Figure 14. Shoulder. Elective total and partial replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020

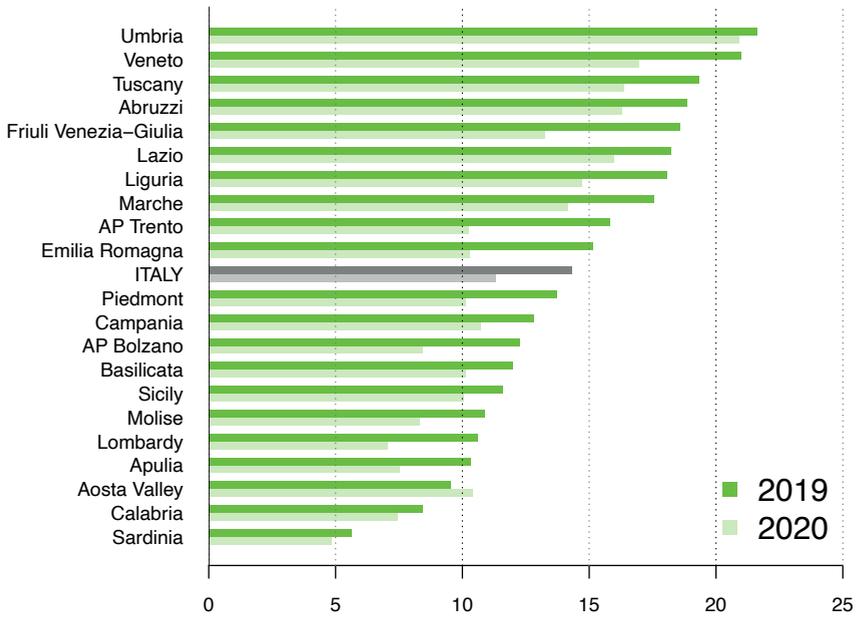


Figure 15. Shoulder. Emergency total and partial replacement (primary and revision procedures). Incidence rate by region. 2019-2020

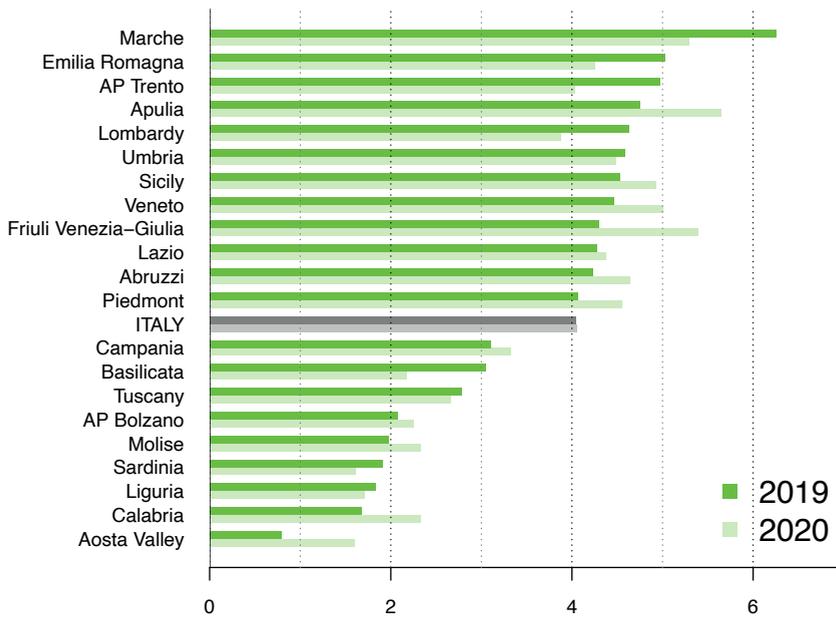


Figure 16. Shoulder. Emergency total and partial replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020

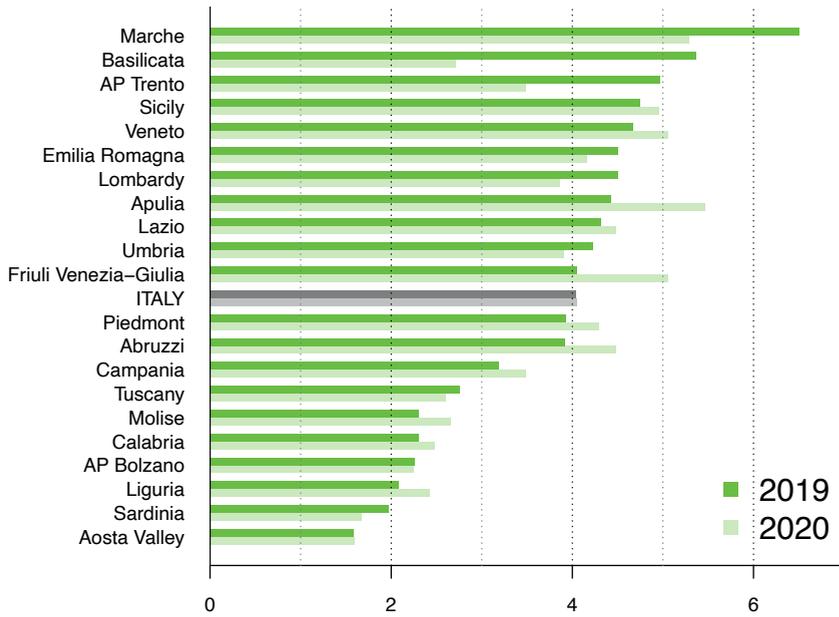


Figure 17. Shoulder. Elective total and partial replacement (primary and revision procedures). National incidence and hospitalisation rate. 2001-2020

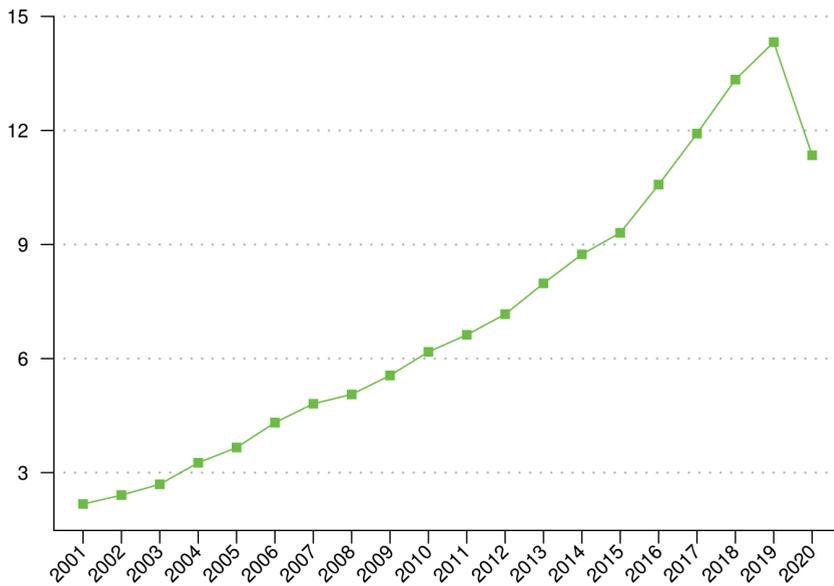


Figure 18. Shoulder. Emergency total and partial replacement (primary and revision procedures). National incidence and hospitalisation rate. 2001-2020

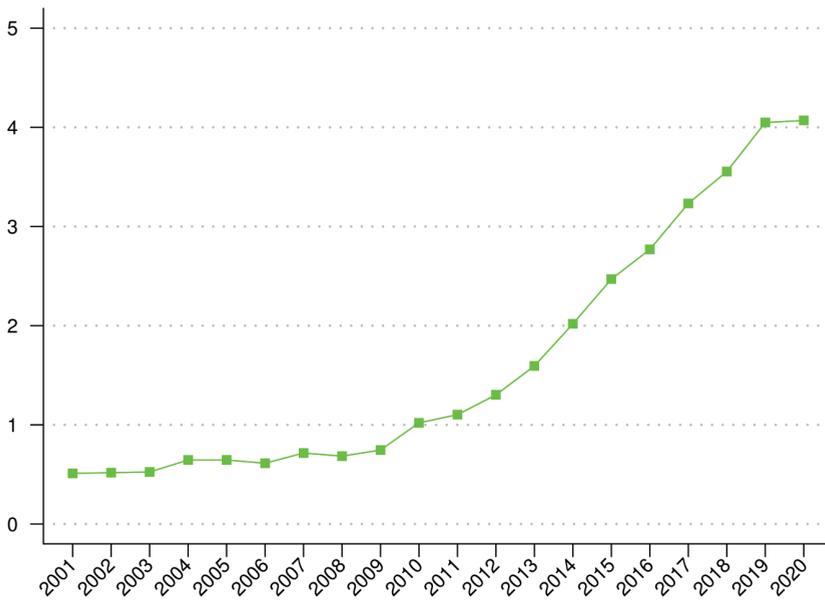


Table 17. Ankle. Total replacement. Number of procedures by region of admission and by procedure type. 2019-2020

Region of admission	Total replacement			
	2019		2020	
	N	%	N	%
Piedmont	34	4.4	27	4.6
Aosta Valley	0	0.0	0	0.0
Lombardy	310	40.4	267	45.0
AP Bolzano	2	0.3	0	0.0
AP Trento	16	2.1	13	2.2
Veneto	67	8.7	58	9.8
Friuli Venezia Giulia	2	0.3	2	0.3
Liguria	5	0.7	1	0.2
Emilia-Romagna	195	25.4	133	22.4
Tuscany	17	2.2	6	1.0
Umbria	1	0.1	1	0.2
Marche	6	0.8	3	0.5
Lazio	70	9.1	50	8.4
Abruzzi	3	0.4	2	0.3
Molise	1	0.1	0	0.0
Campania	8	1.0	7	1.2
Apulia	11	1.4	4	0.7
Basilicata	0	0.0	0	0.0
Calabria	3	0.4	6	1.0
Sicily	16	2.1	12	2.0
Sardinia	0	0.0	1	0.2
Italy	767	100,0	593	100,0
<i>% of national volume</i>	<i>100.0</i>		<i>100.0</i>	

Table 18. Ankle. Total replacement. Number of hospitals by region of admission and by class of volume. 2019 and 2020

Region of admission	Class of volume			
	1-2		3-4	
	2019	2020	2019	2020
	N	N	N	N
Piedmont	6	4	0	3
Aosta Valley	0	0	0	0
Lombardy	13	17	5	3
AP Bolzano	2	0	0	0
AP Trento	1	1	0	0
Veneto	3	4	2	0
Friuli Venezia Giulia	2	2	0	0
Liguria	1	1	1	0
Emilia-Romagna	12	9	3	2
Tuscany	6	5	3	0
Umbria	1	1	0	0
Marche	1	2	0	0
Lazio	14	6	4	5
Abruzzi	2	1	0	0
Molise	1	0	0	0
Campania	4	5	1	0
Apulia	4	3	0	0
Basilicata	0	0	0	0
Calabria	0	0	1	2
Sicily	2	2	2	3
Sardinia	0	1	0	0
Italy	75	64	22	18
<i>% of national volume</i>	<i>62.0</i>	<i>64.0</i>	<i>18.2</i>	<i>18.0</i>

>4		Total			
2019	2020	2019		2020	
N	N	N	%	N	%
2	2	8	6.6	9	9.0
0	0	0	0.0	0	0.0
7	3	25	20.7	23	23.0
0	0	2	1.7	0	0.0
1	1	2	1.7	2	2.0
5	6	10	8.3	10	10.0
0	0	2	1.7	2	2.0
0	0	2	1.7	1	1.0
4	4	19	15.7	15	15.0
0	0	9	7.4	5	5.0
0	0	1	0.8	1	1.0
1	0	2	1.7	2	2.0
2	2	20	16.5	13	13.0
0	0	2	1.7	1	1.0
0	0	1	0.8	0	0.0
0	0	5	4.1	5	5.0
1	0	5	4.1	3	3.0
0	0	0	0.0	0	0.0
0	0	1	0.8	2	2.0
1	0	5	4.1	5	5.0
0	0	0	0.0	1	1.0
24	18	121	100.0	100	100.0
19.8	18.0	100.0		100.0	

Table 19. Ankle. Total replacement. Percent distribution of hospital discharges by patient gender and age group and by procedure type. 2019 and 2020

	Total replacement (elective)	
	2019	2020
	%	%
Gender		
Male	57.2	60.4
Female	42.8	39.6
Age (male)		
Mean age	56,2	56,4
Standard deviation	14,1	14
Age group		
0-19	0.9	0.6
20-39	10.3	12.6
40-49	21.2	15.4
50-59	21.9	25.4
60-69	26.4	29.1
70-79	17.1	14.5
80+	2.3	2.5
Age (female)		
Mean age	57,6	56,7
Standard deviation	14,4	14,7
Age group		
0-19	2.7	1.7
20-39	9.5	9.4
40-49	11.0	17.9
50-59	27.1	27.7
60-69	30.8	19.1
70-79	16.8	21.3
80+	2.1	3.0

Table 20. Ankle. Total replacement. Percent distribution of hospital discharges by discharge type and by procedure type. 2019 and 2020

Discharge type	Total replacement (elective)	
	2019	2020
	%	%
Deceased	0,0	0,0
Ordinary discharge	96,3	98,1
Discharge to a Residential Care Facility	0,4	0,2
Discharge with home health services	0,1	0,2
Discharge against medical advice	0,5	0,2
Transfer to an acute admission unit of a different hospital	0,1	0,0
Transfer in the same hospital	1,3	0,8
Transfer to an inpatient rehabilitation facility	1,2	0,5
Discharge with integrated home care	0,0	0,0

Figure 19. Ankle. Total replacement (primary and revision procedures). Incidence rate by region. 2019-2020

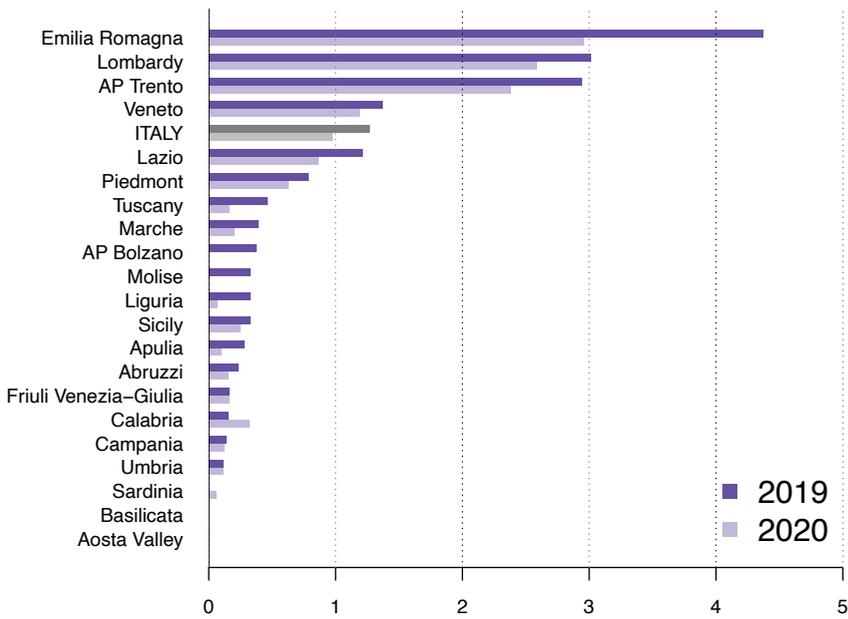


Figure 20. Ankle. Total replacement (primary and revision procedures). Hospitalisation rate by region. 2019-2020

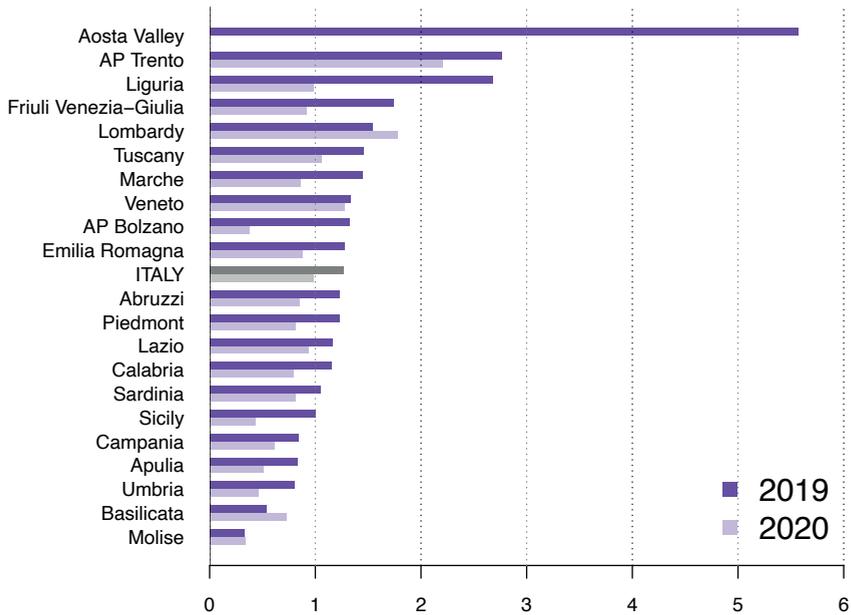


Figure 21. Ankle. Total replacement (primary and revision procedures). Incidence/hospitalisation rate by region. 2001-2020

