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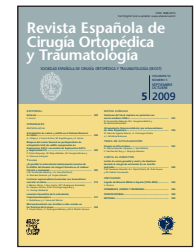

ORIGINAL PAPERS

Hip and knee replacement in the Spanish National Health System

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KEYWORDS
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Abstract
Purpose: To analyze hip and knee arthroplasties and their characteristics in the Spanish National Health System.
Materials and methods: Using clinical-administrative data gathered in 2005, a nationwide and regional cross-sectional study was performed of the number of discharges of patients subjected to primary and revision total hip (THR) and knee (TKR) arthroplasties. Standardized THR and TKR rates were calculated by age and gender per 10,000 inhabitants analyzing their variability as compared with systematic component of variance (SCV) values. Of each discharge we analyzed gender, age, reason for the procedure, the Charlson comorbidity index (CCI), length of stay, in-hospital mortality and pulmonary thromboembolism (PTE). We also analyzed the work-load entailed by revision surgery on the basis of the number of revision procedures as a percentage of the total number of arthroplasties.
Results: The rates obtained were 4.3 for THR and 7.3 for TKR, ranging from 2.3 to 10.0 in THR (SCV: 24.4%) and from 4.0 to 12.8 (SCV: 20.6%) in TKR. The majority of patients were older than 65 years. Osteoarthritis was the main reason for surgery with little variability. Generally speaking, the CCI was 0. Median length of stay was 9 days in THR and 8 in TKR. Mortality varied between 0% and 0.9% and PTE between 0% and 0.6% The percentage of hip revisions was 9.2% and that of knee revisions was 7%
Conclusions: Variability in terms of the different rates and patient characteristics could be pointing to differences in the indication criteria. Homogeneous indication criteria should be established and instruments should be developed for assessing the results.
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PALABRAS CLAVE
Artroplastias de cadera;
Artroplastias de rodilla;
Variabilidad en la práctica médica;
Bases de datos clínico-administrativos

Artroplastias de cadera y rodilla en el Sistema Nacional de Salud

Resumen
Objetivo: Analizar las artroplastias de cadera y de rodilla y sus características en el Sistema Nacional de Salud.
Material y método: Estudio transversal llevado a cabo de forma global y por comunidades autónomas de las altas por artroplastia total primaria de cadera (ATC) y por artroplastias totales primarias de rodilla (ATR), así como las de revisión a partir de datos clínicoadministrativos de 2005. Se calcularon las tasas estandarizadas de ATC y de ATR por edad y sexo por 10.000 habitantes analizando su variabilidad a partir del componente sistemático de variación (CSV). De cada alta se analizó: sexo, edad, motivo de intervención, índice de comorbilidad de Charlson, estancia, mortalidad intrahospitalaria y tromboembolismo pulmonar (TEP). Se analizó la carga de la cirugía de revisión a partir del porcentaje que representó sobre el total de artroplastias.
Resultados: Las tasas fueron de 4,3 en ATC y de 7,3 en ATR variando de 2,3 a 10,0 en ATC (CSV del 24,4%) y de 4,0 a 12,8 en ATR (CSV del 20,6%). La mayoría de los pacientes fueron mayores de 65 años. La artrosis fue el principal motivo de intervención con escasa variabilidad. El ICC fue en general 0. La estancia mediana fue de 9 días en ATC y de 8 días en ATR. La mortalidad varió entre el 0 y el 0,9%y el TEP varió entre el 0 y el 0,6% La carga de revisión en cadera fue del 9,2%y del 7%en rodilla.
Conclusiones: La variabilidad de las tasas y las características de los pacientes puede estar indicando diferencias en los criterios de indicación. Será necesario establecer criterios de indicación homogéneos y desarrollar instrumentos para la evaluación de los resultados.
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Introduction

The quality of healthcare can be affected by the rates of utilization of a particular treatment. The areas that show the highest rates could be exposing patients to unnecessary risk, while those areas with the lowest rates may be denying patients the benefits of a procedure. In spite of the fact that associations have been found between the variability of medical practice and factors such as patient characteristics, physician-related characteristics, and the characteristics of the medical center or of the healthcare process, personal style in medical practice has been found to be the main cause of variability[1,2].

Hip and knee arthroplasties are effective surgical procedures that improve the patients' quality of life, increase their functional capacity and reduce pain[3,4]. Nevertheless, the variability that is observed in the procedure rates in Spain may hinder the effectiveness of these kinds of treatment[5]. In a study carried out in the Basque Country it was observed that 5.1%of the indications were inappropriate. This entails the patients' exposure to unnecessary risk, and might explain, at least partially, the observed variability[6].

The fact that competencies for healthcare were devolved to the autonomous regions in 2002 makes it possible to analyze the use of hip and knee arthroplasty and the characteristics of the patients treated within the National Healthcare System in each of the regions. This study can provide useful information concerning the effect of different healthcare policies, as well as the style of medical practice in each autonomous region. To this effect, the Minimum Basic Data Set (MBDS) at discharge is a valuable and inexpensive source of information for the analysis of the use of healthcare services and of patients' characteristics. The MBDS gathers, among other variables, information about demographic characteristics and on the diagnoses and procedures corresponding to all the patients treated at a particular hospital and that are codified from the discharge reports.

The aim of this work is to describe the characteristics of hip and knee arthroplasty discharges in the Spanish National Healthcare System (NATIONAL HEATH SYSTEM).

Materials and methods

A cross-sectional study of discharges in 2005 with an initial procedure of primary and revision total hip and knee arthroplasty (International Classification of Disease codes, 9th revision, clinical modification [ICD-9-CM], 81.51, 81.53 for THR and 81.55 for TKR) in hospitals included in the MBDS of the National Health System. Partial primary hip arthroplasties were excluded (ICD-9-CM 81.52), because the population was considered to be of a different kind, since this type of treatment is performed in cases of elderly patients with hip fractures.

Of each discharge we gathered information concerning patient's characteristics (gender, age and diagnosis) and the characteristics of the healthcare episode (length of stay and situation at discharge). The main diagnosis was regarded as the cause of treatment. It was analyzed with the CCHPR

grouping system (Clinical Classifications for Health Policy and Research) of the Agency for Healthcare Research and Quality[7] that groups all diagnoses and procedures into 259 mutually exclusive categories, osteoarthritis and rheumatoid arthritis (CCHPR codes 203 and 202) being the reasons for hip and knee treatment, while avascular necrosis (ICD-9-CM codes 733.42 and 743.43) and congenital dysplasia (ICD-9-CM code 755.6) were the main reasons for hip treatment.

With the aim of assessing the patients' general health status at the moment of treatment, comorbidity was analyzed with the Charlson comorbidity index (CCI). This index assigns a particular effect to a set of chronic conditions and it has been associated with the increase in mortality and hospital length of stay[8,9]. In-hospital complications were studied by analyzing pulmonary thromboembolism (PTE) using the ICD-9-CM codes provided by the AHRQ quality indicator for post-surgical PTE: codes 415.1, 415.11 and 415.19 in any of the MBDS secondary diagnoses[10].

Analysis

The analyses were carried out across the whole of Spain and in each autonomous region. The full number of primary total treatments and the crude rates of primary arthroplasties in the whole of the National Health System were calculated. As far as the autonomous region rates are concerned, they were standardized by means of the direct method for age and gender and for the Spanish population that was registered by the National Institute of Statistics for January 1st 2005. The confidence interval was calculated at 95%. Standardization allows the elimination of the effect caused on the treatment rates by the differences in the age and gender structures of the autonomous regions, thus making them comparable.

The systematic component of variance (SCV) was estimated with the purpose of analyzing the variability, between the autonomous regions, of the standardized rates for primary THR TKR[5,11]. The SCV is calculated from the sum of the results obtained in each autonomous region for the difference between the expected cases —estimated from the application of the National Health System rates to the age and gender structure of the autonomous region—and the observed cases, these being divided by the total number of cases expected in the autonomous region. In other words, a 50% SCV would indicate that in the whole of the National Health System the number of patients that were treated is 50% more than was expected according to the age and gender structure of each autonomous region. The SCV shows the excess in the number of cases. The greater the variability in the rates, the higher the value of the SCV will be.

Additionally, the indirect standardization method was used with the purpose of analyzing the differences between the rates for each autonomous region and the global rate for the National Health System. The stratified rates for age group in the National Health System were applied to the age structure of each autonomous region with the intention of obtaining the total number of expected cases of THR and TKR. The ratio between the total number of observed cases and that of the expected cases in the autonomous regions enables the calculation of the standardized utilization ratio (SUR) and its 95%CI. Values above 1 indicate that the rate of the autonomous region is higher than that of the National Health System as a whole. Similarly, values under 1 indicate that the rate of the autonomous region is lower than that of the National Health System. The work-load entailed by revision was estimated as the percentage of revision arthroplasties within the total number of primary and revision arthroplasties that were carried out. In order to estimate the work-load in hip arthroplasty revisions, primary partial arthroplasties were also included (ICD-9-CM 81.52), owing to the fact that the revision code does not state whether the revision of the prosthesis is total or partial.

As regards patients' characteristics, we analyzed their distribution according to gender (percentage of women), age (under 50 years, 50-64 years, 65-74 years, and 75 or more years), reason for treatment and general health conditions determined by the presence of comorbidity that was measured using the CCI and classified into 0, between 1 and 2, and 3 or more. Regarding the healthcare episode, median length of stay and the percentage of patients diagnosed with PTE were calculated, as well as in-hospital mortality (using the discharge conditions variable).

In order to simplify the interpretation of the analysis of the characteristics of discharged patients in each autonomous region, the variance ratio (VR) was calculated as the proportion between the maximum and minimum values of each variable that was analyzed. The cities of Ceuta and Melilla were excluded from the ratio estimation due to the small number of people treated, which markedly increased the variation ranges.

Results

In the year 2005, the sum number of primary total arthroplasties that were carried out in the National Health System was 19,015 for hip arthroplasty and 32,076 for knee arthroplasty. The rates for each one of these procedures were 4.3 per 10,000 inhabitants in the case of hip arthroplasty, and 7.3 per 10,000 inhabitants for knee arthroplasty. However, when the standardized rates in the autonomous regions were analyzed, we observed a wide range of variation. For THR, the rates ranged from the 10.0 procedures per 10,000 inhabitants in Cantabria to the 2.3 procedures per 10,000 inhabitants in Murcia; SCV was 24.4%. As regards TKR, the differences were also significant, ranging from 12.8 procedures per 10,000 inhabitants in Catalonia to 4.0 procedures per 10,000 inhabitants in Galicia; SCV was 20.6% (table 1). For THR, the number of cases observed was 50% higher than expected in 3 autonomous regions—Cantabria, Navarre, and Asturias (SUR>1.5); whereas for TKR it was only in Catalonia that the number of observed cases was 50% higher than expected (figs. 1 and 2). As to the work-load, it was 9.2% (95%CI, 8.9-9.5% range) for hip procedures and 7% (95%CI, 6.7-7.3% range) for knee procedures. As happened with the standardized rates, variability was also observed between the autonomous regions, since the variation ratios between regions with a greater and smaller revision work-load for hip and knee were 2.3 and 3.4 respectively (figs. 3 and 4).

Table 1 Standardized rates per 10,000 inhabitants for primary total arthroplasties in the National Health System for 2005

Autonomous region	Hip		Knee	
	Crude rate	Standardized rate (95%CI)	Crude rate	Standardized rate (95%CI)
Andalusia	3.1	3.4 (3.3–3.6)	8.0	8.8 (8.6–9.1)
Aragon	4.1	3.5 (3.2–3.8)	7.0	5.9 (5.5–6.3)
Asturias	8.9	7.2 (6.7–7.6)	7.4	5.8 (5.4–6.2)
Balearic Islands	3.4	4.0 (3.5–4.4)	4.9	6.0 (5.4–6.5)
Basque Country	5.9	5.4 (5.1–5.7)	5.4	4.9 (4.6–5.2)
Canary Islands	2.3	2.9 (2.6–3.1)	3.7	4.7 (4.3–5.0)
Cantabria	10.9	10.0 (9.2–10.8)	7.9	7.3 (6.6–8.0)
Castile-Leon	5.1	4.0 (3.8–4.3)	5.8	4.5 (4.3–4.7)
Castile-La Mancha	3.3	3.1 (2.8–3.3)	6.4	5.9 (5.6–6.2)
Catalonia	5.1	5.1 (5.0–5.3)	12.7	12.8 (12.6–13.1)
Ceuta	0.3	0.4 (0.0–0.9)	0.7	1.0 (0.1–1.9)
Estremadura	3.1	2.8 (2.5–3.1)	7.1	6.3 (5.9–6.8)
Galicia	6.5	5.4 (5.2–5.7)	5.0	4.0 (3.8–4.3)
La Rioja	7.4	6.8 (5.9–7.7)	7.7	7.1 (6.2–8.0)
Madrid	3.4	3.8 (3.7–4.0)	5.4	6.2 (6.0–6.4)
Melilla	0.5	0.7 (0.0–1.5)	1.1	1.5 (0.4–2.7)
Murcia	1.9	2.3 (2.0–2.6)	4.1	4.8 (4.4–5.2)
Navarre	8.1	7.8 (7.2–8.6)	8.6	8.3 (7.6–9.0)
Valencian Community	3.8	3.9 (3.7–4.1)	6.6	6.7 (6.4–6.9)

The reference population for rate standardization was the one registered on 1st January 2005.
CI: confidence interval.

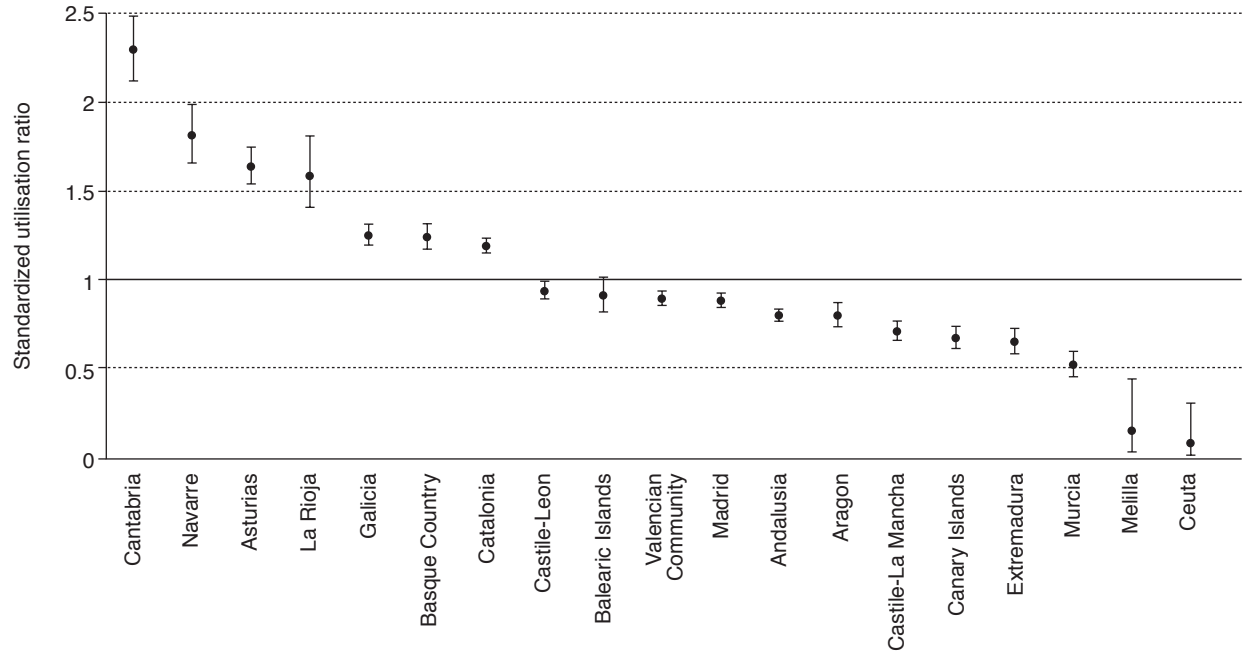

Figure 1 Standardized utilization ratio for primary total hip arthroplasties in the Spanish National Health System in 2005. Value 1 indicates the rate for the National Health System as a whole.

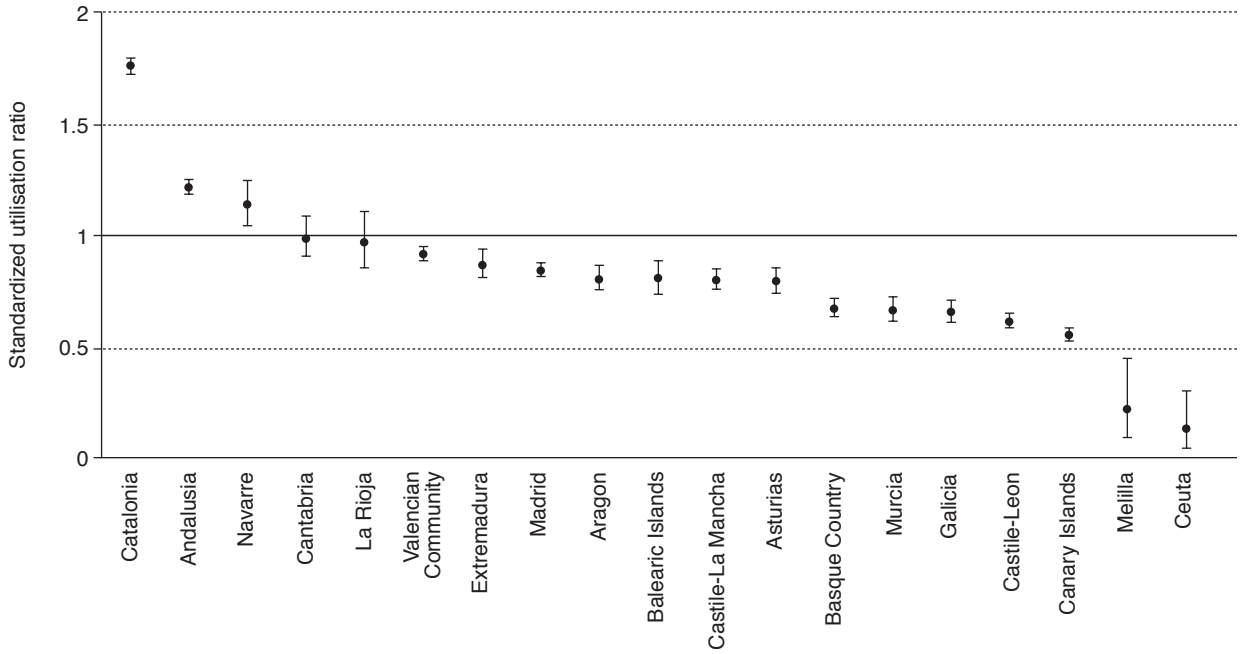

Figure 2 Standardized utilization ratio for primary total knee arthroplasties in the Spanish National Health System in 2005. Value 1 indicates the rate for the National Health System as a whole.

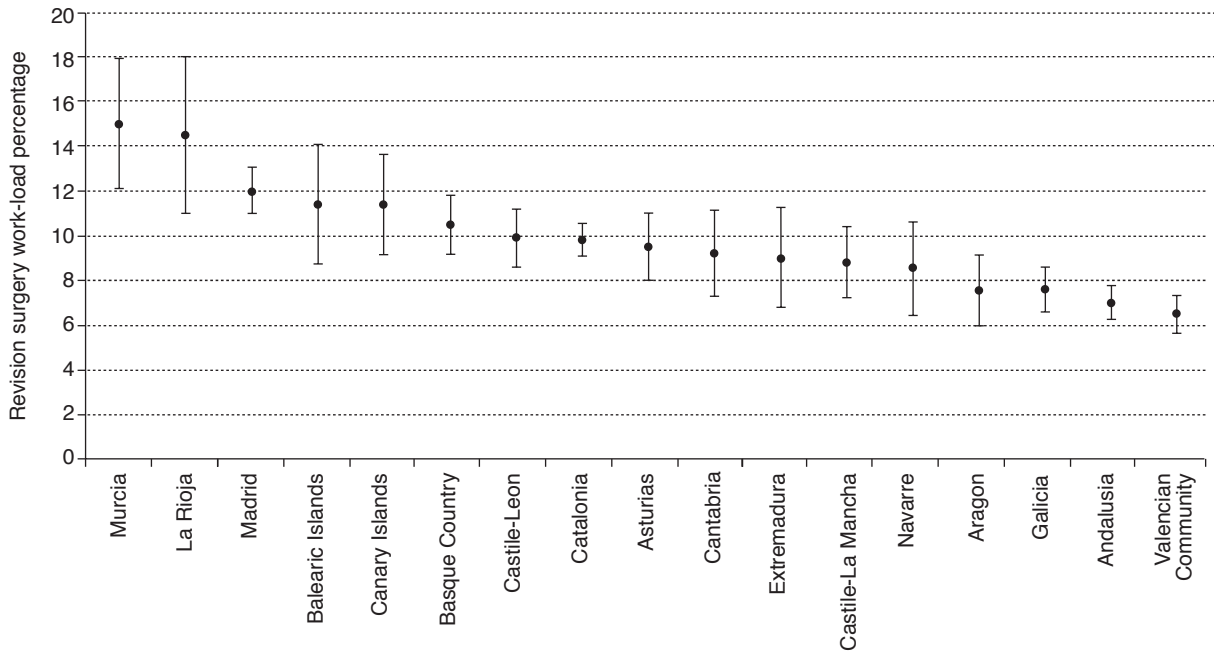

Figure 3 Revision work-load in hip arthroplasties in the Spanish National Health System in 2005.

Primary total hip arthroplasty

Table 2 shows the characteristics of the patients discharged after THR in the whole of the National Health System and by autonomous region. Half the discharges following THR corresponded to women, and showed little variability between regions. The most frequent age groups were the 65-74 and the 75 or more groups, jointly reaching 69.5% of

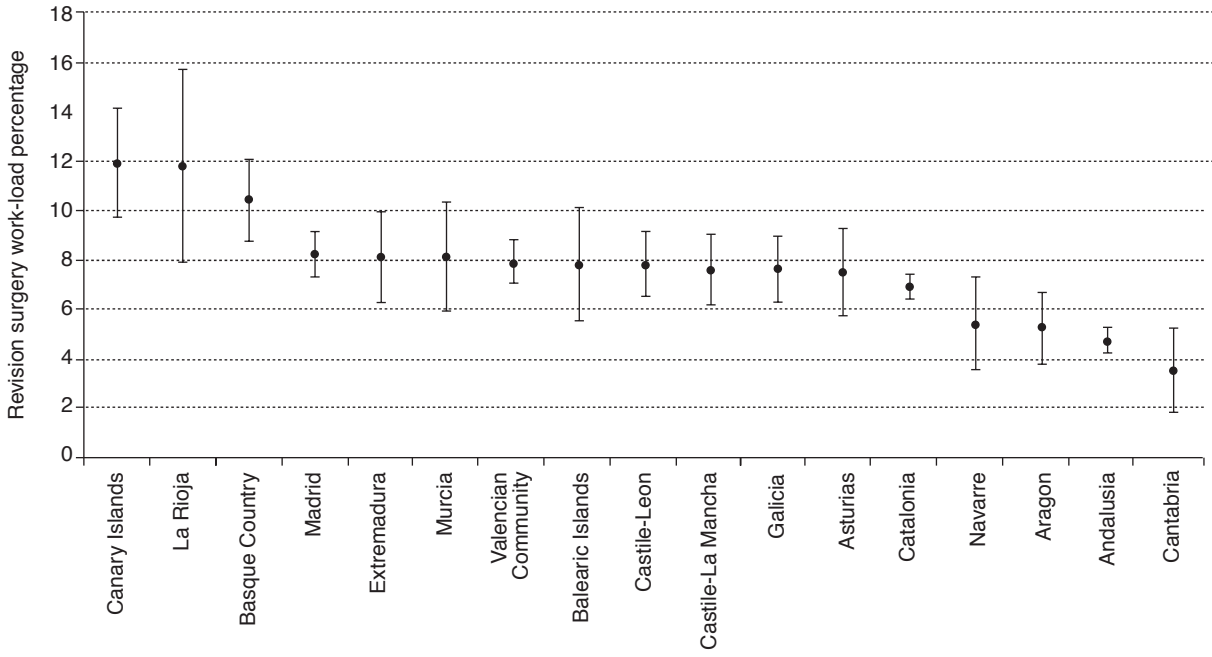

Figure 4 Revision work-load in knee arthroplasties in the Spanish National Health System in 2005.

the discharges, with a greater variability between regions in the lower age groups than for gender.

Osteoarthritis was the most frequently found reason for treatment, representing 77.7% of the total number of discharges, and variability between autonomous regions was low. On the other hand, the rest of the reasons for treatment that we analyzed presented a wider range of variability. Avascular necrosis varied between 3.1 and 9.0%; rheumatoid arthritis varied between 0 and 0.6 and congenital dysplasia, between 0 and 0.8.

With respect to the general health condition of the patients, the majority (74.5%) obtained a score of 0 for the CCI, with little variability between autonomous regions, whereas variability increased in patients with scores between 1 and 2, and of 3 or more, VR being 2.3 and 10.5 respectively.

As regards the characteristics of the healthcare episode, median length of stay was 9, with the values for the autonomous regions ranging from 6 to 12 days. Both in-hospital mortality and PTE were infrequent and showed little variability within the autonomous regions.

Primary total knee arthroplasty

Table 3 shows the characteristics of patients that were discharged following TKR in the National Heath System as a whole, and by autonomous region. 74.3% were women and variability within the autonomous regions was low. As happened in the cases of THR, the most frequently found age groups were the 65-74 and the 75 or more groups, making up 85.7% of the discharges with little variability.

Similarly to the results obtained for THR, osteoarthritis was the most common reason for treatment (95.4%) and variability between autonomous regions was low, whereas rheumatoid arthritis represented 0.1% of the reasons for treatment in the National Health System as a whole and varied between 0 and 0.4%

The CCI was 0 for 79.2% of the patients, and variability within the autonomous regions was low. However, and as happened with THR, variability increased in patients with CCI values of 1-2 and of 3 or more.

As regards the characteristics of the healthcare episode, median length of stay was 8, one day less than for THR, and the values for the autonomous regions ranged from 6 to 12 days. In-hospital mortality and PTE were infrequent and showed little variability between autonomous regions.

Discussion

The variability of the characteristics of the procedures between the autonomous regions seems to be pointing to differences in the indication criteria. The variability that was found in the surgery rates, in the percentages of treatment for the different age groups and in the patients' general health conditions could be indicating that the number of people undergoing surgical treatment for joint replacement varies depending on the autonomous region. In all cases, however, the main reason for treatment was osteoarthritis and it showed little variability between regions. Other published works containing data on the whole of the National Health System but including the analysis of smaller areas also show variability in the THR

Table 2 Characteristics of patients treated for primary total hip arthroplasty in the Spanish National Health System and in autonomous regions, in 2005

	n	Gender (%women)	Age in years (%)				Reason for treatment (%)			Charlson comorbidity index (%)				Stay[a] (%)	Mortality (%)	PTE
			<50	50-64	65-74	≥75	Osteo-arthritis	RA	AN	DYS	0	1 to 2	≥3			
Andalusia	2,444	55.2	10.9	23.1	37.3	28.7	75.9	0.4	4.6	0.1	78.6	20.0	1.4	8.0	0.2	0.0
Aragon	515	48.9	7.2	23.1	32.8	36.9	71.3	0.4	8.5	0.2	75.3	23.3	1.4	11.0	0.4	0.4
Asturias	961	51.3	7.2	22.5	34.8	35.6	84.5	0.1	4.0	0.8	79.7	19.4	0.9	12.0	0.5	0.0
Balearic Islands	337	54.9	9.8	22.3	32.3	35.6	66.8	0.6	4.2	0.3	73.9	25.2	0.9	7.0	0.9	0.6
Basque Country	1,257	50.6	7.7	25.4	32.9	34.0	78.7	0.4	5.6	0.0	82.0	16.9	1.1	10.0	0.7	0.3
Canary Islands	454	51.3	12.1	26.2	37.9	23.8	81.7	0.2	4.2	0.2	74.0	25.8	0.2	8.0	0.0	0.0
Cantabria	613	50.7	6.7	27.6	33.3	32.5	87.1	0.2	3.1	0.2	85.6	13.9	0.5	8.0	0.3	0.2
Castile-Leon	1,283	51.2	5.4	17.7	37.4	39.5	76.7	0.0	3.9	0.5	78.3	21.0	0.7	9.0	0.4	0.2
Castile-La Mancha	623	56.3	7.7	19.1	37.1	36.1	70.6	1.1	6.1	0.2	78.2	21.3	0.5	7.0	0.8	0.0
Catalonia	3,595	53.1	8.0	21.9	33.2	36.9	79.3	0.2	5.2	0.5	74.2	24.3	1.5	9.0	0.3	0.1
Ceuta	2	50.0	0.0	50.0	0.0	50.0	50.0	0.0	0.0	0.0	100	0.0	0.0	31.0	0.0	0.0
Estremadura	332	54.5	6.9	19.9	34.6	38.6	67.8	0.3	9.0	0.0	74.1	23.8	2.1	8.0	0.3	0.0
Galicia	1,807	56.7	6.0	21.6	38.0	34.4	87.8	0.1	3.4	0.5	84.4	15.1	0.5	11.0	0.3	0.2
La Rioja	223	43.5	6.7	17.9	37.7	37.7	78.9	0.5	4.5	0.0	75.8	23.8	0.4	6.0	0.0	0.0
Madrid	2,039	57.8	10.1	20.6	30.1	39.2	75.0	0.3	5.2	0.5	75.5	22.5	2.1	9.0	0.7	0.1
Melilla	3	33.3	0.0	33.3	0.0	66.7	33.3	0.0	0.0	0.0	100	0.0	0.0	9.0	0.0	0.0
Murcia	257	52.1	8.9	19.5	37.7	33.9	76.3	0.0	4.3	0.8	79.0	20.6	0.4	7.0	0.4	0.0
Navarre	483	44.9	5.2	22.4	33.5	38.9	73.5	0.4	8.7	0.8	87.8	11.4	0.8	11.0	0.0	0.2
Valencian Community	1,787	52.8	10.0	23.7	35.3	31.1	71.5	0.1	4.6	0.2	81.5	17.3	1.2	8.0	0.4	0.0
VR[b]	—	1.3	2.3	1.6	1.3	1.7	1.3	[c]	2.9	[c]	1.2	2.3	10.5	2.0	[c]	[c]
Total	19,015	53.0	8.3	22.2	34.7	34.8	77.7	0.3	4.9	0.4	74.5	24.0	1.5	9.0	0.4	0.1

RA: rheumatoid arthritis; DYS: congenital hip dysplasia; AN: avascular necrosis; VR: variation ratio; PTE: pulmonary thromboembolism.
[a]Median length of stay in days; [b]In the estimation of VR the values for Ceuta and Melilla were excluded; [c]VR was not calculated because the minimum value was 0.

Table 3 Characteristics of the discharged patients treated with primary total knee arthroplasty in the National Health System and by autonomous region, in 2005

	n	Gender (%women)	Age in years (%)				Reason for treatment (%)		Charlson morbidity index (%)			Stay[a]	Mortality (%)	PTE (%)
			<50	50-64	65-74	≥75	Osteo-arthritis	RA	0	1 to 2	≥3			
Andalusia	6,265	77.0	0.7	17.6	52.0	29.6	91.3	0.2	82.0	17.5	0.5	7.0	0.2	0.0
Aragon	892	67.5	0.3	11.8	49.0	38.9	94.3	0.0	79.0	20.4	0.6	9.0	0.3	0.3
Asturias	801	75.2	0.5	15.2	46.8	37.5	96.8	0.1	78.7	20.7	0.6	12.0	0.0	0.0
Balearic Islands	485	72.0	0.8	10.3	49.3	39.6	80.6	0.2	77.9	21.2	0.8	6.0	0.0	0.0
Basque Country	1,157	71.4	1.0	14.1	45.5	39.5	97.2	0.4	83.5	15.9	0.6	11.0	0.0	0.4
Canary Islands	721	70.7	2.4	27.2	46.0	24.4	96.5	0.1	71.2	28.2	0.7	7.0	0.0	0.0
Cantabria	447	76.3	1.8	19.7	43.0	35.6	98.7	0.2	83.2	16.8	0.0	9.0	0.2	0.2
Castile-Leon	1,453	69.7	0.6	12.3	47.8	39.3	96.1	0.0	78.0	21.4	0.6	9.0	0.0	0.2
Castile-La Mancha	1,213	71.6	0.5	11.4	55.8	32.3	98.9	0.0	80.5	19.0	0.4	7.0	0.2	0.1
Catalonia	8,895	73.7	0.5	13.8	44.7	41.0	98.5	0.1	74.9	24.1	1.0	8.0	0.1	0.1
Ceuta	5	80.0	0.0	20.0	40.0	40.0	100	0.0	100	0.0	0.0	13.0	0.0	0.0
Estremadura	774	78.3	0.1	12.0	52.8	35.0	98.2	0.0	75.2	24.3	0.5	8.0	0.1	0.1
Galicia	1,379	74.3	0.7	15.3	47.8	36.2	98.3	0.2	85.2	14.6	0.1	12.0	0.1	0.4
La Rioja	232	69.8	0.0	14.2	46.1	39.7	97.4	0.0	79.3	20.3	0.4	6.0	0.4	0.0
Madrid	3,207	78.4	1.0	14.0	44.5	40.4	95.2	0.1	76.9	22.7	0.4	9.0	0.1	0.2
Melilla	7	71.4	0.0	14.3	71.4	14.3	100	0.0	100	0.0	0.0	15.0	0.0	0.0
Murcia	548	75.2	0.9	15.5	54.7	28.8	91.2	0.0	76.5	23.2	0.4	7.0	0.2	0.0
Navarre	508	69.7	0.2	12.0	43.5	44.3	97.2	0.0	90.9	9.1	0.0	11.0	0.0	0.0
Valencian Community	3,087	73.1	0.7	14.1	52.8	32.4	92.7	0.2	84.8	15.0	0.3	7.0	0.0	0.1
VR[b]	—	1.2	[c]	2.6	1.3	1.8	1.2	[c]	1.3	3.1	[c]	2.0	[c]	[c]
Total	32,076	74.3	0.7	14.8	48.2	36.3	95.4	0.1	79.2	20.2	0.6	8.0	0.1	0.1

RA: rheumatoid arthritis; VR: variation ratio; PTE: pulmonary thromboembolism.
[a]Median of length of stay in days; [b]In the estimation of VR the values for Ceuta and Melilla were excluded; [c]VR was not calculated because the minimum value was 0.

and TKR rates, though it is lower. The SCV of the THR and TKR rates in 2002 was 10 and 14% respectively[5]. The differences with our work may be accountable to the aggregation of the results of the autonomous regions, which could have enhanced the regional differences. In spite of this, however, this SCV amounts to only half of the SCV found in the United States for this kind of treatment—67.2% for THR and 55.0% for TKR[12].

The variability that was observed within the autonomous regions in terms of the treatment rates can be accounted to the differences regarding the prevalence of osteoarthritis as the main reason for treatment. However, the results of works that were carried out in Ontario (Canada) and in Massachusetts (U.S.A.) disagree regarding the influence of this factor. The work from Ontario shows that the prevalence of osteoarthritis does not account for the variability in the use of TKR, while in the work from Massachusetts osteoarthritis is considered to be a cause of variability, at least partially[13,14]. The spread of new prosthetic materials and designs in the autonomous regions, and of new alternative treatments, such as inhibitors of tumor necrosis in rheumatoid arthritis[15] could also have had an influence on the results. The degree of aptness of the indications is another factor that could have affected the variability of the surgery rates. In a study carried out in the Basque Country, the percentage for inadequate indications of THR and TKR was 5.2 and 12.4%, respectively; moreover, 21.4% of the THR procedures and 17.3% of the TKR procedures were found to be doubtful[16].

With respect to postsurgical complications, despite the fact that PTE and in-hospital mortality were always infrequent, the differences between the autonomous regions reveal a wide range of variation. This may be accounted for by the variability that was observed regarding general health conditions. Also, the differences between median lengths of stay between the autonomous regions might also be an effect of the variability of patients' characteristics and may be indicating that the costs of the treatment are diverse. In this case the differences between rehabilitation programs could explain the results, though there is insufficient proof of their effectiveness[17].

Regarding surgery for prosthesis replacement, the differences in the work-load between the autonomous regions can be accounted to the accumulation of revisions for primary arthroplasties that were performed in previous years. If the differences in the rates of observed primary arthroplasties remain for a long period of time, the number of expected revisions per region should be greater in the regions with higher rates of primary arthroplasty, assuming prosthesis survival to be equal in all the cases. We also recommend taking into account the possible effect of the work-load increase that might take place in the next few years in the autonomous regions where this type of treatment is being indicated more frequently. In the United States, it was estimated that a 1% reduction in the THR and TKR revision work-load can save between 96 and 211 million dollars[18].

The consequences generated by the increase in the number of THR and TKR that have been observed in other countries are likely to take place in the Spanish National Health System as well[19-21]. The increase in primary arthroplasties will most probably bring about an increase of the work-load in the next few years. This may have a marked effect on the patients' health due to the complexity of revision surgery, as well as on the health system, since these surgeries are complex and require longer hospital stays which, in turn, increase the costs of healthcare[22]. In this respect, the wide offer of prostheses and the insufficient information about long-term results has led some countries to produce arthroplasty registers recording cases with prostheses that failed prematurely due to their design[22-25]. An arthroplasty register for the whole of the NATIONAL HEATH SYSTEM would enable the drawing up of standards to facilitate the evaluation of results and the detection of prostheses that failed to attain the expected results. Despite the fact that the use of registers improves implanted prosthesis survival, its main assessment variable is the survival of the implant[25,26]. Although it constitutes a firm measure it does not take into account aspects such as the patient's quality of life or functional capacity, both of these being standards that involve patient perception and the evaluation of results according to life quality improvement in relation to health[27,28].

The main limitation of our work is connected with the information available from the MBDS and its reliability. The differences that we observed in the patients' health conditions in the different autonomous regions can be attributed partly to divergences in the elaboration of the discharge reports and in the ways of codifying illnesses. The fact that the hospital pay system is increasingly more closely related to the complexity of the patients that are treated, might have led to the hospitals' prioritizing the codifying of illnesses with increased hospital stays, costs and in-hospital mortality[8]. Moreover, the MBDS only gathers information during admission into hospital, thus preventing the analysis of mortality or of complications after discharge. Differences between hospitals as to the availability of healthcare resources that allow shorter hospital stays could affect the results. Also, other data such as the degree of joint involvement or the patient's functional capacity was not available and it could have explained the variability within the autonomous regions to some degree[14]. In spite of these drawbacks, clinico-administrative data bases like the MBDS are an accessible source of information with a wide coverage and a low relative cost.

In conclusion, the variability that was observed between the autonomous regions in terms of primary treatment rates and patient characteristics may be pointing to divergences in the indication criteria that could be corrected via the production of clinical practice guides. Furthermore, the differences in the THR and TKR rates and in the work-load revision rates makes it necessary to design mechanisms for evaluating the long-term results of the different models of prostheses as well as the development of quality standards.

Conflict of interests

The authors have declared that they have no conflict of interests.

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