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Brief report
Usefulness of a national hospital database to evaluate the burden of primary joint replacement for coxarthrosis and gonarthrosis in patients aged over 40 years

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Summary

Objective: To evaluate the 2001 French burden of hospital primary joint replacement (PJR) for coxarthrosis and gonarthrosis.

Methods: Hospital surgical admissions for coxarthrosis and gonarthrosis in people aged over 40 years were selected from the French National Hospital Database. Of the 73,150 and 58,746 admissions for coxarthrosis and gonarthrosis, respectively, only 96 and 73% of them were analysed (exclusion of stays with no respect of coding guidelines). For each, we described the type of osteoarthritis, gender and age group distribution, incidence rate of PJR adjusted on age and gender, the type of joint replacement (total vs partial), the type of hospital (private vs hospital), the mean length of stay (LOS), the percentage of patients transferred to rehabilitation centre and the hospital costs.

Results: Whatever the type of osteoarthritis, PJR was mainly performed for primary osteoarthritis, in the 71−80 years' age group, in private hospital, with a total replacement procedure. The mean LOS were 13 and 12 days, and the transfers to a rehabilitation centre were 33 and 44%, for hip and knee, respectively. The incident rate of PJR increased significantly with age. It was higher in the 71−80 years' age group and decreased thereafter, whatever the gender and the type of osteoarthritis. The whole hospital costs were 591 and 411 millions of euros for hip and knee, respectively.

Conclusion: The French National Hospital Database is a useful tool for assessing the burden of primary PJR for coxarthrosis and gonarthrosis. It might be used for international comparisons.
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Key words: Epidemiology, Coxarthrosis, Gonarthrosis, Hospital costs.

Introduction

Osteoarthritis, a prevalent condition around the world, is a most common cause of pain and disability, particularly in ageing population, and is costly for patient as well as for society. The burden of this disease has been recognized by the United Nations and WHO, by endorsing the Bone and Joint Decade 2000−2010[1]. Osteoarthritis appeared as a healthcare priority in the French public health program with a peculiar attention to the disability and handicap reduction[2]. There is the strong need for nations to develop their own system of information to evaluate and follow-up the burden of this disease and especially of coxarthrosis and gonarthrosis. In order to evaluate the burden of hip and knee osteoarthritis in France, we analysed the available data of surgical hospitalizations for primary joint replacement (PJR) in patients with coxarthrosis and gonarthrosis, extracted from the French National Hospital Database.

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Material and methods

SELECTION OF HOSPITAL ADMISSIONS

Hospital admissions were extracted from the 2001 French National Hospital Database (public and private hospitals). For each hospitalization, according to the French Health System Organization, each physician has to declare all diagnoses and procedures performed, using the code of the International Classification of Disease, 10th revision (ICD-10) and the French Catalogue of Procedures, respectively. The National Hospital Database describes declarative information and data were de-identified.

We selected all surgical admissions (elective and emergency admissions) in women and men over 40 years, identified by the code of the principal diagnosis for coxarthrosis and gonarthrosis (ICD-10 codes starting with M16 and M17, respectively). In France, the principal diagnosis corresponds to the disease which required the most important part of the necessary medical and paramedical resources during the hospital stay. We numbered 73,150 and 58,476 hospital episodes for coxarthrosis and gonarthrosis, respectively.

We excluded the hospital stays for which the coding guidelines were not respected, i.e., the procedures were not in adequacy with the localization of the osteoarthritis and the

hospitalization was dedicated for the revision of a prosthesis. In case of revision surgery, the principal diagnosis is either a mechanical complication or a sepsis of the prosthesis. In this case, osteoarthritis can be a secondary diagnosis only in the case where this disease is present in a different joint. We analysed 69,948 and 42,763 hospitalizations for primary hip and knee replacement for osteoarthritis, respectively.

DESCRIPTIVE ANALYSIS

For each type of osteoarthritis, we described the number of admissions, the type of osteoarthritis according to the description available with ICD-10 codes, the sex ratio (men/women), the distribution in different age groups (41−50 years, 51−60 years, 61−70 years, 71−80 years and ≥81 years), the percentage of management in private hospitals, the mean length of stay (LOS) for all admissions, by public and private hospitals, the percentage of total joint replacement, the percentage of transfer in rehabilitation centre after hospitalization and hospital costs.

For each hospitalization, the medical information (diagnoses and procedures) classified a patient's stay within a given diagnosis-related group (DRG). DRG represented a medico-economic entity concerning a set of diseases requiring analogous management resources. These DRG were evaluated on the basis of data collected in a national study of costs generated by a "reference" hospital patient sample, while taking into account resource consumption for clinical services (wages of physicians, nurses and other health professionals involved, medical equipment depreciation and maintenance, and logistics), resource consumption for medico-technical services (laboratories, operating rooms, functional examinations, dialyses, anaesthesia, emergency units, radiotherapy, other medico-technical procedures, medical consumables and drugs), individual expenses (expenses directly allocated to patients and out-of-hospital procedures) and logistic expenses (catering, laundry services, general logistics). We used the 2004 hospital tariffs per DRG for hospital cost calculation, expressed in 2004€.

As longer LOS was cost consuming, we explored the impact of several variables on LOS (i.e., age, gender, number of secondary diagnoses, number of procedures, type of hospital and transfer to rehabilitation centre). Each explanatory variable was dichotomized according to its median value and introduced in a multivariate model (linear multiple regression). The threshold of a P-value ≤0.20 in the univariate study was retained for including the variables into the multivariate model. Differences were considered significant when $P < 0.05$.

INCIDENT HOSPITAL RATES FOR PJR

We calculated the incident hospital rates (IC 95%) per 10,000 inhabitants for PJR for hip and knee osteoarthritis using as numerator the number of admissions with joint replacement and as denominator the French population (data from the last French census in 1999) adjusted for age group and gender. The effect of age on PJR was studied using a Chi-square test ($\alpha = 0.05$).

Results

DESCRIPTIVE DATA

Table I describes the data of the 69,948 and 42,763 PJR for coxarthrosis and gonarthrosis in France in 2001, respectively. Hip primary replacement was carried out mainly for

Table I
Hospital descriptive data for primary joint replacement for coxarthrosis and gonarthrosis in France in 2001

Number of stays	Coxarthrosis 69,948	Gonarthrosis 42,763
Type of osteoarthritis (%)		
Primary	74	64
With dysplasia	5	−
Post-traumatic	1	1
Secondary	3	11
Unspecified	17	24
Sex ratio (men/women)	0.82	0.50
Age-group (years, %)		
41−50	5	1
51−60	14	7
61−70	29	27
71−80	40	53
≥81	12	12
Admission in private hospitals (%)	66	71
Total replacement (%)	92	85
LOS: day (mean ± standard deviation)	13.0 ± 5.5	12.1 ± 6.3
Transfer to rehabilitation centre (%)	33	44
Hospital costs (€, 2004)		
Total costs	590,611,602	410,466,507
Mean (±standard deviation)	8318 (±1233)	7404 (±2537)

LOS: length of stay.

primary osteoarthritis, in women, in patients aged from 71 to 80 years, in private hospital, with few transfers to rehabilitation centre. Similar results were observed for knee primary replacement, except for gender (sex ratio = 0.50) and transfer to rehabilitation centre (44%).

The whole hospital cost was 1002 millions of euros of which 59% was dedicated for coxarthrosis (Table I). The mean costs were 8318 ± 1233 and 7404 ± 2537€, for hip and knee, respectively.

Age (≥75 years), gender (women), number of secondary diagnoses (≥1), number of procedures performed (≥4), and transfer to rehabilitation centre appeared as significantly impacting on LOS, whatever the type of osteoarthritis (Table II).

INCIDENT RATES OF HOSPITALIZATION FOR PJR

Table III describes the incident rates of PJR adjusted on age and gender for 10,000 inhabitants. The incidence rate increased significantly with age and decreased after 81 years of age, whatever the gender and the type of osteoarthritis ($P < 0.0001$).

Discussion

Our study is a retrospective evaluation of the hospitalizations for hip and knee osteoarthritis, based on the systematically declared data of hospital stays. We found that PJR was mainly performed in the 71−80 years' age group, in private hospital, with a total replacement procedure, whatever the type of osteoarthritis. The mean LOS were 13 and 12 days, and the transfers to rehabilitation centre were 33 and 44% for hip and knee, respectively. The hospital cost for PJR was 1002 millions of euros of which 59% was dedicated for hip osteoarthritis.

The quality control of hospital data is a crucial issue. In France, two types of controls regarding the data quality are performed: internal and external controls. Internal

Table II
Length of stay for surgical admissions (longer that 24 h) for coxarthrosis and gonarthrosis

Coxarthrosis			Test *t*		Linear multiple regression°			
Variables			Mean duration (days)		Variables	Estimate	Standard error	*P*
Modal†	(A)	(B)	(A)	(B)	Intercept	11.8	0.05	<0.0001
Age	<75	≥75	12.2	13.7*	Age ≥75	1.32	0.04	<0.0001
Gender	Men	Women	12.7	13.3*	Gender: men	−0.45	0.04	<0.0001
SD	<1	≥1	12.3	13.5*	Nb of SD: ≥1	1.13	0.04	<0.0001
Rehabilitation	Yes	No	13.3	12.9*	Rehabilitation: no	0.14	0.04	0.0016
Hospital	Private	Public	13.0	13.0	Type of hospital: public	0.15	0.04	0.0011
Procedures	<4	≥4	13.0	13.0	Nb of procedures ≥4	−0.10	0.04	0.013

Gonarthrosis			Test *t*		Linear multiple regression°			
Variables			Mean duration (days)		Variables	Estimate	Standard error	*P*
Modal†	(A)	(B)	(A)	(B)	Intercept	10.23	0.07	<0.0001
Age	<75	≥75	10.5	13.5*	Age ≥75	2.59	0.05	<0.0001
Gender	Men	Women	11.2	12.7*	Gender: men	−0.98	0.05	<0.0001
SD	<1	≥1	11.3	12.6*	Nb of SD: ≥1	1.05	0.06	<0.0001
Rehabilitation	Yes	No	13.1	11.6*	Rehabilitation: no	0.96	0.06	<0.0001
Hospital	Private	Public	12.2	11.9*	Type of hospital: public	−0.32	0.06	<0.0001
Procedures	<4	≥4	12.12	12.1	Nb of procedures ≥4	−0.16	0.05	0.004

*Univariate comparison of mean LOS, $P < 0.001$. °The variables introduced in the multivariate model were those which had a P-value ≤ 0.20 in the univariate analysis.

†Modal: modality of the variable considered, Nb: number, SD: secondary diagnosis.

control is performed by each hospital prior to transmitting the data to the authorities. The external control is performed by the health authority office. To date, the results of the internal and external controls are not published. Despite the quality control (i.e., internal and external quality controls in France) and the de-identified type of our data, we identified remaining errors that led us to exclude some hospitalizations. Indeed, hospitalizations where the types of procedures performed were not in accordance either with the localization of osteoarthritis or with the first occurrence of joint replacement were not included. In the literature, this aspect was assessed. The relevance of diagnosis of osteoarthritis in administrative database was compared to the data of medical records. The positive predictive value for definite and possible osteoarthritis was 78%[3] and 89%[4].

We focused on hospital admissions in people aged over 40 years. Indeed, hospitalizations in people aged ≤40 years represented less than 2% of all hospitalizations for hip and knee osteoarthritis in France, and similar data were established in Iceland[5], Sweden[6] and Australia[7]. The aetiology of the disease and the type of prosthesis fixation deserved further comments. Indeed, we can classify the type of osteoarthritis according to the ICD-10 codes. But, the information is limited by the fact that ICD-10 codes do not provide all the aetiologies of osteoarthritis; 18 to 25% of which are not specified for hip and knee, respectively. So we might have underestimated the accurate aetiology of osteoarthritis managed in French hospitals. For prosthesis, we can only describe the type, total or partial, performed during the hospital stays. Information related to the type of prosthesis fixation (cemented, cementless, hybrid or other) was not available.

A national register is available in other countries such as Finland[8], Sweden[6,9,10], Norway[11], Denmark[12] and Australia[7−13]. When we compared our data with other papers analysing national data, some differences in the description of the data were observed. The duration of the data collection varied from 1 to 15 years[5−7,11,12,14,15]. The data were more frequently issued from registers[6−13] than from national hospital database[5]. The data focused on hip joint replacement, except in Australia where the

register described data for knee replacement, as well[7]. The quality control of the data was described and performed in some countries[7,11,16]. The data described all joint replacements performed whatever the diagnosis leading to the prosthesis, and osteoarthritis represented above 75% of all diagnoses. The data allowed the description of the type of prosthesis carried out (cemented, cementless, hybrid or others[6,7]) with its context of primary prosthesis or not, with the reason for revision. As our data were de-identified, we cannot trace patients who underwent a contralateral procedure during the same period. In Australia, for example, the number of primary hip and knee replacements were 19,637 and 19,881, of which 3.2 and 3.7% contralateral procedures were performed during a 2-year period, respectively[7]. This occurrence appeared low.

Table III
2001 incident rates of primary joint replacement* adjusted for age and gender of stays [confidence interval 95%] for primary prosthesis in coxarthrosis and gonarthrosis for 10,000 inhabitants in France

Number of primary prosthesis	Coxarthrosis 69,948	Gonarthrosis 42,763
Women		
41−50 years	2.96 [2.80−3.12]	0.72 [0.64−0.80]
51−60 years	12.82 [12.43−13.20]	6.04 [5.78−6.31]
61−70 years	34.96 [34.28−35.63]	24.83 [24.26−25.39]
71−80 years	64.31 [63.34−65.29]	58.43 [57.50−59.36]
≥81 years	39.83 [38.81−40.85]	25.71 [24.89−26.53]
Men		
41−50 years	4.21 [4.02−4.40]	0.65 [0.57−0.72]
51−60 years	16.51 [16.07−16.95]	3.49 [3.29−3.70]
61−70 years	38.92 [38.16−39.68]	15.67 [15.19−16.15]
71−80 years	62.25 [61.12−63.39]	39.42 [38.52−40.33]
≥81 years	42.16 [40.59−43.73]	21.66 [20.53−22.78]

*Incident primary joint replacement: number of hospitalizations for primary joint replacement divided by the French 1999 population adjusted for age and gender.

We looked for the explanatory variables that might explain the LOS. Age, gender, number of secondary diagnoses, number of procedures, and rehabilitation after hospitalization appeared as significantly impacting on the LOS. When we compared our results to other studies, for example, for knee joint replacement, our mean duration of stay appeared longer. Despite the fact that the data necessary for adjustment are lacking for age, gender, type of data selection and rules of coding and that the healthcare system organization and funding was different, the mean LOS varied for different centres. In the United States (4 centres), United Kingdom (6 centres) and Australia (2 centres), the data analysed between September 1997 and December 1998 showed mean LOS of 4–6.1, 9.7–5.6, and 5.7–10.8 days, respectively[17]. In another study was outlined how the DRG reimbursement is a much stronger determinant of LOS[18]. Indeed, the developing cost reduction programs decreased hospital costs and LOS in a centre in United States for total knee arthroplasty. The mean LOS decreased statistically significantly from 6.8 in 1992 to 4.2 in 1995. Health system organization and funding is currently changing in France and the described mean LOS might be decreased according to the introduction of DRG reimbursement since 2004.

When we looked at the inpatients' costs, few data were available at country level. For example, Australia published information related to the prevalence, costs and disease burden. They used the Disease Costs and Impact Study prevalence-based methodology to estimate the direct costs of arthritis and especially of osteoarthritis, on the base year 1993–1994. Hospital inpatients' costs represented 131.7 and 134.8 million dollars for public and private hospitals respectively[19]. A recent review of the literature showed that for 1997 the total expenditure on health per capita varied between $400 and $4000 between different countries for hip replacement[20]. The comparison of costs is difficult to perform, because of differences in demographics, type of reporting, changes with time and specific healthcare system organization and financing.

Collecting data about hospitalizations for hip and knee osteoarthritis, and especially for PJR, is important at a country level to evaluate the burden of disease, the need of surgery and to estimate the future demand for the procedure. There is also a need for international harmonization of data collection, quality control and prospective and longitudinal follow-up, which is important for international comparisons.

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