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Health resource use and costs of symptomatic knee and/or hip osteoarthritis

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Abstract

Background: Data on the economic consequences of hip and knee osteoarthritis (OA) are scarce. We aimed to estimate the annual direct and indirect costs for patients followed for hip and/or knee OA in the KHOALA cohort.

Methods: The KHOALA cohort, set up from 2007 to 2009, is a French multicenter study of 878 individuals with symptomatic knee/hip OA who were 40 to 75 years old. Resources used were collected annually for 5 years. Costs were assigned by using official sources and expressed in 2018 euros per patient.

Results: The mean annual total costs per patient over the 5-year study period were $2,180 \pm 5,305\text{€}$. The mean annual direct medical costs per patient were $2,120 \pm 5,275\text{€}$ and mean annual indirect costs per patient $180 \pm 1,735\text{€}$ for people of working age. Costs increased slightly over the study period. Drugs were the largest cost share, representing over 50% of all direct costs. However, the proportion attributable to OA drugs accounted for only 10.5% of drug costs. The second cost share was hospitalizations; hip and knee prosthetic surgery accounted for 27% of surgery hospitalization costs. Health professional visits were the third cost share, accounting for 3% of direct medical costs. The median costs induced could be as high as 2 billion €/year (IQR 0.7–4.3) in France.

Conclusion: Hip and knee OA costs were substantial and increased over the study period in France. However, the costs attributable to OA represented only a small fraction of overall costs

Word count: 245

1 *Introduction*

2 Osteoarthritis (OA) is one of the most frequent musculoskeletal diseases, often resulting in
3 severe functional disability (1). The prevalence of symptomatic knee and hip OA ranges from
4 10% to 20% depending on the population studied and the methods used to elicit these
5 estimates (2). The prevalence of radiographically knee OA in 2010 was estimated to be 3.8%
6 (3). The age-standardised prevalence of radiographically hip OA in 2010 was 0.85% (3). In
7 the United States, the annual incidence of symptomatic knee OA is estimated at 17% and
8 symptomatic hip OA 10% (4,5). In Europe, the prevalence of radiological hip and knee
9 symptomatic OA in people 40 to 75 years old was estimated at 1.9% and 4.7%, respectively,
10 for men and 2.5% and 6.6% for women (2). The overall ageing of the population as well as
11 the increasing prevalence of obesity will be associated with an increased prevalence of lower-
12 limb OA and its functional consequences on affected patients, for an impending public health
13 issue in society (6).

14 The mean total costs associated with knee and/or hip OA range from €500 to €10,900 per year
15 (5). There is a substantial heterogeneity in the methods used to assess the costs of OA (7).
16 Depending on the population studied (community or hospital recruitments, patient profiles,
17 socioeconomic status) and mode of diagnosis (symptomatic vs radiographic OA), OA cost
18 estimates were reported with a multiplication factor between the lowest and highest estimates
19 of 22 for hip and knee OA and even 65 for all-site OA (7). For more accurate estimates from
20 an epidemiologic and public health perspective, we need to assess health resource use in a
21 representative and large population sample with extended follow-up.

22 The Knee and Hip Osteoarthritis Long term Assessment (KHOALA) cohort is a French
23 multicenter, population-based prospective cohort of prevalent cases of symptomatic hip and
24 knee OA; it was the continuation of a population-based survey aiming to estimate the
25 prevalence of hip and knee OA independent of access to care by patients (2,8). Patients were

26 included between 2007 and 2009, then followed regularly to collect information on general
27 and joint health as well as health resource use (2,8).

28 Here we aimed to estimate the annual direct and indirect OA costs incurred by patients in the
29 KHOALA cohort over 5 years to describe their distribution in terms of cost components.

30

31 **Participants and Methods**

32 **Participants**

33 Individuals who were 40 to 75 years old and had uni- or bilateral symptomatic hip and/or
34 knee OA (American College of Rheumatology [ACR] criteria (9,10)) with Kellgren and
35 Lawrence (KL) stage ≥ 2 (11) were recruited from a French national prevalence survey for the
36 multicenter KHOALA cohort study (2). The cohort and its methodology for data collection
37 were previously described (2,8). Individuals were recruited from two-stage population-based
38 national prevalence survey conducted in France from April 2007 to March 2009 (2). Patients
39 have been recruited through a population-based poll aiming to assess knee and/or hip OA
40 prevalence, independently of any visit to a physician. Briefly, the survey involved a random
41 sample of households in six French regions obtained by random digit phone dialing and the
42 next-birthday method in each household. OA diagnosis was confirmed by a rheumatologist.
43 All people with OA identified were invited to participate in the 10-year KHOALA cohort
44 prospective study. Inclusion criteria were both sexes; age 40 to 75 years; uni- or bilateral
45 symptomatic hip and/or knee OA; clinical diagnosis confirmed and fulfilling ACR criteria for
46 knee (10) and hip OA (9); and KL stage ≥ 2 on standard X-rays (11). Individuals were
47 excluded if they had prosthesis for the symptomatic joint, previous osteotomy, severe
48 comorbidity leading to significant deterioration of functional abilities and quality of life or
49 major healthcare consumption, isolated patello-femoral OA, or other joint disease. The cohort
50 study was approved by the Medical Ethics Committee CPP Est III and was registered at

51 ClinicalTrials.gov (NCT00481338). All participants gave their written informed consent
52 before inclusion in the study.

53

54 **Health resource use data**

55 This study is an analysis of data for the first 5-year cohort (2008-2012). Data were collected
56 by use of a validated self-reported questionnaire including consultations with physicians
57 (general practitioners, rheumatologists, orthopedic surgeons and other specialists) and other
58 health professionals (physiotherapists, nurses, occupational therapists, podiatrists, dentists,
59 speech therapists and alternative medicine practitioners), drug use, imaging [radiography (X-
60 ray), CT scan, MRI, bone densitometry, scintigraphy and other work-ups], hospitalizations,
61 biological investigations [i.e. 25-(OH) D3 levels, serum creatinin, parathormone, sensitive C-
62 reactive protein, erythrocyte sedimentation rate, leucocyte count, platelet count, hemoglobin
63 concentrations, albumin and coagulation parameter], technical aids and transportation. This
64 method had previously demonstrated good agreement with administrative data in people with
65 OA (12). The questionnaires were administered every year, exploring a period of 3 months for
66 consultations, drugs, biological investigations, imaging, technical aids and transportation and
67 12 months for hospitalizations. If necessary, health resource use was annualized. The original
68 questionnaire is available in supplemental data.

69

70 **Direct medical costs and indirect costs assessment**

71 Estimation of direct medical costs included all costs incurred via the National Health
72 Insurance System (NHIS) and private supplementary health insurance and by patients. For
73 specialists, general practitioners, nurses and physiotherapists, an average consultation fee was
74 estimated by using the 2015 general classification system for treatments (13–15)..
75 Transportation, lab and imaging work-ups as well as technical aids were estimated according

76 to the 2015 social health insurance reimbursement fee of the Classification Commune des
77 Actes Médicaux (www.ameli.fr/accueil-de-la-ccam/index.php) or the Nomenclature des Actes
78 de Biologie Médicale
79 (http://www.codage.ext.cnamts.fr/codif/nabm/index_presentation.php?p_site=AMELI)
80 (14,16,17).

81 Drugs were grouped according to their international nonproprietary names, and their costs
82 were calculated by estimating the mean fee per milligram or per dose, according to the Vidal
83 2016 database (18). If dosage data were missing, standard dosages were imputed taking into
84 account the patient's weight when applicable. According to the therapeutic class, we
85 differentiated drugs related to OA (analgesics, non-steroidal anti-inflammatory drugs
86 [NSAIDs], symptomatic slow-acting drugs, corticosteroids, corticosteroid infiltration and
87 viscosupplementation) or not.

88 For each hospitalization, a primary diagnosis or action code was assigned according to the
89 reason for the hospitalization reported by participants. This coding enabled the identification
90 of the closest corresponding Diagnosis-Related Group and the associated fees for the year
91 2015 as reported by the Technical Agency for Information on Hospital Care (*Agence*
92 *Technique de l'Information sur l'Hospitalisation*) (19). The attribution to OA was determined
93 by the authors on the basis of the reason for hospitalization.

94 Indirect costs were calculated in terms of the number of days off work per year due to knee
95 and/or hip OA as reported by participants. The costs associated with one day of sick leave
96 corresponded to the mean daily salary of a French employee, on the basis of the national
97 global domestic product (GDP) per capita in 2016.

98 Total costs were the sum of direct medical costs and indirect costs.

99

100

101 **Statistical analysis**

102 Patient characteristics at baseline and health resource use for each year of follow-up are
103 described by mean (SD) or number (%) at baseline. Yearly costs are described by mean for
104 each year (year 1, 2, 3, 4 and 5) and/or median (interquartile range [IQR]) if non-normal
105 distribution. To assess the median annual total costs of hip and knee OA in the 40 to 75-year-
106 old population, standardized prevalence estimates calculated according to the French age and
107 sex distribution for 2006 (www.insee.fr/fr/statistiques) were used (2). All statistical analyses
108 involved using SAS v9.4, (SAS Institute, Inc., Cary, NC).

109

110 **Results**

111 **Patient characteristics**

112 In total, 878 individuals were included in the KHOALA cohort, 222 with hip OA (mean age
113 61.2 ± 8.8 years), 607 knee OA (mean age 62.0 ± 8.5 years) and 49 both hip and knee OA
114 (mean age 64.7 ± 8.0 years). Baseline characteristics of the 878 participants are in Table 1.
115 Radiographic disease severity for KL (11) stages 2, 3 and 4 represented 69.8%, 26.1% and
116 4.1%, respectively, of hip OA patients and 44.5%, 30.3%, and 25.2%, respectively, of knee
117 OA patients. Mean Functional Comorbidity Index (FCI) (20) was 3 ± 1.5 for hip OA; $3.1 \pm$
118 1.6 for knee OA and 3.1 ± 1.4 for hip and knee OA. Mean duration after first symptoms is
119 higher compared to mean duration after diagnosis. Mean body mass index (BMI) was $26.9 \pm$
120 4.4 for patients with hip OA, 30.3 ± 6.2 for those with knee OA and 29.8 ± 6.2 for those with
121 both hip and knee OA.

122

123 **Health resource use**

124 The proportions of patients using healthcare resources are shown in Table 2. General
125 practitioners have a central role. Only 20% of patients consult a rheumatologist. Most of

126 health care use is stable over 5 years. The decrease in the number of patients is due to loss-to-
127 follow-up (refusal to prosecute (60%), death (22%), other (18%)).

128

129 **Costs**

130 *Direct medical costs*

131 The mean and median annual direct medical costs per patient over 5 years were 2,120€ and
132 980€ (IQR 395–2,350) respectively. The mean annual direct medical costs per patient were
133 1,515€ in year 1; 1,945€ in year 2; 1,935€ in year 3; 3,270€ in year 4; and 2,140€ in year 5.
134 Although OA mean direct medical costs increased by 41% at the end of the follow-up, the
135 median decreased by 33% from 515€ in year 1 to 345€ in year 5. This decrease was explained
136 by the fact that 50% of the patients accounted for 89% of the total direct medical costs over
137 the 5 years. The mean annual direct medical costs per patient over 5 years were 1,805€ for hip
138 OA; 2,230€ for knee OA; and 2,195€ for hip and knee OA (Table 3).

139

140 *Indirect costs*

141 The mean annual indirect costs per patient over 5 years were 60€ (180€ for the 554 patients
142 who were still on the market place). These costs were 95€ in year 1; 65€ in year 2; 40€ in year
143 3; 70€ in year 4; and 45€ in year 5. Hip and knee OA patients did not differ in indirect costs:
144 60€ for hip OA; 65€ for knee OA and 40€ for hip and knee OA (Table 3).

145

146 *Total costs*

147 The mean and median (IQR) annual total costs per patient over 5 years were 2,180€ and
148 1,115€ (400–2,385), respectively. They ranged from 1,615€ in year 1; to 2,010€ in year 2;
149 1,975€ in year 3; 3,340€ in year 4; and 2,190€ in year 5 (Figure 1). The mean annual total

150 costs per patient over 5 years were 1,865€ for hip OA; 2,295€ for knee OA; and 2,235€ for
151 hip and knee OA (Table 3).

152

153 **Costs over 5 years by patient characteristics (Table 3)**

154 The affected joint, KL stage and FCI seemed associated with consumption of care. Indeed, the
155 mean annual total costs over 5 years were increased for patients with knee OA and increased
156 KL grade and FCI but not body mass index.

157

158 **Cost share (or cost structure) and costs attributable to OA**

159 The estimated costs of health resource use are shown in supplemental data. Drugs were the
160 largest cost share, representing over 50% of all direct medical costs across the years. Annual
161 drug costs ranged from 905€ in year 1 to 1,760€ in year 4 and 1,130€ in year 5. However, the
162 proportion attributable to OA-specific agents (analgesics, NSAIDs, symptomatic slow-acting
163 drugs, corticosteroids, corticosteroid infiltration and viscosupplementation) accounted for
164 only 10.5% of drug costs over 5 years (i.e., annual mean of 110€ per patient and per year).

165 Hospitalizations were the second largest component of health resource utilization. Costs of
166 OA-related hospitalizations in medicine accounted for 9% of the total hospitalizations costs
167 over 5 years (i.e., annual mean 20€ per patient and per year). Direct medical costs of OA-
168 related hospitalizations in surgery accounted for 43% of surgery hospitalization costs over 5
169 years (i.e., annual mean 280€ per patient and per year). Hip and knee prosthetic surgery was
170 the main reason for surgery (23%) but accounted for 27% of surgery hospitalization costs
171 over 5 years (i.e., annual mean 177€ per patient and per year). The other reasons for surgery
172 were less frequent but more expensive (according to the 2015 coding of the Technical Agency
173 for Information on Hospitalization).

174 Health professional visits were the third direct medical cost component of health resource
175 utilization, mainly for physiotherapy. They accounted for 3% of direct medical costs over 5
176 years (i.e., annual mean 150€ per patient and per year). Physiotherapy accounted for 1% to
177 2% of the direct medical costs over 5 years (i.e., annual mean 8€ per patient and per year).
178 Annual cost distribution per resource user and average annual direct medical costs per patient
179 and per resource are available in supplemental data.

180

181 **The economic burden of hip and knee OA in France**

182 On standardization to the French population 40 to 75 years old, the prevalence of hip and
183 knee symptomatic and radiological OA was 2.5% and 6.5% for men and 1.0% and 2.7% for
184 women, respectively [i.e. 1.8 million patients in 2017 (2)]. From these prevalence estimates,
185 the median annual total costs of hip and knee OA in the 40- to 75-year-old population would
186 be approximately 2 billion €/year (IQR 0.7–4.3), with direct medical costs of 1.7 billion
187 €/year (IQR 0.7–4.2).

188

189 ***Discussion***

190 This study described costs related to healthcare use among a representative sample of
191 individuals with symptomatic hip and/or knee OA over 5 years. The mean and median annual
192 total costs per patient over 5 years were 2,180€ and 1,115€ (IQR 400–2,385) respectively.
193 Direct medical costs accounted for 97% of the total cost. Our findings highlight the burden of
194 drugs, which represented the largest cost component among KHOALA patients.

195 Worldwide, the mean estimated annual total costs for knee and/or hip OA are heterogeneous:
196 €1,000 in Europe, €6,200 in Asia (Singapore) and €1,000 in North America (7). The
197 difference in costs we observed could be related to several points. First, published studies
198 showed substantial methodological heterogeneity. Our economic study is innovative in its

199 method of recruitment and duration of follow-up. Indeed, the multi-center recruitment of
200 individuals independent of any medical consultation is a major strength because it potentially
201 allowed for including individuals who never consulted any physician (2). Regardless, OA
202 diagnosis was ascertained by physicians on the basis of clinical and radiological features.
203 Second, we included patients who had a prosthesis during follow-up. Prosthetic surgery is not
204 always included in the direct medical costs of studies even though joint surgery is considered
205 an important cost driver in hip and knee OA (7). Also, the follow-up of our study was 5 years,
206 whereas the median follow-up for previous studies was 1 year (range 3 months to 2 years) (7).
207 Third, the health resources studied in KHOALA are quite exhaustive, unlike in some studies,
208 in which costs such as physiotherapy, hospitalizations, biology and imaging are not
209 systematically included in direct cost estimates (7).

210 In terms of all elements, the KHOALA cohort can be considered representative of the reality
211 of people living with knee and hip OA.

212 The social burden of OA is expected to be high and increasing in France. Indeed, in 1993, 3
213 million people had symptomatic OA, with direct medical costs of about 0.6 billion €/year
214 (21). In 2003, 4.6 million people had symptomatic OA, with direct medical costs of about 1.6
215 billion €/year (22). These studies included patients with symptomatic general OA, including
216 those over 75 years old. From the standardized prevalence, 1.8 million people 40 to 75 years
217 old would have symptomatic and radiological hip and/or knee OA in 2017. Median annual
218 direct medical costs would be about 1.7 billion €/year (IQR 0.7–4.2). The prevalence of OA is
219 increasing with the aging of the population as well as obesity, which is becoming more
220 common (23). The costs of the disease have increased even further, owing to an increase in
221 patient demand for care and more frequent use of prosthetic surgery (24,25). Previous studies
222 reported high rates of comorbidities and healthcare utilization among OA patients (26–28).
223 However, specific costs attributable to OA represented only a small fraction of overall costs.

224 Our patients had a substantial number of comorbidities, which was expected due to the
225 population demography. As a result, the main cost share was related to these comorbidities
226 rather than OA. The importance of costs attributable to OA-related comorbidities has been
227 discussed (26) but never clearly demonstrated.

228 The limitations of the study include the observational design, missing data and lack of
229 comparison. The presence of a control group (a cohort of patients matched for age, sex and
230 co-morbidities, without knee and / or hip osteoarthritis) would reduce confounding bias.
231 Moreover, use of self-reported questionnaires can imply memory bias and inaccurate data.
232 However, the observational design have the advantage of better meeting the needs of daily
233 practice and including subjects often excluded from randomized controlled trials and on a
234 larger number of subjects and time much longer observation time. Using a patient-completed
235 questionnaire was a feasible and valid way to capture health resource use and costs for
236 patients with OA as compared with data from administrative databases (12).

237 To conclude, in the KHOALA cohort, healthcare consumption costs over the first 5 years
238 after inclusion in the cohort were heterogeneous and substantial. The costs might be related to
239 a high proportion of patients with comorbidities. The follow-up of the cohort is 10 years, we
240 will can study annual direct and indirect OA costs over 10 years and if the use of the
241 replacement joints allows a costs reduction in long-term. These data are important for
242 describing the healthcare costs of a representative sample of patients with symptomatic OA of
243 the hip and/or knee recruited from the general population in France.

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249

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252 CG, FG and BF. All authors participated in the interpretation of the results and manuscript
253 writing. All have read and approved the final version of the manuscript for publication.

254

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256

257 **Competing interests**

258

259 **Conflict of interest:** None

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Figure Legends:

Figure 1: Average annual total costs per patient over 5 years

Supplemental data: Mean annual direct medical costs per patient and per resource

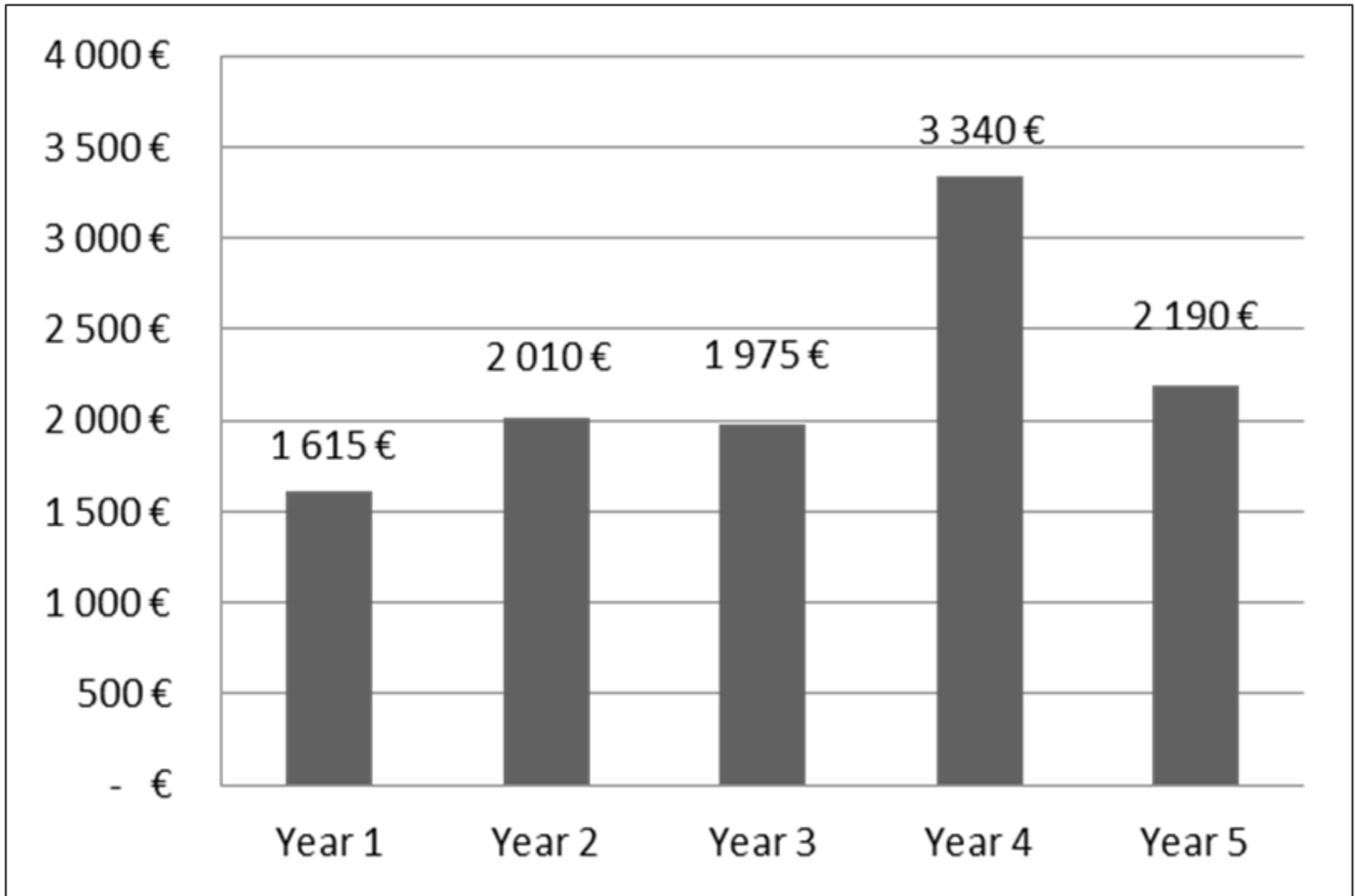


Table 1: Characteristics of patients with osteoarthritis (OA) at baseline (n = 878)

	Patients with available data (n)	Hip OA n = 222 (25.3%)	Knee OA n = 607 (69.1%)	Hip and knee OA n = 49 (5.6%)
Age, mean (SD)	878	61.2 (8.8)	62 (8.5)	64.7 (8.0)
Sex	878			
Female		148 (66.7)	429 (70.7)	32 (65.3)
Male		74 (33.3)	178 (29.3)	17 (34.7)
Education	873			
Primary		45 (20.3)	144 (23.9)	11 (22.4)
Secondary (college)		110 (49.6)	319 (52.5)	28 (57.1)
University		67 (30.1)	139 (22.9)	10 (20.4)
Married/relationship	873	161 (72.5)	404 (66.5)	36 (73.5)
Occupation	869			
Farmer		18 (8.2)	33 (5.5)	6 (12.2)
Manager		21 (9.5)	31 (5.2)	1 (2.0)
Executive		34 (15.5)	86 (14.3)	7 (14.3)
Intermediate		51 (23.2)	125 (20.8)	9 (18.4)
Employee		66 (30.0)	208 (34.7)	19 (38.8)
Worker		21 (9.5)	62 (10.3)	2 (4.1)
No occupation		9 (4.1)	55 (9.2)	5 (10.2)
Retired	869	18 (8.2)	33 (5.5)	6 (12.2)
BMI	877	26.9 (4.4)	30.3 (6.2)	29.8 (6.2)
Pain (VAS: 0-100 mm), mean (SD)	804	34.4 (24.2)	36.8 (25.3)	46.3 (24.6)
Disease duration since first symptoms (years), mean (SD)	867	7.8 (8.7)	9.3 (7.8)	9.9 (9.0)
Disease duration since diagnosis (years), mean (SD)	837	3.2 (5.8)	4.1 (5.8)	3.7 (4.8)
Functional Comorbidity Index¹, mean (SD)	878	3 (1.5)	3.1 (1.6)	3.1 (1.4)
Kellgren and Lawrence stage	878			
Knee				
2			270 (44.5)	25 (51.0)
3			184 (30.3)	13 (26.5)
4			153 (25.2)	11 (22.5)
Hip				
2		155 (69.8)		34 (69.4)
3		58 (26.1)		12 (24.5)
4		9 (4.1)		3 (6.1)

Data are the n (%) of patients unless indicated.

BMI, body mass index; VAS, visual analog scale

SD: standard deviation

¹Groll index

Table 2: Health care use in the KHOALA cohort over 5 years

Resource category	Year 1 (N = 878)			Year 2 (N = 801)			Year 3 (N = 738)			Year 4 (N = 741)			Year 5 (N = 631)		
	User of resource (n) %	N of resource	Mean use (resource/user)	User of resource (n) %	N of resource	Mean use (resource/user)	User of resource (n) %	N of resource	Mean use (resource/user)	User of resource (n) %	N of resource	Mean use (resource/user)	User of resource (n) %	N of resource	Mean use (resource/user)
Hospitalizations	81 (9)	97	1.2	143 (18)	180	1.3	152 (21)	213	1.4	158 (21)	203	1.3	130 (21)	94	0.7
- Medicine	42 (5)	51	1.2	52 (6)	60	1.2	58 (8)	69	1.2	64 (9)	73	1.1	43 (7)	46	1.1
- OA-related medicine	6 (1)	6	1.0	2 (0)	4	2.0	3 (0)	5	1.7	7 (1)	7	1.0	5 (1)	7	1.4
- Surgery	42 (5)	46	1.1	99 (12)	119	1.2	113 (15)	137	1.2	107 (14)	127	1.2	90 (14)	103	1.1
- OA-related surgery	7 (1)	7	1.0	34 (4)	37	1.1	35 (5)	39	1.1	39 (5)	40	1.0	32 (5)	35	1.1
- Prosthetic surgery	4 (0)	4	1.0	23 (3)	23	1.0	31 (4)	33	1.1	31 (4)	32	1.0	31 (5)	33	1.1
Physician consultations	735 (84)	2156	2.9	653 (82)	2043	3.1	614 (84)	1996	3.3	637 (85)	2324	3.6	544 (86)	1879	3.5
- General practitioners	698 (79)	1419	2.0	600 (75)	1233	2.1	575 (78)	1219	2.1	601 (81)	1317	2.2	515 (82)	1083	2.1
- Rheumatologists	179 (20)	205	1.1	115 (14)	220	1.9	132 (18)	166	1.3	151 (20)	220	1.5	139 (22)	212	1.5
- Orthopedists	32 (4)	49	1.5	42 (5)	66	1.6	36 (5)	65	1.8	48 (6)	76	1.6	49 (8)	49	1.0
- Internal medicine	10 (1)	14	1.4	8 (1)	10	1.3	12 (2)	16	1.3	6 (1)	20	3.3	15 (2)	18	1.2
- Other specialists	236 (27)	469	2.0	199 (25)	514	2.6	213 (29)	530	2.5	250 (34)	691	2.8	202 (32)	517	2.6
Physiotherapists	115 (13)	1992	17.3	139 (17)	1929	13.9	119 (16)	1929	16.2	127 (17)	1937	15.3	86 (14)	1722	20.0
Nursing care	99 (11)	694	7.0	85 (11)	935	11.0	60 (8)	468	7.8	90 (12)	1054	11.7	72 (11)	752	10.4
Biological testing	302 (34)	-	-	300 (38)	-	-	251 (36)	-	-	291 (39)	2980	10.2	224 (36)	427	1.9
Imaging	303 (34)	449	1.5	54 (7)	42	0.8	274 (38)	588	2.1	224 (30)	336	1.5	292 (46)	586	2.0
Transportation	100 (11)	158	1.6	54 (7)	73	1.4	97 (13)	123	1.3	110 (15)	134	1.2	87 (14)	106	1.2
Technical aids	83 (9)	139	1.7	91 (11)	150	1.6	78 (11)	149	1.9	78 (10)	98	1.3	67 (11)	125	1.9
Drugs	802 (91)	3155	3.9	700 (88)	3016	4.3	578 (79)	2398	4.1	654 (88)	2886	4.4	547 (87)	2371	4.3
- Analgesics	481 (55)	481	1.0	450 (56)	450	1.0	346 (47)	346	1.0	390 (53)	390	1.0	322 (51)	322	1.0
- SySADOAs	162 (18)	162	1.0	163 (20)	163	1.0	106 (14)	106	1.0	92 (12)	92	1.0	65 (10)	65	1.0
- NSAIDs	258 (29)	258	1.0	281 (35)	281	1.0	219 (30)	219	1.0	174 (23)	174	1.0	192 (30)	192	1.0
- Corticosteroids	24 (3)	24	1.0	32 (4)	32	1.0	23 (3)	23	1.0	25 (3)	25	1.0	21 (3)	21	1.0
- Corticosteroid infiltration	38 (4)	56	1.5	38 (5)	66	1.7	33 (4)	40	1.2	34 (5)	57	1.7	31 (5)	61	2.0
- Viscosupplementation	78 (9)	78	1.0	141 (18)	141	1.0	98 (13)	98	1.0	136 (18)	136	1.0	120 (19)	120	1.0
Total	838 (95)	8840	10.5	761 (96)	8368	11.0	682 (94)	7864	11.5	706 (95)	11952	16.9	599 (95)	8062	13.5

NSAIDs, non-steroidal anti-inflammatory drugs, SySADOAs, symptomatic slow-acting drugs

Table 3: Mean annual costs per patient over 5 years by patient characteristics

	Direct medical costs (€)	Indirect costs (€)	Total costs (€)
KHOALA cohort			
- Mean ± SD	2,120 ± 5,275	60 ± 525	2,180 ± 5,305€
- Range [min - max]	[0 – 82,620]	[0 – 35,530]	[0 – 82620]
Osteoarthritis			
Hip (n=222)	1,805 ± 4,390	60 ± 465	1,865 ± 4,415
Knee (n=607)	2,230 ± 5,655	65 ± 560	2,295 ± 5,690
Hip and knee (n=49)	2,195 ± 3,865	40 ± 280	2,235 ± 3,865
Kellgren and Lawrence stage			
2 (n=443)	1,960 ± 5,600	45 ± 345	2,005 ± 5,610
3 (n=259)	2,230 ± 5,425	55 ± 525	2,280 ± 5,450
4 (n=176)	2,360 ± 4,095	560 ± 3,740	2,475 ± 4,180
BMI, kg/mm²			
< 25 (n=211)	2,165 ± 7,370	35 ± 260	2,200 ± 7,370
≥ 25–29 (n=329)	2,005 ± 4,815	60 ± 485	2,065 ± 4,840
≥ 30 (n=337)	2,200 ± 4,000	80 ± 665	2,280 ± 4,070
Functional Comorbidity Index¹			
1 (n=139)	1,400 ± 4,360	75 ± 550	1,475 ± 4,395
2 (n=235)	1,915 ± 5,720	30 ± 215	1,945 ± 5,720
3 (n=204)	2,475 ± 7,125	80 ± 720	2,555 ± 7,180
4 (n=150)	2,195 ± 3,845	45 ± 315	2,245 ± 3,850
≥ 5 (n=150)	2,545 ± 3,150	90 ± 675	2,635 ± 3,220

¹Groll index,

Range [min value - maximum value]

SD : standard deviation