

Research Article

Knee Osteoarthritis: Impact on Quality of Life and Effectiveness of Total Knee Arthroplasty

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ABSTRACT

Background: Arthrosis has a huge impact due to its consequences on suffering and function loss and because it damages the well-being and the physical, emotional and social aspects of *Health-Related Quality of Life*. Our objective was to assess the influence of Knee Osteoarthritis and Total Knee Arthroplasty on the perception of the patients with regard to their quality of life, before and after the intervention.

Method: We carried out a quasi-experimental intervention study with a *before and after* design in a sample of 125 patients with knee osteoarthritis who were assessed *before and after* the operation. They all were operated by the same orthopedic surgeon and with the same type of total knee arthroplasty between the year 2008 and 2012. The *Health-Related Quality of Life* was assessed with the questionnaire SF-36.

Results: We have observed that knee osteoarthritis significantly affects all the dimensions of *Health-Related Quality of Life* before the operation and that all the dimensions included in the

SF-36 show a clinical improvement after the intervention with total knee arthroplasty. When the results of the different scales of quality of life from the SF-36 are compared between the patients in our study and the general population in Spain, only Social Functioning is lower, while five dimensions show similar levels and two of them, Role-Emotional and Mental Health, show an improvement. Therefore, we can state that the operation of total knee arthroplasty significantly improves *Health-Related Quality of Life* in all its dimensions and components, except for Physical Functioning and Role-Physical, although they also improve over time after the operation.

Conclusion: Total knee arthroplasty is justified according to the perception of clinical improvement and the improvement of *Health-Related Quality of Life* reported by the patients.

KEYWORDS: Knee Osteoarthritis; Quasi-experimental intervention study; Total Knee Arthroplasty; Health-Related Quality of Life.

Abbreviations

OA: Osteoarthritis; HRQOL: Health-Related Quality of Life; TKA: Total Knee Arthroplasty

Introduction

Osteoarthritis (OA) is a degenerative, disabling and multifactorial disease with a high prevalence that increases exponentially with age¹⁻³. It is divided into categories as primary or secondary Osteoarthritis, depending on the related cause². It mainly affects weight bearing joints such as knees and hips, which are the most frequently affected areas¹. Knee osteoarthritis is more disabling than any other orthopedic and musculoskeletal disorder².

The impact of osteoarthritis is huge regarding suffering, function loss and use of social-health resources. Also, it worsens well-being and *Health-Related Quality of Life (HRQOL)* in its physical, emotional and social aspects². Consequently, it is important to know the impact of this condition on HRQOL in order to make therapeutic decisions in the context of health policies related to the efficiency and sustainability of the health system⁴.

Health-Related Quality of Life is expressed as the degree of perception to which the disease or its treatment affects the physical, psychic, emotional and social abilities of an individual⁵. It is a global index of clinical results in the field

of Health which makes it possible to associate the therapeutic/surgical objectives with the results obtained in the individual and social spheres of the patient. Also, it can be measured with generic or specific health questionnaires⁶.

On the other hand, total knee arthroplasty (TKA) is the orthoprosthesis operation with the highest clinical success rate, with good prognosis and sustained clinical results in over 95% of the patients after 10 years. Also, it reduces pain and improves function and HRQOL⁷.

There are few reports on knee OA and its impact on HRQOL in Spain. In other Europe countries like Sweden and the United Kingdom, there are National Registers of Arthroplasty. These registers recover statistic information regarding prosthesis as well as Patient Reported Outcome Measures. This information is used to evaluate the Quality of Services and to plan clinical-based-decision and cost/effectiveness analysis, thanks to the feedback obtained by this clinical-epidemiological process.

The objective of this study is to assess the influence of knee OA and its clinical intervention (TKA) from the perspective of the perception of the operated patient with regard to HRQOL. The hypothesis of this work is based on the fact that there are no statistically significant clinical differences between the clinical situation and HRQOL of patients with knee osteoarthritis *before and after* the operation.

Methods

In order to reach our objectives and prove our hypothesis, a quasi-experimental intervention study with a *before and after* design, was carried out. It is an experimental or intervention study on a sample of patients with knee osteoarthritis who were assessed *before and after* the operation of TKA. This type of epidemiological study has a good scientific evidence level, according to the categories and classification proposed by the Task Force US and the Centre for Evidence Based Medicine (CEBM) of Oxford^{8,9}.

The clinical research was carried out in the Health Area of Salamanca, which comprises the Clinical University Hospital of Salamanca, and it included all patients with severe knee osteoarthritis who were referred by Primary Care Doctors in order to assess the possibility of a surgical operation.

Our series was made up of 125 patients (46.8%) out of a total of 267 patients. They were all operated by the same orthopedic surgeon and with the same type of prosthesis (Scorpio-Stryker[®]) between the years 2008 and 2012. All the patients filled out the SF-36 survey before and after the operation, and their clinical history was reviewed in order to obtain the independent variables related with HRQOL, such as age, sex, comorbidities, other arthroplasty, other operations on the locomotor system, and in-hospital stay.

The *criteria for inclusion* as CASES were: adult patients of any age and sex with a diagnosis of osteoarthritis of the knee who were operated with TKA type Scorpio and/or with diverse comorbidities. The *criteria for exclusion* were: patients with disorders and/or pathologies that prevented them from knowing, understanding or assessing their clinical situation. Also those in which it was impossible to obtain updated personal data or who failed to attend the post-intervention interview in which the questionnaire was filled out, after the first post-intervention visit, which took place after 2 to 3 months. As a consequence, some cases were lost during the study because they failed to attend, or due to a severe disease caused by any of their comorbidities, death or any other social reason.

The collection of data was carried out with a *Clinical and Epidemiological Protocol* created by the research team for this study and filled out during a personal interview to each patient. In the assessment of HRQOL we used the SF-36 questionnaire, due to its characteristics of viability, reliability, sensitivity to change and transcultural validation in Spain^{10,11}.

SF-36 is the most widely used generic questionnaire in the world because it makes it possible to compare the impact/result of an intervention, and it has been used with different chronic diseases and in different population groups¹². SF-36 measures HRQOL, it provides a profile of the health condition that can be applied to the general population and to the patients, as well as in studies that assess clinical results. It is also used in musculoskeletal and orthopedic clinical studies to obtain a more detailed description of the Health parameters and to research changes in the health condition¹³⁻¹⁵.

The data collected from the clinical histories and the results of the SF-36 questionnaire were introduced and coded for processing and analysis with the statistical package SPSS[®] version 21. The statistical analysis included, first of all, a

descriptive study (*univariate analysis*) which calculated the adequate frequency measures to assess the different indexes and indicators, as well as the subsequent descriptive statistics (mean value, standard deviation). Once that the different data were obtained, together with their prevalence and/or proportions we calculated their 95% confidence interval as

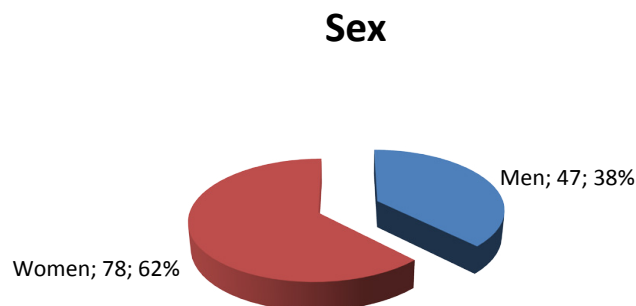


Figure 1: Sex as a demographic variable in the analyzed sample.

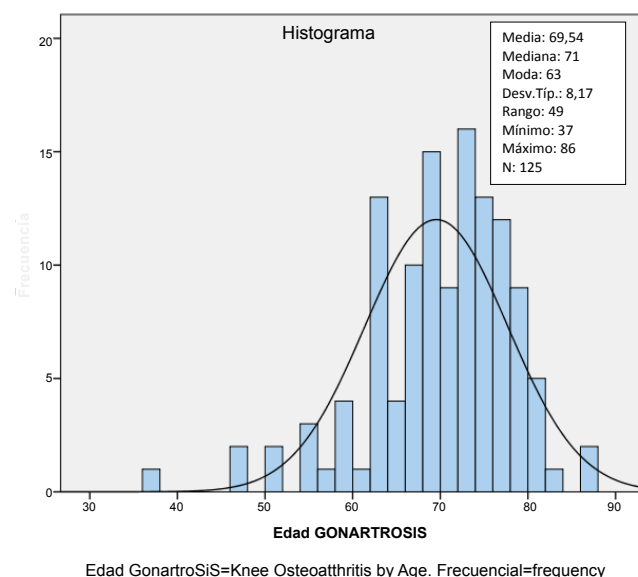


Figure 2: Age as an epidemiological variable, and its distribution on the sample (n=125).

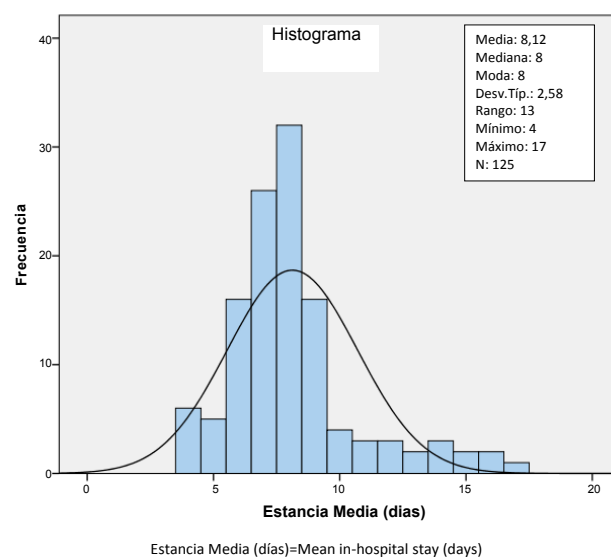


Figure 3: Mean in-hospital-stay of patients with knee osteoarthritis and total knee replacement.

Other previous prostheses

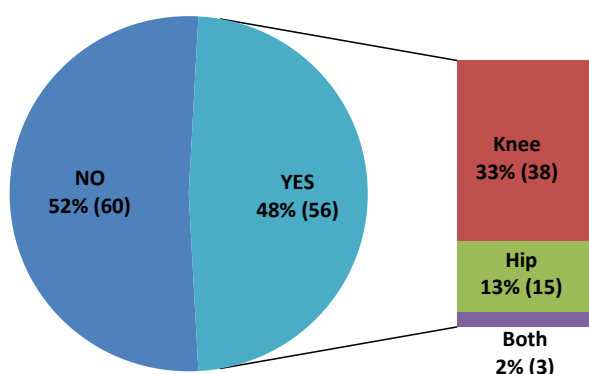


Figure 4: Existence of previous total knee arthroplasty or total hip arthroplasty surgery.

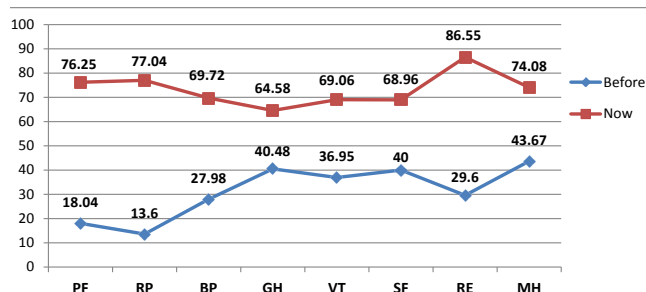


Figure 5: Average values of all the dimensions of the SF-36 survey and improvement before and after 5th the operation (TKA).

(PF=physical functioning; RP=Role-Physical; BP=Bodily Pain; GH=General Health; VT=Vitality; SF=Social Functioning; RE=Role-Emotional; MH=Mental Health)

a measure of precision (*Inferential statistics*). Chi-square test was used for the qualitative variables and Student's t-test and ANOVA were used for quantitative variables in order to assess whether the differences observed in the clinical parameters and the components of the SF-36 and other indicators and the abovementioned epidemiological variables regarding the patients were statistically significant or, on the contrary, they could be explained by chance. Finally, a logistic regression model was used so as to assess the influence of the presence or absence of several clinical and epidemiological variables on HRQOL (*bivariate and multivariate analysis*). The level of statistical significance (error) used by the research team was 5% (*degree of statistical significance* $p < 0.05$).

Results

The distribution according to sex in our 125 cases was 78 women (62%) and 47 men (38%), with a 1.6:1 man/woman ratio and an average age of 70 years (Figure 1). The most common age was 71 years, with a range between 37 and 86 years (Figure 2). The average time of in-hospital stay was 8.12 days; the most common value was 8 days, and the range was between 4 and 13 days (Figure 3).

Half of our patients had a prior orthoprosthetic history. 33% had TKA, 13% had a THA (total hip arthroplasty), and 2.5% had both prostheses (Figure 4). Also, 20% of the patients had a prior history

of operations in the locomotor system and 31.2% of the patients had a history of other prior surgery.

With regard to comorbidity, 95 patients (76%) showed associated comorbidity, 28 patients (22.5%) presented with a single comorbidity and 67 patients (53.6%) revealed two or more comorbidities. Also, in 17 patients (15%), the comorbidity was musculoskeletal and 92 patients (81%) showed other comorbidities.

We have observed that osteoarthritis significantly affects all the dimensions of quality of life (before the intervention). All the dimensions of the SF-36 questionnaire reveal a clinical improvement after the operation (TKA) (Figure 5).

The association study of HRQOL-SF-36 *before* and *after* the operation shows a statistically significant improvement in the scales Bodily Pain (BP $p=0.000$), General health (GH $p=0.000$), Vitality (VT $p=0.005$), Social Functioning (SF $p=0.000$), Role-Emotional (RE $p=0.050$), and Mental Health (MH $p=0.000$). One significant aspect is that the operation (TKA) causes no improvement in Physical Functioning (PF $p=0.295$) and in Role-Physical (RP $p=0.385$) (Table 1). We have also observed that having a prior knee or hip prosthesis improves Physical Functioning (PF $p=0.021$) and Mental Health (MH $p=0.036$).

Discussion

Knee osteoarthritis is one of the diseases with the highest impact regarding the functional disability, and one which greatly affects the personal autonomy of patients. Also, its incidence increases with age and it affects more than 33% of people over 70 years in Spain¹⁶. The average age in our series at the time of operation is 70 years, and the age distribution shows a normal curve, in accordance with national studies which have shown average ages of 66.5 ± 6.2 years^{17,18} and 74 ± 2.3 years¹⁹⁻²¹, with a progressive ageing in the population. International studies have reported ages of 68 years²¹ and 72 years²². Consequently, the average age of the patients who were operated and monitored in our series is higher, due to the social and demographic characteristics of the general population of reference, which corresponds to the area of the city and province of Salamanca, part of the Autonomous Community of Castile and León, which has one of the highest indexes of population ageing in Spain.

Osteoarthritis usually affects the knee, and its incidence increases exponentially with age, with a clear predominance on women. The observed women/men ratio is 1.6:1, in accordance with other national studies, with ratios of 2.7:1¹⁵, 3:1¹⁷⁻¹⁹, 4:1¹⁶, 4.9:1²⁰; and with international studies, with ratios of 1.5:1²², 1.6:1²³, and 2.2:1²¹.

Adult and symptomatic patients with osteoarthritis generally have more than one affected weight bearing joint, be it the knee, the hip or a similar contralateral joint²⁴. Some experts also report that 90% of the patients with knee pain report bilateral symptoms. With regard to the presence of previous joint prostheses, all the studies report an orthoprosthetic history. In our series, 33% of the patients had a previous prosthesis in the knee, 13% in the hips and 2% in both. National studies have revealed contralateral surgery in 24.6% of the patients <75 years old and 33% in patients >75 years old²⁰; and other international studies have found contralateral surgery of the knee in 17%²⁵ of

Table 1: Association HRQOL-SF36 *before and after* the intervention.

ITEMS AND DIMENSIONS	Before		After		Parametric test
	Average	St. Dev	Average	St. Dev.	p
SF-3	10.40	25.63	67.74	39.91	0.004
SF-4	19.20	30.96	78.63	31.34	0.385
SF-5	22.00	33.23	75.20	30.95	0.285
SF-6	7.60	20.13	63.64	36.51	0.217
SF-7	21.77	31.39	79.84	30.52	0.219
SF-8	8.74	21.82	63.71	36.81	0.241
SF-9	13.20	28.50	79.03	35.55	0.500
SF-10	20.80	31.22	79.03	31.94	0.159
SF-11	32.40	37.70	87.50	26.76	0.098
SF-12	30.40	40.60	87.50	26.76	0.149
DIMENSION Physical Functioning (PF)	18.04	22.12	76.25	24.73	0.295
SF-13	16.80	37.53	79.67	40.40	0.064
SF-14	12.80	33.54	75.00	43.47	0.064
SF-15	15.20	36.04	77.42	41.98	0.211
SF-16	9.60	29.57	77.24	42.10	0.599
DIMENSION Role-Physical (RP)	13.60	29.70	77.04	37.42	0.385
SF-21	27.36	21.33	69.44	23.35	0.247
SF-22	28.60	18.97	70.00	23.54	0.734
DIMENSION Bodily Pain (BP)	27.98	17.35	69.72	20.83	0.000
SF-1	24.80	19.69	55.08	23.07	0.001
SF-33	49.40	28.41	72.38	19.60	0.000
SF-34	46.57	27.66	67.94	19.27	0.000
SF-35	41.53	21.82	62.70	20.53	0.000
SF-36	39.92	24.47	64.43	21.94	0.001
DIMENSION General Health (GH)	40.48	19.05	64.58	15.28	0.000
SF-23	37.76	25.68	65.60	22.66	0.345
SF-27	38.21	27.22	69.35	20.94	0.000
SF-29	35.45	28.03	72.26	19.20	0.000
SF-31	36.29	25.16	68.55	21.66	0.099
DIMENSION Vitality (VT)	36.95	21.84	69.06	17.11	0.005
SF-20	45.00	30.94	77.62	22.27	0.000
SF-32	34.84	22.93	60.32	15.71	0.000
DIMENSION Social Functioning (SF)	40.00	25.45	68.96	16.58	0.000
SF-17	28.80	45.46	87.90	32.74	0.008
SF-18	28.00	45.01	85.48	35.36	0.005
SF-19	32.00	46.83	86.29	34.53	0.014
DIMENSION Role-Emotional (RE)	29.60	43.62	86.55	32.06	0.050
SF-24	45.00	31.19	76.64	17.54	0.000
SF-25	46.34	32.11	79.52	16.55	0.000
SF-26	38.70	25.44	68.16	22.01	0.000
SF-28	47.32	30.75	76.13	17.42	0.000
SF-30	41.77	28.17	70.00	21.86	0.000
DIMENSION Mental Health (MH)	43.67	26.15	74.08	14.35	0.000
Health Transition ItemSF-2	35.04	27.01	68.13	22.67	0.041

the patients; in 20% of the patients <80 years old and in 54% of the patients >80 years old, and 35% of the patients showed THA²⁶. These results prove that osteoarthritis is a bilateral condition that particularly affects weight bearing joints. All the studies reveal orthoprosthesis records similar to those of our series and these records are higher in older groups. The results observed in patients with previous prosthesis of the knee or the hips are associated with a faster and steadier improvement of Physical Functioning and Mental Health, and this improvement

may be due to the better mental predisposition of the patients caused by the previous surgical experiences and by the process of adaptation to living with prosthesis.

The average in-hospital stay in our study is 8.2 days, with a range between 4 and 17 days. All the studies that have been carried out, both national^{16,20} and international^{27,28}, show similar periods of average in-hospital stay, and they all report a decreasing evolution of this factor. This decrease has been made

possible thanks to the improvements in the surgical techniques and the program for immediate postoperative rehabilitation treatment which has been implemented in the medical-surgical protocols in order to improve the quality of the care process, its effectiveness and efficiency.

Regarding HRQOL, we have observed a clinical improvement in all the dimensions of the SF-36, and this improvement is significant in all sections except for Role-Physical and Physical Functioning. This result may seem in conflict with what was reported by other experts on TKA, who state that it substantially improves Physical Functioning, as published by some researchers²¹, and it is only observed in patients with a previous prosthesis. Nevertheless, it may be due to the conditioning of age and comorbidity, which are variables that affect the immediate postoperative period in which the HRQOL questionnaires were filled out. This means that patients need more time to notice a significant clinical improvement with regard to Physical Functioning (PF). Some authors state that a previous joint prosthesis does not lead to worse results after the operation, as was observed in our series²². Other researchers have observed that preoperative factors are predictors for mobility and results^{27,29,30}.

In line with what was observed in our series, most of the studies^{14,16,21,22,24,26} report that total replacement arthroplasty improves pain, Physical Functioning, Mental Health, Social Activity and HRQOL. Knee osteoarthritis produces limitations in Activities of Daily Living and therefore limits social functioning, and although after the operation there is an improvement in all other dimensions, and particularly pain and physical functioning, it is difficult for older patients to recover the lost social functioning due to their advanced age and the fact that they have comorbidities, as has already been shown by other studies³¹⁻³³.

On the other hand, when the results from the different components of HRQOL in SF-36 in our series are compared with the general population in Spain¹¹, which is our standard population of reference, only Social Functioning is lower, while five of them show similar levels and two of them, Role-Emotional and Mental Health, show an improvement. Consequently, we can state that the operation of total knee arthroplasty is justified according to the perception of clinical improvement and the improvement of HRQOL reported by the patients.

Conclusion

According to what was observed in this study, *our typical patient is a 70 year old woman with a previous prosthesis, comorbidity and knee osteoarthritis that affects her HRQOL*, we can state that TKA significantly improves HRQOL in all its dimensions and components, except for Physical Functioning and Physical-Role, although they also improve over time after the operation.

Competing Interests

Each author certifies that he or she has no commercial associations that might pose a conflict of interest in connection with the submitted article. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

Author's Contribution

ME Fernández-Cuadros participated in acquisition of patients' data, drafting and designed of the article and analysis and interpretation of results. *OS Pérez-Moro* participated in acquisition of patients' data. *JA Mirón-Canelo* participated in the conception and design of the study, designed the manuscript, supervised and interpretation of results.

All authors read and approved the final version of the manuscript.

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REFERENCES

1. Roig Escofet D: Osteoarthritis of peripheral joints. Editorial Momento Medico Ibero Americana. Madrid. Spain; 2002.
2. Quintero M, Monfort J, Mitrovic D. Osteoarthritis: Biology, fisiopathology, clinics and treatment. Editorial MédicaPanamericana. Madrid, Spain; 2010.
3. Casals Sánchez JL: Clinical Guides. Osteoarthritis. Ediciones SEMERGEN. Madrid, Spain. 2011.
4. Moskowitz RW: The bourden of Osteoarthritis: clinical and quality of life Issues. Am J Manag Care 2009, 15:223-229.
5. Monfort J: Osteoarthritis. Fisiopatología, diagnostic and treatment. SER (Sociedad Española de Reumatología. Editorial MédicaPanamericana. Madrid, España. 2010.
6. Alonso M, Mirón JA: System of Health Information. Health Indicators, Wellness and Quality of Life. In: Guide for the preparation of Scientific Papers. Grade, Master and Postgrade. Salamanca. Gráficas Lope; 2013; 55-66.
7. Rodríguez Merchán EC: Traumatology and Orthopedic Surgery of the knee. State of the Art. Editorial MédicaPanamericana. Madrid. Spain; 2011.
8. US Preventive Task Force. Guide to Clinical Preventive services: an assessment to the effectiveness of 169 interventions. Baltimore: Wiliams and Wilkins; 1989.
9. Centre for Evidencice -based Medicine (CEBM): Levels of Evidence (March 2009). Oxford University: CEBM, 2013. [<http://www.cebm.net/?o=1025>]
10. Villagut G, Ferrer M, Rajmil L, Rebolle P, Permanyer-Miralda G, Quintana JM, Santed R, Valderas JM, Ribera A, Domingo-Salvany A, Alonso J: Spanish SF 36 questionnaire: a decade of experience and new concepts. Gac Sanit 2005, 19(2):135-150.
11. López-García E, Banegas JR, Graciani Pérez-Regadera A, Gutierrez-Fisac JL, Alonso J, Rodríguez-Artalejo F: Reference values on Spanish SF 36 questionnaire in people older than 60 years of age. Med Clin (Barc) 2003, 120(15):568-573.
12. Mirón Canelo JA, Alonso Sardón M, Serrano López de las Hazas A, De Godos N. Sáenz González MC: Health Related

- Quality of Life (HRQL) in people with intellectual disability. *Pan Am J Public Health* 2008, 24(5):336-344.
13. Soderman P, Malchan H: Validity and reliability of Swedish WOMAC osteoarthritis index. A self-administered disease-specific questionnaire (WOMAC) vs generic instruments (SF-36 and NHP). *Acta Orthop Scand* 2000, 31(1):39-46.
 14. Ostendorf M, Van Stel HF, Buskens E, Schrijvers AJP, Marting LN, Verbout A, et al: Patient reported outcome in total hip arthroplasty. A comparison of five instruments of health status. *J Bone Joint Surg* 2004, 86(6):801-808.
 15. Quintana JM, Escobar A, Aróstegui J, Bilbao A, Azkarate J, Goenaga I, et al: Health related quality of life and appropriateness of knee or hip joint replacement. *Arch Intern Med* 2006, 166:220-226.
 16. Moreno Palacios JA, Catedra Valles E, Plazas Andreu N, Sancho Loras R, Manjón-Cabezas Subirats J, Mozo Muriel A: Comparative results according to age in older patients with knee replacement. *Rev Esp Geriatr Gerontol* 2009, 44(3):120-123.
 17. Pagés E, Iborra J, Rodríguez S, Jou N y Couxart A: Total Knee arthroplasty. Evolution of in-hospital-stay rehabilitation from 1988-1998. *Rehabilitación (Madr)* 2000, 34(5):347-353.
 18. Pagés E, Iborra J, Jou N, Moranta P, Ramón S y Couxart A: Total Knee arthroplasty. Functional assessment and personal satisfaction at five years follow-up. *Rehabilitación (Madr)* 2001, 34(1):3-8.
 19. Pagés E, Iborra J, Rodríguez S, Jou N y Couxart A: Total Knee arthroplasty. Determinant factors of in-hospital-stay and discard. *Rehabilitación (Madr)* 2002, 36(4):202-207.
 20. Ramón Rona S: Function and Quality of life in Osteoarthritis patients before and after the operation. Cost/effectiveness according to age and ratio of survival. Doctoral Thesis. Barcelona 2001.
 21. O'Brien S: An outcome study on average length of stay following total hip and knee replacement. *J Orthop Nursing* 2002, 6:161-669.
 22. Bachmeier CJM, March LM, Cross MJ, Lapsley HM, Tribe KL, Courtney BG, et al: A comparison of outcomes in osteoarthritis patients undergoing total hip and knee replacement surgery. *Osteoarthr cartilage* 2001, 9(2):137-146.
 23. Wallace DA, Car AJ, Murray DW, Woods DA: Etiological factors in severe osteoarthritis of the knee. *The knee* 1995, 2(2):113-115.
 24. Dawson J, Linsell L, Zondervank K, Rose P, Randall T, Carr A, et al: Epidemiology of hip and knee pain and its impact on overall health status in older adults. *Rheumatology* 2004, 43:497-504.
 25. Jones A, Voaklander D, Johnston W, Suarez-Almazor M: The effect of age on pain, function and quality of life after Total Hip and Knee Arthroplasty. *Arch Intern Med* 2001, 161:454-60.
 26. Mangione C, Goldman L, Orav J, Marcantonio E, Pedan A, Ludwig L, et al: Health Related quality of life after elective surgery. Measurement of longitudinal changes. *J Gen Intern Med* 1997, 12:686-697.
 27. Ackerman J, Graves S, Bennell K, Osborne R: Evaluating quality of life in hip and knee replacement: Psychometric properties of the World Health Organization Quality of Life Short Version Instrument. *Arthritis and Rheumatism* 2006, 55(4):583-590.
 28. Nilsson AK, Lohmander LS: Age and waiting time as predictors of outcome after total hip arthroplasty for osteoarthritis. *Rheumatology* 2002, 41:1261-1267.
 29. Parent E, Moffet H: Pre-operative predictors of locomotor ability two months after Total Knee Arthroplasty for severe osteoarthritis. *Arthritis and Rheumatism* 2003, 49(1):36-50.
 30. Katz JN: Total joint replacement in osteoarthritis. *Best Pract Res Clin Rheumatol* 2006, 20(1):145-153.
 31. Bjorgul K, Novicoff W, Saleh K: Evaluating comorbidities in total hip and knee

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