



## Patients poorly estimate the overall costs of a total knee arthroplasty and strongly overestimate the surgeon's fee

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**In an attempt to reduce health care expenses, regulated competition between health care providers has been introduced in The Netherlands. As for total hip and knee arthroplasties, health care providers have to publish their prices to make them available for the insurance companies and the public. Eventually, competition between health care providers should result in optimal care for lower prices.**

**The purpose of this study was to define the patients' consciousness of the overall costs and specialist's fee for a total knee arthroplasty.**

**Thirty-nine patients with a recent total knee arthroplasty were asked to estimate the total costs and the surgeon's fee of this procedure. The average overall cost of a total knee arthroplasty in our hospital was € 11.500. The orthopaedic surgeon's fee represents a non-negotiable 5% of these total costs.**

**The mean estimate of the overall costs of a total knee arthroplasty by the patients was € 10.000 (range : € 600 to € 55.000). Only 26% of the patients (n = 10) gave an estimate within the accepted "correct" range of € 8.500 to € 14.500. The surgeon's fee was estimated at 32% (range : 5% to 75%) of the total costs and a majority reckoned the actual fraction of 5% was low. Patients have a poor notion of the overall costs of a total knee arthroplasty and strongly overestimate the specialist's fee. Whether the introduction of budget competition in health care may actually result in a decrease in health care costs remains to be seen.**

**Keywords :** total knee arthroplasty ; cost ; patient estimation.

### INTRODUCTION

A new financial health care system was introduced in The Netherlands In February 2005. Billing is now based on pathology packages or so-called "diagnosis-treatment combinations" (DBC's) in an attempt to make health care costs more transparent and comparable between different health care providers. DBC's are defined as a set of activities and interventions, made by the hospital and the medical specialist from the first consultation at the outpatient clinic until the end of treatment. The medical specialist's fee and all other costs of the hospital including wages, medication, medical materials, housing, equipment and general overheads are captured in a single billing code. According to the government this transformation may then change the current supply-led system to a

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demand-led system, facilitate regulated competition between health care providers and increase efficiency. Insurers, as the representatives of patients' interest, are given a more active role as they negotiate the prices of the DBCs with health care providers. Patients are said to have more influence as they have a free choice of health care insurer, which stimulates competition between health care insurers and providers (5). A more active participation may render patients more aware of health care expenses, and lower their health care consumption.

Whether these changes may indeed lead to an overall decrease in health care expenses is truly hypothetical. A Dutch governmental study shows that patients have a poor notion of health care costs and concluded that a better patient consciousness is necessary to keep the expenses of health care manageable (4). From the medical profession profound doubts have been expressed whether patients do indeed develop a proper insight in costs of medical care. A recent study by Xu *et al* (6) shows that near-elderly women were more likely to use health care services if their insurance covered the costs. A positive relation was found between the extent of coverage and the frequency of physician visits and hospitalisation (6). On the contrary, Long *et al* found that patients do not change their consumption of health services or take advantage of insurance when they have more generous insurance coverage. They find little support for the hypothesis that people anticipate changes in their insurance

status and arrange their health care consumption accordingly (3).

In an attempt to get definite insight in patients' notion of health care costs, we have submitted patients, who had recently undergone a total knee arthroplasty (TKA) to a simple questionnaire. The main question was : does the patient have a correct idea of the costs of the DBC total knee arthroplasty and especially the fraction of total costs representing the orthopaedic surgeon's fee ? Our hypothesis was that patients have a poor insight in health care expenses, resulting in an underestimation of total costs and an overestimation of the orthopaedic surgeon's fee.

## PATIENTS AND METHODS

### Patients

Fifty-eight randomly selected patients, who underwent a TKA (LCS, Johnson & Johnson, USA) between January and July 2006, were approached. In September 2006 one researcher questioned all patients by phone with a standardised questionnaire (table I) and the 12-item Oxford Knee Score. The Oxford knee score was used in this study as a measurement of postoperative outcome. It is intended specifically for use with knee surgery and assesses the outcome as judged by the patient on a scale from 12 (least difficulties) to 60 (most difficulties) (2). Nineteen patients were excluded from the study : in 12 the interview was impossible (one had died, 9 could not be reached, one was deaf, and one was mentally retarded), one was a revision surgery and 6 had

Table I. – Standardised questionnaire

Questions
Did you receive a bill from the hospital or the insurance company for your recent knee operation ?
Did you ever before the operation think over the costs of the knee operation ?
Could you make an estimation of the total costs of the knee operation (incl. hospital stay, surgery, physiotherapy, specialist's fee, anaesthetics and prosthesis) ?
How did you reach this estimation ?
Could you make an estimation about the costs of the prosthesis ?
The total expenses are € 11.500, what is your opinion about this sum ?
Which part of this sum would you expect to be the orthopaedic surgeon's fee ?
The orthopaedic surgeon's fee is € 600 (or 5 percent), what is your opinion about this sum ?
Would you be willing to pay a personal contribution ?
Would you like to have more information on your future health care expenses ?

Table II. – Results of the questionnaire

Estimated costs	Estimate	Range of estimates	Actual costs	Opinion actual costs	
Total costs, median	€ 10.000	(€ 600 - 55.000)	€ 11.500	Low	18%
				Reasonable	46%
				High	36%
Costs prosthesis, median	€ 2.000	(€ 250 - 15.000)	€ 2.600		
Specialist's fee, mean	32%	(5 - 75%)	5%	Low	74%
				Reasonable	26%
				High	0%

received the hospital bill, at the time of the interview. Thus 39 patients (29 women) with a mean age of 70 (SD 8.5) years and a median hospital stay of 5 (4-31) days were included. They were interviewed at an average of 188 (SD 52.9) days postoperatively.

### Costs

The estimated overall costs were compared with the amount charged by the hospital according to the DBC total knee arthroplasty. The actual total expenses of the DBC were € 11.500 ; the fraction of these total costs represented by the prosthesis was € 2.600. We defined the estimates of the total costs between € 8.500 and € 14.500 as correct. For the prosthesis an estimate ranging from € 1.950 to € 3.250 was judged correct. The fraction of total costs represented by the surgeon's fee was € 600, which is 5% of the total costs.

### Statistics

Ordinal and scale variables were tested with the Mann-Whitney or Kruskal-Wallis test. Nominal variables were tested by the Chi-square or Fisher's exact test. Correlations were tested by Spearman's correlations. All tests were two-sided. The results were considered significant at  $p < 0.05$ .

## RESULTS

### Estimation expenses

Three quarters (77%) of the patients had thought about the expenses of the operation prior to the operation. Nevertheless, all patients had difficulties expressing an evaluation of the actual sum covering the entire procedure. The average estimate of total

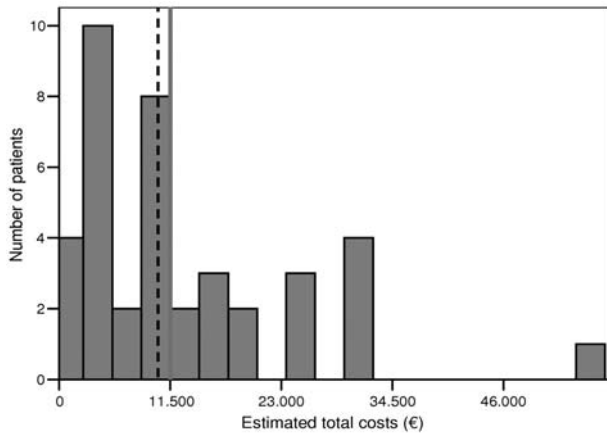
costs of a TKA (including hospital stay, specialist's fee, prosthesis and physiotherapy) was € 10.000, with a broad range from € 600 to € 55.000 (fig 1). Twenty-six percent ( $n = 10$ ) of the patients were able to make an appropriate estimation of the total costs within the defined range of € 8.500 to € 14.500. Most patients (82%) based their estimation on personal knowledge ; others used sources like media, information from their specialist or previous bills from other health care services. Gender did not significantly influence accuracy of estimation, although the right price was estimated by 50% of men and 17% of women ( $p = 0.056$ ).

The median estimated price of the prosthesis was € 2.000, with a range from € 250 to € 15.000 (fig 2). An appropriate estimation of the costs of the prosthesis between € 1.950 and € 3.250 was made by 21% of patients ( $n = 8$ ).

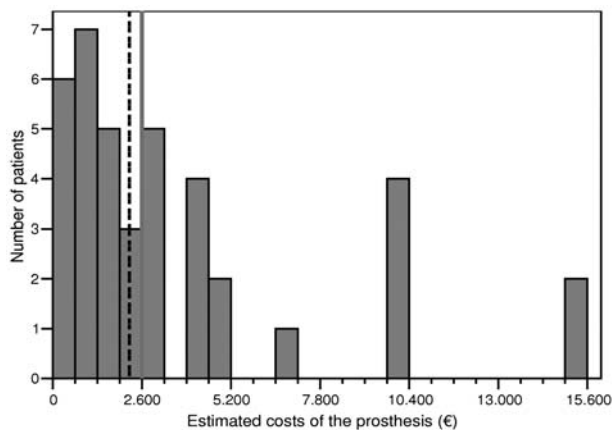
The orthopaedic surgeon's fee was estimated at an average 32% (SD 16.8) of the total costs of the TKA, but again with a broad range from 5 to 75% (fig 3). Age, duration of hospitalisation and prior awareness of operation costs did not have any influence on the estimation of total costs or surgeon's fee.

### Oxford score

The average Oxford score was 23 points (SD 9.5), which means patients experienced little difficulties at the time of interview. The longer the hospitalisation, the higher the Oxford score at follow up ( $p = 0.021$ ). Patients with more postoperative difficulties estimated the total costs significantly higher than those with a smooth recovery ( $p =$

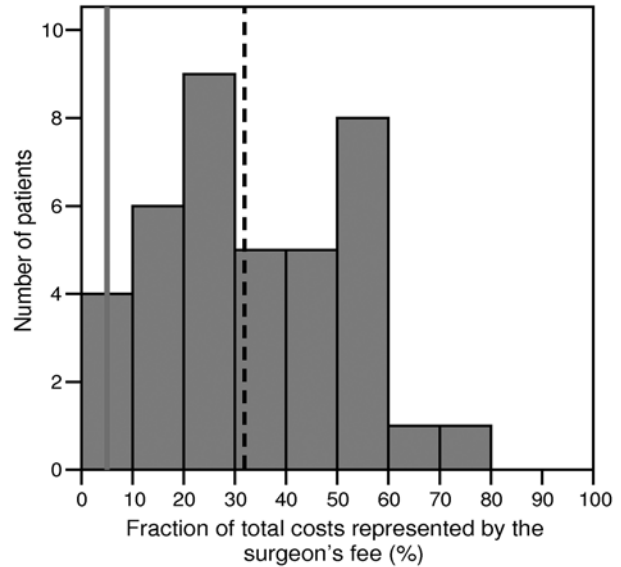


**Fig. 1.** — Graph showing the patients' estimations of the total costs of total knee arthroplasty. The dotted line indicates the mean estimation of € 10.000. The solid line indicates the actual costs of a total knee arthroplasty procedure : € 11.500. Estimations were accepted as correct between € 8.500 and € 14.500 ; these correct estimations are indicated by one bar above and one below the solid line.



**Fig. 2.** — Graph showing the estimations by patients of the costs of the total knee arthroplasty implant. The dotted line indicates the mean estimation of € 2.000. The solid line indicates the actual costs of the implant of € 2.600. Estimations were accepted as correct between € 1.950 and € 3.250 ; these correct estimations are indicated by one bar above and one below the solid line.

0.059). The patients with a higher Oxford score also estimated the fraction of total costs represented by the surgeon's fee at 41% which is significantly higher ( $p = 0.017$ ).



**Fig. 3.** — Graph represents the estimation of the specialist's fee as part of the total costs of a total knee arthroplasty. The dotted line indicates the mean estimate of 32%, whereas the solid line represents the actual fraction of 5%.

### Opinion of expenses

Patients who made an estimate above the DBC price found the actual costs low, and patients with a low estimate found them high ; this correlation was significant ( $p = 0.002$ ). None of the patients reckoned the specialist's fee of € 600 high and a majority of 74% found it low, because of 'the responsibility of the job' and because 'things could easily go wrong'.

### Personal contribution

Of all patients, 80% were willing to make a personal contribution. They repeatedly added that, although they would like to pay this contribution, they could not afford it. Patients not willing to make a personal contribution had significantly higher Oxford scores ( $p = 0.003$ ).

### Awareness of health care expenses

Half of the patients would like to have more insight in future health care expenses. Their

estimates were correct in 35% of the cases versus 10% of the non-interested patients ( $p = 0.039$ ). Arguments for patients to abandon the pursuit of more future insight were: being elderly, no difference in health care consumption, insurance is already paying. Patients, who declared to seek more future insight, were motivated by the wish to know what was paid on their behalf, to have some control over hospital and insurance, or were made aware and more interested in expenses as a result of this study.

## DISCUSSION

We found that patients have a poor notion of the overall costs of TKA in the Netherlands. Patients both under- and overestimated the expenses; total costs and prosthesis cost estimates were within the range defined as correct in only 26% and 21% of patients respectively. The poor awareness of expenses could be caused by the relatively high age of the patient population. Although age was not correlated with poor notion in this study, it might have been if all age groups were represented. One might question the rationale behind the outermost estimates (respectively € 600 and € 55.000), but for both cases patients clearly stated that this was their idea of the expenses. It would be interesting to ask patients for an estimation of more health care services. This way one would be able to differentiate between a lucky guess and proper notion. Our study was conducted on a relatively small number of patients. The initial aim was to question more patients; however, we abandoned this target since some patients seemed to be disturbed by the interview when they were questioned about their opinion on the surgeon's fee. Four patients actually called the hospital to find out whether the orthopaedic surgeons acknowledged this study. It is interesting to note that information about the total expenses did not disturb patients, however, being informed about the specialist's fee did. The reason for this may be that media frequently focus on the assumption of overpaid medical specialists and this information may have stimulated the defensive attitude of these patients.

The fraction of the overall costs represented by the orthopaedic surgeon's fee was estimated on average at 32%. This is at least 6 times more than the actually agreed 5% or approximately € 600. The 5% fraction of total cost representing the orthopaedic surgeon's fee in the Netherlands is in agreement with literature from different other countries. Bernstein and Holt (1) concluded that fees for physicians' services represent only a small component of total health care costs. Complementary costs (particularly hospital charges) are recognised to represent a substantial portion of the total costs, and may be 10 times larger than surgical fees. They also found that even if the surgeon's fees are lowered, this paradoxically increases health care costs as surgeons may respond by performing more surgery, which will increase the substantial portion of complementary costs (1).

Age, duration of hospitalisation and prior consideration of operation expenses do not have any influence in this study. More postoperative difficulties made the estimation of the specialist's fee higher and made patients less willing to pay a personal contribution.

To our knowledge, no previous studies have focussed on the insight and understanding of health care costs by patients. Although we investigated only a small number of patients, the results are interesting. It gives us an image of the notion of costs in the elderly orthopaedic patient. This study shows that only 50% of the patients appreciated insight in future health care expenses and 90% of the patients who did not, have poor notion of expenses. Interest in health costs seems to influence a better estimation of expenses. Besides interest, patients should have information about expenses. The price list of DBCs is readily available on the Internet (7), and patients have the opportunity to find the price for every available treatment with specifications. The availability of this information is not generally announced, although it might give patients a better insight on expenses of health care. We conclude that patients have a poor notion of the expenses of total knee arthroplasty in the Netherlands and strongly overestimate the specialist's fee. There is reason to believe that this is not only true for total knee arthroplasty patients but

also for other health care services. Whether the introduction of budget competition in health care and the expected participation of patients may actually result in a decrease in health care costs remains to be seen.

### REFERENCES

1. **Bernstein J, Holt GB.** Paying surgeons less can cost more. *Med Pract Manage* 1999 ; 4 : 282-287.
2. **Dawson J, Fitzpatrick R, Carr A, Murray D.** Questionnaire on the perceptions of patients about total knee replacement. *J Bone Joint Surg* 1998 ; 80-B : 63-69.
3. **Long SH, Marquis M S, Rodgers J.** Do people shift their use of health services over time to take advantage of insurance ? *J Health Econ* 1998 ; 17 : 105-115.
4. **Ministerie van Volksgezondheid, Welzijn en Sport.** Evaluatie no-claimteruggaaf. Kenmerk Z/VU-2691243 (Den Haag, 2006).
5. **Oostenbrink JN, Rutten FFH.** Cost assessment and price setting of inpatient care in The Netherlands. The DBC case-mix system. *Health Care Manage Sci* 2006 ; 9 : 287-294.
6. **Xu X, Patel DA, Vahratian A, Ransom SB.** Insurance coverage and health care use among near-elderly women. *Women's Health Issues* 2006 ; 16 : 139-148.
7. **Zorgverzekeraars Nederland.** DBC-Inkoopgids 2005. Segment B.  
<http://www.zn.nl/leeszaal/znuitgaven/dbcinkoopgidsb.asp> (Zeist, November 2004).