

Cost of sick leave for total hip replacement

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Totally, 42/92 nonretired patients between 50 and 59 years of age were on sick leave for more than 6 months before total hip replacement for primary arthrosis. Reductions of these periods of sick leave to 6 months each would have meant a productive gain to society of 41,000–653,000 Swedish kronor per patient. The range in the estimate is due to the degree of causal relationship between preoperative and postoperative sick leave/early retirement.

Total hip replacement (THR) requires a combination of productive factors that include not only surgeons, nurses, hospital facilities, operating theaters, drugs, social service, etc., but also – and this is important – the patient's own time. In order to produce a THR efficiently, both the technology of production and the costs of the productive factors must be known. Patient-time costs are caused by decreased consumption and production.

Sick leave exceeding 6 months before THR for primary arthrosis in patients under 60 years of age may increase the risk of early retirement or long postoperative sick leave (Löfmark and Rydell 1984, Johnsson and Persson 1986). We have calculated the potential effects on productive output by reducing preoperative sick leave to no more than 6 months.

Patients and methods

During the period 1970–1982 inclusive, 937 cemented metal-on-plastic THRs were performed in Lund for primary coxarthrosis. We investigated the 92 patients (61 men and 31 women) who were 50–59 years of age at surgery, were not retired preoperatively, and were living in Malmöhus County 2 years before and 2 years after surgery. For both sexes the mean age at surgery was 56

years. For 14 patients with bilateral THR performed within a 3-year period, the preoperative 2-year investigative period was recorded until the first replacement and the postoperative 2-year investigative period from the second replacement. Information about sick leave and retirement was obtained from the local Social Insurance Office.

Reduction of long preoperative sick leave might affect patient-time costs by decreasing preoperative/postoperative sick leave and early retirement. These factors, as well as the remaining time to retirement age (65 years), the prosthetic survival rate (Johnsson et al. 1988), and average earning data for Sweden were included in the following economic model.

A general expression of the effect on productive output due to a reduction in preoperative sick leave is

$$Z = \lambda w_1 A + \lambda w_1 B + d\lambda \sum_{t=1}^n \frac{w_t k_t \Sigma_t}{(1+i)^{t-1}}$$

Z	net present value of a reduction of preoperative sick leave
λ	probability of returning to work
w_t	average earnings per day in year t
A	reduction of preoperative days of sick leave
B	reduction of postoperative days of sick leave
$d\lambda$	change in λ due to reduction of preoperative days of sick leave
n	years from time of surgery until normal retirement
k_t	number of productive days in year t
i	discount rate
Σ_t	survival rate of hip prosthesis in year t

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Table 1. Probability of postoperative occupational status 2 years after THR among 92 patients with different types of work and duration of preoperative sick leave

Type of work	Duration of preoperative sick leave (days)	Postoperative status		
		Working (n 60)	Still on sick leave (n 5)	Retired (n 27)
All types	0-180 (n 50)	0.84	0.02	0.14
	180-360 (n 21)	0.57	0.05	0.38
	360-720 (n 21)	0.24	0.14	0.62
	180-720 (n 42)	0.41	0.09	0.50
White-collar (including household work)	0-180 (n 11)	0.91	0	0.09
	180-360 (n 1)	1.0	0	0
	360-720 (n 0)	—	—	—
Blue-collar	0-180 (n 39)	0.82	0.03	0.15
	180-360 (n 20)	0.60	0.05	0.35
	360-720 (n 21)	0.24	0.14	0.62
	180-720 (n 41)	0.41	0.10	0.49

The value of an increase in the probability of returning to work was estimated as the present value of all extra future earnings over the period from an early retirement until the patient retires at aged 65 years (Lindgren 1981, Hartunian et al. 1981). The discount rate was set at 4 percent.

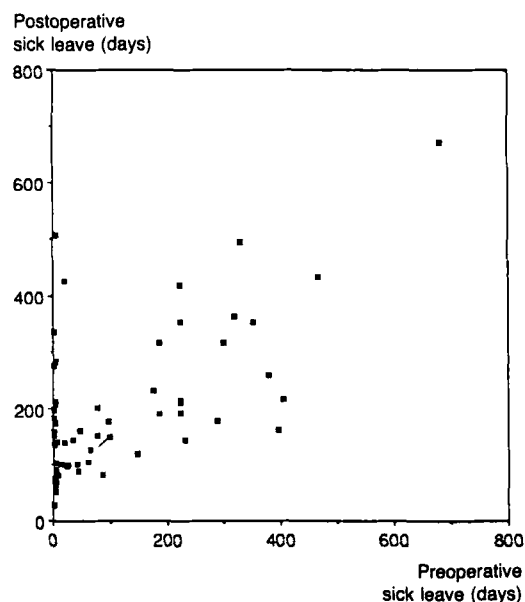
The average earning's data for Sweden in 1985 were used. The average salary was 175,000 Swedish kronor (SEK) per annum for full-time employees within the age bracket 50-59 years, employer's contributions included (Statistics Sweden 1987).

Results

There was a positive correlation between the duration of preoperative sick leave and early retirement ($P = 0.0001$, Pearson's chi-square test; Table 1). The patients with less than 180 days of preoperative sick leave had a 84 percent probability of going back to work within 2 years after surgery. A corresponding probability for the 42 patients with more than 180 days was 41 percent, and these patients had on an average 389 days of preoperative sick leave. There was also a positive correlation between the duration of preoperative and postoperative sick leave ($P = 0.0008$, Pearson's chi-square test; Table 2 and Figure 1). The risk of early retirement and the risk of long postoperative sick leave were fairly stable over the time period for the study.

Preoperative sick leave (yr)	Postoperative sick leave (yr)			Total
	0-0.5	0.5-1	1-2	
0-0.5	31	9	2	42
0.5-1	2	8	3	13
1-2	1	2	2	5
Total	34	19	7	60

Table 2 and Figure 1. Sick leave before and after replacement of the hip for arthrosis among 60 patients who went back to work within 2 years



A reduction of all long preoperative sick leaves (n 42) to 180 days would immediately have given a net gain of SEK 41,000 per patient with reduced sick leave.

If the correlation between preoperative and postoperative sick leave indicates a causal relationship, a reduction of all long preoperative sick leaves to 180 days would have decreased the mean postoperative sick leave by 113 days for the 18 patients with more than 180 days of preoperative sick leave and who had returned to work. This would have corresponded to an increase in productive output by SEK 22,000 per patient with reduced sick leave.

The effects of a change in the probability of returning to work on the total sick leave was included in the following estimate of the economic value of reduced early retirement.

Because retirement due to age is at 65 years in Sweden, early retirement for the average patient (56 years at THR) in our study entails a loss of 9 productive years. If the correlation between the duration of preoperative sick leave and early retirement indicates a causal relationship, reduction of all long preoperative sick leaves to 180 days would have increased the productive years by 3.9 years per patient with reduced sick leave. After correction for the probability of prosthetic survival, this is equivalent to SEK 590,000 per patient at a 4 percent discount rate. The 5 patients still on sick leave 2 years after surgery were treated as if they had obtained early retirement.

The estimated total productive net gain (Table 3) varied from SEK 41,000 to 653,000 depending on the strength assumed for a causal relationship

between preoperative sick leave and postoperative sick leave/occupational status.

Discussion

Because the prevalence of primary arthrosis of the hip is very low in patients under 50 years of age (Danielsson et al. 1984), the lowest age limit in our study was set at 50 years. The study was extended to 2 years after THR because the hip function improves continuously during that time (Murray et al. 1975, Murray et al. 1981).

Economic analyses have documented the cost effectiveness and the strong potential of total hip replacement (Laing and Taylor 1982, Williams 1985). A vital ingredient in these estimates is the patient-time costs. Our analysis further stresses this point.

Patient-time costs were measured as the loss in productive output due to sick leave and early retirement. Our method may result in an overestimation of the net gain for the following reasons. A sick or disabled person might be replaced by someone who would otherwise be unemployed. This effect has not been taken into account in the estimates. However, the unemployment rate is relatively low (2.5-3 percent) in Sweden and, at least in the short run, it is extremely difficult to replace a vacancy with an unemployed person (Lindgren 1981). Other causes of overestimation might be the influence of a poorly functioning hip prosthesis or other diseases on the magnitude of the loss of production. On the other hand, potential improvements in labor productivity have not been considered, and this may cause some underestimation of the true value. Further, the total value of a reduction in disability would be underestimated because both the value of being healthy and of leisure time were not included in our calculation. We believe that our estimates are conservative.

The relationship between physically demanding work, long preoperative sick leave, and the risk of early retirement is emphasized in this study. Patients with blue-collar work preoperatively had a several times higher risk of early retirement after THR than patients with white-collar work. However, the value in a reduction of preoperative sick leave would be approximately the same for pa-

Table 3. Increase in productive output/patient (n 42) in SEK by reducing long preoperative sick leave to 6 months before THR. The estimates are based on three different assumptions of the causal relationship between duration of preoperative sick leave and postoperative sick leave/occupational status. 4 percent discount rate, and 1985 prices

	Causal relationship		
	0	0.25	1
Reduction of preoperative sick leave	41,000	41,000	41,000
Reduction of postoperative sick leave	-	6,000	22,000
Increase in probability of going back to work	-	148,000	590,000
Total	41,000	195,000	653,000

tients with blue-collar work as for the total population studied. This was due to the fact that 41 of the 42 patients with more than 180 days of preoperative sick leave were blue-collar workers, that wage differentials between blue- and white-collar workers are relatively small in Sweden, and that blue-collar workers were predominantly men who generally have somewhat higher wages.

It should be noted that the result was highly

dependent on the assumption of the causal relationship between preoperative sick leave and postoperative sick leave/occupational status. However, even with a moderate causal relationship there are considerable economic gains in not allowing more than 6 months of sick leave before THR for primary arthrosis in working patients younger than 60 years.

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