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Policy encouraging earlier hip fracture surgery can decrease the long-term mortality of elderly patients

Kobi Peleg [a,b,*], Michael Rozenfeld [a,b], Irina Radomislensky [a], Ilya Novikov [c], Laurence S. Freedman [c], Avi Israeli [d,e]

[a] National Center for Trauma & Emergency Medicine Research, Gertner Institute for Epidemiology and Health Policy Research, Tel-Hashomer, Ramat Gan, Israel
[b] School of Public Health, Tel-Aviv University, Tel-Aviv, Israel
[c] Biostatistics Unit, Gertner Institute for Epidemiology and Health Policy Research, Tel-Hashomer, Ramat Gan, Israel
[d] Hadassah – Hebrew University Medical Center, Jerusalem, Israel
[e] Ministry of Health, Jerusalem, Israel

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ABSTRACT

Background: In April 2004 the Israeli Ministry of Health decided to condition DRG payment for hip surgery by time between hospitalisation and operation, giving a fine for every day's delay beyond 48 h. An evaluation study performed 2 years after the reform has shown the positive influence of the reform on patient's survival in the hospital. This study evaluates the impact of the reform on the longer-term mortality of patients.
Methods: A retrospective study based on data from nine hospitals of the national trauma registry available for the years 2001–2007, with surveillance on 2-year survival through data of Ministry of the Interior. The study population includes patients aged 65 and above with an isolated hip fracture following trauma. Mortality curves and Cox regression were utilised to compare the influence of different parameters on long-term mortality.
Results: Earlier surgery had a significant positive impact on survival through the whole length of the study period. In the period after the introduction of the new reimbursement system for hip fracture surgeries, a significant decrease in the longer-term mortality was observed up to 6 months of follow-up, even when adjusted by patients' age, gender and the receiving hospital. After 6 months there was no further decrease in relative risk, though the survival advantage remained with patients hospitalised after the reform.
Conclusions: The reform appears successful in decreasing the longer-term patient mortality after hip fracture through influencing surgical practice.

Introduction

Hip fractures are frequent in the elderly population and are associated with much suffering, decrease in quality of life and increased mortality, while the cost to the healthcare system is high [1,2]. According to many studies, patients who sustained a hip fracture are at much higher risk of dying as compared to other representatives of their age group [1–3].

The recommended method of treating a hip fracture is either replacement or fixation surgery. Most sources agree that surgery should be performed in the first 24 h and not later than 48 h after hospitalisation [4–7]. Many studies have shown that delay of surgery can lead to increased morbidity, mortality and length of stay in the hospital [4–7].

The growing awareness of the effects of delayed surgery of hip fractures on medical outcomes brought a change in the system of reimbursement of Israeli hospitals for these surgeries. In April 2004 the Director of the Israel Ministry of Health (IMH) issued a directive to impose a differential pricing on hip fixations, conditioned by time of surgery. The directive defined full DRG payment for hip fixations of all patients with diagnosis of isolated hip fracture only if the surgery was performed in the first 48 h of hospitalisation. In cases of later surgery not justified by medical

* Corresponding author at: National Center for Trauma and Emergency Medicine Research, Gertner Institute for Epidemiology and Health Policy Research, Sheba Medical Center, Tel Hashomer, Ramat-Gan 52621, Israel. Tel.: +972 3 5354252; fax: +972 3 5353393.
E-mail address: KobiP@gertner.health.gov.il (K. Peleg).

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considerations such as clear contraindications, each day of delay would further subtract from the payment. This new policy was introduced for all Israeli hospitals performing hip fracture surgeries, while demanding a consistent registration of surgery times.

In 2007 the Israeli National Center for Trauma and Emergency Medicine Research performed a study, sponsored by the National Institute for Health Services Research, whose purpose was to measure the impact of this policy change on volume of delayed surgeries and in-hospital mortality [8]. The study found an increase of 35% in volume of operations in the first 48 h of hospitalisation and a decrease of one day in median waiting time for hip fixations in the period after the change in the reimbursement system compared to the period before it. In the later period, in-hospital mortality decreased by more than 30% [8].

The drop in in-hospital mortality shown by that study demonstrated the short-term advantages that occurred after introduction of the new method of reimbursing hospitals for hip fracture surgeries, but many other studies stress the importance of considering the effects of earlier surgery for hip fracture on longer-term mortality [6,9–11]. Recent studies have shown that in different spans of follow-up after hip fracture surgery, there are variations in the importance of different factors influencing mortality [3,12]. These factors such as patients' age, gender and the hospital environment should be considered when trying to establish a relationship between time of surgery and longer-term mortality.

In this study we investigate the longer-term effects of the change in reimbursement system on mortality following hip fracture, and to what extent the possible changes in mortality after the reform could be ascribed to decreased time of surgery.

Objectives

- To examine whether introduction of differential pricing of hip fracture surgery conditioned by time of surgery lowered the long-term mortality of patients aged 65+.
- To find out whether shorter waiting times for hip fracture surgery of patients aged 65+ are associated with lower long-term mortality.

Materials and methods

This is a retrospective study of patients included in the Israeli National Trauma Registry (ITR) during the period 2001–2007 (with year 2004 omitted as the year of the policy change). Patients aged 65 and above with an isolated diagnosis of hip fracture (ICD-9-CM 820) [13] who were hospitalised at all 6 level I trauma centres in Israel and at 3 regional trauma centres were included in the study. These 9 hospitals were chosen because they were included in the Registry during all 7 years of the study. The data on patients in the registry were linked to mortality data from the population database of the Ministry of the Interior in order to obtain 2-year follow-up on their survival. Altogether 10,900 patients met the inclusion criteria.

The main outcome measure was longer-term mortality, with emphasis on 6-month, 1-year and 2-year mortality. Comparisons of interest were: between patients operated in less than 48 h since arrival, those operated after 48 h and unoperated patients; and between the period before the change of reimbursement policy (2001–2003) and the period after (2005–2007). In addition to survival analysis of patients over the full 2-year follow-up period, we also performed survival analysis of patients over the 6 months to 1 year period and from the 1-year to 2-year period. This was done in order to analyze whether the factors influencing mortality change over time.

Chi-square tests were used to compare categorical variables between the period before and after the reimbursement policy change. Survival curves were estimated by the Kaplan-Meier method and converted to mortality curves by subtracting survival percentages from 100%; Cox regression was used to estimate Hazard Ratios (HR) comparing the periods before and after reimbursement policy and adjusted for patient's age, gender and the receiving hospital. The time of surgery was then inserted into the model in order to estimate to what extent the difference between the two policy periods was explained by the decreased waiting time for hip-fracture surgery.

A value of $p < 0.05$ was considered to be statistically significant.

Results

To compare the long-term mortality before and after the change of reimbursement policy, we began our analysis with a comparison of the patients in the two periods (Table 1).

Females represented the majority (71%) in both periods. The age distribution was slightly more heterogeneous in the first period, but in both periods almost half of the patients belonged to

Table 1
Comparison of patients in two study periods (% (*n*)).

Parameter		Period	
		2001-2003 (*N* = 5538)	2005-2007 (*N* = 5326)
Gender	Male	28.93 (1602)	28.95 (1589)
	Female	71.07 (3936)	71.05 (3773)
Age**	65–74	19.75 (1094)	18.35 (984)
	75–84	45.92 (2543)	49.01 (2628)
	85+	34.33 (1901)	32.64 (1750)
Rehabilitation**	Yes	45.02 (2493)	55.71 (2987)
LOS** (29 values are missing)	0–3	5.27 (391)	6.58 (352)
	4–6	17.95 (991)	31.18 (1668)
	7–13	53.60 (2959)	49.36 (2641)
	14+	23.18 (1280)	12.88 (689)
Time to surgery** (21 values are missing)	<48 h	38.59 (2133)	52.80 (2826)
	≥48 h	47.24 (2611)	35.24 (1886)
	No surgery	14.17 (783)	11.96 (640)
In-hospital mortality**	3.54 (196)	2.35 (126)	
1-Month mortality		5.40 (299)	5.02 (269)
3-Month mortality*		11.11 (615)	9.88 (530)
6-Month mortality**		15.78 (874)	13.84 (742)
12-Month mortality*		20.98 (1162)	19.12 (1025)
24-Month mortality*		29.79 (1650)	27.68 (1484)

* Significant difference between periods (p value <0.05).
** Significant difference between periods (p value <0.01).