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Audit of surgical delay in relationship to outcome after proximal femoral fracture

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SUMMARY

To ascertain the influence of surgical delay on outcome after proximal femoral fracture in elderly females, a cohort study of patients presenting in 1987 was compared to 1989/90. Organisational changes in the intervening period were introduced to reduce delay to surgical intervention. Two hundred and eighty females aged 65 years and over presenting from the local catchment area of an acute inner-city teaching hospital were enrolled in the study. Seventy-nine patients received surgery in 1987 and 186 in 1989/90. The one year mortality was 34% and 26% respectively. The proportion receiving surgery within 24 hours rose from 34% in 1987 to 57% in 1989/90. The relative hazard of the group receiving surgery on day 2 in comparison to day 1 was 1.7 (95% CI 1.0 to 2.9) when adjusted for co-variance of age and mental score. Medically fit elderly patients presenting with proximal femoral fracture have improved survival with early surgery within 24 hours of admission. Improvements in the organisation of hospital care will result in important benefits for the increasing number of elderly females presenting with proximal femoral fracture.

INTRODUCTION

Proximal femoral fracture in the elderly is a common condition occupying 25% of orthopaedic beds and has an attendant high mortality and morbidity. The influence of delay prior to surgical treatment in relation to outcome has been reported as both important[1-8] and unimportant.[9-11] The intention to reduce surgical delay allowed the study of outcome to be undertaken before and after measures were introduced to effect such a change. This study was, therefore, undertaken to seek to clarify in a proximal femoral fracture population the influence of surgical delay with respect to outcome.

METHODS

All females aged 65 and over admitted to the Fracture Unit in the Royal Victoria Hospital from a defined geographical area were entered in the study. The admissions in 1987 were compared with the admissions in 1989 and 1990. During the intervening period of one year (in 1988) considerable organisational efforts were made to reduce delay to surgical intervention following admission, in particular by improving theatre availability. Surgical and anaesthetic procedures were not altered. The type of fracture and time of surgery were noted, with patients being categorised according to time to surgery following admission into 4 groups – (1) within first 24 hours (day 1), (2) 24 - 48 hours (day 2), (3) more than 48 hours (day 3+) and (4) no operative intervention. Additional information was gathered on a weekly ward round and included pre-admission drug therapy, social circumstances, mental score,[12] type of dwelling and level of independence. The data were updated at each weekly review, place and date of discharge were recorded, and survival documented from general practitioner or hospital records as previously described.[1] Patients were deemed to require long term care if they remained in hospital for more than 180 days.

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Statistical analysis was conducted using SPSS. Data were examined with Kaplan-Meier for survival curves and Cox's Proportional Hazards regression analysis was performed to investigate the influence of delay, age and mental score on survival.

RESULTS

A total of 280 females with femoral neck fracture were studied with the first cohort of 89 patients admitted in 1987 and the second cohort of 191 in 1989 and 1990. Surgery was not undertaken if the patient had a painless stable impacted sub-capital fracture or remained medically unfit for surgery and anaesthesia. There were 15 such patients, (ten in 1987, five in 1989/90) of whom 12 were unfit for anaesthesia and three had stable impacted sub-capital fractures. In addition to delays due to theatre and anaesthetic availability, patients were also delayed if deemed unfit for surgery and requiring medical stabilisation. This occurred in 18 out of 186 patients in 1989/90, with medical treatment required for respiratory tract infection in eight cases and stabilisation of diabetes mellitus in two cases. Other conditions which resulted in delay before surgery was undertaken included management of acute cerebrovascular accident, cardiac failure, renal failure, bronchiectasis, chronic obstructive airways disease, obstructive jaundice, aortic stenosis and declined consent.

The patient details are listed in Tables I and II and the outcome according to surgical delay in Table III. In 1987 the mean total delay to surgery was 2.6 days in comparison to 2.3 days in 1989/90 with 66% in 1987 receiving surgery within 48 hours of admission increasing to 81% in 1989/90 (Table IV).

Figure 1 illustrates the Kaplan-Meier survival curves for the surgically managed patients, indicating after 1 year 66% survival of the 1987 cohort and 74% survival of the 1989/90 cohort, falling after 2 years to 59% and 64% survival respectively.

Analysis of the survival at up to 2 years of operative cases by cohort using the Cox's Proportional Hazard model indicates a relative hazard of 0.82 (95% CI 0.51 to 1.32, $p = 0.37$) for the 1989/90 cohort in comparison to the 1987 cohort adjusted for the covariance of age and mental score. When adjusted for the additional covariance of surgical delay the relative hazard rose to 1.03 (95% CI 0.67 to 1.59, $p = 0.89$).

The relationship of surgical delay with respect to the outcome measures of length of hospital stay and survival of all patients (1987 and 1989/90 combined) are listed in Table III and Figure 2. There is a clear trend of increased survival with

TABLE I

Details of patients admitted in 1987 and 1989/90 with proximal femoral fracture

	1987	*1989/90*
Number	**89**	**191**
Mean Mental Score (SD)	6.85 (3.5)	6.43 (3.1)
Mean Age in years (range)	83.0 (65-94)	82.0 (66-98)
Mean LOS in days (range)	39.3 (1-180)	44.8 (1-180)
Median LOS in days	29	29
Number (%) treated surgically	79 (88.8%)	186 (97.4%)
Number (%) transferred for rehabilitation	38 (43%)	88 (46%)
Number (%) died in hospital	16 (18%)	27 (14%)
Number deaths (%) at 1 year	33 (37%)	54 (28%)
Number deaths (%) at 2 years	38 (43%)	72 (38%)
Number (%) discharged to own home	54 (61%)	126 (66%)
Number (%) discharged to long term care	5 (6%)	18 (9%)

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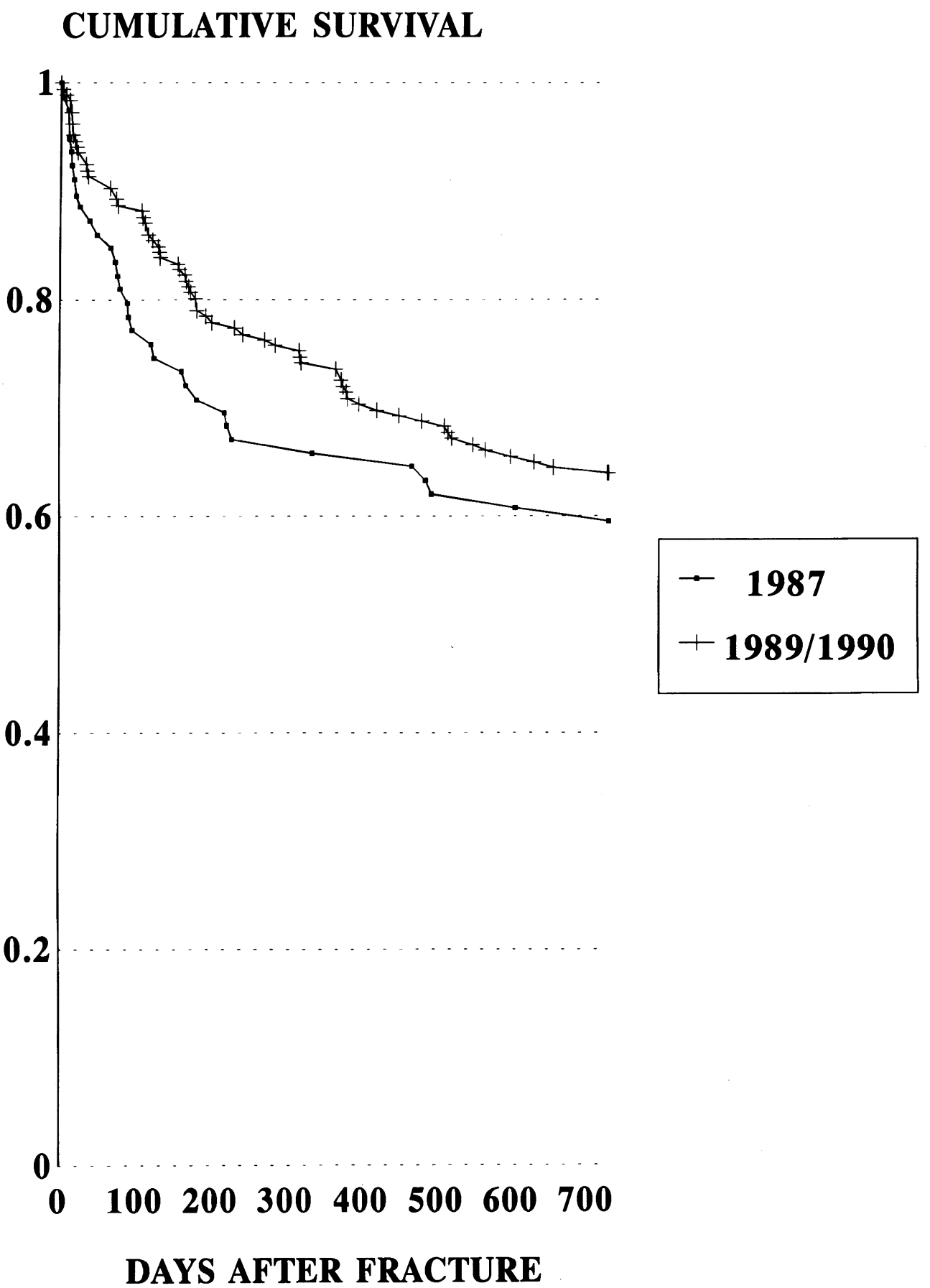

Fig 1 Outcome following surgical management (1987 vs 1989/90)

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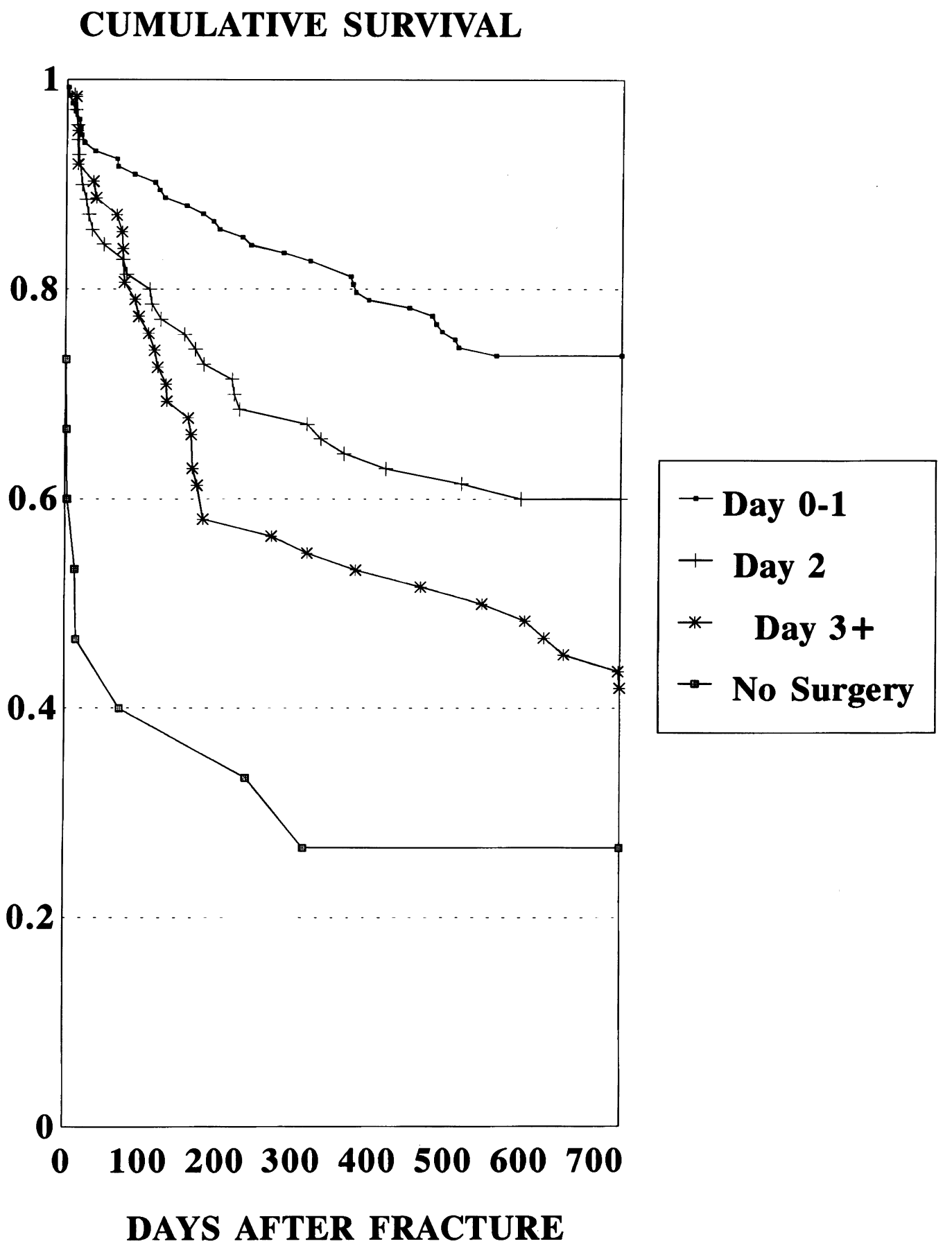

Fig 2 Operative delay and survival (1987, 1989/90 combined)

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TABLE II

Details of surgically treated patients admitted in 1987 and 1989/90 with proximal femoral fracture

	1987	*1989/90*
Number	**79**	**186**
Mean age years (range)	82.7 (65-94)	81.9 (66-98)
Mean LOS in days (range)	41.9 (2-180)	44.6 (3-180)
Median LOS in days	31	29
Mean delay in days (range)	2.6 (1-14)	2.3 (1-17)
Median delay in days	2	1
Number (%) deaths at 1 year	27 (34%)	49 (26%)
Number (%) deaths at 2 years	32 (41%)	67 (36%)

TABLE III

Outcome with respect to time of surgery for proximal femoral fracture (1987 and 1989/90)

	Surgery			
	0-1 Days	*2 Days*	*3+ Days*	*No Surgery*
Number of patients	133	70	62	15
Mean age years	81.0	82.9	83.5	86.4
Total LOS in days (range)	34.3 (2-180)	52.5	54.2	29.7
Median LOS in days	21	35	36	13
Number (%) alive at 2 years	98 (74%)	42 (60%)	26 (42%)	4 (27%)
Hazard (CI) of death relative to surgery 0-1 days	—	1.7 (1.1-2.8)	2.7 (1.7-4.3)	6.0 (3.1-11.9)
Hazard (CI) of death relative to surgery 0-1 days adjusted for age	—	1.6 (1.0-2.7)	2.6 (1.6-4.1)	4.9 (2.5-9.8)
Hazard (CI) of death relative to surgery 0-1 days adjusted for mental score	—	1.6 (0.9-2.9)	2.7 (1.5-4.8)	1.8 (0.7-4.8)
Hazard (CI) of death relative to surgery 0-1 days adjusted for age and mental score	—	1.7 (1.0-2.9)	2.7 (1.5-4.8)	1.7 (0.6-4.6)

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TABLE IV

Comparison of surgical delay in 1987 vs 1989/90

	1987	*1989/90*
Number (%) patients with delay 0-1 days	27 (34%)	106 (57%)
Number (%) patients with delay 2 days	25 (32%)	45 (24%)
Number (%) patients with delay 3+ days	27 (34%)	35 (19%)
Total Number	79	186

shorter time to surgery with 74% survival at 2 years amongst those receiving surgery within 1 day, 60% if receiving surgery on day 2 and falling to 42% survival in those with surgery after 3 or more days. The non-operative group had a 2-year survival of 27%. The relative hazard of the group receiving surgery on day 2 in comparison to day 1 was 1.67 (95% CI 0.95 to 2.93, p = 0.07) when adjusted for the covariance of age and mental score (Table III). The relative hazard of the group receiving surgery on day 3+ in comparison to day 1 was 2.68 (95% CI 1.5 to 4.76, p = 0.0007) when adjusted for the covariance of age and mental score.

DISCUSSION

This study reveals clinically important differences in survival between the two cohorts, with 34% mortality at one year in 1987 and 26% mortality at one year in 1989/90. Although this large difference between the cohorts did not achieve statistical significance, possibly due to inadequate study numbers, the principal variable factor contributing to the differences was surgical delay. Analysis of the 2 cohorts combined revealed a significantly worse mortality with delayed surgery on day 2 in comparison to day 1. It is important to consider the possible confounding influence that surgery may be delayed for medical care to allow time to stabilise the patient before proceeding to surgery. Analysis revealed that where surgery was delayed for medical reasons (18 out of 186 surgically treated patients in 1989/90) this resulted in a delay of 72 hours or more. The comparison of patients receiving surgery within 24 hours or 24-48 hours is not thus confounded by medical conditions and fitness for surgery. The differences in survival between those receiving surgery within 24 hours compared to 24-48 hours commence early in the hospital stay, supporting the role of early surgical intervention rather than other aspects of medical care being of importance. However, association does not imply cause and effect, and other important factors related to early surgery may remain to be identified.

It has previously been reported[13] that surgery delay for 72 hours in patients with acute medical illness in addition to the fracture was accompanied by lower mortality than early surgery. A similar pattern of care occurred in this study and provided sufficient time to enable medical care to improve fitness for anaesthesia in subjects deemed initially unfit.

While some studies have not demonstrated survival benefits of early surgery[8-11] other studies demonstrate improvements in mortality,[3, 7] morbidity,[5] pressure sore rates,[4] improved chances of returning home,[2] quality of bony union[14] and reduced stay in hospital.[6] In this study the improved number of survivors in 1989/90 was not associated with poorer outcome or increased dependency, as 66% were fit to return home compared with 61% in 1987.

The extent of surgical delay in this study with 57% receiving surgery within 24 hours may be contrasted with 83%[14] in Budapest, 78% in Glasgow[15] and 55% in England.[16] The proportion of 9.7% in whom surgery was delayed due to poor initial medical condition compares with 11.8% in Peterborough[4] with similar proportions 5.4% vs 5.8% treated conservatively. While considerable scope remains for a higher proportion of medically fit subjects to receive surgery within 24 hours in Belfast, many other centres in the UK are experiencing similar or greater delays, and the opportunity for improvement is considerable.

In addition to surgical delay and medical condition of the patient, other factors including age, sex, place of domicile and pre-fracture social function[17] strongly influence outcome after hip fracture. It is thus difficult to compare directly outcome between centres if such factors are not also allowed for. The wide range of post-operative one year mortality

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rates may be demonstrated by the figures reported from Southampton of 42%,[18] Stirling of 33%,[19] 30% in Aalborg[20] and 14.8% in Ohio[3] in addition to the 26% reported in this study, and are likely to reflect in part differences in the populations presenting with hip fracture.

In conclusion this study indicates the ability to improve speed of operative fixation with attention to theatre availability and anaesthetic provision. There appear to be important benefits in terms of improved survival after hip fracture if elderly patients who are medically stable receive operative treatment within 24 hours, as recommended by the Royal College of Physicians.[21] Surgery may be delayed in 10% of cases for 72 hours or longer in acutely ill elderly patients to allow sufficient time to stabilise the patient before proceeding to surgery, and conservative management may be employed in 5-6% of cases.

Using these criteria it is likely that in excess of 80% of elderly patients presenting with hip fracture should be medically fit to benefit from planned and scheduled surgery within 24 hours of admission with resultant improvement in survival and the ability to return home. At present approximately 55% of hip fractures receive surgery within 24 hours in England.[16] There are thus considerable opportunities for improved outcome for elderly people with hip fracture with the use of such criteria in purchasing contracts for health care.

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