

## FRACTURED NECK OF FEMUR

### *Pattern of Incidence and Implications*

A. J. G. SWANSON & G. MURDOCH

Department of Orthopaedic and Traumatic Surgery, Royal Infirmary, Dundee, Scotland

Projected figures for the 1975 incidence of fracture neck of femur in Dundee are compared with the actual figures. Analysis of the incidence in 1952, 1975 and 1980, relating it to age and other factors, shows both an increase in the true incidence and a marked rise in the total number over the period. The length of stay in an Orthopaedic ward is considerably increased if the patient then has to be admitted to a long-stay bed. This length of inpatient stay and the increased incidence continues to raise the demand on acute Orthopaedic female beds.

*Key words:* femoral neck; fracture; implications; incidence

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In 1955 I. M. Stewart published his paper on the incidence and implications of fractures of the neck of the femur. Although it was “a first” and clearly of significance, as seen by being frequently quoted in later studies (Alffram 1964, Gallagher et al. 1980, Jensen 1980, Lewinnek et al. 1980, Melton et al. 1982, Stott & Gray 1980) it has a particular interest in that the expected number of cases of fractured neck of femur in females was predicted for the projected population of Dundee for 1975.

It was the original purpose of the present paper to compare the expected with the actual figures but it became clear that such a bald comparison would be quite inadequate and that the figures demanded further analysis because of their importance in a broader context at a time when an ageing population is increasing the burden on the state National Health Service facilities and its administration.

### PATIENTS AND METHODS

For the purposes of direct comparison of numbers, Stewart's method of presentation, where relevant, has been followed. This has resulted in complexities which require explanation. In the 1955 paper figures for a 12-month period in 1952–3 are utilised in the main, but there is also referral to the 2 years 1952–4 from which a similar 12-month average had been calculated. This has been taken into consideration in the present study and the figures presented are truly comparable. Further, the patients in the 1952–3 were those referred to the fracture and orthopaedic unit of Dundee Royal Infirmary, from the city of Dundee and its environs. This is unchanged. However, the main portion of that analysis, in particular the predicted figures, is derived from the female patients from the more precisely defined City of Dundee Census Area. In 1973 administrative boundaries were slightly altered as a result of the Local Government (Scotland) Act. For a true comparison therefore, it has been necessary to calculate the correct population figures for what was originally the City of Dundee (C.D.) Census Area. This has been done with the help of the Statistics Department of Tayside Health Board through the use of the post-code areas. The source for the figures themselves is the SMR1 (Scottish Morbidity Recording) which is a patient based record completed for every patient admitted to a specialty. Thus the risk of including duplicate admissions with the

same pathology but to different specialties is avoided. To re-inforce the value of these figures, the cases for Dundee and its environs (C.D.E.) all of whom were admitted to and treated in Dundee Royal Infirmary, have been subjected to the same analysis. Finally, to exclude a freak result from a single year (1975) the figures for 1980 have been studied in the same manner. As in Stewart's paper, cervical and trochanteric fractures are included in the figures but only those over the age of 50 will be considered throughout the paper in view of the fact, agreed by other authors, that although the anatomical site is the same, the causation and characteristics of the fracture in those under 50 years, are quite different.

## RESULTS

In 1975 the number of cases of fractured neck of femur admitted to Dundee Royal Infirmary from the City of Dundee and its environs (C.D.E.) was 162, of whom 131 were female and 31 male. Of these 87 females and 24 males were from the equivalent of the City of Dundee (C.D.).

In 1980 the number of cases of fractured neck of femur admitted to Dundee Royal Infirmary from C.D.E. was 218 of whom 177 were female and 41 male. Of these, 102 females and 21 males were from C.D.

Thus, female patients accounted for 80.9 per cent in 1975 and 81.2 per cent of the total admission for such fractures in 1980.

Not only is the number of female patients from C.D. (City of Dundee Census area) more than

Table 1. Pattern of incidence (female) Dundee census area/C.D.

Age	Cases 1952-3		Cases 1975		Cases 1980	
	n	per cent	n	per cent	n	per cent
50-54	1	2.1	2	2.3	1	1
55-59	4	8.3	1	1.2	2	2
60-64	3	6.3	2	2.3	8	7.8
65-69	7	14.6	8	9.2	7	6.7
70-74	11	22.9	12	13.8	12	11.8
75-79	8	16.7	14	16.1	20	19.6
80-84	10	20.8	22	25.3	30	29.4
85+	4	8.3	26	29.9	22	21.6
Total	48	100	87	100	102	100

doubled by 1980 when compared with 1952-3, but there is a very definite and statistically significant shift into the older age group ( $\chi^2 = 10.71$ ; table value  $\chi^2 = 0.05$ , 2 d.f. = 5.99) as shown in Table 1 (and confirmed in Table 3). In 1975, 71.3 per cent, and in 1980, 70.6 per cent of these patients were in the 75 years and over age group, compared with the 45.8 per cent of these patients in 1952-3. This increase in the number of older women who sustained a fractured neck of femur is indicated by their average age - 79 years in 1975 and 78 years in 1980, whereas in 1952-3 the average age was 75 years.

Table 2 is a comparison in detail of the expected numbers for 1975 and the actual numbers

Table 2. Fractured neck of femur incidence in population at risk in the City of Dundee/C.D. (female)

Age	1952-3 (av)		Projected 1975		1975		1980	
	Dundee popul. at risk	Actual Cases	Project. popul. at risk	Expect. Cases	Actual popul. at risk	Actual Cases	Actual popul. at risk	Actual Cases
50-54	6393	1	6500	1	5789	2	5314	1
55-59	5494	2	5400	2	4996	1	5608	2
60-64	4864	3	5700	4	5524	2	4678	8
65-69	4191	5	5400	6	5334	8	4968	7
70-74	3327	12	4500	16	4535	12	4618	12
75-79	2416	9	3400	13	3298	14	3555	20
80-84	1136	9	2000	16	1895	22	2209	30
85+	513	7	1000	14	1175	26	1357	22
	28 334	48	33 900	72	32 546	87	32 307	102

Table 3. Incidence per thousand of population at risk (females)

Age	1952-3 (CD)	1975 (CD)	1980 (CD)	1975 (CDE)	1980 (CDE)
50-54	0.16	0.35	0.18	0.55	0.13
55-59	0.36	0.20	0.36	0.12	0.75
60-64	0.62	0.36	1.71	0.64	1.34
65-69	1.19	1.49	1.41	1.68	1.56
70-74	3.61	2.65	2.60	2.54	3.64
75-79	3.73	4.24	5.63	3.65	8.45
80-84	7.92	11.61	13.58	10.70	21.42
85+	13.64	22.13	16.21	19.12	22.53
Overall	1.69	2.67	3.16	2.84	3.88

with the corresponding figures for 1952-3 and 1980. Instead of the expected 50 per cent rise by 1975 there was in fact a rise in numbers of 81.2

per cent - this trend continuing to rise to an increase of 112.5 per cent by 1980.

It should be noted that although the population overall has increased by 14 per cent there has been, in the over 85 year old population, a dramatic increase of 119 per cent in 1975 and 164 per cent in 1980. The incidence per thousand in the population at risk in 5-year age bands is presented in Table 3 in which the figures for Dundee and its environs (C.D.E.) are also portrayed for comparison. (Figure 1 is the conventional graphical representation of the annual fracture rate per 100,000 of the population at risk.)

In both 1975 and 1980 there were noted swings in the number of admissions from month to month with no seasonal pattern emerging other than January having the highest number of admissions in both years.

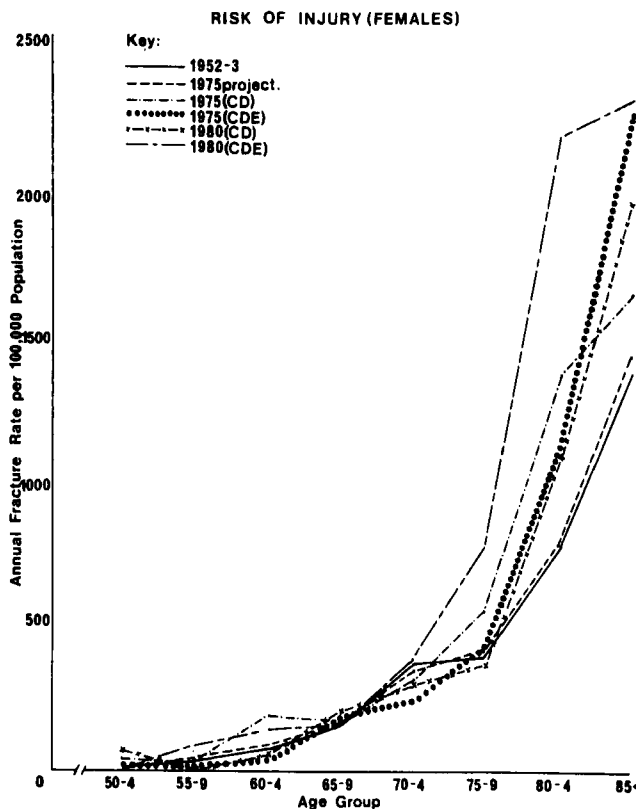


Figure 1. Risk of injury (females).

## ANALYSIS OF RESULTS

Although the number of cases of fractured neck of femur has risen very considerably, proportionally they remain at about one fifth of all trauma admissions. However, whereas the bed occupancy of the fractured neck of femur group as a percentage of the total trauma bed occupancy for females in 1952–3 was approximately the same as its percentage of trauma admissions (20 per cent), the comparable bed occupancy percentage for that group in 1975 and 1980 was double at 42 per cent and 44 per cent. This is clearly a disproportionate drain on resources on a grand scale and thus requires further analysis.

In Table 4 it may be seen firstly that the average length of stay for female patients is in the region of 44 days and that the male bed occupancy average is only slightly more than half that, at 25 days. Secondly, it is not, in the female group, increasing age alone which delays discharge, for the long-term bed occupancy commences in the 65–69 age-group. Thirdly, the figures, although representative of a standard hospital drawing from a population of about a quarter of a million, are small enough to be affected by grossly extreme numbers. This can be illustrated by the 13 female patients in the 65–69 age group in 1980 who had an average inpatient stay of 90 days. In fact one patient was in the ward for

780 days and if she was excluded from the figures the remaining 12 patients would have a much more respectable 32.5 day average. Similarly, one patient in the 80–84 age group by staying in the ward for 603 days raised the average from 39.8 to 50.8 days. Indeed, excluding these two patients would bring the overall average for 1980 down from 44.2 days to 36.4. It must be emphasized, however, that although the statistical pattern may be distorted by these exceptional cases the effective use of the available beds is nonetheless diminished and the total and average bed days quoted are a true representation of the facts.

Indeed the problem of the long term patient is not limited to freak extremes – almost a third of the patients take longer than 6 weeks to be discharged while 10 per cent are in the Orthopaedic trauma wards for over 3 months.

Because there are more females in the older age groups, evidenced in other papers as well as in this study, it is often assumed that the long stay patients are derived mainly from the older group simply as a result of the increasing number of problems which arise with geriatric patients. However, we found that of those patients staying in our wards more than 42 days, those over 80 years of age stayed an average of 108 days while those under 80 stayed an average of 101 days.

Whereas in 1952–4 operation was performed on 78 per cent of the total patients admitted, in

Table 4. Length of stay of all fractured neck of femur patients admitted to Dundee Royal Infirmary

	1952–3		1975		1980		Average bed days /patient		
	Average bed days /patient	Total bed days	Male	Female	Male	Female	Male	Female	
50–54	N.A.	84	54	42	13.5	139	24	34.8	24.0
55–59		124	10	62	10.0	45	59	11.3	11.8
60–64		23	90	11.5	22.5	65	243	16.3	22.1
65–69		9	351	4.5	29.3	52	1170	52.0	90.0
70–74		107	774	21.4	45.5	131	1122	32.8	48.8
75–79		265	694	26.5	38.6	182	1197	22.8	34.2
80–84		110	1553	18.3	45.7	226	2593	28.3	50.8
85+		22	2290	11.0	55.9	215	1416	26.9	37.3
Total	46	744	4816	24.0	44.4	1055	7824	25.7	44.2

both 1975 and 1980, 88 per cent were operated on. The 12 per cent in 1975 and 1980 who for a variety of reasons were not operated on, stayed in the Orthopaedic trauma wards an average of 27.6 days in 1975 and 26.1 days in 1980, that is, this group did not raise the average "long" inpatient stay by their not being operated on.

Over 90 per cent of the patients who did have an operation, did so within 48 hours. The 10 per cent who had their operation 48 hours or longer after admission did not have a significantly increased length of stay in our wards when compared with those operated on without delay.

In 1952-4 Stewart, without going into details, quoted four out of his total of 190 C.D.E. cases as being admitted from "institutions" - a percentage of 2.1. In 1975 at least 28 of 162 cases (17.2 per cent) were admitted after an accident in a hospital or institution, and in 1980 at least 42 of 218 cases (19.3 per cent) came directly from a hospital or institution.

Second in importance perhaps only to the increasing numbers of cases of fractured neck of femur are the figures for patient placement on discharge (male and female, but excluding inpatient deaths). In 1952-54, 80.7 per cent (92 out of 114 patients) returned home with "considerable help forthcoming from relatives, friends and general practitioners". In 1975 (Table 5) an almost identical number of patients (91) returned home but in view of the increased total numbers this was a considerably reduced ratio at 65.5 per cent. Conversely the percentage of patients which required to be admitted to geriatric and other wards rose from 19.3 per cent to 34.5 per cent in the same period. It should be noted that the approximately 10 per cent worsening of this situation by 1980 (Table 5) in practical terms means the requirement of the provision of virtually two extra wards for long term inpatients.

In 1975 out of 162 patients there was an overall mortality, in our wards, of 14.2 per cent made up of nine of 31 (29 per cent) male and 14 of 131 (10.7 per cent) female, whereas in 1980 there were three of 41 (7.3 per cent) male and 23 of 177 (13 per cent) female, an overall mortality of 11.9 per cent.

Table 5. Patients discharged to home or other hospital

	1952-4 (CDE)		1975 (CDE)		1980 (CDE)		Total	
	Male n	Female Per cent	Male n	Female Per cent	Male n	Female Per cent	n	Per cent
Home	N.A.	N.A.	16	72.7	75	64.1	91	65.5
Other	N.A.	N.A.	6	27.3	42	35.9	48	34.5
Hosp.			22	100	117	100	139	100
							38	100
							106	55.2
							86	44.8
							192	100

Excludes I.P. deaths and those where placement was not recorded.  
1952-4 numbers are 2-year totals.

## DISCUSSION

The original aim of this study was to compare the projected with the actual figures for fractured neck of femur in females over 50 for 1975. It is clear that there has been a great increase in the numbers of fractured neck of femur since 1952–3. It is also clear that in spite of foreseeing what he called the “inevitable increase in incidence”, Stewart did not in fact anticipate its true extent. His projection for 1975 was of an increase of 50 per cent in the numbers assuming an unchanged true incidence but for an estimated increasing population at risk. Assuming this unchanged true incidence for the actual population at risk in 1975, which was 5 per cent lower than estimated, the total numbers would have been the same as those projected, although distributed differently throughout the age-groups. In fact, the number of patients for that population was 30 per cent greater than estimated. This then is a genuine increase in incidence and is not simply an increase in the number of cases as suggested by the Mayo Clinic (Melton et al. 1982). Indeed there appears to be a divarication between the results of other recent European authors (Gallanaugh 1976, Jensen 1980), and those published by Gallagher (1980) and Lewinnek et al. (1980) and Melton (1982) of the United States of America. In 21 years there was an 81 per cent increase in the numbers of fractured neck of femur – a rate of 3.8 per cent per year, but in 26 years there was an increase of 112.5 per cent – a rate of 4.3 per cent per year. This would appear to contradict the contention of Nilsson & Obrant, (1978), and of Waris et al. (1979) that the incidence is levelling off and rather confirms Steen Jensen’s prediction (Jensen & Tøndevolve 1980) that the number of fractures of the neck of femur will double in 17–26 years – on our 1980 figures the doubling will occur in 23 years. A note of caution should be applied to these predictions – a significant part of the rise in numbers of fractured necks of femur in females is related to the rise in the population of the older age groups especially those over 85 years as confirmed by the larger numbers in our CDE group for 1980. Thus a projected doubling by the year 2003 must be linked with an assumed continuation of the pres-

ent increase in the elderly population. Nonetheless the true incidence has markedly increased even for the population at risk, as re-inforced by the figures of Lewis (1981).

Although our figures do not precisely follow the doubling of incidence for each 5-year increment of age after the fifth decade (Bauer 1960, Gallanaugh et al. 1976, Jensen & Tøndevolve 1980), there is no doubt about the exponential rise with advancing years, giving a rate of 22.5 per thousand population at risk for the over 85’s.

The effect of this high overall incidence of 3.9 per thousand is compounded, at least in Dundee, by the high bed occupancy of this patient group. Whereas other recent authors quote an average bed occupancy in the region of 22 days for female patients (Stott & Gray 1980, Jensen & Tøndevolve 1980), and for both sexes, 24 days (National U.S. Center for Health Statistics, 1978), our average female bed occupancy is of the order of 44 days, still higher than the average for female patients in England and Wales of 39 days (Lewis 1981). Direct comparison with other centres is invidious as many factors pertaining to inpatient stay, such as social structure and availability of convalescent, long term stay geriatric beds (Stott & Gray 1980), are external to the orthopaedic unit. Nonetheless some factors must be considered. Our figures show the average age to be rising (cf. 73 years: Allfram 1964; 78 years: Jensen 1980) and common sense dictates that the older the patient, the more likely there is to be a debilitating condition delaying discharge. While this must be granted, closer inspection of our figures of those patients who raised the average inpatient stay, shows only a slight preponderance of the over 80 year olds.

We studied other factors which may be thought to influence the delay in discharge such as the cause of injury, conservative management and length of time prior to operation, but they do not in themselves prolong stay in our wards. We cannot therefore decrease the average length of stay by any attempt to increase the number of patients operated on or by operating earlier.

Our “in ward” mortality (11.9 per cent) is of little value for statistical analysis as it is not over a defined period, but is relatively low and slightly less than the expected percentage of 14.1 at 42

days post-operatively, quoted by Gordon (1972).

By improving our overall care of the patient we ourselves are compounding our problem, for the "extra survivors" of course continue to occupy beds both in acute orthopaedic wards and in long stay beds in the geriatric wards and thus diminish the flow from the former to the latter. Further the female to male ratio is 4 to 1 making an uneven demand on available beds (cf. 70.2 per cent female patients (Waris et al. 1979), 73.7 per cent (Stewart 1955), 76.7 per cent (Jensen 1980), 77.6 per cent (Stott & Gray 1980), 79 per cent (Gallagher et al. 1980), and 85 per cent (Fitzgerald 1965)).

The figures relating to the placement of the patients on discharge from the orthopaedic trauma wards are perhaps the most revealing. It is quite plain that many more patients are having to be admitted to long stay beds (geriatric, psycho-geriatric and to a lesser extent nursing home beds) than 25 years ago. This is perhaps a reflection on our society but in Dundee at least, it is clearly the cause of our specific problem of prolonged bed occupancy in our acute trauma wards. The average inpatient stay for those whose eventual placement is a long-stay bed, is 67.4 days whereas the average inpatient stay of those who eventually go home is 29.3 days. Our treatment of these patients is the same; the average 6-week delay in transfer out of our wards of the first group is due to the lack of available long-stay beds. This not only means the blocking of "acute beds" by long term patients and the "boarding out" which affects other specialties as well as the patient herself but means also increased visits by consulting physicians in geriatric, psychiatric and general medicine to the trauma wards. More subtly it emphasizes the temptation to create beds and "improve cost-effectiveness" by sending those patients with other complaints home earlier than might properly be expected. It is clear that our efficiency must improve to cope with the increasing numbers of patients presenting to our wards and yet it is apparent that this cannot be done simply by improving surgical techniques. Better rehabilitation, perhaps by predicting (Ceder et al. 1980) which patients will respond to intensive medico-social back-up, would seem to be the most pragmatic approach for a real im-

provement in the management of the fractured neck of femur. We are now paying the penalty for not heeding or circumventing in practical terms the warnings of Alffram "whereas much can be done to shorten the primary hospital stay, little can be done to shorten the entire period of institutional care needed"; and Stewart's poignantly underestimated "inevitable increase in incidence of these fractures".

## CONCLUSION

Considering the proportion of time and effort spent on fractured neck of femur in females, a regular analysis of incidence would be of value. In view of the presently still increasing burden of fractured neck of femur in the elderly female we must quickly establish a change of attitude to the emphasis placed on the case of the long stay patient, not merely for their benefit but simply to maintain the ability to offer a bed and fair service to the other 80 per cent of female trauma patients.

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Correspondence to: Mr A. J. G. Swanson, FRCS, Senior Lecturer,  
Department of Orthopaedic and Traumatic Surgery, Royal Infirmary, Dundee, Scotland.