Use of standardised assessment scales in elderly hip fracture patients

ABSTRACT—Standardised scales recommended by a joint working party from the Royal College of Physicians (RCP) and The British Geriatrics Society (BGS) in 1992 for the assessment of elderly hospitalised patients were employed in an elderly hip fracture population to investigate their feasibility and usefulness in this group. Patients were assessed at the time of their fracture and one, six and 12 months later. An informant was invited to provide information on behalf of patients (39%) who were classified as having significant memory and cognitive impairment (Abbreviated Mental Test score < 7) or if they had some other communication difficulty. Patients and informants found the format and content of the scales acceptable as well as the administration time of around one hour. Difficulties with the depression (Geriatric Depression Scale) and quality of life (Philadelphia Geriatric Center Morale Scale) scales were due to some patients' digressions, and the fact that little change was noted in the scores over the one-year period of follow-up questions their sensitivity. In the cohort of survivors 31% were classified as being depressed at baseline (score > 5) and this rose to 36% at one year. Ten per cent of the surviving patients were classed as dependent by the Barthel Index at the time of their fracture (score < 12) and this increased to 24% at one year. Despite exhibiting a ceiling effect, this scale was the most responsive of the scales at all time points. The social checklist highlighted important aspects for the management of hip fracture patients.

The elderly are increasingly important consumers of health care [1]. It is therefore necessary to make the most efficient use of available resources [2]. This, coupled with the need to provide the best health care at an individual level, has given impetus to assessing health and health care in a more systematic and comprehensive manner. The Royal College of Physicians (RCP) and the British Geriatrics Society (BGS) responded to this need by producing a set of standardised assessment scales which covered six key domains for assessing the elderly: communication, visual and hearing ability; memory and cognitive function; depression; quality of life; primary activities of daily living; and social status [3]. Clinical care, screening, outcome assessment, casemix adjustment, clinical audit, planning and support services were all identified as areas where the assessments would potentially be of benefit.

Hip fractures in the elderly cause much morbidity, and the mortality is high [4–14]. A report from the Royal College of Physicians highlighted the need to improve their management [15].

The purpose of this paper is to report the use of standardised assessment scales in a series of patients with presumed osteoporotic hip fracture at the time of their fracture and during their rehabilitation. It is the first major study to utilise the recommendations from the joint working party of the RCP and BGS to assess an elderly population as well as to monitor the changes following a major medical event.

Material and methods

Subjects and data collection

All patients aged 60 years or more admitted to hospital between 1 November 1991 and 31 May 1992 with a fresh hip fracture of presumed osteoporotic cause who were resident in the city of Edinburgh were eligible for the study. Patients were excluded if:

1. the fracture was pathological;
2. the fracture was sustained as a result of a high velocity road traffic accident;
3. there was a concurrent medical condition which would have interfered with the assessment of the impact of the hip fracture, such as sustaining a stroke at the time of the fracture;
4. the patient was obviously moribund at the time of admission or died within seven days of admission.

Data were collected by one trained researcher (SMS) in a series of four interviews. The first interview, to collect information about the pre-fracture status of the patient, was conducted three to four days postoperatively; further information was collected at one, six and 12 months after the fracture. For patients who were cognitively impaired, as gauged by an Abbreviated Mental Test (AMT) score [16] of less than seven, and/or lived in a nursing home or long stay hospital, or who had significant difficulties with communication, such as dysphasia, an informant (proxy) was asked to provide information on their behalf. The mental health of patients requiring proxies was not assessed. A nested patient/proxy validation study was undertaken in the last month of recruitment to check the comparability of the information from cognitively

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unimpaired patients and informants. All such patients and their corresponding proxy were enrolled in the validation study. Data collection was identical to that undertaken in the main study except that no mental health questions were asked of the proxies.

Consent to participate in the study was obtained from patients who were not cognitively impaired, or from informants and the patient's general practitioner. Ethical approval for the study was granted by the local ethics committee.

Case ascertainment was verified through the hospital information systems for the city of Edinburgh. An *ad hoc* listing from the Information and Statistics Division of the Scottish Health Service was also obtained for all emergency hospital admissions for patients with an ICD code of 820 during the recruitment period.

Measurements

The data recommended by the joint working party for routine collection in elderly patients formed the basis for the measurements in the current study (Table 1). Four questions from the Lambeth Disability Screening Questionnaire [17] were selected to screen for visual, hearing and communication disability; the AMT was used to assess memory and cognitive function; the shortened form of the Geriatric Depression Scale (GDS) [18] was used to screen for depression; quality of life was assessed with the 17 question anglicised version of the Philadelphia Geriatric Center Morale Scale (PGCMS) [19]. The 10 questions of the Barthel Index [20] covered walking, transferring, maintaining continence, dressing, feeding and bathing, which are the basic activities of daily living (ADL). The checklist of the major social indicators compiled by the joint working party covered four main areas: (1) personal factors, such as with whom the elderly persons lived, and whether their companions helped them, what visitors they had and the type of accommodation; (2) difficulties the elderly may have had in looking after themselves or their house or moving around both inside and outside, whether they had enough help or any special aids or adaptations in their home; (3) whether the elderly person had any help and whether the main helper was coping and had enough support; (4) advice on issues such as equipment or finance.

Visual disturbances are particularly important in a hip fracture population due to their causal role in falls [21,22]; as a result of this, more detailed questions covering sensory disabilities were asked in the current study than those in the Lambeth Disability Screening Questionnaire. In addition, the Katz Scale [23] was used in the present study to compare its utility with the Barthel Index in assessing the impact on the ADLs of a hip fracture patient. The Clackmannan Scale [24] was included to help overcome the ceiling effect known to limit the Barthel Index. This scale deals with the ability to perform household tasks, the instrumental ADL, thereby assessing a higher level of functioning than the Barthel Index. To gauge hip function the Harris Scale [25] was employed. The results from these additional scales will be reported elsewhere. In the present study no data were collected on depression or quality of life from patients who required an informant, as the validity of such data in patients with severe dementia is questionable [26].

The primary purpose of this report is to present the data recommended by the joint working party for

Table 1. Health assessment scales

Subject area	RCP and BGS recommendation	Edinburgh Hip Fracture Study[a]
Communication, hearing and visual disability	Lambeth Disability Screening Questionnaire	Specific questions
Memory and cognitive function	Abbreviated Mental Test	Abbreviated Mental Test
Depression	Geriatric Depression Scale	Geriatric Depression Scale
Quality of life	Philadelphia Geriatric Center Morale Scale	Philadelphia Geriatric Center Morale Scale
Primary activities of daily living	Barthel Index	Barthel Index, Katz Scale, Clackmannan Scale, Harris Scale
Instrumental activities of daily living	—	Clackmannan Scale
Social status	Short checklist Detailed review where needed	Specific questions covering checklist
Patient satisfaction	—	Patient Judgements of Hospital Quality Questionnaire[b]
Hip function	—	Harris Scale[c]

a All instruments used at baseline, one, six and 12 months unless otherwise specified
b One and two month interviews only
c Six and 12 month interviews only

routine collection in the elderly hospitalised patient. Due to the extensive nature of the social checklist only selected variables are given. A limited number of additional variables not covered by the recommendations are also presented to provide a broader picture of the hip fracture population. The secular changes during the period of follow-up are limited to the cohort of survivors in order to remove the distorting effects of the frailer individuals dying. Significance testing is carried out using non-parametric methods. Means and standard deviations (SD) are however reported when summarising the distribution of variables because the mean is more sensitive to small changes than the median. Standardised response means and effect sizes are reported to indicate the responsiveness of the scales [27–29]. Qualitative variables in the validation study are summarised using Cohen's kappa statistic, and quantitative variables with Pearson's correlation coefficient. Systematic differences between patients and proxies are investigated using the Wilcoxon Signed Rank test and the paired t-test as appropriate.

Results

Over the recruitment period, 337 patients from the defined population sustained a hip fracture. Three patients were treated in hospitals outside the catchment area. Fifty-nine patients were ineligible for the 66 reasons shown in Table 2. Of the remaining 275 eligible patients, one blind patient refused to participate, two were excluded incorrectly on the basis of their place of residence, and a further two patients were only identified retrospectively from the hospital administration system. Of the 270 (98%) eligible patients who were recruited 104 (39%) required an informant and almost all (97%) of that group suffered from Alzheimer's disease. One patient refused follow-up at one year post-fracture and five patients had to be followed up by postal questionnaire as they had moved away from the study area. Four patients were excluded because of a severe medical event during the course of their follow-up which interfered with the assessment of their hip fracture.

The patient interviews took approximately one hour to complete. The GDS and the PGCMS, however, took longer than expected as many of the elderly, particularly the very elderly, tended to digress and did not adhere to the yes/no format required. Overall, the interviews were well tolerated by both patients and informants and data collection was over 99% complete. The AMT was difficult to use in patients with severe Alzheimer's disease due either to a lack of cooperation or a marked speech impairment. Some of the cognitively intact patients found the questions too basic.

The demographic, mental and physical health profile of the 28 patients in the nested proxy/patient validation study was very similar to that of the whole study population. Informant-derived data were broadly comparable to those provided by the patient in the validation study, the only exception being dependency; patients systematically over-reported their independence relative to their informant. The mean Barthel Index score reported by the patients was 4.8 points (SD 2.3) higher than that reported by their proxies ($p = 0.0001$). All the qualitative variables except for 'who the patient visited prior to fracture' yielded 'fair to good' or 'excellent' agreement between patients and proxies according to the criteria of Sheikh [30] for the interpretation of Cohen's kappa statistic. The median value observed was 0.57. Strong associations were noted for the majority of the ordered categorical and continuous variables, the more objective variables such as the type of walking aid used by the patient attaining the highest correlations. The median correlation coefficient was 0.74.

Table 2. Reasons for study ineligibility

Exclusion category	Number
Age less than 60 years	*17*
Major trauma	*7*
Road traffic accident	4
Football injury	1
Epileptic fit	2
Pathological fracture	*11*
Metastatic deposit	6
Previous deep X-ray therapy for malignancy	1
Previous hip arthrodesis	2
Cerebral palsy	1
Polio	1
Old fracture	*2*
Patient moribund	*20*
Medical condition which interfered with the assessment of the hip fracture	*9*
Recent fractured humerus	1
Severe episode of Crohn's disease	1
Profound depression requiring electroconvulsive therapy	1
Severe Parkinson's disease	1
Extension of a cerebrovascular accident	1
Subarachnoid haemorrhage	1
Profound deafness and no next of kin	1
Spiral fracture of femur	2

Demographic data

The average age of the study population was 81 years (SD 8) and there was a 4:1 female predominance; 21% were single and 53% were widowed.

The cumulative mortality at one, six and 12 months after the fracture was 19 (7%), 53 (20%) and 77 (29%) respectively. The mean age of the survivor cohort was 4 years younger than that of the 77 patients who died ($p = 0.0003$, t-test).

General health

Self-reported or informant-reported general health was 'very good' for 30% of the patients and 'poor' or 'very poor' for 18%; 5% were registered blind or had no useful vision, a further 5% could not watch television and another 10% could not read newspapers even with glasses on; 3% could only hear shouted conversation even with the assistance of a hearing aid and a further 17% could only hear loud conversation; 7% had at least some difficulty with speech, of whom half had severe difficulty; 13% had sustained a previous hip fracture. There was little change in the general health of those who survived to one year. The percentage who reported their general health as 'very good' fell slightly from 36% to 31%, but so did those who were 'poor' or 'very poor' (15% to 12%).

Mental health

The frequency distributions of the baseline (first assessment) scores for the scales covering mental health are presented in Fig 1. Patients who died had a significantly lower mean AMT score at the time of their fracture than patients who survived (5.6 (SD 3.7) vs 7.3 (SD 3.2) $p = 0.0003$, Wilcoxon Rank Sum (WRS) test), but there were no statistically significant differences between survivors and non-survivors with respect to the depression scores ($p = 0.41$, WRS test) or quality of life scores ($p = 0.51$, WRS test). The secular changes in the mental health scale scores are given in Table 3. There were minor increases in the AMT score and the GDS score, and a small reduction in the PGCMS score. Using the recommended cut-off point of a score of more than five on the GDS to indicate depression, 31% of the survivor cohort were classified as being depressed at the first assessment and this rose slightly to 36% one year later. The standardised response means ranged from 0.12 to 0.30 with corresponding effect sizes in the range 0.07 to 0.25 (Table 3).

Dependency

Before the fracture 28% of the patients could 'manage on a daily basis with no difficulty' whilst 26% had 'great difficulty' or 'did not manage'. The ceiling effect of the Barthel Index is evident in Fig 2, only 13% of the frail population being categorised as dependent (score < 12). Patients who later died were, on average, more dependent at the initial assessment (mean Barthel Index score 15.0 (SD 4.9)) than the survivors (17.4 (SD 3.7), $p < 0.001$, WRS test). During the year of follow-up the study population became more dependent: 32% of the survivors could 'manage on a daily basis with no difficulty' prior to their fracture but this halved over the year of follow-up. Over the same time period the proportion of survivors who were classed as dependent by the Barthel Index rose from 10% at initial assessment to 24%. The mean Barthel score was lowest one month after the fracture (Table 3). The score improved over the next five months but remained significantly below the pre-fracture level. A slight increase in dependency was observed over the final six months

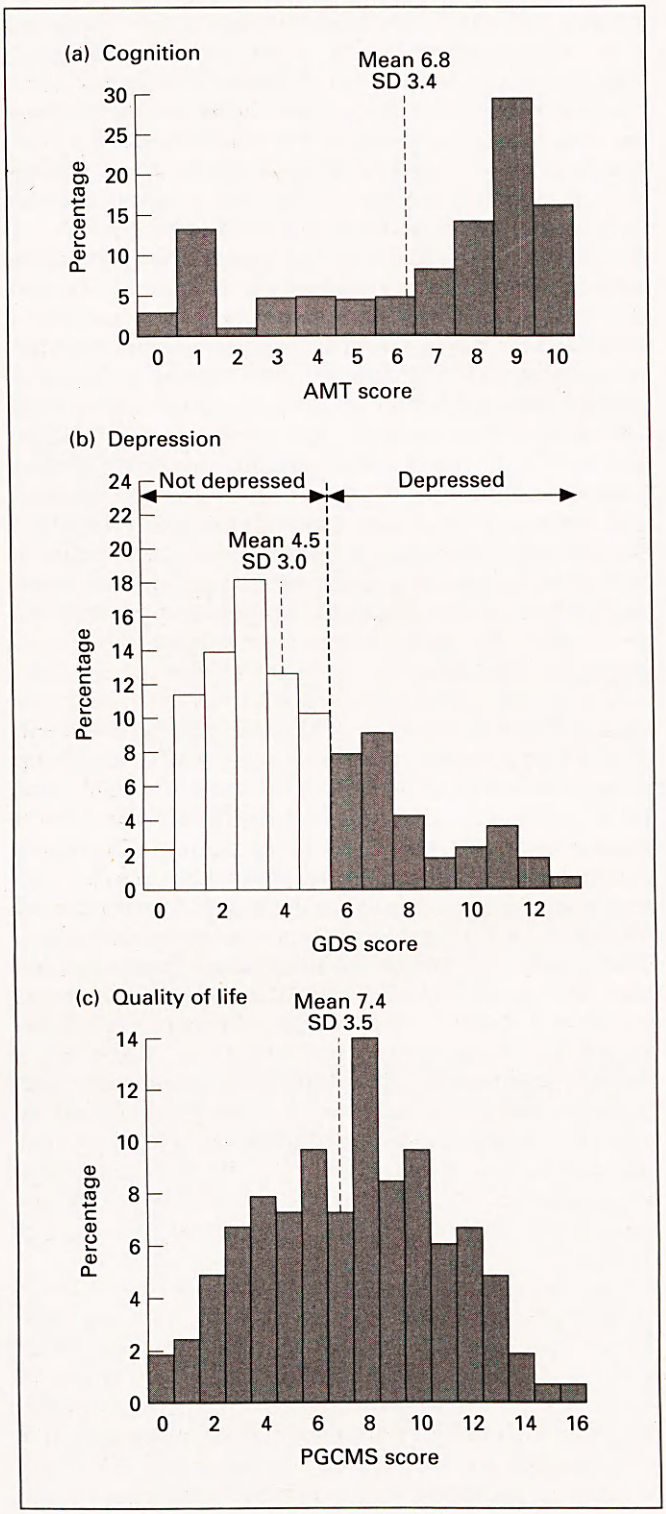

Fig 1. Baseline mental health scale scores

Table 3. Secular changes in continuous variables for whole study population for survivors to one year after fracture

Scale scores	Research instrument (possible score range: impaired to healthy)			
	Abbreviated Mental Test $n = 187$ (0 to 10)	Geriatric Depression Scale $n = 123$ (15 to 0)	Philadelphia Geriatric Center Morale Scale $n = 123$ (17 to 0)	Barthel Index $n = 187$ (0 to 20)
Baseline interviews: mean (SD)	7.2 (3.3)	4.4 (3.0)	7.3 (3.6)	17.3 (3.8)
Change in scores from baseline interview at:				
One month				
Score change: mean (SD)	—	0.7 (2.5)**	–0.5 (3.1)	–2.7 (3.5)***
Standardised response mean	—	0.30	0.17	0.79
Effect size	—	0.25	0.15	0.73
Six months				
Score change: mean (SD)	0.5 (1.8)***	0.4(2.4)	–0.7(3.3)*	–1.6 (3.0)***
Standardised response mean	0.27	0.16	0.22	0.56
Effect size	0.15	0.13	0.21	0.44
Twelve months				
Score change: mean (SD)	0.2 (1.8)	0.6 (2.7)*	–0.6 (3.5)	–2.3 (3.8)***
Standardised response mean	0.12	0.23	0.16	0.62
Effect size	0.067	0.21	0.16	0.62

*$p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

of follow-up. At the various time points the standardised response means for the Barthel Index ranged from 0.56 to 0.79, with corresponding effect sizes of 0.44 to 0.73 (Table 3).

Social indicators

Table 4 summarises selected social status indicators from the joint working party checklist. The already high level of social dependence in the study population prior to their fracture became even more marked during follow-up. The ability to walk unaided and to perform self-care activities without difficulty were the variables showing the greatest deterioration. Despite the worsening of the survivors' social indicators the number of people who required home helps declined from 77 at the time of the fracture to 52 one year later, whilst the number of people in instititional care remained the same at 54.

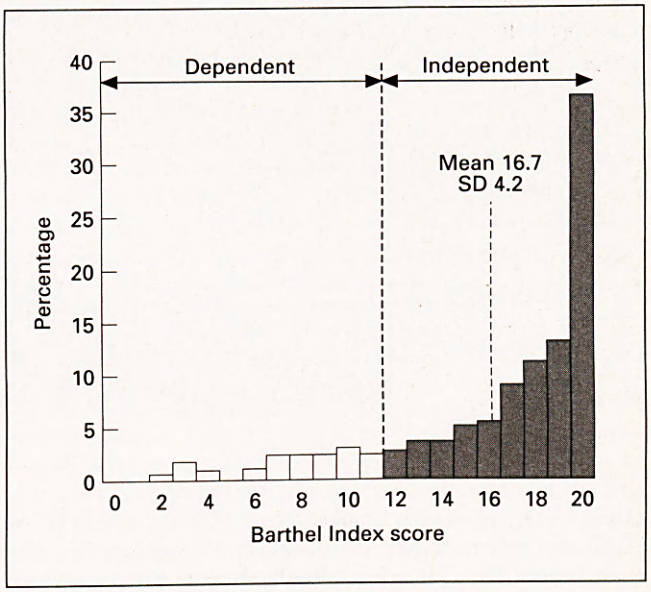

Fig 2. Baseline dependency scale scores

Discussion

In the present study the mortality of an elderly and frail hip fracture population was just over two and a half times that expected for an age- and sex-standardised population with most of the excess occurring in the first two months, as has been reported elsewhere [10,31–34]. This indicates that the physiological age of the hip fracture patients exceeded their chronological age. We have obtained data on their baseline characteristics and of the survivors' subsequent rehabilitation, using recommended assessment scales for the elderly.

These scales were straightforward to use and generally acceptable in their format, content and timing to both patients and proxies. While fairly comprehensive, the scales do not include an assessment of general health status and it was necessary to include two

Table 4. Secular changes in social indicators

Social variable	Interview		
	Baseline		12 months
	Whole study population (%)	Survivor cohort (%)	
Accommodation			
Own home	58	65	49
Home of relative or friend	7	8	5
Sheltered housing	6	5	5
Residential care	9	7	12
Institution	20	16	29
Lived on own	37	38	26
Visitors less than once a week	27	28	26
Visited others[a]	37	42	26
Able to walk unaided inside	56	63	32
Able to walk unaided outside	32	38	9
Required a wheelchair outside	21	16	12
Main helper			
Co-resident	28	32	27
Non-resident friend or relative	26	28	10
Home help/private help	16	18	21
Warden	1	0	0
Residential staff	9	8	12
Nurse	20	16	29
Difficulty in at least one self-care activity	60	27	71
Difficulty in at least one household activity[b]	87	85	96
Health and social service use[c]			
Home helps	50	40	47
District nurse	15	13	17
Meals on wheels	5	3	7
Day centre	9	10	11
Chiropodist	51	56	41
General practitioner	60	62	51

a Patients in own home, home of a relative or friend, or sheltered housing
Baseline for whole study $n = 216$. Survivor cohort $n = 158$

b Patients not in institutional care. Baseline for whole study $n = 192$. Survivor cohort $n = 109$

c Baseline information for three month period prior to fracture, 12 month information for one month prior to interview

additional scales, the Clackmannan Scale and the Harris Scale, to investigate the impact of the hip fracture itself more fully. It seems likely that in most areas of application additional scales will be needed to supplement the recommendations.

In order to recruit a representative group of patients with hip fracture we had to ask a proxy to provide information on behalf of patients with communication difficulties. It was then necessary to establish that the information from both sources was comparable. This was confirmed in the proxy/patient validation study. The more private behaviour showed poorer agreement than the more readily observable variables and this has been noted elsewhere [35]. The only bias detected was an over-reporting by the patients of functional ability, as gauged by the Barthel Index. This has been reported elsewhere [35–40]. Two of the published studies incorporated direct observation of the patient into their protocol and established that the patient's self-report is the more accurate [36,38].

We documented a substantial sensory impairment in this population and a high prevalence of visual disability has been reported in other hip fracture populations ranging from 9% in an unselected series of patients [6] to 28% in patients who fell in institutional care [41]. We therefore advocate the need to screen elderly people for potentially correctable visual defects.

We took an AMT score of six or less to be indicative of cognitive impairment rather than the recommended score of seven in order to avoid misclassification arising from mild peri-operative confusion. This precaution was taken because acute confusional states following a hip fracture may be as high as 61% [42]. In the present study, when an acute reversible cause of confusion was identified and the patient had no past history of mental clouding, the baseline interview was postponed until it had resolved. Even with this more conservative cut-off point, just over one in three patients was classified as having significant cognitive impairment. Differences in patient selection, case-finding intensity and the diagnostic criteria employed make literature comparisons of the prevalence of dementia in hip fracture patients difficult [6,43–45]. Effect sizes of less than 0.20 were observed for the AMT and changes of this magnitude have been described as indicating no clinically relevant effect [46]. This is consistent with the clinical expectation that there would be little change in memory and cognitive functioning over one year.

Although sustaining a hip fracture is a major medical event with a profound impact on patients' lives, coupled with an often extensive period of rehabilitation, we found surprisingly little change in mental health, as gauged by the GDS and the PGCMS. The effect sizes for the GDS and the PGCMS were less than 0.30, and effect sizes of less than 0.50 are considered small [46]. One might expect that a major life event causing deterioration in physical functioning would lower morale. The failure of the GDS and the PGCMS to detect a change in the patients' mood could be due to an absence of such a change in mood or to insensitivity of the scales. Another reason may be that the baseline interviews were conducted several days after the definitive management of the hip fracture and this may have affected the responses, even though patients were asked to provide data on their pre-fracture state. The use of these scales for hip fracture patients is therefore still uncertain and further work is required to establish normative values. It is particularly relevant to the current study that only one question in the GDS is directly related to physical functioning. We found a baseline prevalence of depression of one in three which corresponds to that reported in other series of hip fracture patients using different research instruments for depression [9,43]. Community studies of the elderly have shown a prevalence of major depressive symptomatology of around one in four [47,48]. The slight rise in prevalence of depression in the survivors over the follow-up period may be a result of their greater dependency.

Hip fracture had a bigger impact on physical functioning than mental health. Functional impairment, as measured by the Barthel Index, was most evident at one month post-fracture, as would be anticipated. Over the next five months there was a levelling out of recovery, followed by a slight decline in function over the final six months of follow-up, which has also been reported by Jette *et al* [49]. The actual changes in scores were, however, not very large, reflecting the lack of sensitivity of the Barthel Index to other than marked disability [3]. This is also evident in our study from the greatly skewed distributions of the baseline scores.

Our study has confirmed the considerable social dependency observed in other hip fracture populations [6,13,14,23,32,50–52]. This dependency was greater than that in an unselected general geriatric population. Standardising by age and sex for the Edinburgh population one would have expected to find 21 patients in instititional care in the study population at baseline. The fact that there were 54 reflects the greater physiological age of the hip fracture patients compared with their chronological age. The increasing dependency of the survivors was clearly demonstrated by the greater proportion living in more dependent forms of accommodation. Those who remained in the community had a greater need for home helps. Paradoxically, however, the absolute number of home helps required declined, and the number of people in institutional care remained unchanged. This arose because more of those who were frail at the outset of the study died, and those moving into institutional care were commonly those who had previously required home helps.

This study has indicated that it is feasible to use the recommended scales to assess the elderly in longitudinal research studies. The scales, however, did take around one hour to administer and this could be a limiting factor in their every day use. Administration by paramedical staff would help and adapting the scales for self-administration, where possible, would also reduce the manpower requirements. The small changes in GDS and PCGMS scores in response to a major life event question their sensitivity and further work is required with these scales. In the short term a more established scale, such as the Nottingham Health Profile [53], could be used to assess quality of life. The study also indicates that there is a need for a scale which assesses a higher level of functioning than basic bodily maintenance to overcome the ceiling effect of the Barthel Index in a hip fracture population. In our hands the Clackmannan Scale proved easy to administer and was more responsive to the disability following a hip fracture than the Barthel Index, with effect sizes approximately 50% greater.

Feasibility constraints may limit the clinical use of the scales although they do encourage a more systematic assessment of patients, enable dissemination of information in a common language and have an educational role [3]. The scales may also be used to monitor and predict the clinical progress of patients. Research is, however, still required into the interpretation of the scale scores and the clinical utility of the data derived from the scales if their clinical benefit is to be more fully realised. The introduction of clinical

audit and the need for casemix adjustment will add impetus to the collection of data in a more systematic manner. However, it is likely that more readily obtainable data, such as length of hospital stay and mortality from hospital records may be adopted for audit for pragmatic reasons in preference to data derived from standardised assessment scales [54]. Scale data may nonetheless have an important role in health service planning as disability levels may be established if the scales are used for the 'over 75's checks' [3,55]. The joint working party's recommendations for standardised assessment of the elderly is an important first step in health care.

AMT = Abbreviated Mental Test
GDS = Geriatric Depression Scale
PGCMS = Philadelphia Geriatric Center Morale Scale
SD = standard deviation

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