

Measuring outcomes in care of the elderly

ABSTRACT—This observational study was designed to assess whether routine measurement of outcomes using standard instruments is possible as part of clinical routine in care of the elderly, and to establish if such instruments are responsive to clinical change. Indices of functional status, cognitive function and subjective health status were collected routinely on admission and discharge in 540 inpatients and 340 patients attending a day hospital. Data collection became integrated into clinical routine. Response rates were generally good and yielded acceptably complete data. For inpatients, outcome was reflected by measurement of survival, physical function (Barthel index) and social status, each of these indicators showing significant change between admission and discharge. For day hospital patients, neither these, nor the Nottingham ADL scale, nor a health status indicator proved sufficiently responsive to clinical change to merit recommendation as outcome indicators for routine use in older patients. In ambulatory care in older patients, such as those attending a day hospital, new approaches are needed to measure clinical outcomes.

There is currently much interest in standardised assessment and in the measurement of outcomes in geriatric medicine in the United Kingdom [1–5]. The routine use of a system for standardised assessment in geriatric medicine in the UK [4] would offer a real opportunity for measuring patient outcomes as part of routine clinical practice. By applying measures of health and functional status to patients at intervals during an episode of care, a measure of health outcome may be obtained [6].

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Standard assessment scales to measure outcomes could provide health service purchasers, providers and consumers with valuable information for policy making on the provision and quality of care to achieve the best outcomes for patients [1,7,8].

The aims of this study were to examine the practicality of identifying and collecting relevant outcomes information as part of routine clinical practice in geriatric medicine, and to explore the responsiveness of widely used standard instruments to clinical change [9] in an inpatient facility (a geriatric medicine assessment and rehabilitation unit) and an ambulatory care setting (a day hospital for the elderly).

Methods

The geriatric medicine assessment and rehabilitation unit at the Freeman Hospital, Newcastle upon Tyne, is integrated with general medicine [10]. The 30-place day hospital is situated on the main hospital site and provides access to the full range of facilities of the main hospital site.

A set of valid and reliable indicators was agreed following discussions with representatives of the various professional groups in the clinical team.

Outcome measures

For inpatients.

- *Survival.*
- *Functional status,* measured using Barthel index (BTI) [11–13,4].
- *Accommodation.* Changes in living accommodation frequently accompany episodes of inpatient care. In the absence of a standard scale for social assessment [4], a 10-point ordinal scale was constructed.
- *Subjective health status.* In the pilot phase of the study, we experienced considerable difficulty in administering health status questionnaires to patients with impaired communication and/or cognitive function. A health status measure did not enter into routine use for inpatients.
- *Carer strain.* A simple questionnaire was used [14]. It was administered by the nursing staff.
- In addition patients were characterised on admission by recording age, cognitive function using the 10-point mental test score [15] and the number of active medical problems.

For day hospital patients.

- *Survival.*
- *Functional status,* measured using the BTI. For patients with acceptable cognitive function (ie 10-

point mental score > 6) a self-administered instrumental ADL (activities of daily living) scale, the Nottingham extended ADL scale, was used [16].

- *Subjective health status.* This was measured using the first part of the Nottingham Health Profile (NHP) [17,18]. It was self-administered at the first attendance and posted to the patients for completion at discharge. Use of the instrument was restricted to patients with an abbreviated mental test score of > 6.
- Patients were further characterised on admission by recording age, assessing cognitive function using the 10-point mental test score and classifying the reason for attendance as either active intervention (patients attending for functional assessment, medical and nursing procedures and rehabilitation) or maintenance (patients attending for respite and social care and physical maintenance) [19].

Statistical methods

All data were stored on an IBM compatible micro-computer using commercially available database software (dBASE III plus, Ashton Tate). For data analysis we used a statistical software package (SPSS-PC, version 4.0.1). Non-parametric statistical methods were used for all analyses because many of the data had appreciably skewed and non-normal distributions and were represented by ordinal scales. The central tendency of such scores is most appropriately represented by the median [20], and these are quoted with the interquartile range in parentheses. Comparisons between indices over time were made using the Wilcoxon signed rank test for paired data and between-group differences using the Mann-Whitney U test. Comparisons across multiple categories were made using Kruskal-Wallis one-way analysis of variance by ranks.

Results

Inpatients

Over a period of 18 months 576 patients were admitted to the unit, 18 for terminal care and 18 for medical investigation only (eg endoscopy). Experience with routine outcomes evaluation in the major part of the unit's workload concerns the remaining 540 patients (182 men; median age 81 (75–86)).

In-hospital mortality, BTI and accommodation status were recorded in over 90% at admission and discharge. Cognitive function was recorded in 315 (58.3%) admissions. Strain on carer was not recorded reliably, and did not become a useful longitudinal measure of patient outcome.

The total BTI score improved in 68% of patients between admission and discharge, the median discharge BTI of 17 (interquartile range 9–18) being some six points higher than the median admission BTI of 11 (7–17) ($p < 0.0001$). The ceiling effect of the index was apparent. Initial scores of > 17 increased on average by only 0.2 point (95% confidence interval 0.0–0.04, $n = 120$); initial scores of less than five increased on average by 5.8 (4.2–7.3, $n = 51$).

There were strong and statistically significant links between the total BTI score on admission and mortality. The median total BTI score for those who died in hospital was 6.5 (3.5–12), and this was significantly lower ($p < 0.0001$, Mann-Whitney U) than that for survivors, 12 (8–17).

Relationships between the total BTI score and various other indicators are shown in Table 1. Kruskal-Wallis analysis of variance by ranks suggested a significant relationship between total BTI score and admission mental test score (MTS) ($p = 0.008$), patients with the lowest BTI scores tending to have the lowest MTS scores. The number of active medical problems and the strain on the caregiver were not significantly

Table 1. Inpatients: admission characteristics of patients, demonstrating relationships between the Barthel index and other instruments.

Barthel index	Admission from 'home' (%)	Mortality (%)	Age	Caregiver strain score	Admission MTS	Number of active problems
1–4	52/72 (79.2%)	21/72 (29.2%)	78 (72.5–84)	7 (5–10)	6 (3–8)	2 (2–4)
5–8	82/107 (76.6%)	21/87 (24.1%)	79.5 (74–85)	7 (4–8)	7 (5–9)	2 (1–3)
9–12	92/115 (80.0%)	15/100 (15.0%)	82 (75–87)	5 (3–8)	8 (4–9)	2 (1–3)
13–16	72/81 (88.9%)	7/75 (9.3%)	83 (77–87)	7 (4.5–9)	7 (5–9)	2 (2–3)
16–20	128/136 (94.1%)	8/128 (6.25%)	81 (77–88.5)	4.5 (1.5–8.5)	8 (6–9)	2 (1–3)
Test statistic	$\chi^2 = 24.00$	$\chi^2 = 25.92$	$T = 10.48$	$T = 6.7$	$T = 13.9$	$T = 7.8$
Degrees of freedom	4	4	4	4	4	4
<i>p</i> value	< 0.0001	< 0.0001	0.033	0.15	0.008	0.1

Table 2. Inpatients: home environment at admission, discharge and 3 months follow-up.

Home environment (10-point ladder)	Number of patients		
	Admission (<i>n</i> = 540)	Discharge* (<i>n</i> = 455)	3 months† (<i>n</i> = 319)
Home alone	98 (18.1%)	29 (6.4%)	22 (6.9%)
Home with informal carer	100 (18.5%)	75 (16.5%)	47 (14.7%)
Home with social services support	29 (5.4%)	22 (4.8%)	7 (2.2%)
Home with professional nursing care	209 (38.7%)	130 (28.6%)	65 (20.4%)
Local authority sheltered accommodation	38 (7.0%)	24 (5.3%)	10 (3.1%)
Local authority residential care	46 (8.5%)	56 (12.3%)	30 (9.4%)
Private residential care	4 (0.7%)	6 (1.3%)	12 (3.8%)
Health authority further rehabilitation	2 (0.4%)	53 (11.6%)	26 (8.2%)
Health authority nursing care	9 (1.7%)	51 (11.2%)	21 (6.6%)
Private nursing care	2 (0.4%)	4 (0.9%)	0 (0.0%)
Not contacted	3 (0.6%)	5 (1.1%)	79 (24.8%)

*Eighty five patients died between admission and discharge.

†Sixty one patients died between discharge and three months. Seventy five patients were readmitted to hospital between discharge and three months and are excluded from the analysis of three months home environment.

Table 3. Inpatients: relationship between the 10-point and 3-point accommodation ladders and functional dependence as measured using the Barthel index.

Discharge destination (10-point ladder)	<i>n</i>	Total Barthel index		Total Barthel index		Discharge destination (3-point ladder)
		Median (25–75%)	Mean rank*	Median (25–75%)	Mean rank†	
Home alone	29	19 (17–19)	318.2			
Home with informal care	75	17 (17–19)	289.1			
Home with social services support	22	17 (15–19)	274.6	17 (15–19)	266.6	'Home' (<i>n</i> = 280)
Home with professional nursing care	130	17 (12–19)	248.2			
Local authority sheltered accommodation	24	17.5 (12–19)	268.6			
Local authority residential care	56	14 (11–17)	189.0			
Private residential care	6	13.5 (9–18)	182.2	14 (11–17)	192.6	'Residential' (<i>n</i> = 62)
Health authority further rehabilitation	53	11 (8–14)	123.6			
Health authority nursing care	51	6 (3–12)	82.5	9 (6–14)	113.3	'Nursing' (<i>n</i> = 98)
Private nursing care	4	7 (5–13)	179.9			

*Kruskal-Wallis test statistic (*T*) = 37.7, 10 degrees of freedom, *p* < 0.0001.

†Kruskal-Wallis test statistic (*T*) = 127.3, 2 degrees of freedom, *p* < 0.0001.

related to BTI. Contingency table analysis suggested that the total BTI score was significantly related to survival and 3-point accommodation score. Multiple regression analysis of total BTI scores against these variables confirmed significant independent relationships between BTI and survival, 3-point accommodation score and admission MTS, but not the number of active medical problems.

The main feature of change in accommodation is a

greater degree of dependency (Table 2). Between admission and discharge 115/455 (25.8%) patients changed their accommodation and in all but one the change was from non-custodial to custodial (residential and nursing) care (*p* < 0.001, χ^2).

Comparison of the BTI scores and the 10-point accommodation ladder (Table 3) shows ordering and suggests that the scale reflects functional dependence. The abbreviated 3-point summary scale appears to

Table 4. Day hospital patients: outcome indicators for active group from admission to discharge.

Indicators	<i>n</i>	Admission Median (25–75%)	Discharge Median (25–75%)	<i>p</i> *
Admission Barthel				
≥17	153	18 (17–20)	19 (18–20)	0.353
≤16	111	12 (9–15)	13 (10–17)	< 0.001
Extended ADL				
Mobility	86	0 (0–3)	0 (0–3)	0.657
Kitchen	66	5 (3–5)	4 (4–5)	0.578
Domestic	66	2 (1–2)	1 (0–2)	< 0.001
Leisure	85	2 (1–3)	2 (1–3)	0.896
Total	55	9 (7–13)	9 (7–12)	0.063
NHP				
Energy	102	60.8 (24–100)	60.8 (24–100)	0.049
Pain	102	19.57 (0–36.8)	19.0 (0–41.9)	0.373
Emotions	102	24.0 (7.1–53.3)	19.4 (0–53.2)	0.591
Sleep	102	34.6 (12.6–72.7)	28.7 (0–72.7)	0.296
Social	102	22.0 (0–43.1)	22.0 (0–44.5)	0.889
Mobility	102	55.7 (34.6–71)	56.8 (31.1–78.7)	0.761

*Wilcoxon matched pairs signed rank test.

reflect a hierarchy of dependency associated with accommodation.

Day hospital patients

Four hundred and three patients (median age 81, range 61–98, 69% women) attended the day hospital. Of these, 60 attended for less than two weeks, either because of self-discharge, or inappropriate referral (23 patients), or admission to hospital, or death (37 patients), and these patients were excluded. Of the remaining 343 patients (85% of total workload), 302 (88%)—the 'active' group—were referred for rehabilitation, functional assessment or active treatment. Forty (12%) patients were referred for respite care and physical maintenance (the maintenance group).

Response rates were good (> 90% for all instruments used on admission, > 80% postal response at discharge). Only three patients died while attending the day hospital. Thirty six patients (10.5%) had an unplanned admission to hospital; 35 were still attending at the end of the study. MTS scores greater than six were achieved by 221 patients (64%) who were therefore eligible for assessment using the ADL scale and the NHP.

The instruments proved sensitive to differences between patients. Maintenance patients scored significantly worse than those attending for active intervention on the BTI (17 (13–19) *vs* 16 (12–18, *p* < 0.001),

the mobility and kitchen dimensions of the Nottingham extended ADL scale (*p* < 0.05) and the energy, pain and mobility dimensions of the NHP (*p* < 0.02). However, when the instruments were used to characterise individual patient outcomes by looking for change between admission and discharge, there was little difference (Table 4).

Discussion

In an inpatient rehabilitation unit, routine measurement of patient outcome using standardised clinical instruments and measuring scales (SCIMS) is feasible and outcomes are reflected in measures of survival, physical function and social change. In day hospital patients, a similar approach, while feasible, did not produce useful measures of outcome.

Functional disability is common in elderly hospital inpatients [21], and in most of them the BTI has been shown to be capable of documenting changes in functional morbidity. The BTI is limited in scope to aspects of self care and measures disability rather than handicap [22]. It is the index of choice in standardised functional assessment in the elderly [4], but its well recognised ceiling effect limits its usefulness in day hospital patients. It was hoped that the inclusion of an instrumental ADL scale would make it possible to measure change in patients who were already functionally

'good'; unfortunately this proved not to be the case. Day hospital attenders were fairly independent, living either at home or in residential care, and were medically stable. This presents a further challenge to outcomes measurement as these patients are likely to experience only marginal gains in health. Indicators of potential use in this setting need to assess a wide range of patient outcomes with sufficient sensitivity to detect small but clinically important change [23]. A multi-dimensional approach was therefore adopted, utilising instruments reflecting a broad range of functional, cognitive and subjective aspects of health status. Despite this, little or no change was shown between admission to and discharge from the day hospital, even when only patients attending for active intervention were considered.

There was no either no change or the instruments used were not sensitive to it. Our data cannot be used to support or refute either of these hypotheses, but it is clear that outcome assessment in ambulatory care settings, such as the day hospital for the elderly, requires different approaches from those that were used here. Possible alternatives include the identification and use of currently available SCIMS which are sensitive to the clinical change of geriatric interventions in ambulatory care. However, many of the scales used in this study have already received consensus recommendation and, while there may be SCIMS that are more suited to outcomes measurement in this setting, it is likely that they will be subject to similar constraints on design and performance as those used in the present study. The use of individualised function scales, chosen for their responsiveness in specific clinical settings, would be a way of identifying and quantifying individual patient outcomes, but some of the advantages of SCIMS would be lost by sacrificing the ability to aggregate across cases.

Goal attainment scaling [24] promises to address this issue by measuring outcome in relation to individualised goals. With this method, each patient's goals are different but scoring is standardised according to goal attainment. This method holds promise for use in standardised assessment of older patients; however, further development in ambulatory care settings is required.

Health services exist to bring about changes in health status in individual patients. If such changes in health status (outcomes) were measured explicitly as a part of routine clinical practice, then standardisation on outcome measures across a health district, region or country would permit meaningful comparisons to be made between health care provider units. Due allowance would, of course, have to be made for case mix and styles of practice. For example, in the present study the inpatient rehabilitation unit provides medical assessment and accepts patients largely from acute medical wards in an integrated system [10]. The unit also has slow stream rehabilitation and continuing care at a separate site, hence the high rate of transfer

to other NHS accommodation. A different unit with a different style of practice on a single site would perform differently in this regard. Such comparisons could form the basis for recommendations about the patient groups most likely to benefit from specific types of care [25]. This approach is relatively straightforward for single organ disorders in which a medical intervention brings dramatic improvement in health status. Examples include joint replacement or cholecystectomy [26,27]. However, in care of the elderly, multiple chronic diseases, complex disability and multidisciplinary intervention conspire to make outcomes measurement more challenging than in the case of the single, curable pathology.

The methodology of outcomes measurement, particularly in ambulatory care settings for older people, requires further development and evaluation before providers and purchasers of health care can become aware of the impact of these services on patients.

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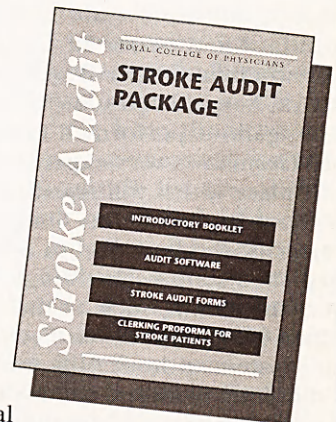
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Stroke Audit

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