A neurological rehabilitation unit: audit of activity and outcome

ABSTRACT—A clinical audit was carried out to determine the impact of multidisciplinary rehabilitation in a specialist neurorehabilitation unit, and to demonstrate how outcome measurement can be incorporated into routine clinical audit. The study describes and interprets the results of one year's activity and outcome in a neurorehabilitation unit. A total of 138 patients were admitted to the 18 bedded unit between April 1994 and March 1995. The main outcome measures were: length of inpatient stay, admission and discharge destination, disability as measured by the Barthel Index and Functional Independence Measure, handicap as measured by the Environmental Status Scale and the Handicap Assessment Scale, and the time spent undertaking the audit. Improvement in disability was demonstrated in 112 (83%) patients and in handicap in 89 (66%) patients. The time taken to analyse the data on a quarterly basis was reduced from 20 hours for the first quarter to 4.5 hours for the last quarter. The results show that multidisciplinary inpatient neurorehabilitation leads to functional improvement in the majority of neurologically impaired patients. Outcome measurement and data collection can be incorporated into routine clinical practice once a sound methodology has been established.

Audit involves the systematic critical analysis of the quality of medical care, including the procedures used for diagnosis and treatment, the use of resources and the resulting outcome and quality of life for the patient [1]. The aim of outcome measurement is to provide health care providers (clinicians and managers) and purchasers with objective information on the effectiveness of health care intervention [2].

It has been traditional to use mortality rates to describe the outcome from acute illness but they are inadequate for describing the health care problems of people with chronic conditions. The *International classification of impairments, disabilities and handicaps* (ICIDH), developed by the World Health Organisation [3], has provided a framework for describing the long-term consequences of illness. At the neurorehabilitation unit of the National Hospital for Neurology and Neurosurgery (NHNN) outcome measurement

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using standardised measures of impairment, disability and handicap has been part of routine clinical activity since 1990.

Information gathered from audit activity is used locally but rarely distributed widely. Consequently, it is not available to other units to aid evidence-based decision-making. Provided the structure and process are described, the information obtained from measuring outcome should be generally applicable. The purpose of this paper is to describe our unit's patient activity and multidisciplinary team assessment of outcome over a period of one year and comment on the methodology used to incorporate these measures into routine practice.

Methodology

The neurorehabilitation unit at the NHNN is an 18 bedded unit which specialises in the rehabilitation of patients with neurological disease. For three months only 12 beds were available due to building development.

Patients were referred from within the National Hospital by consultant staff, directly by consultants from surrounding teaching and district hospitals, and by general practitioners. Assessment was performed prior to admission by a multidisciplinary team (consultant neurologist, a clinical nurse specialist, a senior physiotherapist and occupational therapist and, when appropriate, a speech and language therapist and psychologist) to determine the main purpose of the admission. Patients were admitted only when medically stable and likely to improve functionally or were in need of 'set-up' in the community.

Within 24 hours of admission to the unit, patients were assessed at a joint meeting by all members of the treating team. The core members of this team always included a nurse, occupational therapist and physiotherapist. A psychologist, social worker and speech and language therapist were involved as appropriate. The patient and close family/carers actively participated in this joint assessment. At the end of the week of admission the treating team jointly listed impairments, disabilities and handicaps, set short and long-term goals which were agreed by the patient, and used standardised assessments to score, by consensus, the patient's level of disability and handicap. Patients participated in a structured multidisciplinary programme which specifically addressed the problems identified on assessment. This typically included efforts to improve functional independence, mobility, bladder and bowel function, and communication. Advice and education

regarding work and leisure pursuits, muscle tone management, fatigue management and strategies to compensate for memory dysfunction were also regular components of the rehabilitation process. On completion of this programme the same outcome measurements were repeated at the time of each patient's discharge report. The team took approximately 45 minutes each for the admission assessment and discharge report. For all patients basic demographic details were recorded including age, sex, admission and discharge destination, diagnosis and length of stay. The time taken to perform the audit was also documented.

The following measures of disability and handicap were recorded: Barthel Index (BI), Functional Independence Measure (FIM), Environmental Status Scale (ESS) and a Handicap Assessment Scale (HAS). Both the FIM and BI are widely used measures of disability which have been assessed in terms of their psychometric and clinical properties. The BI [4] is an ordinal scale with a range of 0–20, an increasing score indicating less disability. It was designed to assess the ability of the patient to care for himself, and has been used as a measure of disability in clinical research for many years. Although used widely, this instrument appears to be less sensitive to clinically relevant change in patients with moderate to severe disability [5]. The FIM provides a more comprehensive and sensitive assessment not only of self-care activities and mobility but also of communication and cognitive function. It is an 18 item instrument which measures and scores disability in terms of burden of care, addressing both motor and cognitive function [6].

Few handicap scales are available and fewer are fully evaluated. The ESS was developed as a measure of handicap for the Minimal Record of Disability in Multiple Sclerosis [7]. But there is some concern that its validity is limited, it mixes disability and handicap, and has a misleading scoring system [8]. The HAS was developed at the NHNN to overcome these difficulties, and is currently undergoing reliability studies. Like the ESS it comprises six items, each with a score of 0–5, a decreasing score indicating a reduction in handicap; the categories comprise: productivity, financial status, personal residence, transportation, social activity and autonomy.

All data were stored and analysed on an IBM compatible computer using a commercially available statistical software package [9]. Patients were divided into subgroups on the basis of their diagnosis. For the Rasch analysed FIM subscales [10], parametric statistics were used to determine group changes in mean score from admission to discharge. Non-parametric statistics were used to analyse the changes in the ordinal scales. The central tendency of such scores is most appropriately represented by the median and this is quoted, together with the range.

Results

In the year 1 April 1994 to 31 March 1995, 138 patients (66 men, mean age 44, range 16–87) were admitted. Three patients were transferred back to their referring hospitals within one week because they were medically unstable and were therefore excluded from subsequent analyses.

Patients

The distribution of disorders was as follows: multiple sclerosis: 55, stroke: 28, non-traumatic spinal cord lesions (cervical myelopathies, intrinsic cord lesions, inflammatory disease and spinal cord infarcts): 18, neuropathies: 7, tumours: 6, and 21 other disorders including spinocerebellar degeneration, multiple system atrophy, phenylketonuria, post-anoxic myoclonus, and neurofibromatosis (Fig 1).

Eighty-one patients were married, 37 were single, 11 were either separated or divorced and 6 widowed. In total 104 people lived with a spouse or family and 31 lived alone. Eighty-four patients required assistance with their care. In 53 cases this was provided by a family member or friend, and in 31 cases care was paid for. Twenty-three patients were full-time homemakers, 6 were students; 40 patients were retired, 33 of them on medical grounds. Among the 46 unemployed patients 38 were not currently seeking employment.

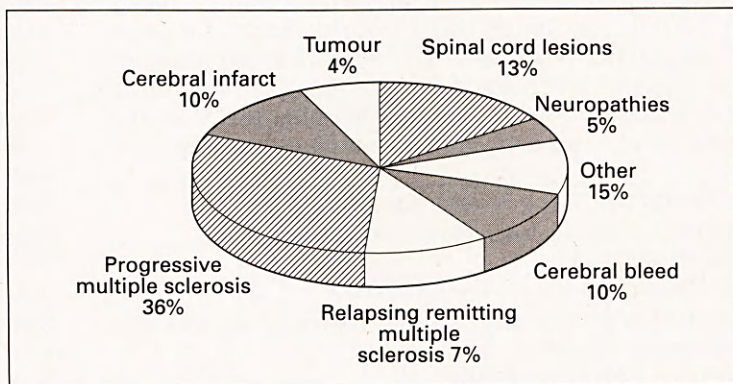**Fig 1. Primary neurological diagnosis in 135 patients**

Table 1. Length of stage for each diagnostic category

Diagnosis	n	Mean (days)	Range (days)	Length of stay in weeks (% of patients)		
				< 3 weeks	3–6 weeks	> 6 weeks
Multiple sclerosis	55	23	7–62	57	33	9
Stroke	28	47	7–148	11	54	35
Tumours	6	32	7–183	50	33	17
Spinal cord lesions	18	40	7–193	39	33	28
Neuropathies	7	47	12–91	29	34	57
Other	21	26	11–73	43	48	9

The mean duration of stay was 33 days (range 7–193). Its relationship to diagnosis is outlined in Table 1. The shortest duration of stay was for patients with multiple sclerosis and the longest was for stroke and neuropathies; within these groups the longer durations related to those with recent infarct and Guillain–Barré syndrome.

Of the 135 patients, 59 patients were admitted from acute hospitals, 60 from home and 15 from other rehabilitation units. One patient was admitted from a residential unit. On discharge 126 patients returned home, 7 to an acute hospital, 1 to another rehabilitation unit and 1 to a nursing home.

Disability and handicap scores

Admission and discharge scores on the BI and FIM were available for all 135 patients. The scores on the BI improved in 106 patients, worsened in 5 and were unchanged in 24. For the FIM motor subscale, 112 patients improved and 9 deteriorated. On the cognitive subscale of the FIM, 57 patients improved and 28 deteriorated. Scores on the ESS were available on 30 patients of whom 18 improved and 2 deteriorated. The HAS was carried out on 105 patients of whom 71 improved and 8 deteriorated. Table 2 shows the change in scores for each scale from admission to discharge.

Case history

This is best illustrated by a case presentation: Mr C is a 50-year old man with a 25-year history of multiple sclerosis. He has been wheelchair bound for the past 12 years. Before admission to hospital he had been living alone at home in an adapted ground floor council flat, receiving home help service three times per week to assist with shopping, laundry and housework. He was in regular contact with his three adult children. Over the past 12 months he had experienced a steady deterioration in his function and was struggling to maintain independence in many self-care activities. Eventually Mr C was admitted to his local hospital on 3 June 1994 because of frequency of micturition, con-

Table 2. Change in disability and handicap scores

	Admission score	Range on admission	Discharge score	Range on discharge
BI (median)	13	0–20	18	1–20
FIM (motor) (mean*)	52	0–79	63	0–100
FIM (cognitive) (mean*)	74	40–100	78	34–100
HAS (median)	18	6–30	15	2–28
ESS (median)	22	9–33	20	9–31

BI, Barthel Index; FIM, Functional Independence Measure; HAS, Handicap Assessment Scale
*Rasch analysed scores [7] (interval data)

fusion and hallucinations. A diagnosis of pyelonephritis was made and a course of antibiotics commenced. Unable to return home with his current level of function he was referred to the multidisciplinary assessment clinic at the NHNN, where he was found to be dependent for all care and mobility, with extremely low mood, and a poor quality of life. His impairments were listed as: spastic paraplegia and spasms, trunk and upper limb weakness, bladder hyper-reflexia, bowel dysfunction, pressure sore on left heel, altered sensation in lower limbs and right hand, cognitive impairment, depression and fatigue. Mr C scored 8.0 on the Expanded Disability Status Scale (possible range 0–10, where 0 is normal and 10 is death), a scale widely used by neurologists to measure the overall level of impairment in people with multiple sclerosis [11]. The team identified a number of areas of potential functional improvement and he was admitted to the unit on 22 June 1994.

His disabilities and handicaps on admission included:

- Requiring assistance with all self-care, transfers and bed mobility
- Poor sitting balance, poor posture and unsuitable wheelchair

- Urinary tract infection and constipation
- Low mood and reluctance to interact socially
- Dependency for all domestic tasks
- Restricted outdoor mobility, including driving, affecting leisure pursuits
- Low activity tolerance
- Risk of further pressure problems
- Inability to manage own medication.

By the end of the first week of admission, the following long-term goal was established in agreement with Mr C: 'to return home with minimal assistance for self-care, independent in all transfers (including car) and relevant domestic tasks, sitting with improved posture, independent in performing a home exercise programme, and with appropriate bladder, bowel and tone management'. It was anticipated that this goal would be achieved within eight weeks. A series of measurable short-term goals was also set and monitored.

Throughout the admission period Mr C participated in an intensive programme involving joint input from the neurologist, nursing staff, occupational therapist, psychologist, psychiatrist, physiotherapist, social worker and continence adviser. Management included:

- Re-education in self-care activities, transfers, sitting balance, and domestic activities including food preparation
- Education regarding pressure care, prevention and treatment of urinary tract infections and self-medication
- A regime of suppositories and regular aperients
- Temporary adaptations to wheelchair, with recommendations to the local wheelchair service regarding provision of a lightweight wheelchair, and pressure-relieving cushion
- Assessment by psychiatrists, began antidepressant medication
- Advice regarding strategies to compensate for memory dysfunction, education in relaxation techniques to cope with anxiety and stress
- Advice regarding leisure activities, including referral for a full driving assessment
- Assessment of home environment prior to discharge with recommendations for rails to be fitted beside his toilet and repositioning of intercom system.

Mr C was discharged home after two months, having achieved his long-term goal. Close liaison with community services was crucial throughout the rehabilitation

Fig 2. Changes in impairment, disability and handicap between admission and discharge for Mr C. Note: an increase in disability scores, denotes an improvement in overall function (a and b) while a decrease in impairment and handicap scores (c and d) denotes improvement in these dimensions
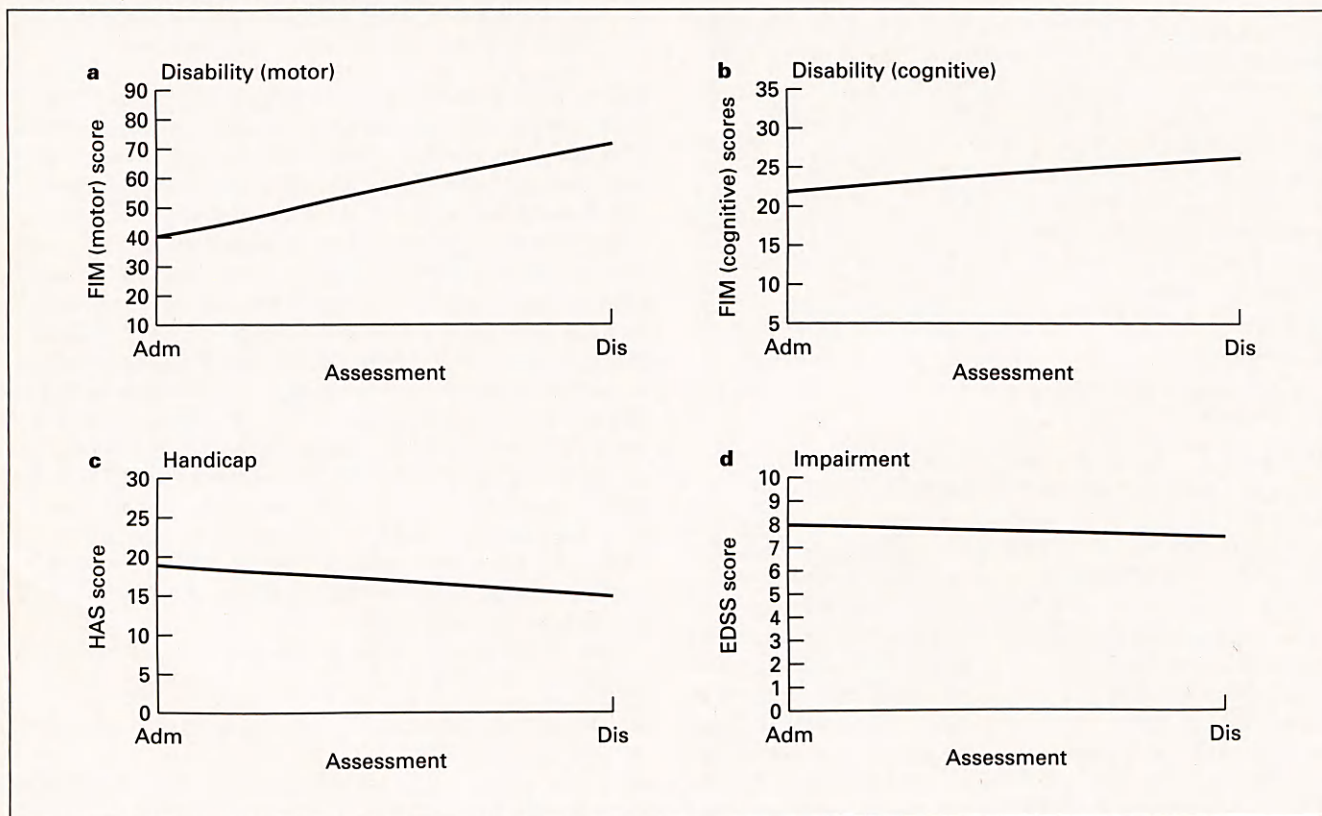
process to ensure safety on return home and carryover of the improvements gained. Referral was made to district nurses, community physiotherapist, social services, occupational therapist, local wheelchair service, review by psychiatrist, social worker and general practitioner.

Mr C's progress is illustrated by the positive changes measured between admission and discharge in the outcomes of disability and handicap (Fig 2a and c), which were carried over to the home environment on review three months later. These demonstrate that despite unchanging impairment (Fig 2d) Mr C was able to improve both his functional independence and level of handicap.

Discussion

Clinical audit is essential for the continuing evaluation of neurological rehabilitation. There is evidence to suggest that careful measurement of any activity results in higher standards of observation, documentation and response, thus improving the quality of care [12]. Previous studies have documented the feasibility of using the BI to monitor disability in the acute management [13] and rehabilitation [14] of elderly people. This study demonstrates that the measurement of outcome can be incorporated into routine clinical practice in a high turnover, intensive inpatient neurorehabilitation unit.

In this unit, scoring of disability and handicap scales takes place during routine assessment and discharge meetings. The scales provide a structure for multidisciplinary assessment of the patient's problems. Use of the scales in this way is time efficient but demanding. Its success requires continued commitment from all staff who understand the value of outcome measurement as an integral part of clinical practice.

As in many units, junior staff rotate on a regular basis and staff training is therefore essential. This maintains accuracy of scoring and ensures that new members learn to appreciate the relevance of outcome measurement. A standardised record of the audit data has been developed to ensure that clinical staff document the information in a consistent manner which enables non-clinical staff to perform the audit. The results of the audit are discussed within the unit on a quarterly basis. Staff share the credit for the success (or failure) of data collection, are free to comment on the results, and are encouraged to instigate changes in practice where necessary.

The proportion of patients requiring assistance with their daily care reflects the severity of the disability and handicap in this population where over half the population have a progressive neurological impairment. There is little scientific evidence to prove that disability and handicap improve with rehabilitation. The results indicate that functional improvement occurs between admission and discharge with inpatient re-

habilitation in most of our patients. The results are complementary to those described in a previous study [15]. An anomaly appears in the worsening of FIM cognitive subscale scores, probably because initial assessment often underestimates the extent of cognitive and psychosocial difficulties.

The results of this audit focus on outcome but this is just one aspect of monitoring the quality of patient care. Review of the process of service delivery and goal achievement is also important. Integrated Care Pathways (ICPs) originally established within the acute sector to monitor service delivery, have been developed within this unit as a method of auditing the rehabilitation process [16]. The combination of auditing process and outcome ensures delivery of efficient and effective health care.

These audits were performed quarterly. The first took 20 hours to complete while the last required only 4.5 hours. This reduction in time was achieved by establishing a systematic filing system, improving recording and collation of data through staff education and identifying a single coordinator.

Clinicians tend to feel that outcome measurement uses time that could be better spent in direct patient contact. This approach prevents collection of information which providers and purchasers could use to raise the standards of patient care. We have shown that data collection can be incorporated into patient focused activity and that regular analysis can be performed by non-clinical staff.

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Alcohol and the heart in perspective

SENSIBLE LIMITS REAFFIRMED

Joint report of the Royal Colleges of Physicians, Psychiatrists and General Practitioners

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Contents

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