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IS "HANDICAP" AFFECTED BY A HOSPITAL BASED REHABILITATION PROGRAMME?

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ABSTRACT. "Handicap", categorised according to the ICIDH, and "Disability", measured by the Smith Activities of Daily Living (ADL) Index, were assessed in over 300 patients (suffering from strokes, lower limb amputations, cardiac disorders, low back pain and other diseases) on admission to and after discharge from a hospital based rehabilitation programme. Statistically significant improvements were found in Physical Independence and Mobility Handicaps which correlated with improvements in ADL Self-care ($R=0.58$, $p<0.001$) and ADL Mobility ($R=0.53$, $p<0.001$) averages. Small but significant improvements were also found in Orientation, Occupation and Social Integration Handicaps but there was no change in Economic Self Sufficiency Handicap. Thus it is possible to use the Handicap categorisations to assess disabled people sequentially during a rehabilitation programme. The problems of data collection, however, are so formidable that its usefulness must be limited.

Key words: handicap, disability, international classification, activities of daily living, rehabilitation, stroke, amputees, low back pain, cardiac.

The International Classification of Impairment, Disability and Handicap (ICIDH) (14) introduced a terminology of the consequence of disease. The physical and psychological problems experienced by patients are categorised within the I (impairment) and D (disability) codes but these are taxonomies rather than scales. Disability (the functional consequence of an impairment) has traditionally been measured by using indices of activities of daily living (ADL) (6). The ICIDH suggested not only a classification of handicap (the dimensions of social disadvantage suffered by an individual as the result of an impairment or disability) but also published scales by which these effects might be measured. The social impact of a disabling illness is thus represented by hierarchies of defined categories which reflect "Handicap" in six specified dimensions—orientation, physical independence, mobility, occupation, social integration and economic self-sufficiency. The ICIDH definitions and classifications have not been accepted wholeheartedly but they have been commended widely for their conceptual framework (1).

The success or failure of rehabilitation programmes may be measured in various ways. As part of an audit of rehabilitation medicine services in Lothian we measured "handicap" using the scales recommended in the ICIDH, and "disability", using an ADL index, in a group of in-patients and day-patients referred to our Unit. We attempted to answer the following questions. 1. Can the handicap scales be used to measure changes during a hospital based rehabilitation programme? 2. How do measured changes in handicap relate to changes in disability in this population?

METHOD

Patients

Patients in this study were amongst those included in an audit of all patients referred to Lothian Rehabilitation Medicine Services in one calendar year. The methodology of this study has been described in detail elsewhere (12). For nine months of this study, we attempted to complete Handicap classification on all in-patients and day-patients on entry to and discharge from our services. In-patients outnumbered those seen only as day-patients by a ratio of 6.7:1. The interval between initial and final assessments varied from a few days to several months, depending on the length or follow-up, the longer intervals usually being from those who attended our day hospital after in-patient treatment. Completed scores were obtained on admission in 316 patients, and on discharge in 300. This group was representative in terms of age and diagnoses of all in-patients and day-patients seen in the unit during the year.

For the purpose of analysis, referral problems of patients were grouped as follows:

- strokes (including sub-arachnoid haemorrhage). (Data complete in 76 patients)

Table I. *Components of ADL self-care and mobility scores*

Self-care	Mobility
Dressing	Getting in and out of bed
Eating/drinking	Propelling wheelchair
Washing	Transferring to toilet
Toiletting	Rising from chair
Bathing/showering	Walking indoors
Being safe in kitchen	Managing stairs
Simple cooking	Using public transport
Performing simple housework	

- low back pain (35 patients)
- lower limb amputees (40 patients)
- cardiac conditions (mainly after cardiac surgery and myocardial infarction) (38 cases)
- others (111 cases).

These groups were selected because they have problems referred to us frequently and for which specific treatment programmes have been devised. As shown elsewhere (12), median lengths of stay for these specified patient groups lie in the following intervals: strokes 31–50 days, back pain 21–30 days; amputees 31–50 days; cardiac conditions 11–20 days.

Measurement of handicap

Handicap scores were assigned by the physician dealing with the patient at admission and discharge, according to the instructions of the ICIDH manual. All scores were scrutinised by the authors C. R. or Y. A. to ensure conformity. We termined "H" code data collection after nine months as staff enthusiasm was waning, the work of categorisation being perceived as tedious. As an outcome measure, we chose a "threshold" level of each handicap dimension likely to allow a disabled person to live in the community without extensive support from others. This was set at level 3 in each category except Mobility, where level 4 or better was chosen.

McNemar's (sign) test was used to determine whether there was any change in the proportion of patients achieving the threshold levels in each handicap dimension after rehabilitation.

Measurement of "disability"

Disability was measured before and after treatment by an Activities of Daily Living (ADL) index adapted from Smith (13). Activities were grouped into those representing self-care and mobility (Table I) and scored by the method given in Table II. The activities rated as either 6 or 7 on these scales were discounted. The mean of the remaining, relevant scores for the two groups were then calculated and termed the "self-care" and "mobility" indices for each patient.

McNemar's (sign) test was used to measure the significance of changes in ADL self-care and mobility scores before and after rehabilitation.

The changes in Physical independence and Mobility Handicap scores were compared with changes in the ADL self-care and mobility indices respectively using Spearman Rank Correlation Coefficients.

RESULTS

Handicap scores

The cumulative frequencies of scores in each specified handicap dimension before and after rehabilitation are shown in Figs. 1, 2 and 3 for all patients studied. Statistically significant improvements ($p<0.001$) were made in all dimensions except Economic Self-sufficiency, but the magnitude of these changes was small except for Physical Independence and Mobility.

There were marked differences between the various diagnostic groups both in initial distribution of handicap scores and in the extent of improvement (Table III). There were significant ($p<0.001$) gains in Physical Independence and Mobility in all patient groups except those with back pain where an initially high proportion of patients reaching the threshold level precluded a statistically significant improvement despite all patients reaching the threshold level after rehabilitation. The gains in Orientation handicap were significant only for the stroke group and "Other" group which included some neurologically damaged patients such as those with head injuries. Other groups of patients had few problems in Orientation.

The overall improvement found in Occupation Handicap contrasted with the decline in the number of patients in paid employment; 29% were employed full or part time before attending the rehabilitation programme but only 23% afterwards.

The changes described above applied to the groups rather than to individual patients but more than half the patients changed grades in a number of handicap dimensions (Table IV).

Disability (ADL) scores

ADL mobility and self-care averages before and after treatment are listed in Table V. The differences were

Table II. *Scoring system for ADL assessments*

1. Independent
2. Independent with aid
3. Requires supervision and/or occasional assistance
4. Requires assistance of one or more persons
5. Unable to perform activity
6. Not applicable
7. Not known

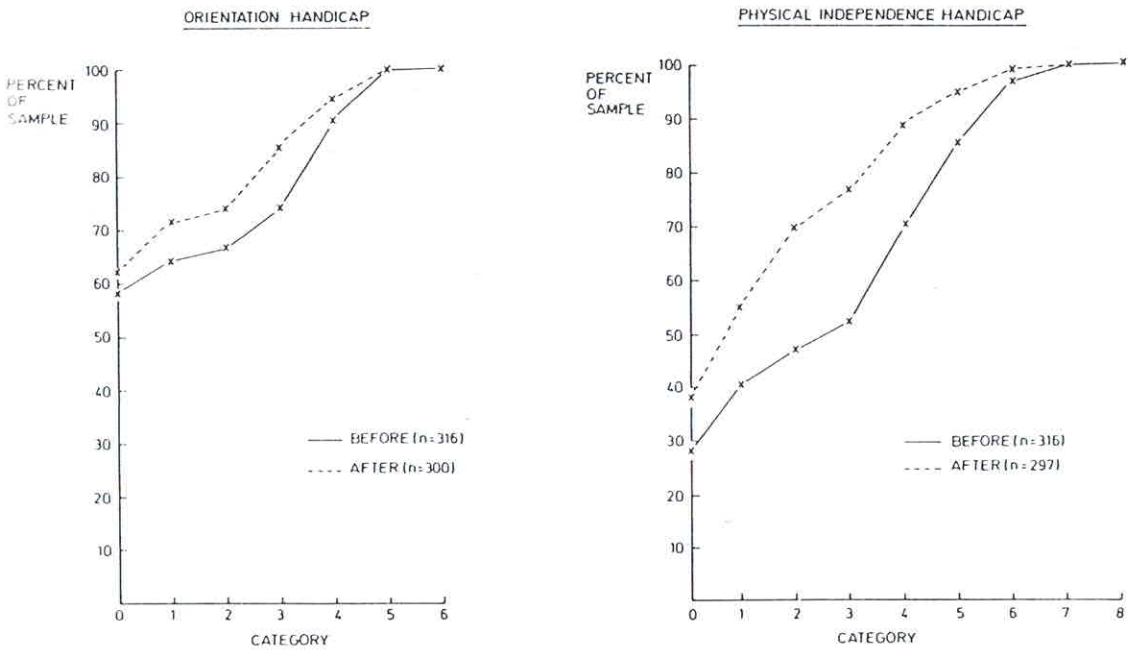

Fig. 1. Cumulative frequency histograms of Orientation and Physical Independence handicap categories before and after rehabilitation.

not only significant statistically but represented real gains for the individual patients.

The changes in Physical Independence Handicap correlated significantly with changes in ADL self-care averages ($R=0.58$, $p<0.001$). The relationship between changes in Mobility handicap and ADL mobility averages was also significant statistically ($R=0.53$, $p<0.001$).

DISCUSSION

This is the third large study to appear describing the use of handicap scales for the sequential assessment

Table III. *Percentage of diagnostic groups attaining "threshold" level for each handicap category before (b) and after (a) rehabilitation*

		Stroke ($n=76$)	Back pain ($n=35$)	Amputee ($n=40$)	Cardiac ($n=38$)	Other ($n=111$)
Orientation	b	51	100	80	97	75
	a	71***	100	88	97	86**
Physical	b	28	91	23	74	62
independence	a	64***	100	73***	97**	73**
Mobility	b	33	86	30	85	68
	a	79***	100	68***	100*	75*
Occupation	b	21	44	20	50	31
	a	19	56	35**	68**	40**
Social	b	67	91	75	87	71
integration	a	75	94	88	90	78**
Economic	b	91	82	92	87	75
self-sufficiency	a	92	79	95	89	74

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

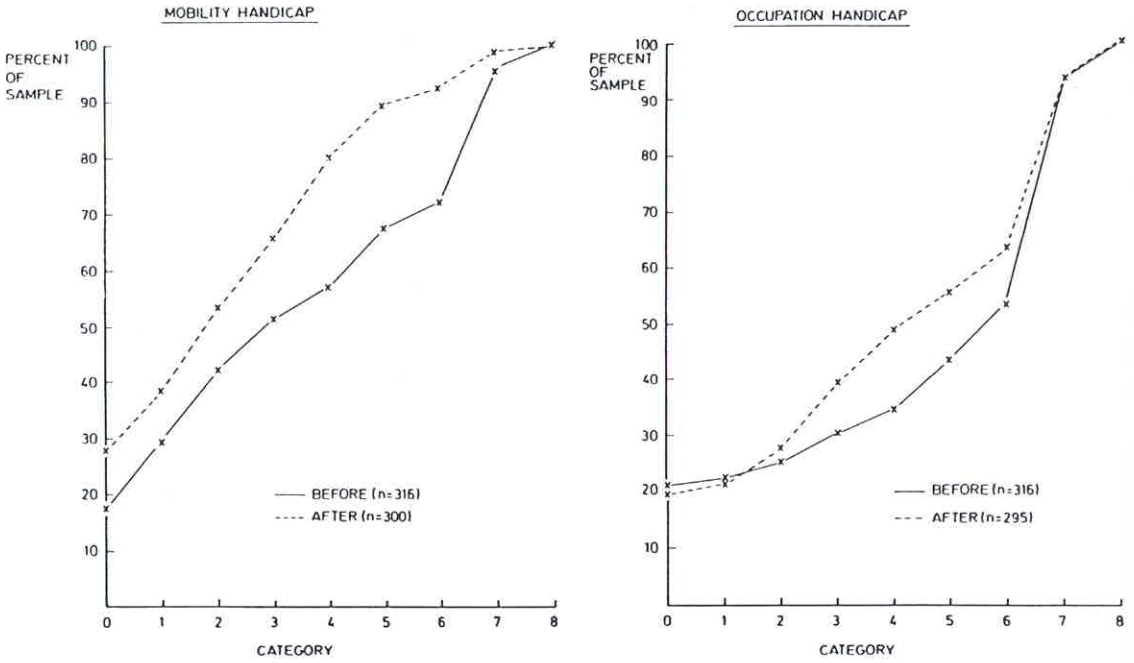

Fig. 2. Cumulative frequency histograms of Mobility and Occupation handicap categories before and after rehabilitation.

of disabled people. It differs from the others (2, 5) in covering a wider range of patients, and covering all six specified handicap dimensions. Our study has shown that it is possible to collect data as recommended in the handicap section of ICIDH. It has also shown that improvement in a number of dimensions of handicap can be documented following a hospital-based rehabilitation programme and subsequent follow-up into the community.

The other data in our audit of patients, including the ADL Index, was collected relatively easily but the acquisition of sufficient information to allow accurate classification of handicap required perserverence and commitment. Other workers (8, 11) also have commented on the difficulty in using the handicap codes. The recruitment of patients to the handicap section of the overall audit was terminated after nine months when waning staff cooperation threatened to jeopardise the quality of the study (a difficulty reported by other groups also) (2).

The degree of difficulty in assigning patients to handicap category varied between the different di-

Table IV. *Percentages of patients changing grades in each handicap dimension*

	Stroke ($n=76$)	Back pain ($n=35$)	Amputees ($n=40$)	Cardiac ($n=38$)	Other ($n=111$)
Orientation	51	30	7	0	18
Physical independence	61	23	70	26	30
Mobility	70	27	67	53	43
Occupation	43	35	45	42	35
Social integration	24	17	18	8	22
Economic self-sufficiency	7	12	3	5	9

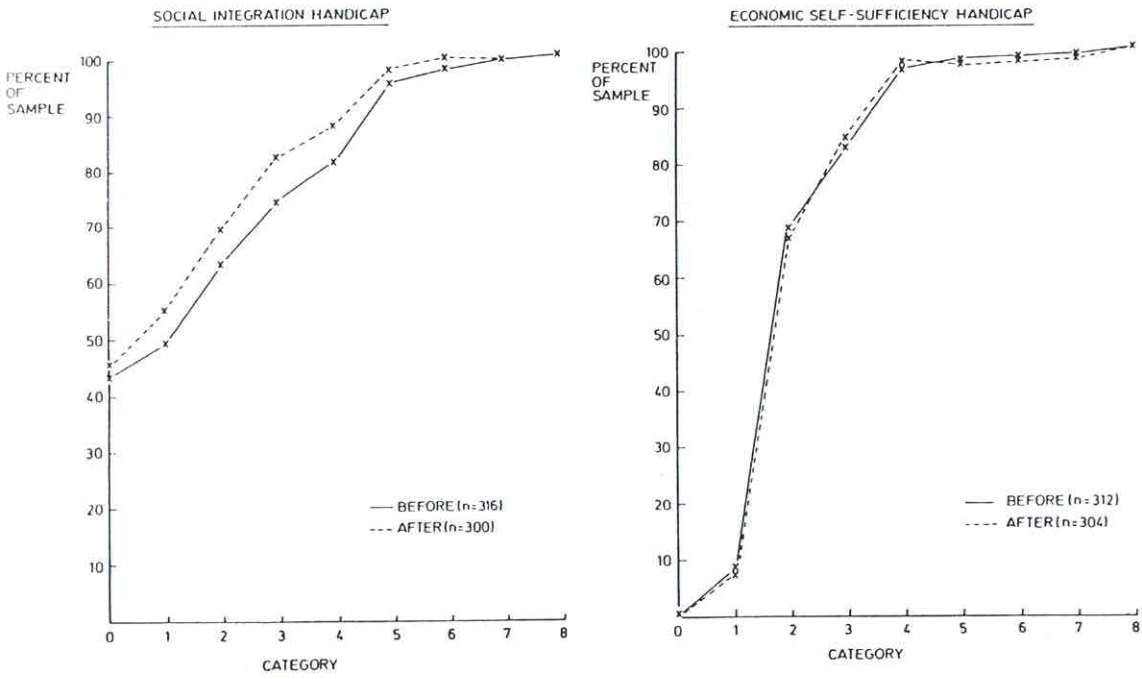

Fig. 3. Cumulative frequency histograms of Social Integration and Economic Self-sufficiency handicap categories before and after rehabilitation.

mensions. Physical Independence categories were relatively straightforward to use, perhaps because they depend in part on the concept of interval dependency, a robust measure developed from clinical practice (7) rather than theory. The suggested categories of Mobility handicap were also relatively easy to apply. Occupation handicap, on the other hand, contains some apparent anomalies which took time to resolve. The reduction in the number of people in paid employment after rehabilitation was a reflection of the illnesses, such as stroke, from which they suffered. The documented improvement in Occupation handicap after rehabilitation was mainly due to improvements in the middle categories of the handicap dimension. This reflects in part the effort made to resettle the more disabled patients in alternative settings such as day centres, and emphasises that Occupation handicap categories were designed to be suitable for all ages and circumstances and are not dependent on employment status.

The categorisation of Social Integration handicap depends on the extent of the patient's social contact

Table V. *ADL self-care and mobility averages before and after rehabilitation*

	Stroke ($n=81$)	Back pain ($n=36$)	Amputees ($n=44$)	Cardiac ($n=38$)	Other ($n=111$)
Self-care					
Admission	2.8	1.1	2.6	1.4	2.1
Discharge	2.0***	1.0	1.8***	1.1***	1.7***
Mobility					
Admission	3.1	1.2	3.4	1.5	2.3
Discharge	2.1***	1.1	2.4***	1.1***	2.0***

*** $p<0.001$.

and overlaps to some extent with aspects of Occupation handicap. The high base-line of social integration in our patients reflects the fact that our hospital-based programme tried to maximise contacts between patients and their relatives or friends. This may explain the contrast in our findings from Grimby's group (5), who found only 32% (25 cases) in Grade 3 or better at admission. That their cases had all suffered CVA does not sufficiently explain this discrepancy, as amongst an identical number (76) of patients with stroke, we found 67% at Grade 3 or better. This latter divergence may account for the difference in the number of stroke patients who improved across the threshold value between that study and this: 6 cases in the present report, and 20 in Grimby's study. Our study, of course, includes not only in-patient treatment, but also periods in day hospital, but, since our discharge assessment was made after final discharge from services in either of these categories, one would have expected if anything a bias towards a larger number improved. Such a large difference in admission scores is unlikely to result from the mixing of day hospital and in-patients, since the number who had their admission score rated whilst attending day hospital was small (13% of the whole sample)—indeed, our sample showed similar percentage improvement in physical independence and mobility to Grimby's group, although less severe problems were recorded in our patients at admission.

Alternatively, our application of the ICIDH ratings may have differed. Our approach to categorisation was consistent but our interpretation of the rules of assignment of social integration may be different from those of other workers. Data on inter-rater reliability of these scales is scant, but good reliability has been reported in one study (4). Grimby found differences between different professions in their rating (5). The present report did not evaluate that (physicians only recorded scores), but, recognising the problem, chose to have two observers (Y. A. and C. R.) to scrutinise scores, and review these with individual practitioners where necessary. This consistency does, however, mean that we have confidence in the validity of the improvements documented in our study. It is of note that Charpentier (2) found that doctors had to take over some scoring from other professions because of difficulties in maintaining motivation (which we also noted).

Physical Independence, Mobility, Occupation, Social Integration and Orientation handicaps were assigned according to the status of the disabled person when first seen by our service and on discharge. The initial assessment of Economic Self-sufficiency handicap, on the other hand, was related to the patient's pre-morbid circumstances, if he had become disabled through an acute illness, or to his circumstances on presentation if he was suffering from a chronic condition. No change was observed overall in this type of handicap (Fig. 3) although there were some changes in individual patients (Table IV). The background of the patients (most of whom were not employed) and the British Social Security system are the main reasons why change in economic handicap did not occur during the relatively short period of our study; in retrospect the result obtained for Economic Self-sufficiency could have been anticipated. Perhaps it is sensible to omit this dimension, especially in in-patients, as has been done by others (2, 5). However, we feel inclusion of Occupation handicap was valuable.

The results of our study therefore depend on the construction of the handicap scales and must be viewed in the context of the types of patient seen in, and the service provided by, our unit. The intervals between categories in the handicap scales are hierarchical but not uniform. Analysis of the number of grades of improvement is appropriate for individual patients but more difficult to interpret for groups of patients who have started at different levels. In assessing a sample, therefore, it was felt appropriate to look at the number who had achieved a particular level or higher. The thresholds chosen were selected because they were of use clinically and reflected service requirements. The patients (with the exception of those with back pain) were mainly in the early stage of recovery from illness; the aim of rehabilitation in this situation was to help them achieve a level of function sufficient to allow discharge safely back into the community. The threshold category of handicap in each dimension was selected as that likely to indicate that the patient could live successfully in the community with little support from professional or informal carers. This is not, of course, the criterion of successful rehabilitation for all patients. Services dealing primarily with the longer term care of severely disabled people would require to use other thresholds. Even among our patients who did not meet these threshold levels, small gains were often recorded which represented worthwhile improvements for the individual although they remained partially dependent on others or support services. The threshold levels were, however, met by the majority of patients in many handicap dimensions. The handicap scales may therefore have

achieved one of their objectives which was to reflect a patient's requirement for services.

The handicap categories recommended in the ICIDH are the most widely recognised way of measuring this aspect of the consequence of disease. In contrast there is no accepted method of assessing "disability" in groups of patients. Disability has many facets, many, but not all of which are covered by the term "activities of daily living". A pragmatic decision was taken to measure disability by an appropriate ADL index. From the plethora of potential indices, the Barthel Index (10) was considered but rejected since it appeared to focus too much on the needs of the highly dependent patients. The ADL Index of Smith was chosen since it is robust, easy to use, and covered a range of functions relevant for all groups of patients.

The improvements in ADL scores were reflected in the changes in certain handicap dimensions. A significant relationship was established between changes in ADL mobility and self-care scores and the corresponding handicap scales of Mobility and Physical Independence. This does not mean that the two scales are equivalent to one another—the disability aspects accounted for less than half the variance of the corresponding handicap scale, in keeping with the conceptual differences between the measures.

Disability and handicap are two tiers in a conceptual hierarchy in the ICIDH but in practice there is a continuum between them. The controversy over the differentiation between disability and handicap has centred on where the boundary, if any, should be drawn between them. Grimby has argued, persuasively, that only two dimensions are necessary (impairments and disabilities), with the second combining "disability" and "handicap" in the ICIDH concept (5). However, since our ADL (disability measures) and handicap showed concordance of less than 50% our view is rather that there are three factors in consequences of disease but the "Handicap" scale measures the third imperfectly. Perhaps we should look for reform of the classification rather than revolution.

Beyond this conceptual question, two further reasons may be advanced for retaining a three-tier taxonomy. Firstly, in teaching, students may find it useful to consider which aspects can be expected to change with rehabilitation. It is our view that during rehabilitation impairment is often unchanged (as shown in Charpentiers work (2)), and the effect on disability, although significant, is limited; but major gains can be made in preventing disability progressing to handicap. Secondly, it is widely accepted that, in many countries, people with disability are socially disadvantaged in a number of spheres. The remedy for this is liable to be a change in *society*, rather than the individual, and thus a delineation of "handicap" is essential to allow politicians and planners to address society's responsibility; the handicap scale has for example, been used in identifying training needs amongst disabled people (4).

In clinical practice, this boundary will inevitably be blurred. For example, difficulty in walking will vary according to the surface the subject is crossing and the gradient. In addressing conceptual reform of the classification however, it may be useful to recognise that there are intrinsic and extrinsic influences on each person with disability. "Disability" will include those intrinsic influences—physical and psychological—which are relevant for an individual in their immediate environment. "Handicap" would take account of their interaction with wider extrinsic influences: mainly social and environmental. This view is consistent with the adapted Handicap assessment used by Ferngren & Lagergren (3). Extrinsic barriers are, of course, easy to itemise (e.g. access, employment, family, finance housing) but difficult to measure.

This study has shown that a hospital-based rehabilitation programme can improve handicap, as assessed by the ICIDH manual, in those dimensions (particularly Physical Independence and Mobility) which reflect to a great extent recovery within the individual. There was no impact on the purely social realm of Economic Self-sufficiency in our study. The changes in Social Integration and Occupation handicaps were small. This relatively modest impact on social parameters reflects the comparative impotence of medical services in dealing with agencies outwith their direct sphere of influence. Thus, although rehabilitation must take account of the social as well as the physical and psychological factors in each patient, the influence of medical rehabilitation services on social aspects must be questioned.

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