

## ASSESSING THE VALUE OF EARLY REHABILITATION AFTER MYOCARDIAL INFARCTION

By D. E. Anderson and E. Schiller

### SYNOPSIS

Using a previously developed numerical rating scale for predicting return to work after myocardial infarction, a prospective controlled study of early rehabilitation which has now started is described. The objects of the study include the validation of the rating scale when used during the acute phase of the disease; an assessment of the value of early rehabilitation in returning the patient to suitable work; an evaluation of the financial cost of the heart attack to the patient; and objective psychological testing of patients for anxiety and depression in hospital and after recovery.

### Prediction of return to work after myocardial infarction

About two years ago one of the unit's social workers and one of the authors constructed a rating scale which included the various factors which we knew were concerned with difficulties in rehabilitation (Schiller and Morris, 1971). The scale, based on earlier work (Jezer, 1959) but considerably modified, allotted numerical weightings to these factors (Table I).

The higher the numerical score obtained, the less likely should be success in rehabilitation. We tested it initially in a small retrospective study, and it appeared to correlate well with results achieved by rehabilitation.

We then went on to test the rating scale in a prospective trial of 99 patients; one of us attempted to forecast the likelihood of return to work of patients three months after their first visit to the unit by our standard method of considering the full social work history, medical assessment, and employment officer's report; the other tried to predict the outcome by using the scale described.

In 82 of our 99 cases the two methods of assessment agreed in predicting the outcome. In our remaining 17 cases the two methods of assessment did not agree in predicting outcome.

We then revised our scale and included numerical weightings for several further factors which were found to be important in predicting return to work. In addition, to enable the scale to be used during the acute phase of myocardial infarction, we eliminated Items 3, (length of time since original attack) and 4 (length of time off work before referral to unit) from the scale. The revised rating scale is shown in Table II.

It includes a loading for place of residence: workers in country districts, unless skilled, have a much poorer chance of re-employment after a heart attack. It also includes loadings for the worker whose previous employer cannot re-engage him, and for the patient who is overtly and excessively dependent on his wife or other family members.

Application of this revised scale to the 17 cases for whom our two methods previously disagreed now produced agreement in eight cases. This improved the predictive accuracy of our rating scale to between 70 per cent and 75 per cent, which was very close to the accuracy achieved by our more time-consuming and detailed usual method of assessment. At this stage the rating scale was considered good enough for use in a new and more extensive prospective trial.

### Introduction of the rehabilitation concept during the acute phase of myocardial infarction

It has been the experience at our unit that the majority of the problems referred there could have been lessened or avoided by the identification of likely problems earlier in

the disease—preferably during the patient's hospital admission. We therefore decided to use our rating scale to assess patients in hospital during the acute stage of the disease.

Before this could be attempted, it was necessary to modify one of the main loadings in our rating scale: the classification of physical disability, Factor 1. The New York Heart Association Classification cannot be used for patients lying in bed and unable to demonstrate their exercise potential. We decided to make use of a Coronary Prognostic Index for predicting three-year survival after recovery from acute myocardial infarction described by Norris *et al* (1970) to overcome this difficulty. In this study all relevant observations made at the time of admission were analysed; age, heart size, pulmonary oedema or congestion, and presence or absence of previous infarction were found to be the best discriminants for long term survival after recovery. The Norris Coronary Prognostic Index is shown in Table III (Norris *et al*, 1970).

Factor X in the first column is multiplied by factor Y in the second column; the products are added to give the score.

On the untested though probable assumption that there should be a relationship between long term prognosis and cardiac reserve three months after the attack, the expected cardiac status has been equated with scores on the Norris Coronary Prognostic Index (Table IV).

This method of assessment has been incorporated into our rating scale (Table II). Verification as to whether this relationship in fact holds will be obtained in the course of the study which I shall now describe.

### Outline of present study—objects and methods

A two year study has now been started in four hospitals in Sydney. Between six hundred and one thousand male patients under 65 will be assessed by hospital social workers on our rating scale during their admission for myocardial infarction. These will be subdivided into three groups according to their score. A sample of approximately two hundred and fifty patients will constitute the population of our prospective trial of early rehabilitation. The sample fractions which determine selection from the total population for admission to the trial are shown in Table V.

The main objects of the study are:

1. Validation of the rating scale (Table II), used during the acute phase, as an instrument for predicting return to work three months after the attack.
2. Assessment of the value of early rehabilitation starting at the acute stage, by means of a controlled trial. The differences in management between the rehabilitation or treatment group and the controls are shown in Table VI.

It is not part of the charter of the Cardiac Rehabilitation Unit, or one of our aims, to influence or advise on conventional medical treatment. We have found diazepam (Valium) helpful in the management of unduly tense and anxious patients, and tricyclic antidepressants for some depressed patients; the use of these may be suggested when appropriate. Intervention against risk factors such as smoking, hyperlipidaemia or obesity will be undertaken in treatment group patients along the lines presently practised at the Unit. This includes strong recommendations to cease cigarette smoking, to reduce weight as near as possible to the ideal, and also arrangements for investigation of hyperlipidaemia where this seems appropriate and has not already been done elsewhere. Rehabilitation group patients will be exercise tested about three months after their attack unless this is contraindicated by their condition, and given an appropriate programme of progressive regular physical

TABLE I  
EVALUATION CHART

1. CLASSIFICATION:								
1B - - - - -	-	-	-	-	-	-	-	0
2B - - - - -	-	-	-	-	-	-	-	1
2B— - - - -	-	-	-	-	-	-	-	3
2C or worse - - - - -	-	-	-	-	-	-	-	6
2. AGE								
Under 45 years - - - - -	-	-	-	-	-	-	-	0
45 to 55 years - - - - -	-	-	-	-	-	-	-	1
55 to 65 years - - - - -	-	-	-	-	-	-	-	2
3. LENGTH OF ILLNESS SINCE ORIGINAL ATTACK:								
Less than one year - - - - -	-	-	-	-	-	-	-	0
One to three years - - - - -	-	-	-	-	-	-	-	1
More than three years - - - - -	-	-	-	-	-	-	-	2
4. LENGTH OF TIME OFF WORK BEFORE REFERRAL:								
Less than three months - - - - -	-	-	-	-	-	-	-	0
Three months to one year - - - - -	-	-	-	-	-	-	-	1
More than 1 year - - - - -	-	-	-	-	-	-	-	2
5. STABILITY OF WORK HISTORY:								
Regular full-time or part-time work - - - - -	-	-	-	-	-	-	-	0
Irregular work - - - - -	-	-	-	-	-	-	-	2
6. OCCUPATION:								
Professional, clerical skilled - - - - -	-	-	-	-	-	-	-	0
Semiskilled - - - - -	-	-	-	-	-	-	-	1
Unskilled - - - - -	-	-	-	-	-	-	-	2
7. MARITAL STATUS:								
Married - - - - -	-	-	-	-	-	-	-	0
Single, widowed - - - - -	-	-	-	-	-	-	-	1
Divorced, separated - - - - -	-	-	-	-	-	-	-	2
8. FAMILY OR SOCIAL STABILITY:								
Good or adequate - - - - -	-	-	-	-	-	-	-	0
Poor - - - - -	-	-	-	-	-	-	-	2
9. EACH OTHER SIGNIFICANT DISEASE:								1
10. PERSONALITY FACTORS:								
Past history:								
Depression								
Anxiety								
Present symptoms:								
Anxiety ("nerves", phobic reactions etc.) or Depression (withdrawal, insomnia, anorexia, etc.)								
Mild - i.e., of normal intensity, causing concern, rather than distress, to patient and family - - - - -	-	-	-	-	-	-	-	0
Moderate - i.e., causing significant distress to patient and family - - - - -	-	-	-	-	-	-	-	2
Severe - incapacitating or causing severe distress - - - - -	-	-	-	-	-	-	-	4
11. INHIBITING SOCIAL SERVICE AND OTHER FINANCIAL FACTORS:								
(e.g. Workers' Compensation, Pensions, Superannuation)								
Nil - - - - -	-	-	-	-	-	-	-	0
If present - - - - -	-	-	-	-	-	-	-	2
12. ETHNIC FACTORS:								
Australian or assimilated migrant - - - - -	-	-	-	-	-	-	-	0
Migrant with assimilation problems - - - - -	-	-	-	-	-	-	-	2

TABLE II  
EVALUATION CHART

	Rating	Score
I. PHYSICAL CLASSIFICATION:		
(1) (Complete according to following table of values):		
1B - - - - -	-	0
2B - - - - -	-	0
2B— - - - -	-	3
2C or worse - - - - -	-	6
NORRIS C.P.I.		
0 - 5		1B - 2B
5 - 8		2B—
8+		2C or worse
Norris Coronary Prognostic Index Score:		
Corresponding N.Y.H.A. Classification:		
(2) EACH OTHER SIGNIFICANT DISEASE: (Score 1 for each disease).		
(a).....		
(b).....		
(c).....		
II. SOCIAL CLASSIFICATION:		
(3) AGE		
Under 45 years - - - - -	-	0
45 - 55 years - - - - -	-	1
55 - 65 years - - - - -	-	2
(4) STABILITY OF WORK HISTORY:		
Regular full-time or part-time work - - - - -	-	0
Irregular work - - - - -	-	2
(5) LAST OCCUPATION:		
Professional, clerical, skilled - - - - -	-	0
Semiskilled - - - - -	-	1
Inskilled - - - - -	-	2
(6) PLACE OF RESIDENCE:		
Metropolitan or industrial city - - - - -	-	0
Country:		
Semiskilled - - - - -	-	1
Unskilled - - - - -	-	2
(7) PREVIOUS JOB:		
Job with previous employer:		
Available - - - - -	-	0
Not available - - - - -	-	2
(8) MARITAL STATUS:		
Married - - - - -	-	0
Single, widowed - - - - -	-	1
Divorced, separated - - - - -	-	2
(9) FAMILY OR SOCIAL STABILITY:		
Good or adequate - - - - -	-	0
Poor - - - - -	-	2
(10) PERSONALITY FACTORS:		
Note past history of depression, anxiety or other psychiatric episodes.		
Present symptoms:		
Anxiety ("nerves", phobic reactions etc.) or depression (withdrawal, insomnia, anorexia, etc.)		

(Continued)

TABLE II (Continued)

Mild - i.e., of normal intensity, causing concern, rather than distress, to patient and family, - - -	0
Moderate - i.e., causing significant distress to patient and family— - -	2
Severe—incapacitating or causing severe distress - - - -	4

- (11) **INHIBITING SOCIAL SERVICE AND OTHER FINANCIAL FACTORS:**  
(e.g. Workers' Compensation, Pensions, Superannuation).
- |                      |   |
|----------------------|---|
| Nil - - - - -        | 0 |
| If present - - - - - | 2 |
- (12) **ETHNIC FACTORS:**
- |                                      |   |
|--------------------------------------|---|
| Australian or assimilated migrant -  | 0 |
| Migrant with assimilation problems - | 2 |
- (13) **EXCESSIVE PATIENT DEPENDENCE OR OVER-PROTECTIVE FAMILY ATTITUDE:**
- |                      |   |
|----------------------|---|
| If absent - - - - -  | 0 |
| If present - - - - - | 2 |

**TOTAL SCORE**

TABLE IV

Norris C.P.I.	N.Y.H.A.
0 - 5	1B—2B
5 - 8	2B—
8 +	2C or worse

TABLE V

Group	Score	Sample fraction	
		Treatment	Control
A	0 - 5	1/8	1/8
B	6 - 9	1/3	1/3
C	10 +	1/2	1/2

TABLE VI

Part of Programme	Rehabilitation Patients	Controls
(1) Medical care	Unchanged	Unchanged
(2) Risk factor intervention (smoking, diet).	As usually practised at the Unit, in addition to advice already received.	Unchanged (as advised by hospital and own medical attendant).
(3) Physical exercise programme	Verbal and written instructions	Unchanged or none
(4) Social	Full case history. Aid provided by contacts between staff and social agencies, relatives etc.	As at present (in hospital, usually if serious problems are apparent).
(5) Vocational	Vocational history. Contacts with employer. Work requirements study, aptitude tests, and retraining arrangements where required.	Present management unchanged

TABLE III

**CORONARY PROGNOSTIC INDEX**

Factor	X	Y	Result
<b>AGE:</b>			
Less than 50	0.2)	4.9	
50 - 59	0.4)		
60 or over	0.6)		
<b>HEART SIZE:</b>			
Normal	0 )	1.7	
Doubtfully or definitely Enlarged	1 )		
<b>LUNG FIELDS:</b>			
Normal	0 )	5.1	
Pulmonary congestion	0.3)		
Interstitial or pulmonary oedema	1 )		
<b>PREVIOUS ISCHAEMIA:</b>			
No previous infarction	0 )	3.5	
Previous infarction	1 )		
<b>TOTAL</b>			

TABLE VII

**DATA ABOUT PATIENT INCOME**

Item 1. Income before illness from work (gross):	_____
Item 2. Income during illness and period before return to work:	_____
(i) Commonwealth Sickness Benefit	_____
(ii) Unemployment benefit	_____
(iii) Sickness Insurance	_____
(iv) Sick Pay	_____
(v) Gratuities from employer: Long service leave or other financial benefit	_____
Item 3. Income after return to work:	_____
(i) Wages or salary (gross)	_____

exercises, based on the instruction booklet for cardiac patients published by the National Heart Foundation of Australia.

Rehabilitation group patients will be seen at the Unit four weeks after discharge from hospital. At this stage assistance will be provided with any social, family and work problems which come to light; some of these will already be obvious from the assessment previously made in hospital. They will be seen again, if possible, four weeks later, at about the time that many of them will be due to resume work. Follow-up of both groups, rehabilitation and control, will be done six months after admission by interview or questionnaire. At the six month stage any patients in the control group who have encountered difficulties in rehabilitation, whether with work or in other areas, will be offered the help of the unit if they desire it.

The end points used in assessing the benefits, if any, from an early rehabilitation programme will be as follows:

1. Time of return to work. In the uncomplicated case, this is usually between eight and twelve weeks after the attack in this community. It is likely to vary with different prognostic groupings and other factors.
2. Number and proportion of days worked during the observation period, i.e. the first three months after return to work. This is a reliable criterion of successful work rehabilitation: it shows whether the patient has been returned to a job which he is capable of handling physically and emotionally, and, in the case of employed persons, to their employer's satisfaction.
3. Mortality rate from all causes during the study.
4. Rate of recurrence of myocardial infarction.

It is not expected that these last two will show significant differences during the short period of observation, as average follow-up will be only about one year.

#### FURTHER INVESTIGATIONS

The following additional investigations are also being undertaken as part of the study:

1. An assessment of the financial cost of the heart attack to the patient; the data being obtained are shown in Table VII.

We have obtained the assistance of the Department of Health Administration at the University of New South Wales for this part of the project. When the results of our rehabilitation study are available it may be possible to carry out a cost-benefit analysis of early cardiac rehabilitation, that is, a comparison of the total cost of a programme such as ours with the economic benefits produced.

2. Objective psychologic testing of our entire patient series by questionnaire during hospitalisation and six months after the attack is being carried out, using the questions for measuring anxiety and depression from the Minnesota Multiphasic Personality Inventory. The questionnaires were prepared

and are analysed by the Senior Clinical Research Psychologist to the National Heart Foundation of Australia (N.S.W. Branch). It is hoped to obtain objective information regarding the frequency and severity of anxiety and depression after myocardial infarction, and the effect of resumption of work and early rehabilitation on these.

3. After termination of the study we hope to undertake statistical analysis of the separate factor loadings used in our rating scale in order to eliminate factors of little predictive value, and construct a simplified scale if possible.

Some preliminary results of the trial should be available for this presentation.

In conclusion, we wish to quote from Helander (1971) whose words admirably summarise our objectives:

"Account must be taken of the fact that, when a rehabilitation department in a hospital is established, a new system of medical care is being introduced, where attention is focused on the social consequences of the patient's disease; in this case myocardial infarction. In other words the aim will be to test the advantages of a system, where an effort is made, at an early stage of the disease, to foresee the probable difficulties which will arise on return to work and to daily living activities. All available means will be used to make it possible for the patient to lead a normal life once more, and, to this end, the co-operation of the authorities, employers, families, etc. will be sought.

The patient will thus not be left trying (often at a much later phase of his disease) to find for himself the right way to approach the responsible agencies and bureaucratic networks.

By adding a rehabilitation programme to the usual care, we shall increase the initial costs. On the other hand, these costs will be more than offset by returning the patient earlier to work."

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