

## The Course and Determinants of Reactions to Myocardial Infarction

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**SUMMARY** The growth of speculative theories about response to physical illness has not been backed by quantitative information. The introduction of standardized measures of psychological and social adjustment has allowed description and analysis of disability for 100 patients and their spouses two and twelve months after a first myocardial infarction. (1) Global measures of social outcome were found to be inadequate and misleading and therefore work, leisure, marriage and family relationships, sex and compliance were separately examined. (2) There was considerable continuity in individual reactions throughout convalescence and it was possible (3) to identify factors in the premorbid psychosocial state predictive of outcome and (4) to describe characteristic patterns of coping. (5) Outcome for spouses can be similarly described and understood. The findings have clinical applications for diagnosis, prophylaxis, treatment and the evaluation of medical care. The conclusion also extend our understanding of the basic principles underlying response to physical illness.

### Introduction

Psychosomatic medicine has generally neglected the psychological consequences of illness even though the pursuit of aetiology has been largely unfruitful, and improved understanding of reactions to illness has obvious and important applications in improving and evaluating treatments. Recent increased interest has led to numerous descriptions of individual illness and to interesting but as yet speculative hypotheses and reviews (Lipowski, 1975). The lack of relationship between disability and medical severity has been repeatedly demonstrated but there is otherwise little quantitative evidence to provide a basis either for burgeoning theory or for clinical practice (diagnosis, prophylaxis, treatment). A number of the unresolved major issues were examined in a study of 100 patients suffering first myocardial infarction:

(1) *Are there characteristic patterns of psychological and social outcome?* It has been assumed that outcome can be viewed either as a single dimension from good to bad or as several broad

categories. These generalizations have been based on narrowly focussed measures of psychological state and social adjustment (most often return to work) and there is a need for detailed re-examination.

(2) *Is there continuity of individual reactions throughout the course of illness?* Whilst clinicians often assume a continuity of individual response, little is known of the natural course of reaction and of the extent to which very early behaviour and feelings can be taken as an indication of eventual outcome.

(3) *Is it possible to identify factors predictive of psychosocial outcome?* Scattered evidence has related disability to pre-morbid psychological and social state, but the measures used go little beyond clinical impression.

(4) *Are there specific coping strategies associated with the quality of final outcome?* A steadily growing literature has emphasized the role of so called 'coping behaviour', but although the theory is appealing there has been a marked reluctance to define these forms of behaviour or

to relate them to the course and outcome of illness.

(5) *How do the effects for spouses' lives compare with those for patients?*

Posing these five questions it is apparent that despite much speculation they remain substantially unanswered for all physical illnesses. The major obstacle to understanding has perhaps been the failure to apply appropriate measures and a reliance on questionnaires and psychometric measures of uncertain validity and unclear relevance. We therefore turned to well established procedures of social psychiatry and used standardized ratings and a semi-structured interview (cf. Brown, 1965). The emphasis on actual behaviour makes this approach particularly relevant to patients' everyday problems and to routine clinical practice. First myocardial infarction is especially suitable for investigation of our principal questions because it is common, because of its substantial impact and because the sudden onset allows reliable retrospective measures of pre-morbid adjustment.

Previous reports shed some light on the five questions. Cay *et al* (1972) concluded that difficulties during follow-up were associated with pre-existing psychosocial problems and psychiatric history. Stern and his colleagues (1976) differentiated during hospital admission two groups of patients, depressives and deniers, who had respectively poor and good psychological outcomes during the year after an infarct. The depressive group also had work and sexual problems and higher readmission rates. An elaborate study by Croog and Levine (1977) examined a large number of variables in the year after an infarct, but the measures and analyses are such that few conclusions about the patterns of psychological and social outcome are possible.

We have already described considerable and widespread psychosocial effects both for the patients and for spouses two and twelve months after the first infarction (Mayou *et al*, 1978, a, b, c, d) and have partially answered our first question. Apart from the extreme of very good or very bad outcome, global outcome categories were heterogeneous and valueless, even misleading, as a summary of morbidity and in the analysis of predictive factors. It is therefore

essential to consider each aspect of social life separately.

### Methods

The procedures have been described in detail elsewhere (Mayou *et al*, 1978d). One hundred consecutive patients aged under 70 with a definite first myocardial infarction, and 82 spouses were separately interviewed at hospital admission and two and twelve months after their infarction. There were 89 men and 11 women. A flexible semi-structured interview approach was used and ratings made from tape recordings according to previously agreed definitions on a series of rating scales (cf. Brown, 1965). Apart from the first patient contact, all interviews were in the patients' homes.

The initial interviews covered history of the infarct, pre-morbid adjustment (work, leisure, marriage, family, social contacts, life events, sex) and mental state. At two months, mental state, physical activity and interaction with others were rated and at one year all areas of adjustment were reassessed together with questioning about medical care and new life events. Spouses were interviewed both to check reliability and to describe the changes in their own lives.

At one year, as well as rating levels of physical activity in work and leisure, the three members of the research team made consensus assessments of change in activity since the infarction, satisfaction, change in satisfaction for work, leisure, sex, marriage, family and social contacts. The measure of the quality of outcome was a consensus rating by the three members of the research team, taking into account all the factors in the patient's life (physical handicap, life events, medication, recommendations, etc.). Information was also taken from hospital notes and from general practitioner's replies to questionnaires. Chi-squared was used throughout to assess the significance of associations and Kendall's Tau as a measure of strength of relationships.

### Results

1. *Are there characteristic patterns of psychosocial outcome at one year?*

We have previously presented descriptive data of final outcome (Mayou *et al*, 1978b) but

further analysis of the associations between our measures at all stages defines the principal independent themes in the heterogeneous picture of adjustment.

(a) *Mental State*—Individual psychological symptoms are at each stage highly correlated with each other and neither predominant anxiety nor depression was associated with a characteristic social disability. Mental state could be viewed as resultant of predisposition and of current overall satisfaction. It was significantly associated on the one hand ( $p < .05$ ) with previous liability to psychological symptoms and on the other hand with measures of marital intimacy and satisfaction with most areas of life.

(b) *Work*—In view of the considerable security of employment of most patients and the financial pressures it is unsurprising that most patients return to work at a level of physical activity comparable to that before illness (0.46). Change in work was related ( $P < .05$ ) to previous intensity of exertion, to early expectations, to the occurrence of new life events (specifically those affecting work itself and health) and to reported somatic symptoms. Work adjustment was in no way related to any of our other ratings of psychological and social outcome.

(c) *Leisure*—The generally perceived threat of heart disease to physical activity made it probable that the main social consequences of an infarct would be on leisure interests. Our results confirmed this and our principal rating of change in physical activity in leisure pursuits correlated highly with other measures (change in social contacts 0.37, change in domestic chores 0.37), social contacts being less affected than aspects of leisure involving more physical exertion.

Since few survivors of myocardial infarction are physically limited to an extent to affect activities of any everyday intensity, we did not expect, and indeed did not find, any association with any of our cardiac measures or with reported symptoms. However, patients with other limiting physical illness did significantly less well. The results supported the hypotheses that the main predictive factors would be pre-morbid leisure activity and the patient's

and his family's beliefs about the implications of a heart attack.

(d) *Relationships*—Illness had two main influences on the quality of family life and marriage; increased awareness of the value of close relationships and problems arising from changes in mental state and behaviour of the partners. Changes in marriages and in other aspects of family life predictably occurred in parallel ( $p < .05$ ). Changes (for better or worse) were common and statistically significant predictive factors were the previous quality and the occurrence of other major life events during the year.

The frequency of sexual intercourse was much reduced following myocardial infarction, but satisfaction was much less affected, indeed some patients and a rather greater number of wives, welcomed the change. We were unable to identify any possible determinants in the reduction of frequency of intercourse; however, satisfaction with sex at one year was significantly associated with marital and family change and quality. There was no association with mental state or with physical symptoms or psychiatric history.

(e) *Compliance*—Compliance was a distinct and complex aspect of outcome with its own (largely obscure) determinants. The components of compliance with advice about medication, diet, smoking and activity were unrelated to each other and to all other outcome ratings. (Mayou *et al.*, 1978c).

## II. *Is there continuity of individual response?*

The patients' state two months after the infarct was usually a very good predictor of eventual stable outcome at one year and in the exceptions, environmental or medical reasons were apparent. Considering aspects of social function separately there were in all areas significant correlations between the ratings at two and twelve months (Table I): mental state (0.52), physical activity (0.43), coping (0.35), reported somatic symptoms (0.24) and for the various types of compliance.

We examined the psychological reaction in detail. A simple rating of mental state in hospital was significantly associated with scores at the later stages and at two and 12 months for

TABLE I  
*Continuity of reactions. Significant associations (p < .05) between ratings at two months and one year after myocardial infarction.*

One year	Two months
Mental state	Mental state Patients subjective assessment
Somatic symptoms	Somatic symptoms
Coping	Coping Planning
Work change in activity	Beliefs about work
Leisure change in activity	Coping Beliefs about leisure
Leisure activity	Coping Physical activity
Compliance (smoking, medication)	Compliance intentions

which correlations were as high for individual symptoms (anxiety, depression, fatigue, irritability, concentration) as for the total scores. However, there were five patients who were much worse and 4 who were much better at a year than at two months (discrepancy of 4 or more points in score: maximum reported score 11). In each case the interviews suggested clear environmental reasons, either the occurrence or resolution of life events or changes in chronic difficulties

### III *Is it possible to identify factors predictive of outcome?*

Since outcome cannot be viewed globally, possible predictive factors must be considered separately for each measure. Statistical associations were analysed under three broad headings: medical state, factors in the patient and factors in the social situation.

#### (1) *Medical state*

(a) *Cardiac state and medical care*—There were no significant correlations of any of our outcome criteria with any of a wide variety of measure of cardiac state or of medical care throughout the year.

(b) *Somatic symptoms*—Somatic symptoms were at two months and at one year associated

with mental state (and especially tension) and with change in work physical activity ( $p < .05$ ).

(c) *Other physical illness*—Patients with other current physical illness were ( $p < .05$ ) less physically active at two months and reduced their leisure activity significantly more during the year.

#### (2) *Factors in the patient*

##### (a) *Demographic*

*Age*—The only significant correlation was that families of older patients were likely to be more protective and restrictive.

*Sex*—There were 11 women patients (age 55–67) for whom at two months and a year the outcome was considerably less satisfactory than for men. They were distressed and less physically and socially active and generally more cautious even though they were no more physically disabled.

*Occupation*—Those in non-manual occupations were ( $P < .05$ ) more likely to return to work early, to return to work part-time and to have made fewer changes in their physical activity at work a year later. These differences are presumably partly due to greater physical demands of manual work, but also reflect different attitudes to convalescence since non-manual workers were significantly more active in their approach (coping behaviour).

*Family structure*—There were no differences between single and married patients or between couples with or without dependent children.

(b) *Expectations*—We anticipated that patients' initial beliefs about long-term consequences would be self-fulfilling and the results support this hypothesis for work, leisure, and for family life ( $P < .05$ ). Expectations were unrelated to patients' ideas about possible cause of the infarct (overwork, stress, etc.). Husbands and wives at two months had very similar expectations about eventual outcome in work, leisure, stress and diet and family life ( $P 0.01$ ).

(c) *Psychological vulnerability*—Our principal rating of previous psychological vulnerability (liability in the past to develop psychological symptoms under stress) was highly predictive of mental state in hospital, at two months and at twelve months, but not of any aspect of social disability.

(3) *Social situation*

(a) *Pre-morbid social function*—As expected, measures of social life 12 months after the infarct (Table II) were generally related to adjustment before the heart attack, the closest association being for work activity (0.46). Apart from these associations of the absolute levels of intensity or satisfaction, change for the worse was more likely ( $P < .05$ ) for patients previously most dissatisfied with their work or marriage (Table III). As well as rating activity

and satisfaction, we also identified patients who had 'chronic difficulties'. Such patients were more likely ( $P < .05$ ) to report deterioration in the marriage and family life a year later.

(b) *Other major problems*—Both before and after the infarct many patients experienced other life events (positive and negative) often with considerable effects on their lives and occasionally reported as having been of much greater consequences than the infarct (Table

TABLE II  
Associations ( $* = p < .05$ ) between premorbid state and adjustment one year after infarction

Premorbid	One year	
	Activity	Satisfaction
Work activity satisfaction	*	—
Leisure activity satisfaction	*	—
Marriage satisfaction	—	*
Family satisfaction	—	*
Sex satisfaction	—	*

TABLE III  
Changes in marital and family satisfactions at one year compared with pre-morbid adjustment ( $* = p < .05$ )

Changes at 1 year	Premorbid adjustment	Significance
Change in marital satisfaction	Previous marital satisfaction	*
	Chronic marital difficulty	*
Change in satisfaction with family life	Previous satisfaction	*
	Chronic family difficulty	*
Change in satisfaction with sex	Previous satisfaction	—

\* =  $p < .05$ .

TABLE IV  
Number and type of life events and chronic difficulties (excluding transient self-limiting events)

	Marriage	Family	Work	Health	Accom- modation	Finance	Birth/ Death	Total
<i>Life events pre MI</i>								
Total number in 2 years before infarct	3	14	14	7	9	1	10	58
Moderate or severe threat:								
at time of infarction	0	9	3	4	2	0	2	20
at 1 year after	0	3	0	2	1	0	0	6
<i>Life events in convalescence</i>								
Nil threat/welcome	0	6	6	1	5	1	4	23
Mild threat	0	6	3	4	5	1	8	27
Moderate threat	2	7	3	8	1	0	5	26
Total events	2	19	12	13	11	2	17	76
<i>Chronic difficulties</i>								
Number with moderate or severe threat at time of infarct	4	7	1	13	2	0	0	27



IV). Some events in the follow-up year seemed independent of the illness (for example, bereavement) whilst others could reasonably be seen as a consequence (for example, some job changes). The following associations were statistically significant: (1) History of life events posing a threat at a time of the myocardial infarction and mental state at two months; (2) Occurrence of new life events during convalescence and changes in work activity, in marriage, and in leisure.

(c) *Family attitudes*—Previous marital and family intimacy were significantly ( $p < 0.5$ ) correlated with mental state throughout, but not with outcomes in work and leisure.

#### IV. *Are there specific coping strategies associated with the quality of final outcome?*

(1) *Psychological* Our results give no support to the widely accepted suggestion that there is a qualitatively distinct and persisting mechanism of denial associated with good outcome, but rather we believe that 'lack of concern' in hospital is but one end of a spectrum of psychological reactions. We could identify no separate patterns of behaviour in pre-morbid way of life, before admission or during convalescence for this group of patients. Denial was unrelated to any measure of illness severity.

(2) *Coping by the patient* The principal measure was of general approach to convalescence, a spectrum from active (progressive increasing activity, tackling problems, planning) to excessive caution. This rating (at 2 months associated with physical activity and planning) appeared a useful indication of early progress and a good predictor ( $P < .05$ ) of eventual outcome in physical activity and return to a full life.

(3) *Family coping* Family attitudes appeared to be of considerable importance in determining the rate and extent of social recovery. Protectiveness by relatives restricting the patient's exertion was usual, and in 35 per cent was rated by us as consistent throughout the year. It was commonest with older patients and for those with somatic symptoms and when spouses reported that the patients had been over-active. It was not related, however, to mental state of the patient or spouse or to quality of the marriage. The strength of the association of

protectiveness with other measures of outcome is striking (change in leisure activity 0.38; change in social contacts 0.27; change in domestic chores 0.41; coping 0.35). Discussion of plans and of symptoms varied considerably and unsurprisingly its extent was related to the degree of practical involvement of spouses in convalescence (sharing walks, diets, giving up smoking etc). Both discussion and involvement were related to pre-illness marital intimacy.

#### V. *How do the effects for spouses compare with those for patients?*

Although we obtained less information on outcome, course and determinants for spouses, they can be understood in the same way as for patients. We have previously described (Mayou *et al*, 1978a) some of these findings for wives. In contrast to the patients' accurate expectations, spouses failed to realise that changes in the patient's state and activity would have continuing consequences for their own lives, and there were no significant correlations between spouses' early beliefs and the one year findings.

There were significant similarities in one year outcome for patients and their spouses in mental state (0.32) and, in joint activities (social contacts 0.46) and in their views of marriage, family life and sex. Changes in domestic chores were inversely related ( $-0.40$ ) but the correlation was less strong (0.27) for changes in leisure physical activity.

Patients were somewhat more distressed than spouses and this was so to a marked degree (4 or more points) for 8 at two months and 11 at one year. Only 3 spouses were substantially more upset, all at two months only. These differences appeared to be due either to one partner having long-standing history of psychological difficulties or to very separate and different attitudes to family life. This latter explanation was also clearly apparent for satisfaction with sex where one partner might be pleased and the other frustrated by a reduction.

### Discussion

The semi-structured interview with defined ratings has both a higher reliability and validity than psychometric measures and questionnaires and provides information which is more

comprehensive and more immediately applicable to ordinary clinical care. We now have a much more detailed description of the disability after infarction than is available for any other illness and the further analysis of statistical associations adds substantially to understanding our five basic questions.

Previous views of disability and outcome have been far too simple, and it is now evident that it is inadequate to attempt simple categorization of reactions. Each aspect of psychosocial state must be considered separately and when this is done it is possible to show continuity of individual reaction and to provide substance and refinements for a number of previously hypothesized predictors of outcome and forms of coping behaviour both for patients and for families.

There must, of course, be reservations about the interpretation of causal relationships in an uncontrolled study. Statistical associations (or lack of them) may be misleading and can at best only support hypotheses rather than prove or disprove them. However, this can be a very valuable first stage of research in providing a clear basis for the formulation and testing of more specific hypotheses. The clinical applications of understanding of the impact of physical illness are several: (1) *Diagnosis of complications and 'at risk' patients*—Description of the features of 'unnecessary, psychologically determined disability and of 'at risk' characteristics alerts the physician to them and should affect his routine; (2) *Routine Rehabilitation*—Obvious suggestions for routine rehabilitation are more systematic, precise advice, the involvement of relatives, the encouragement of the coping behaviours associated with outcome;

(3) *Evaluation of treatments*—Since a substantial proportion of disability is psychologically determined it is essential to use quantitative psychosocial criteria of outcome in evaluation of the effectiveness and efficiency of medical care, for instance, routine rehabilitation, home or hospital acute care and surgery.

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#### References

- BROWN, G. W. (1965) Some problems of family measurement. *Proceedings of the Royal Society of Medicine*, **62**, 898-901.
- CAY, E. L., VETTER, N., PHILIP, A. & DUGARD, P. (1972) Psychological status during recovery from an acute heart attack. *Journal of Psychosomatic Research*, **16**, 425-35.
- CROOG, S. H. & LEVINE, S. (1977) *The Heart Patient Recovers*. New York: Human Science Press.
- LIPOWSKI, Z. J. (1975) Physical illness, the patient and his Environment. In *American Handbook of Psychiatry*, ed. S. Arieti. New York: Basic Books Inc.
- MAYOU, R. A., FOSTER, A. & WILLIAMSON, B. (1978a) Psychological and social effects of myocardial infarction on wives. *British Medical Journal*, **1**, 699, 701.
- — — (1978b) Psychosocial adjustment in patients one year after myocardial infarction. *Journal of Psychosomatic Research*. In the press.
- — — (1978c) Medical care after myocardial infarction. *Journal of Psychosomatic Research*. In the press.
- — — WILLIAMSON, B. & FOSTER, A. (1978d) Outcome two months after a myocardial infarction. *Journal of Psychosomatic Research*, **22**, 447-53.
- STERN, M. J., PASCOLE, L. & MCLOONE, J. B. (1976) Psychosocial adaptation following an acute myocardial infarction. *Journal of Chronic Diseases*, **29**, 513-26.

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