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THE EFFECTS OF AN IN-HOSPITAL EDUCATIONAL PROGRAMME FOR MYOCARDIAL INFARCTION PATIENTS

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ABSTRACT. The effects of a standardized audiovisual educational programme for myocardial infarction (MI) patients have been evaluated in 4 hospital departments using a time-sequential quasi-experimental design. Compared with controls, patients offered the educational programme were more knowledgeable and had less fear-provoking beliefs about the MI, expressed more optimistic expectations about future physical ability, resumed physical activities more rapidly, reported less initial emotional disturbances, and consulted physicians less often during the first 6 weeks after discharge. Six months mortality-rate was significantly lower in the educational group, but long-term survival was identical in the two groups. The educational programme had no effect on smoking, return to work, resumption of sexual activity, or number of re-hospitalizations. The results indicate that standardized patient teaching during hospitalization is feasible and improves short-term coping behaviour after a MI.

Key words: coronary artery disease, myocardial infarction, rehabilitation, patient education, health knowledge, illness perception, sick role behaviour, mortality

After a myocardial infarction (MI), patients face a number of adaptive tasks relating to emotional reactions, behavioural modifications, and the resumption of family and social roles. It has been claimed that insufficient knowledge about the illness may be of crucial importance for optimal rehabilitation and adaption in heart patients (21, 26, 29).

According to cognitive psychological theory, a heart attack constitutes a life crisis in which the individual's reactions are partly mediated through the perceived meaning of the illness (3, 10). From this point of view, patient education should be implemented in medical care from the very beginning of an illness. However, the acute physical and emotional stress may restrict the MI-patient's ability to take in and retain information, and the effectiveness of in-hospital teaching for cardiac patients has been questioned (28). In some studies, none or only minor effects of rather ambitious educational programmes have been found (7, 22, 28), whereas other studies have indicated more positive results of early teaching and counselling efforts among heart patients (15, 19).

Ideally, patient education should be personal and tailored to the patient's particular needs (24). In practise, shortness of time and scarcity of human resources constitute major hindrances for optimal patient education during hospitalization. However, several reviews have found standardized patient teaching to be effective (6, 14), and some studies have even indicated certain advantages in audiovisual presentations compared with personal teaching techniques (1, 5).

The purpose of this study was to examine the short-term (i.e. within 6 months) and long-term (within 40 months) effects of a specially designed audiovisual educational programme for hospitalized MI patients, with respect to feasibility, patient evaluation, health knowledge, illness perceptions, sick role behaviour, and mortality. The study is a part of a larger research project concerning cardiac rehabilitation.

METHODS

Study design. The study involved 4 medical departments in 3 hospitals in Western Norway: a 1 200-bed University hospital with 2 medical departments, a 200-bed Community hospital, and a 150-bed District hospital. In all 4 departments, MI patients hospitalized during a predetermined time interval were offered a series of 3 audiovisual educational programmes. The time intervals ranged from 5 to 14 months, according to patient turn-over in each department. During comparable intervals, no standardized patient education was available. During either periods, there was no limitation on the amount of informal patient information given. To minimize the possibility for a systematic influence from external factors, e.g. mass media health campaigns or changes in treatment routines, the group sequence in two of the departments was reversed (Fig. 1).

Patients fulfilling the following criteria were eligible for the study: 1) below 67 years of age, 2) a diagnosis of recent MI, 3) no medical or psychological contraindications, and

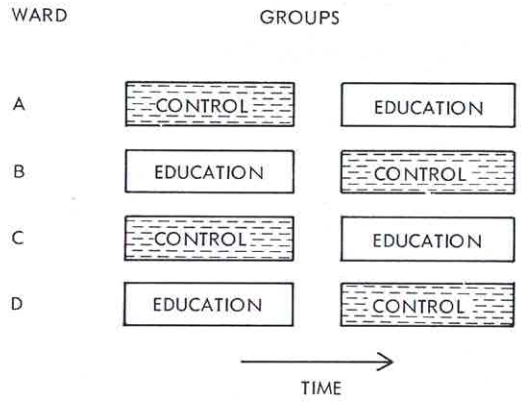

Fig. 1. Experimental design.

4) patient's informed consent to take part in the study. Of 195 MI patients hospitalized during the educational intervals and satisfying the first two criteria, 137 (70.3%) entered the study and constitute the educational (E) group. During the non-educational intervals, 115 (68.5%) of 168 MI patients were included and constitute the control (C) group. The reasons for non-inclusion were equally distributed in the two groups: of those hospitalized during the educational intervals, 26 (13.3% of total) patients had medical or psychological contraindications, 12 (6.2%) were not willing to participate, and 25 (14.9%) were lost due to other reasons (short hospital stay, diagnosis not confirmed before discharge, researchers not notified). The corresponding figures for patients admitted during the control intervals were: 25 (14.9%), 12 (7.1%), and 20 (10.3%).

Examination of background characteristics revealed no significant differences between the two groups, with one exception: E-group patients had on average 0.7 years more formal education than C-group patients ($p<0.05$). Indices of severity of the heart attack were also comparable in the two groups (Table I).

In all hospitals, patients were observed in a coronary care unit for the first 2 to 3 days after admission. Mean duration of the hospital stay was 15 days. After discharge, most patients were followed-up by their primary physician. Only one of the hospitals had an organized rehabilitation programme for selected cardiac patients and less than 2% of the study sample participated in such a programme.

The educational programme. The standardized teaching tool consisted of 3 sound-slide presentations developed for this study. Each part comprised about 40 colour-illustrations with accompanying short verbal commentaries on audio-cassettes, lasting about 15 min.

Part 1 briefly described normal cardiovascular function, atherosclerosis, and the pathogenesis of angina pectoris and myocardial infarction.

Part 2 presented simple rules for gradual physical reactivation after the MI, with a limited number of exercises and a walking regimen for the first weeks after discharge. In addition, commonly occurring problems were discussed, such as emotional reactions at home-coming, chest pain and other cardiovascular symptoms, resumption of driving and sexual activity, and return to work. Specific advice on when to contact the doctor in case of chest pain was given.

Part 3 discussed the possible causes and risk factors for coronary heart disease (CHD). General advice on lifestyle changes was given, in particular about the importance of stopping smoking. A moderate reduction in consumption of fat was recommended. Physical activity, stress, overweight, and hypertension were also briefly discussed.

The nursing staff administered the educational programmes according to the medical state of the patient and the practical circumstances. As a general rule, the first part of the series was shown about 5–7 days after admission and the next two parts during the remainder of the hospital stay. If feasible, the programmes were shown to small groups of patients. Spouses were also encouraged to participate when feasible. Patients were free to watch the programmes as many times as they wanted.

Data collection and analysis. The patients were contacted by the project physician during the last week of hospitalization (T1—mean 9 days after admission) for a short interview. If the patient consented to participate, he completed a set of questionnaires within the day before discharge (T2—mean 14 days after admission), covering various psychological factors (see below) and information about the medical, vocational, and social state before the MI. After discharge, patients returned postal follow-up questionnaires about their medical, psychological, and social functioning at the following points of time: T3 (mean 12 days after discharge), T4 (6 weeks), T5 (6 months), and T6 (mean 40 months). Participation rates were above 90% at all follow-ups.

Before leaving hospital, the patients completed a 5-item scale about their attitudes towards the hospital personnel. At T4 the patients rated the amount of information re-

Table I. *Background factors and indices of severity of the myocardial infarction in educational and control patients*

	Educational group (N=137)		Control group (N=115)	
Background				
Male sex (%)	86.9		87.0	
Married (%)	87.6		81.7	
Urban residence (%)	53.3		58.3	
Age (mean years, SD)	55.7	7.6	56.9	7.4
Education (mean years, SD)	9.3	3.1	8.6	2.0
Employed before MI (%)	70.8		70.4	
Smoking before MI (%)	60.6		60.9	
Previous MI (%)	19.0		20.0	
Previous angina (%)	21.9		16.5	
Indices of severity				
Peak ASAT level in serum (mean U/l, SD)	202.0	143.7	220.5	146.6
Congestive heart failure	32.1		38.3	
Arrhytmias (%)	18.2		20.0	
Duration of hospitalization (mean days, SD)	14.8	4.4	14.9	4.8

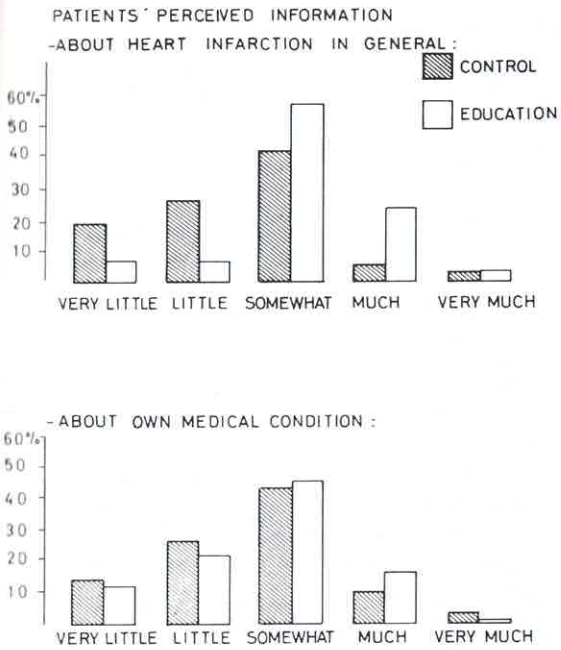

Fig. 2. Patients' evaluation of in-hospital information.

ceived during the hospital stay concerning (*a*) myocardial infarction in general and (*b*) their own condition.

At T3 and T5 the participants completed a Cardiac Health Knowledge Questionnaire including 3 subscales: 1) The Basic Cardiac Knowledge Scale (30 items) about the nature of CHD; 2) The Cardiac Lifestyle Knowledge Scale (15 items) about behavioural aspects concerning the etiology and the rehabilitation of CHD; and 3) The Cardiac Misconceptions Scale (10 items) covering common fear-provoking misconceptions about a heart attack (high score indicating a relative absence of misconceptions). A Total Cardiac Knowledge Score (45 items) was computed by summing the first two subscales.

Before discharge, the patients' appraisal of their future life quality and functioning was assessed by a questionnaire comprising 4 scales: 1) Expectations of Reduced Autonomy (9 items), 2) Expectations of Reduced Physical Ability (5 items), 3) Expectations of Reduced Work Capacity (7 items), and 4) Expectations of Reduced Emotional Control (8 items). In addition, the patients rated their future global health status on an open 9-point scale (1: "Very bad", 9: "Very good").

State-dependent emotional reactions were assessed by a semantic-differential type questionnaire (SED) administered on two different occasions during hospitalization (T1 and T2) and at each follow-up after discharge. This short inventory consists of 16 pairs of bi-polar adjectives describing feelings of anxiety, depression, irritability, and strength. A combined score of anxiety and depression (SED-AD) was used for the present analysis.

At the T4 to T6 surveys, the participants reported their level of physical activity, sexual activity, and work activity, in addition to smoking behaviour, and use of health services such as number of consultations with physicians and readmissions to hospital. Clinical data were noted from the hospital records. Mortality within the follow-up period was checked with the Death Register of The Central Bureau of Statistics.

Statistical analysis. In the analysis, the "intention-to-treat"-principle has been followed, examining differences between all patients recruited to the E- and C-groups. Tests of associations include χ^2-tests and two-tailed *t*-tests, with $p<0.05$ as a criterion for statistical significance. Multiway analyses of variance were performed for simultaneous evaluation of several sources of influence on the dependent variables (17). For mortality data, survival analysis using the Lee-Desu statistic was performed (8).

RESULTS

Feasibility. In 2 of the 4 participating departments, all study patients watched the complete educational series at least once during the hospital stay. Various organizational problems in the other 2 departments prevented 8 patients from participating in any part of the educational series. In addition, 12 patients watched only 1 part and 11 patients only 2 parts before discharge. Thus, only 106 (77%) of the 137 patients assigned to the E-group actually received all 3 parts of the teaching series.

Patient evaluation. Significantly more patients in the E-group felt they had received adequate general information about the heart disease during hospitalization (Fig. 2). Only 14% of E-group patients gave a rating of little or very little information received, compared with 47% of C-group patients ($p<0.05$).

In contrast, ratings of individualized counselling were fairly similar in the two groups. Forty-one percent of the C-group and 35% of the E-group expressed dissatisfaction with the amount of personal advice received (NS). Educational and control patients also had nearly identical attitudes towards the hospital personnel (Table II).

Knowledge and expectations. Immediately after discharge (at T3) E-group patients demonstrated significantly better knowledge than C-group patients in all areas covered by the Cardiac Health Knowledge Questionnaire (Fig. 3). Concerning basic cardiac knowledge, the E-group obtained an average of 61% of maximal score, compared to 52% in the C-group ($p<0.001$). In lifestyle questions, the E-group on average scored 69% compared to 62% in the C-group ($p=0.002$). The difference was most pronounced for the Cardiac Misconceptions Scale (E-group: 62% and C-group: 49%, $p<0.001$).

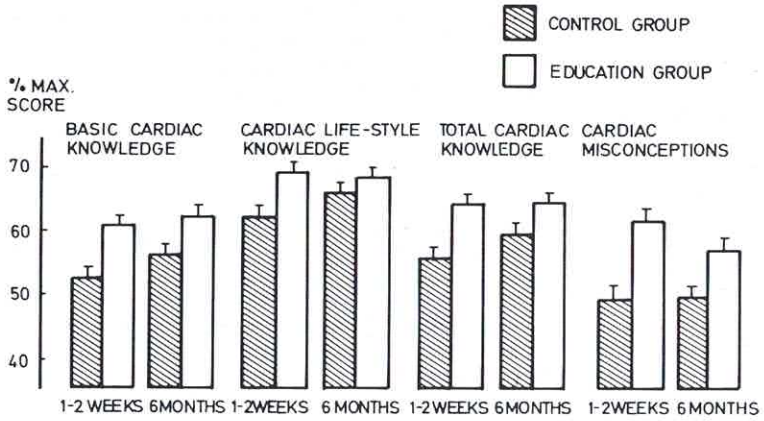

Fig. 3. Cardiac health knowledge among educational and control patients 1–2 weeks and 6 months after discharge. *Note:* a high score on the Cardiac Misconceptions Scale indicates better knowledge.

Level of cardiac knowledge was strongly related to formal educational level ($p<0.0001$). However, the effect of the educational programme on total cardiac health knowledge remained highly significant, even when amount of formal education was used as a covariate (F-value without controlling for formal education: 16.92, after controlling for formal education: 12.27, $p=0.001$). Level of cardiac knowledge was not significantly related to where the patient was hospitalized. In all 4 departments, E-group patients had a higher knowledge level than C-group patients, the relative difference ranging from 9% to 22%.

Half a year after discharge (at T5), the E-group had an unchanged mean level of total cardiac knowledge (64%), whereas C-group patients had improved to 60% of maximal score, a significant change ($p<0.05$) (Fig. 3). Only in the area of basic understanding of CHD was the difference between the E-group and the C-group still statistically significant.

Educational and control patients did not substantially differ in their average expectations of future autonomy, work capacity, and emotional stability, as rated before discharge from hospital (Table II). However, E-group patients clearly expected less reduction of their future physical ability. Also, a tendency towards more favourable ratings of future global health was noticed among educational patients.

Resumption of physical activities and sexual life. Early in the convalescent period, significantly more educational patients than controls stated that they were training regularly (Table III). As time passed, the proportion of patients reporting regular physical training declined and the group differences disappeared.

A more rapid resumption of physical activity among E-group patients was also evident from the patients' description of their ability to perform various defined physical activities. Within the 6 weeks follow-up (T4), 49% in the C-group had yet not tried to walk fast up-hill or run slowly on level ground, compared with 35% in the E-group ($p<0.05$). At each follow-up, more educational patients reported

Table II. *Attitude and expectations among educational and control patients*

	Educational group		Control group			
	Mean	SD	Mean	SD	t	p
Positive attitude towards hospital staff	22.40	2.51	22.30	2.08	0.34	0.731
Expectations for						
Reduced autonomy	23.82	6.48	24.68	7.50	0.95	0.344
Reduced physical ability	11.82	3.47	13.50	4.27	3.36	0.001
Reduced work capacity	15.56	6.69	16.59	6.59	1.20	0.233
Reduced emotional control	11.80	4.37	11.56	4.24	0.44	0.664
Global health	6.36	2.08	5.87	1.72	1.68	0.095

Table III. *Reported regular physical training and resumption of sexual activity after the myocardial infarction among educational and control patients*

	Educational group		Control group			
	n	%	*n*	%	χ^2	*p*
Reporting regular physical training at						
6 weeks (T4)	110	84.0	74	69.8	5.97	0.015
6 months (T5)	30	56.9	49	49.5	0.93	0.334
40 months (T6)	37	33.0	31	33.3	0.00	1.00
Resumption of sexual activity at						
6 weeks (T4)	70	69.3	47	61.8	0.77	0.379
6 months (T5)	85	92.4	64	85.3	1.47	0.226

that they were able to perform the highest activity level, i.e. running on flat ground or running slowly up-hill. (At T4, 16% and 11%; at T5, 31% and 20%; and at T6, 40% and 29% respectively.) However, these differences were not statistically significant.

No differences in resumption of sexual activity between the two groups were found (Table III).

Emotional reactions. During the last 5 days of the hospital stay, 24% of patients in the E-group and 33% in the C-group received tranquilizers. Immediately after discharge, the figures were 9% and 13%, respectively. None of these differences were statistically significant.

After discharge, mean values of anxiety and depression (SED-AD) increased markedly in both groups, but the immediate changes were more pronounced in control patients (Fig. 4). At T3, the group differences were statistically significant for depression ($p=0.04$) but not for anxiety ($p=0.15$) or the combined anxiety-depression score ($p=0.07$). Later, the two groups converged towards a near identical mean level of state-dependent emotional status, demonstrating a weak decline in the course of time. Analysis of variance with repeated measures showed a highly significant effect of time ($p<0.0001$) but not of group assignment.

Smoking. Although smoking was given special attention in the educational programmes, no effect on smoking behaviour after the myocardial infarction was found. Before the MI, 60% in the E-group and 61% in the C-group were daily smokers. Six months after the MI, the proportion of smokers in the two groups were 26% and 24%, and at the 40 months follow-up 35% and 28%, respectively.

Return to work. Resumption of work was not influenced by the educational programme. Six months

Table IV. *Consultations with physicians after discharge and number of re-hospitalizations among educational and control patients*

	Educational group		Control group			
	Mean	SD	Mean	SD	*t*	*p*
Consultations with physicians						
Within 6 weeks after discharge	1.14	0.89	1.45	0.95	2.63	0.009
Within 6 months after discharge	3.38	2.18	3.87	2.17	1.65	0.100
Previous year before the 40 months follow-up	3.63	2.84	4.45	4.51	1.58	0.116
Re-hospitalization						
Within 6 months after discharge	0.43	0.85	0.47	1.03	0.35	0.729
Within 40 months follow-up	1.45	1.55	1.22	1.75	0.31	0.755

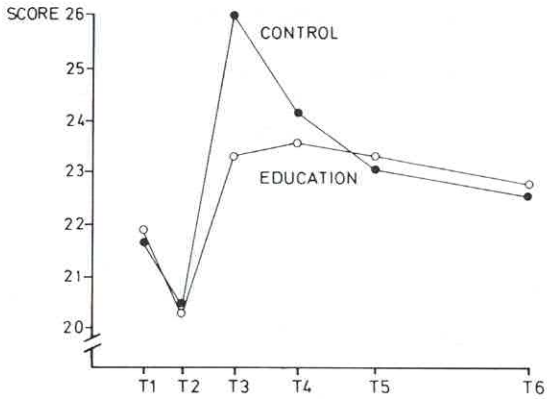

Fig. 4. Self-rated anxiety and depression (mean level SED-AD) among educational and control patients during and after hospitalization. (T 1 = mean 9 days after admission, T 2 = the day before discharge, T 3 = mean 12 days after discharge, T 4 = 6 weeks after discharge, T 5 = 6 months after discharge, T 6 = mean 40 months after discharge.)

after the MI, 66% of the E-group and 70% of the C-group patients had returned to work.

Consultations with physicians. Educational patients consulted physicians less often after discharge than did control patients. The difference was statistically significant in the early post-hospital period (Table IV).

Readmissions to hospital. There was no differences between the E-group and the C-group regarding readmissions to hospital in the follow-up period (Table IV). In both groups, 14% of the surviving patients suffered a reinfarction before the long-term follow-up, whereas 23% in the E-group and 22% in the *C*-group were readmitted to hospital with chest pain not caused by a MI.

Mortality. Analysis of short-term survival demonstrated a significant lower mortality in the E-group. Within the first 6 months, there were 2 deaths among the 137 educational patients and 7 deaths among the 115 control patients ($p<0.05$). Later on, however, the difference between the two groups disappeared and at the 40 months follow-up the survival rates were approximately equal (Fig. 5).

DISCUSSION

In the present study a time-sequential quasi-experimental design was chosen. Random allocation of consecutive patients to either an educational group or to a control group was not considered feasible within the hospital setting for practical reasons and anticipated objections from patients not admitted to the educational programme (20). The internal validity of the experiment was enhanced by the inclusion of 4 different pairs of comparison groups and by reversing the group sequence within 2 of the pairs. Examination of a series of demographic and clinical factors revealed no differences between the groups other than a somewhat higher educational level among E-group patients. The same group difference in formal education was also found for non-included patients, indicating that the variation was a product of chance alone and not due to selective recruitment to the study. However, the absence of a true random assignment of patients warrants caution in the interpretation of the results (2).

The results are based on a 70% subsample of total MI-patients admitted during the study periods. Very few patients refused to cooperate. However, those judged too sick to answer the questionnaires were not included. On the other hand, relatively many patients with small and clinically benign infarctions did not enter the study due to administrative reasons. On balance, therefore, the study population can be considered as fairly representative of MI-patients in comparable age groups.

The study indicates that learning is possible in the acute stage after an acute MI, even after minimal educational efforts. Patients watching less than 1 hour of audiovisual presentation had better knowledge and less fear-provoking misconceptions concerning their disease. Even if differences in formal education could account for some of the variation in cardiac health knowledge between the two groups, the impact of the educational programme remained significant when this factor was controlled for.

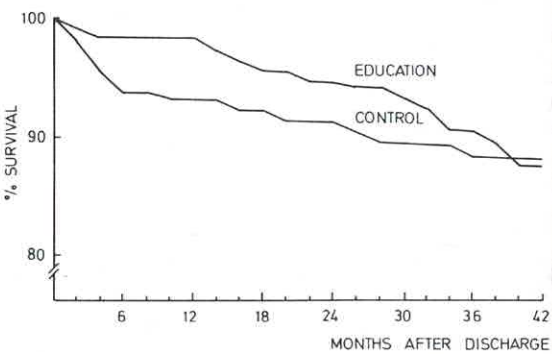

Fig. 5. Survival of educational and control patients.

After discharge, no further improvement in illness understanding occurred in the E-group, whereas control patients seemingly picked up some additional knowledge. A possible explanation can be that the control patients' dissatisfaction with the in-hospital information resulted in a more active information-seeking behaviour after discharge.

The rather modest absolute improvement in patients' knowledge must be judged in view of the limited educational input, the timing of the educational programme, and the fact that not all patients watched the full educational series. Only a minority of patients had repetitions of the programmes, and patients discharged sooner than expected sometimes lost one or two parts. In two of the hospital departments the turn-over of patients was very high and the work-burden on the ward personnel extremely heavy. No extra facilities were available for the educational experiment apart from the audio-visual aids. Whereas these factors possibly reduced the impact of the programme, they strengthen the external validity (i.e. representativeness) of the experiment.

Early and gradual physical reactivation is an important part of the rehabilitation efforts after a heart attack (21, 26). In the educational series, considerable emphasis was placed on motivating the patient to increase their activity level according to a thoroughly described post-discharge exercise programme. On returning home, educational patients had better knowledge in all questions relating to physical activity and also had a more realistic and optimistic attitude towards physical reactivation than control patients. The group differences could not be explained by the relatively lower level of formal education among the controls. Educated patients showed less delay in resuming previous activity levels, a finding corroborated by others (13, 22). However, when the ability to perform various activity levels was compared, no significant overall group difference in maximal physical performance was found.

The educational programme appeared to have a beneficial effect on the emotional adjustment during the first weeks after discharge from hospital. The transfer from hospital to home has been known to induce a feeling of insecurity in many patients and to increase the level of anxiety and depression (27). In addition, fear for recurrences and permanent disability may be precipitated by various unexpected bodily sensations when resuming physical activity.

In the educational programme the patients were explicitly informed about these commonly occurring reactions and told that they were usually not signs of deterioration. This brief preparatory information may have helped the patients to cope with the psychological stress and feeling of helplessness on returning home. A number of studies of preparatory information before surgery or other threatening medical procedures have found positive effects on recovery and psychological well-being (6, 14). Such interventions have best chance for success when the stress is time-limited and focalized, and rather uniform in its manifestations for all participants. In more complex and varying situations, brief preparatory information cannot be expected to have any strong and lasting effect, in accordance with the observations in this study and most other investigations (7, 11, 13, 16, 19). On the other hand, a number of more recent studies have shown improvements in psychosocial functioning and less depression among participants in post-hospital group discussions (18, 23, 25). Common for these interventions have been a combined educational and psychotherapeutic approach, allowing for peer support and open communication between health professionals and patients.

Additional evidence of improved coping as a result of the educational programme is suggested by the lower number of physician contacts reported by educational patients after discharge. Judged by clinical data, the two groups did not differ in the severity of heart disease, and the post-hospital morbidity in terms of number of re-hospitalizations were also comparable. Post-MI physician utilization was unrelated to level of formal education. Thus, we have reason to believe that the lower use of physician services among educational patients reflects an increased ability to use self-care activities in response to physical or psychological problems.

The effect of educational and psychological interventions on survival in heart patients is still open to discussion. Two earlier studies have indicated lower mortality after a heart attack in patients submitted to such treatment (9, 20). However, due to small sample sizes and high alpha levels, type-I error cannot be ruled out as an explanation for these findings. In the present study, the lower short-term mortality rate for educational patients—although statistically significant—should also be considered as a tentative finding, due to the small number of deaths and the later convergence of the survival curves.

On the other hand, evidence is accumulating that excessive emotional arousal possibly can trigger life-

threatening cardiac arrhythmias (12). The psychological response during hospitalization has been found to predict six-months mortality after a MI (4). To the extent that patient education ameliorates emotional reactions, a secondary preventive effect of such activities cannot be excluded. In the present study there were indications of less psychological disturbance among educational patients shortly after discharge, corresponding to the period of reduced mortality risk.

No other long-term effects of the educational programme were observed. Neither return to work nor resumption of sexual activity was influenced by the educational programme. Morbidity as measured by subsequent admissions to hospital, was also found unrelated to early education. Thus, the main effects of the in-hospital educational programme appeared to be limited to the first months after the MI.

In conclusion, standardized audiovisual educational programmes represent a practical and cost-effective method of providing basic information about the illness during hospitalization for heart diseases and similar conditions. However, standardized educational programmes should only be considered the first step in optimal patient education, and should preferably be supplemented by individual counselling and post-hospital group-discussions.

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