Lippincott Williams & Wilkins
a Wolters Kluwer business

EUROPEAN SOCIETY OF CARDIOLOGY®

Original Scientific Paper

Improving outcomes after myocardial infarction: a randomized controlled trial evaluating effects of a telephone follow-up intervention

Tove Aminda Hanssen[a], Jan Erik Nordrehaug[b], Geir Egil Eide[a,c] and Berit Rokne Hanestad[d]

[a]Department of Research and Development, Centre for Clinical Research and [b]Department of Heart Disease, Haukeland University Hospital, [c]Section for Epidemiology and Medical Statistics and [d]Section of Nursing Science, Department of Public Health and Primary Health Care, University of Bergen, Bergen, Norway

Received 13 June 2006 **Accepted** 29 November 2006

Background **Providing information is an important part of standard care and treatment for acute myocardial infarction inpatients. Evidence exists indicating that acute myocardial infarction patients experience an information gap in the period immediately after discharge from the hospital. The aim of this study was to assess the short-term effects of a nurse-led telephone follow-up intervention to provide information and support to patients with acute myocardial infarction after their discharge from hospital.**

Design and method **A prospective randomized, controlled trial with a 6-month follow-up was conducted. A total of 288 patients were allocated to either an intervention group ($n=156$) or a control group ($n=132$). The latter received routine post-discharge care. The primary endpoint measured at 3 and 6 months after discharge was the health-related quality of life using the 36-item Short Form Health Survey. Secondary endpoints included smoking and exercise habits.**

Results **In both groups, health-related quality of life improved significantly over time on most subscales. A statistically significant difference in favour of the intervention group was found on the 36-item Short Form Health Survey Physical Health Component Summary Scale ($P=0.034$) after 6 months. No difference was found between the groups on the Mental Health Component Summary Scale. We found a significant difference with respect to frequency of physical activity in favour of the intervention group after 6 months ($P=0.004$). More participants in the intervention group than the control group had ceased smoking at the 6-month follow-up ($P=0.055$).**

Conclusion **A nurse-led systematic telephone follow-up intervention significantly improved the physical dimension of health-related quality of life in patients in the intervention group compared with usual care patients. Participation in this intervention also seemed to promote health behaviour change in patients after acute myocardial infarction.** ***Eur J Cardiovasc Prev Rehabil*** **14:429–437 © 2007 The European Society of Cardiology**

European Journal of Cardiovascular Prevention and Rehabilitation 2007, **14**:429–437

Keywords: acute myocardial infarction, follow-up, intervention, randomized clinical trial, rehabilitation, telephone

Introduction

Providing information is an important part of standard care and treatment for acute myocardial infarction (AMI) inpatients [1–3]. The goal is to prepare and enable patients to cope with the consequences of the disease in daily life, and to continue the rehabilitation process at discharge [1,2,4–6]. Evidence of a shortening of the hospital stay after AMI suggests the time spent in hospital, however, may no longer be adequate to provide information, counselling, and support, thereby insufficiently preparing the patients for further rehabilitation [4,7,8].

AMI patients in particular report an information gap in the period immediately after discharge from the hospital

Correspondence to Tove Aminda Hanssen, RN, Cand. Polit., PhD student, Centre for Clinical Research, Armauer Hansen's House, Haukeland University Hospital, N-5021 Bergen, Norway
Tel: +47 55 97 47 88; fax: +47 55 97 60 88;
e-mail: tove.aminda.hanssen@helse-bergen.no

1741-8267

[8,9]. Only a few studies have described early follow-up interventions in the rehabilitation phase immediately after hospital discharge [10]. Some nurse-led psychological and educational interventions delivered early in the rehabilitation of AMI patients have reduced psychological distress, and increased knowledge and satisfaction [11].

Telephone hotlines and telephone consultations are increasingly used in health interventions [12–14]. According to a recent research review, patients indicate generally high satisfaction with telephone consultations and increasingly prefer this option [13]. Telephone follow-up strategies have reduced psychological distress [15] and increased patient satisfaction [16]. Nevertheless, there are areas of debate. Although a reduction in rehospitalization [16] and a positive effect on lifestyle changes have been reported [14], these findings have been refuted by other researchers [17,18].

In Norway, entering standardized cardiac rehabilitation programmes is not a part of routine patient care after an AMI. During the hospital stay, patients are provided with information and education. Standard follow-up usually consists of one visit to the cardiologist at the outpatient clinic about 6 weeks after discharge, and subsequent visits to the patient's general practitioner. Only a small proportion of patients are referred to cardiac rehabilitation programmes. These are usually provided by patient organizations. The aim of this study was to assess the short-term effect of an individualized nurse-initiated telephone follow-up intervention with the aim of providing information, education, and support. The primary endpoint was health-related quality of life (HRQOL) and secondary endpoints smoking and exercise habits.

Methods

Design and setting

A prospective randomized controlled trial with a 6-month follow-up was conducted at Haukeland University Hospital, Bergen, Norway, from September 2001 to December 2003. The study conformed to the principles outlined in the Declaration of Helsinki, and The Regional Committee for Medical Research approved the study. In addition, the study was reviewed and subsequently approved by the Privacy Issues Unit, at Norwegian Social Science Data Services, according to the privacy and licence requirements of the Personal Data Registers Act.

Patients and randomization

All patients with a diagnosis of AMI confirmed through medical records, and admitted to the hospital, were eligible for inclusion in the study. Patients were excluded from the study if they had a coexisting severe chronic disabling disease, were residing in a nursing home, were unable to receive telephone calls or fill in questionnaires, were living in an area in which the local hospital provided any nurse-initiated post-discharge follow-up services, or if they had or were expected to have coronary artery bypass grafting surgery during their hospital stay. During the first year of inclusion, patients older than 80 years of age were not included.

After hospitalization for at least 2 days, patients consenting to participate in this study were randomized to an intervention or control group. A simple randomization procedure using a computer-generated list of random numbers and group allocation in sealed opaque envelopes prepared by the researcher was used. After the group allocation was exposed, each participant was informed orally and in writing what the study participation encompassed.

Intervention group

All patients randomized to the intervention group received, in addition to the current clinical practice (see below), a structured intervention encompassing telephone follow-up and an open telephone line (Table 1). The intervention was developed on the basis of the Lazarus and Folkman's theory on stress, appraisal, and coping [19], principles about patient education [20,21], findings from previous research, and according to guideline recommendations [2,4,6,8,9,15,22–24].

The intervention was organized as a low-threshold service, easy to implement, and transferable to other settings. The patient follow-up included primarily response to individual needs and support of the patient's own coping efforts with respect to lifestyle changes, and risk-factor reduction. Further, we chose an individualized approach providing information on the basis of needs, readiness, and motivation to learn, not an information dissemination approach independent of the individuals' needs. We, however, chose to be explicit on ordinary questions and problems after an AMI in the follow-up calls to make asking questions easier. Only one issue was addressed in each call, with further elaboration on the topic if desired by the patient. A number of strategies for responding to the individual patient's concerns were also emphasized in the intervention. These included the following: repeating the information about how the patient himself or herself could reduce the risk of further cardiovascular disease; providing emotional support; providing alternative coping strategies when the patient appeared to use inappropriate strategies; identifying problems; clarifying values; setting realistic goals; encouraging visits to the general practitioner; and if necessary, discussing questions with a cardiologist.

The follow-up intervention lasted until 6 months after discharge. If the patients preferred they could terminate the follow-up calls earlier, but they were encouraged to

Table 1 The follow-up intervention

Intervention elements	Time structure	Objective/content/questions
I Telephone follow-up	Starting the first week after discharge, then weekly for the first 4 weeks. Then after 6, 8, and 12 weeks. The last phone call made after 24 weeks.	To provide patients with information, education, and support on the basis of individual needs. To provide patients with information about what are common questions after AMI and encourage further elaboration on the issues if desired.
For patients only	The patients could stop the telephone follow-up calls if they preferred, but were encouraged to accept the first 5–6 calls.	Main question sequence and topics in the phone calls The main part of the conversation deals with questions one and two. Each call starts with the nurse introducing herself and explaining why she is calling.
Telephone follow-up initiated by nurses with interests and experience in counselling and providing information, and patients with ischemic heart disease.		1. How are you and how have you been since discharge/last call? 2. Are there any aspects of your experience of having gone through an AMI that you would like to ask questions about? 3. Some can experience (a) chest pain or physical discomfort or (b) feeling anxious or depressed after AMI. Are there any questions you would like to ask about this? or Some are uncertain and have questions in relation to (c) how much physical activity to do, (d) the medical treatment, (e) how to prevent further heart disease, or (f) about family and married life after AMI. Would you like to ask any questions about these issues? [Only one topic (a-f) in each call] 4. Ending the conversation and arranging the time for the next call. If the patient do not wish to receive more calls, wish him/her the best of luck and remind him/her about the possibility of using the open telephone line.
II Open telephone line	Telephone slot times open 2 days a week, 3 hours each time (Mondays and Thursdays).	To provide patients and next-of-kin with information, education and support in relation to their individual needs.
For both patients and relations/relatives.		

AMI, acute myocardial infarction.

respond to the first five or six phone calls within the first 2 months after discharge.

Control group

All patients in the control group were managed in accordance with the current clinical practice, which encompassed one visit to a physician at the outpatient clinic 6–8 weeks after discharge, and subsequent visits to the patient's general practitioner.

Data collection

Demographic and clinical data were collected at enrolment through self-report and from the medical chart (Table 2). Baseline data on the endpoints were collected 1 week after discharge. Endpoints in this study are measured 3 and 6 months after discharge through self-report in a mailed questionnaire. One reminder was sent on each occasion. At 3 months follow-up, we assessed the extent to which sources such as family, friends, and patient organizations had been contacted by the patient to obtain additional information about heart disease.

Health-related quality of life

The 36-item Short Form Health Survey (SF-36) version 1.0 [25,26] is one of the most widely used generic self-reporting HRQOL instruments, with good psychometric properties in general populations and in patients with ischemic heart disease [27]. It encompasses 36 items that assess eight dimensions: physical functioning (10 items), bodily pain (two items), social functioning (two items), role limitations owing to physical problems (four items), role limitations owing to emotional problems (three items), mental health (five items), energy/vitality (four items), and general health perception (five items). The scores on the eight scales are transformed into a scale from 0 (worst health) to 100 (best health). To enhance interpretation, norm-based scores, in which each scale was scored to have the same average (50) and the same standard deviation (SD) (10), were calculated, building the 1998 US norms into the scoring algorithm. Two summary scales were calculated: the Physical Component Summary score (PCS) and the Mental Component Summary score. Scoring, including missing imputation for missing items, was conducted according to the original guidelines [25,26].

Lifestyle

Lifestyle outcomes included assessment of exercise and smoking habits, investigated with questions developed specifically for this study. With respect to exercise we asked, 'How often on an average do you exercise each week?' The response options were: none, once, 2–3 times, and four times or more. On the basis of questions about smoking habits, a variable smoking habit was constructed for those smoking before the AMI, with the response options 'still smoking' and 'have stopped smoking'.

Effect size and statistical analysis

We were not aware of any studies reporting the effects of telephone follow-up on HRQOL. The effect of cardiac rehabilitation on HRQOL has been described [28]. The reported differences in effect size between the control and the intervention groups have ranged from 0.30 to 0.37

Table 2 Baseline characteristics from in-hospital data of the randomized groups ($n=288$)

	Intervention ($n=156$)	Control ($n=132$)
Demographic characteristics		
Mean age (SD) in years	59.5 (12.9)	60.9 (10.8)
Gender, *n* (%)		
Men	132 (84.6)	101 (76.5)
Women	24 (15.4)	31 (23.5)
Married/cohabitating, *n* (%)	118 (75.6)	107 (82.3)
Living alone, *n* (%)	32 (20.5)	20 (15.4)
Employment, *n* (%)		
Full time	70 (45.8)	59 (45.7)
Part time	6 (3.9)	11 (8.5)
Not working	77 (50.3)	59 (45,7)
Highest level of education, *n* (%)		
Primary school	43 (27.6)	42 (32.3)
High school	48 (30,8)	43 (33.1)
College/university	45 (28.9)	36 (27.7)
Clinical characteristics		
Previous CVD, *n* (%)	42 (27.1)	27 (20.8)
Previous AMI, *n* (%)	19 (12.2)	16 (12.2)
Family history of CVD, *n* (%)	91 (66.4)	79 (68.1)
Daily smokers, *n* (%)	77 (49.4)	61 (46.6)
Diabetes (type I/II), *n* (%)	13 (8.5)	15 (11.4)
Hypercholesterolemia, *n* (%)	60 (38.7)	62 (47.3)
Hypertension, *n* (%)	44 (28.4)	41 (31.3)
Mean body mass index (SD) (kg/m^2)	26.5 (3.7)	25.8 (3.2)
Thrombolysis, *n* (%)	19 (12.1)	19 (14.4)
Primary PCI, *n* (%)	53 (34.0)	41 (31.3)
Total PCI, *n* (%)	118 (75.6)	101 (76.5)
Median length of stay, (IQR) days	5 (4, 6)	5 (4, 7)
STEMI, *n* (%)	98 (62.8)	84 (64.1)
Median peak CKMB (IQR) in U/l	108.00 (36.25, 240.50)	88.00 (29.50, 203.50)

AMI, acute myocardial infarction; CKMB, creatinine kinase myocardial band; CVD, cardiovascular disease; IQR, inter-quartile range; Primary PCI, percutaneous coronary intervention within 24 h; Total PCI, PCI during hospital; SD, standard deviation; STEMI, ST-segment elevation myocardial infarction.

[28]. Psychosocial interventions in patients with coronary heart disease have shown a mean effect size of 0.30 on psychological distress [23]. We intended to include 300 patients altogether, on the basis of a pragmatic assessment. We expected to detect small to medium effect sizes of 0.2–0.5 of the intervention on the primary outcome of the study, the PCS score of the SF-36 questionnaire. We anticipated approximately 10% drop out at each time point. Thus, we expected 200 patients to remain at 6 months, and to detect an effect size of 0.4 on the PCS score with a significance level of 0.05 (two-tailed) and a power of 0.80.

Descriptive statistics for continuous variables with approximately normal distribution are presented as mean and SD, and for continuous variables with non-normal distribution as the median value and interquartile range. Demographic and clinical variables were compared in the treatment and control group at baseline using the χ^2-test, Student's *t*-test, and the Mann–Whitney *U*-test, as appropriate. To determine any differences between the intervention and control groups in participants lost to follow-up, from discharge to 1 week after, and between the other time points, we used two-way analysis of variance (ANOVA) with Bonferroni correction, the χ^2-test and logistic regression analysis. The χ^2-test was used to compare the intervention and control groups with respect to exercise, and Fisher's exact test for smoking habits, at 3 and 6 months after discharge. One sample *t*-test was used to compare HRQOL dimensions score at baseline and after 6 months in the sample with the US normal population scores [26]. The Student's *t*-test was used to compare change in the intervention and control group in SF-36 scores, from baseline to 6 months after discharge. To analyse any effect on the SF-36 scales from group and time, we performed an ANOVA with repeated measures using the general linear model in SPSS (SPSS Inc. Chicago, Illinois, USA) [29], allowing for test of time × group interaction. Analyses of the effect of the intervention were performed according to the intention to treat principle. All tests were two sided. Data were analysed using SPSS version 13.0 (SPSS Inc.).

Results

Study patients

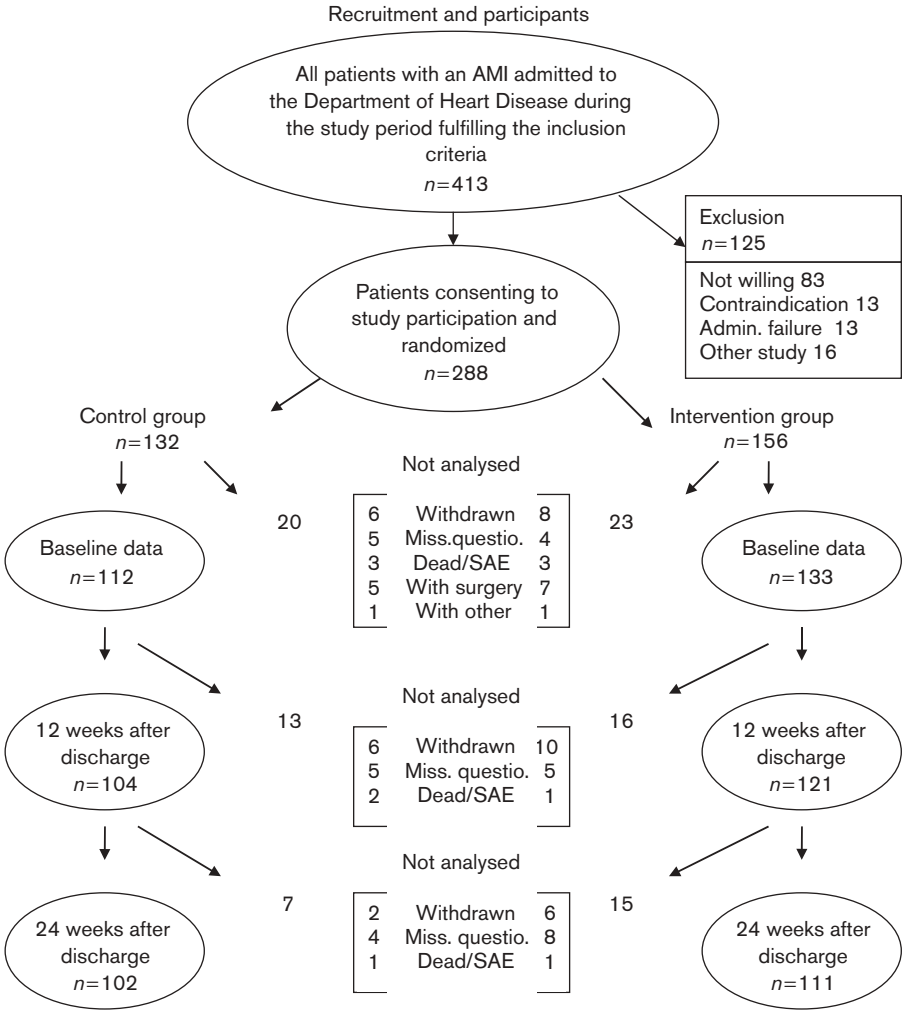
Altogether, 413 patients fulfilled the inclusion criteria, and were invited to participate in the study. One hundred and twenty-five (28%) of these were excluded from the study (Fig. 1), and thus 288 patients were randomized. Of the 138 randomized to the intervention group, 137 completed the telephone follow-up with a median of six calls (interquartile range: 5–8 calls). Each call lasted an average of 6.88 min (SD: 3.89).

The most frequent loss to follow-up took place in the period from randomization to 1 week after discharge, before the baseline was established. These participants demonstrated a significantly longer hospital stay, were more frequently nonsmokers, and received fewer primary percutaneous coronary intervention procedures compared with those remaining in the study (Fig. 1). When analysing for an effect of group on loss to follow-up, no significant effects were found on the baseline clinical and socio-demographic variables, at 1 week after discharge, nor at 3 and 6 months after discharge. Analysis of the effect of group on loss to follow-up after 3 months on baseline HRQOL scores demonstrated that participants lost in the control group demonstrated a lower score in most HRQOL dimensions than those remaining, and scored significantly lower in the SF-36 general bodily pain score ($P < 0.001$), the general health score ($P < 0.001$), and in the physical health summary score ($P = 0.025$). No such differences were found in the intervention group, or at 6 months in either group.

Baseline characteristics including health-related quality of life and lifestyle factors

The demographic and clinical characteristics of the intervention and control group are shown in Table 2. No statistical differences were found between the control

Fig. 1



AMI, acute myocardial infarction; SAE, serious adverse event. Admin., administrative; Miss. Questio., missing questionnaire.

and intervention group with regard to the clinical and demographical variables.

The baseline scores of the intervention and the control group on the SF-36 are shown in Table 3. The baseline scores were comparable except for the SF-36 role-emotional scale, in which the control group scored significantly lower than the intervention group. All subscale scores, except for the bodily pain and the mental health subscales, were significantly lower in our sample ($P < 0.001$) compared with the US population mean score [26], indicating that the patients' HRQOL scores were negatively affected in all these dimensions.

There were no significant differences in frequency of exercise before the AMI between the groups (Fig. 2). No significant difference in smoking status was observed between the groups.

Effect of the intervention on health-related quality of life

When comparing change in HRQOL scores from baseline to 6 months after discharge, there were improvements in all dimensions (Table 3) in both groups. After 6 months, both groups scored significantly lower than the norm in the role-emotional and role-physical subscales. In addition, the intervention group scored significantly lower than the norm in the general health score. The groups were comparable or had levels above the US norm population in the other subscales and sum scores [26]. When comparing differences in change between the intervention and control group, there was a significant improvement in the SF-36 PCS score ($P = 0.039$) in favour of the intervention group (Table 3). No intervention effects were seen on the mental health component summary score or on any of the eight subscales. When analysing the effect of time (at baseline, 3, and 6 months after discharge) and time × group effect in a repeated

Table 3 Baseline[a] norm-based SF-36 scores, mean change in SF-36 norm-based scores between baseline and 6 months after discharge, and differences in mean change between the intervention and control group

	Intervention group						Control group						Difference in mean change[b] between groups		
SF-36 norm-based scores[c]	*n*	Baseline[a] mean	(SD)	*n*	Mean change	SD	*n*	Baseline[a] mean	(SD)	*n*	Mean change	(SD)		(95% CI)	*P*-value[d]
PF-physical functioning[e]	133	44.08	(7.90)	108	6.62	(7.82)	112	44.48	(8.30)	99	5.46	(7.59)	−1.16	(−3.28, 0.95)	0.280
RP-role physical[e]	129	33.69	(9.32)	102	13.49	(11.95)	111	32.75	(8.64)	98	11.65	(13.02)	−1.84	(−5.32, 1.64)	0.299
BP-bodily pain	132	49.60	(10.27)	106	3.23	(9.48)	111	49.75	(9.76)	98	1.49	(10.76)	−1.74	(−4.54, 1.05)	0.220
GH-general health[e]	131	47.34	(8.43)	104	0.53	(8.66)	112	47.76	(9.06)	99	0.17	(7.69)	−0.36	(−2.64, 1.91)	0.752
VT-vitality[e]	133	47.10	(9.34)	107	2.75	(8.06)	111	47.50	(9.77)	98	2.68	(7.64)	−0.07	(−2.23, 2.10)	0.951
SF-social functioning[e]	133	43.46	(11.90)	109	5.72	(12.76)	112	43.93	(11.45)	99	6.08	(11.36)	0.36	(−2.96, 3.67)	0.832
RE-role emotional[e]	130	38.73	(12.64)[f]	103	8.31	(14.30)	110	35.37	(12.21)[f]	97	9.08	(14.86)	0.78	(−3.29, 4.84)	0.706
MH-mental health	133	49.74	(9.42)	107	0.66	(7.59)	111	50.66	(10.07)	98	1.06	(8.44)	0.40	(−1.81, 2.60)	0.723
SF-36 summary scores															
PCS-overall physical[e]	127	43.17	(7.53)	97	7.31	(7.46)	109	43.70	(6.77)	96	4.98	(8.10)	−2.33	(−4.54, −0.12)	0.039
MCS-overall mental[e]	127	46.14	(10.29)	97	2.93	(9.87)	109	45.23	(10.45)	96	4.00	(9.73)	1.07	(−1.71, 3.86)	0.447

[a]Baseline defined as 1 week after discharge. [b]Negative change favours intervention group and positive change favours control group. [c]Norm-based scoring using the 1998 SF-36 (v1) US population norms with mean = 50 and standard deviation (SD) = 10 [20]. [d]Equal variances assumed. [e]Total sample statistically significant below US normal population [20] level $P < 0.001$ at baseline in this dimension/summary score. [f]Statistical significant difference ($P < 0.05$) between the control and experiment group independent sample *t*-test (without correction for multiple testing).

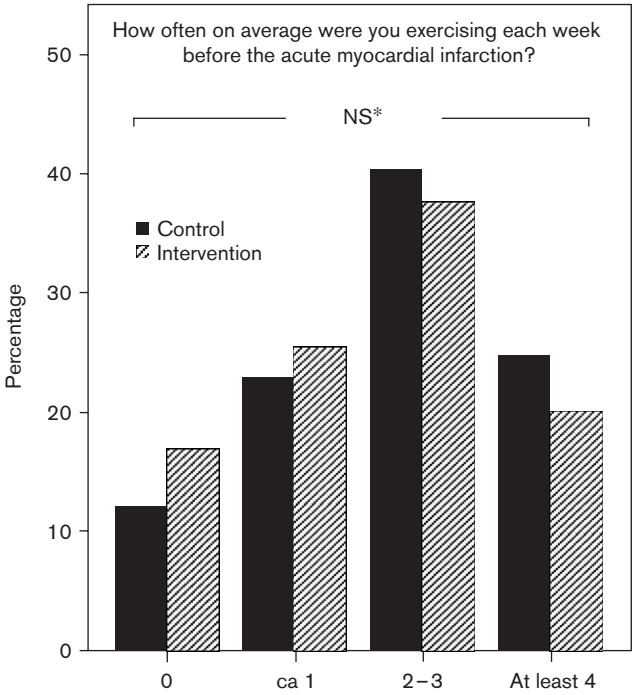
measures ANOVA, we found a significant ($P < 0.001$) effect of time on all dimensions, except in the general health and mental health dimension (Table 4).

For most SF36-scores in Table 4 there was a substantial increase over time from baseline to 3 months, however not so from 3 to 6 months. No significant main effects of group were seen, but when analysing within-subject contrasts there was a significant time × group interaction for the PCS score ($P = 0.031$), implying a larger improvement over time in the intervention group (mean change from baseline to 6 months: 7.31) than in the control group (mean change from baseline to 6 months: 4.98).

Effect of the intervention on exercise habits and smoking cessation

The χ^2-test showed no significant difference in weekly exercise habits between intervention and control group after 3 months. After 6 months, we found a difference in favour of the intervention group (Fig. 3) (χ^2-test for linear trend $P = 0.004$). Table 5 shows that in those smoking before the AMI 59.4% in the intervention group and 47.9% in the control group had stopped smoking at 3 months ($P = 0.254$). This proportion increased at 6 months (60.0 vs. 40.8%) and thus reached a difference of borderline significance ($P = 0.055$).

Fig. 2



*χ^2-test.

Discussion

This study demonstrated that a telephone follow-up intervention after AMI improved the physical component of HRQOL and frequency of weekly exercise after 6 months. Twenty percent more in the intervention group compared with the control group managed to stop smoking 6 months after the AMI.

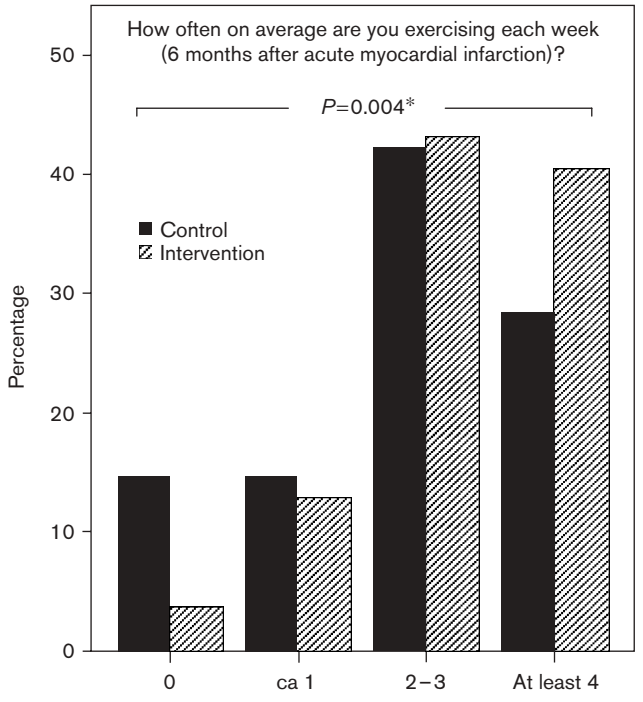
There were significant improvements in HRQOL scores in both the control and the intervention group, including improvement to normal population levels of most of the eight dimensions after 6 months. Cohen's effect size criterion evaluating meaningful change longitudinally between groups was applied [30]. The physical sum

Table 4 Repeated measures analysis of variance of SF-36 with respect to group[a] and time

End points		Multivariate tests within patient design						Test of within patient contrast					
		Time			Time × group			Time			Time × group		
	n	Value[b]	d.f.	*P*-value	Value[b]	d.f.	*P*-value	F	d.f.	*P*-value	F	d.f.	*P*-value
SF-36 Scores													
PF-physical functioning	201	0.563	2, 198	<0.001	0.989	2, 198	0.333	85.870	1, 199	<0.001[d]	1.894	1, 199	0.170[d]
RP-role physical	193	0.474	2, 190	<0.001	0.988	2, 190	0.323	36.082	1, 191	<0.001[d]	1.116	1, 191	0.292[c]
BP-bodily pain	200	0.914	2, 197	<0.001	0.992	2, 197	0.445	10.463	1, 198	0.001[d]	1.434	1, 198	0.233[c]
GH-general health	198	0.982	2, 195	0.165	0.991	2, 195	0.404	2.989	1, 196	0.090[d]	1.157	1, 196	0.215[d]
VT-vitality	200	0.861	2, 197	<0.001	0.981	2, 197	0.145	18.708	1, 198	<0.001[d]	3.362	1, 198	0.068[d]
SF-social functioning	204	0.793	2, 201	<0.001	0.997	2, 201	0.766	24.037	1, 202	<0.001[d]	0.480	1, 202	0.489[d]
RE-role emotional	194	0.688	2, 191	<0.001	0.998	2, 191	0.836	31.255	1, 192	<0.001[d]	0.229	1, 192	0.633[c]
MH-mental health	200	0.986	2, 197	0.237	0.981	2, 197	0.145	1.815	1, 198	0.179[c]	3.759	1, 198	0.054[d]
PCS-overall physical	185	0.567	2, 182	<0.001	0.974	2, 182	0.089	32.260	1, 183	<0.001[d]	4.705	1, 183	0.031[c]
MCS-overall mental	185	0.851	2, 182	<0.001	0.985	2, 182	0.259	13.149	1, 183	<0.001[d]	2.480	1, 183	0.117[d]

[a]There were no statistically significant between-group effects. [b]Wilks' lambda. [c]Linear trend. [d]Quadratic trend.

Fig. 3



*χ^2-test for linear trend.

Table 5 Smoking habits and change in smoking habits after 3 and 6 months

	Control group	Intervention group	*P*-value[b]
Baseline *n*=287	*n*=131	*n*=156	
Smoking at baseline % (*n*)	46.6% (61)	49.4% (77)	
Total at 3 months follow-up	*n*=103	*n*=119	
Available subj. smoking at baseline	*n*=48	*n*=64	
Stopped smoking[a] % (*n*)	47.9 (23)	59.4% (38)	0.254
Total at 6 months follow-up	*n*=99	*n*=109	
Available subj. smoking at baseline	*n*=49	*n*=60	
Stopped smoking[a] % (*n*)	40.8% (20)	60.0% (36)	0.055

[a]Proportion and analysis restricted to those smoking at baseline. [b]Fishers' exact test comparing control and intervention group.

score in the intervention group improved significantly more than in the control group and demonstrated a small to medium effect in favour of the intervention group. The somewhat surprising improvement of the HRQOL scores in both groups could reflect the effect of the reduced morbidity that has been found in this patient group following the widespread use of new medical and surgical treatments over the last 5–10 years [31,32]. As a consequence of reduced myocardial damage and improved survival, the individual's perception of illness could correspondingly be changed and thus contribute to explaining the improvement in HRQOL for both groups.

The essential aspects of the intervention were to provide tailored information and education on the basis of the patient's individual needs, and to respond to and support his or her adaptive coping strategies with regard to taking prescribed medication, healthy eating, ceasing smoking, and increasing physical activity. We aimed to reduce the information gap experienced in the period immediate following discharge from the hospital [8,9], when most participants are receptive to lifestyle changes that reduce the risk of cardiovascular disease [2,22]. Nurse-delivered interventions have not always been as effective as might be expected in cardiac rehabilitation [18]. We believe that by responding to the individual patient's needs and supporting their own coping efforts, as well as providing information and prescribing interventions, we have both indirectly and directly improved HRQOL.

The effects in the physical dimension of HRQOL that principally encompasses physical functioning, role-physical, and bodily pain, but also includes general health perception, are in agreement with the effects found with respect to exercise and smoking habits, and the emphasis on these aspects in the intervention. A similar effect on outcomes was also demonstrated in a recent survey, in which patients who gave up smoking also took significantly more actions to improve other aspects of their lifestyle than did persistent smokers [33]. Although changing lifestyle is not easy, maintaining these changes is even more difficult [3]. The strategies likely to affect sustained altered lifestyle [3] which were used in this study included the following: setting goals, receiving social support, having self-monitoring, receiving feedback, preventing relapse through both regular follow-up, and a booster session after 6 months.

In a metaanalysis of smoking cessation interventions in cardiovascular patients, no trials were found in which the effect of telephone counselling on cardiovascular patients was examined [34]. Thus, the results from this study add new knowledge to this area. The results from this study agree with the results in a review of the effect of interventions for smoking cessation on hospitalized patients [35]. The authors concluded that intensive interventions (inpatient contact and follow-up for at least 1 month) are effective in promoting smoking cessation [35].

There appeared to be small potential for improving the mental dimensions within HRQOL as even at baseline these were close to the normal population levels. This is in agreement with a systematic review, where AMI was found to principally impact on physical areas such as physical capacity, work status, symptoms, functional status, and general health perception. Further, the impact on HRQOL appeared to be modest over time, and the majority of HRQOL domains improved in most of the studies to normal levels with time [36]. We also note that contrasting results have since been reported [37]. The findings in this study also resonate with findings that psycho-educational programmes and cardiac rehabilitation have successful outcomes such as reducing smoking behaviour and increasing physical exercise [23].

We acknowledge some study limitations. The principal limitation of this study is the small sample size. To reduce the possibility of type II errors in this study, we measured endpoints with an instrument proven to be sensitive in this population [27]. A threat to internal validity could be posed by the biased attrition found between those dropping out from the control group after 3 months and those remaining. This could have led to an underestimation of the effect of the intervention, as those dropping out from the control group had significantly poorer HRQOL scores than those remaining. To control for treatment diffusion, as the intervention was not blinded to the participants, we assessed whether and to what extent both groups had made contact with others to receive information, such as patient organizations. The only difference found was that the control group had made contact with family and friends to obtain information about heart disease to a larger extent than the intervention group, to borderline significance ($P = 0.058$), possibly explaining improved HRQOL in the control group.

Another limitation is the loss to follow-up from this study of 22.7% of the control and 28.8% of the intervention group over three measurement points. To reduce the dropout rate, one reminder was sent by mail to the control group and to the intervention group if a telephone call was not arranged within the following 2 weeks. Additional reminders through mail or telephone, with potential of reduced loss to follow-up, were not performed owing to ethical constraints.

All the endpoints were self reported and exercise and smoking status was not verified, using exercise or biochemical tests, respectively. This could have led to an over-reporting of the proportion doing exercise and quitting smoking in both groups. To reduce the social desirability tendency, all participants were informed that no one except the researcher, not working in the department of heart disease, would have access to their responses in the questionnaires. We cannot determine which elements of the intervention were effective, nor the extent to which the improvement was caused by the attention-only effect. We, however, believe that the results in this study do not reflect an attention-only effect, as some similar nurse-delivered interventions have not proven an effect on specified outcomes in cardiac rehabilitation [17,18].

Our study showed that compared with usual care, a telephone follow-up intervention up to 6 months significantly improved the HRQOL of AMI patients. By reducing the information gap experienced by many AMI patients in the period after discharge and providing continued support, the intervention has an additionally promising effect in improving important health behaviours after AMI. Telephone follow-up should be considered for AMI patients after discharge and it is likely that this type of follow-up is cost effective [38].

Acknowledgements

This study was supported by the grants from the Haukeland University Hospital, the Norwegian Nurse Association, the Meltzer Foundation for grants, and the Norwegian Lung and Heart Foundation. The authors are grateful to the nurses performing the follow-up of

patients in this study: Sherry Grønnevedt, Berith Hjellestad, Kjersti Oterhals, Janne Halvorsen and Nina Kronen Mowinckel. Further, the authors want to thank the head nurse, Kjellaug Nummedal Shandiz, and the enthusiastic staff at the Department of Heart Disease, and Centre for Clinical Research at Haukeland University Hospital for their valuable help, support and advice.

Conflict of interest: none.

References

1 Acute myocardial infarction: pre-hospital and in-hospital management. The task force on the management of acute myocardial infarction of the European Society of Cardiology. *Eur Heart J* 1996; **17**:43–63.
2 Jones D, West R. *Cardiac rehabilitation*. London: BMJ Publishing Group; 1995.
3 Thompson DR, Webster RA. *Caring for the coronary patient*. 2nd ed. Edinburgh: Butterworth-Heinemann; 2004.
4 Ades PA. Cardiac rehabilitation and secondary prevention of coronary heart disease. *N Engl J Med* 2001; **345**:892–902.
5 Pell J. Cardiac rehabilitation: a review of its effectiveness. *Coronary Health Care* 1997; **1**:8–17.
6 Wood D, Backer GD, Faergeman O, Graham I, Mancia G, Pyörälä K. Prevention of coronary heart disease in clinical practice. Recommendations of the second joint task force of European and other societies on coronary prevention. *Eur Heart J* 1998; **19**:1434–1503.
7 Giannuzzi P, Saner H, Bjornstad H, Fioretti P, Mendes M, Cohen-Solal A, *et al.* Secondary prevention through cardiac rehabilitation: position paper of the Working Group on Cardiac Rehabilitation and Exercise Physiology of the European Society of Cardiology. *Eur Heart J* 2003; **24**:1273–1278.
8 Worth A, Tierney AJ, Watson NT. Discharged from hospital: should more responsibility for meeting patients and carers' information needs now be shouldered in the community? *Health Soc Care Commun* 2000; **8**:398–405.
9 Hanssen TA, Nordrehaug JE, Hanestad BR. A qualitative study of the information needs of acute myocardial infarction patients, and their preferences for follow-up contact after discharge. *Eur J Cardiovasc Nurs* 2005; **4**:37–44.
10 Mayou RA, Thompson DR, Clements A, Davies CH, Goodwin SJ, Normington K, *et al.* Guideline-based early rehabilitation after myocardial infarction. A pragmatic randomised controlled trial. *J Psychosom Res* 2002; **52**:89–95.
11 Thompson DR, Quinn T, Stewart S. Effective nurse-led interventions in heart disease. *Int J Cardiol* 2002; **83**:233–237.
12 Soet JE, Basch CE. The telephone as a communication medium for health education. *Health Educ Behav* 1997; **24**:759–772.
13 Car J, Sheikh A. Telephone consultations. *BMJ* 2003; **326**:966–969.
14 McBride CM, Rimer BK. Using the telephone to improve health behaviour and health service delivery. *Patient Educ Couns* 1999; **37**:3–18.
15 Roberts J, Browne GB, Streiner D, Gafni A, Pallister R, Hoxby H, *et al.* Problem-solving counseling or phone-call support for outpatients with chronic illness: effective for whom? *Can J Nurs Res* 1995; **27**:111–137.
16 Riegel B, Carlson B, Kopp Z, LePetri B, Glaser D, Unger A. Effect of a standardized nurse case-management telephone intervention on resource use in patients with chronic heart failure. *Arch Intern Med* 2002; **162**:705–712.
17 Gallagher R, McKinley S, Dracup K. Effect of a telephone counselling intervention on psychosocial adjustment in women following a cardiac event. *Heart Lung* 2003; **32**:79–87.
18 Frasure-Smith N, Lespèrance F, Price RH, Verrier P, Garber RA, Juneau M, *et al.* Randomized trial of home-based psychosocial nursing intervention for patients recovering from myocardial infarction. *Lancet* 1997; **350**:473–479.
19 Lazarus RS, Folkman S. *Stress, appraisal, and coping*. New York: Springer Publishing Company; 1984.
20 Redman BK. *The practice of patient education*. 8th ed. St. Louis: Mosby; 1997.
21 Lorig K. *Patient education. A practical approach.* 2nd ed. Thousand Oaks: Sage Publications; 1996.
22 Cundey PE, Frank MJ. Cardiac rehabilitation and secondary prevention after a myocardial event. *Clin Cardiol* 1995; **18**:547–553.
23 Linden W, Stossel C, Maurice J. Psychosocial interventions for patients with coronary artery disease: a meta analysis. *Arch Intern Med* 1996; **156**:745–752.
24 Thompson DR, Lewin RJ. Coronary disease. Management of the post-myocardial infarction patient: rehabilitation and cardiac neurosis. *Heart* 2000; **84**:101–105.
25 Ware JE, Kosinski M, Gandek B. *SF-36 Health survey: manual & interpretation guide*. 2nd ed. Lincoln, Rhode Island: QualityMetric Inc.; 2000.
26 Ware JE, Kosinksi M. *SF-36 Physical and Mental Health Summary Scales: a manual for users of version 1*. 2nd ed. Lincoln, Rhode Island: QualityMetric Inc.; 2001.
27 Dempster M, Donnelly M. Measuring the health related quality of life of people with ischemic heart disease. *Heart* 2000; **83**:641–644.
28 McGee HM, Hevey D, Horgan J. Psychosocial outcome assessment for use in cardiac rehabilitation service evaluation: a 10-year systematic review. *Soc Sci Med* 1999; **48**:1373–1393.
29 Norman GR, Streiner DL. *Biostatistics: the bare essentials*. 2nd ed. Hamilton: Decker; 2000.
30 Fayers PM, Machin D. *Quality of life. Assessment, analysis and interpretation*. Chichester: John Wiley & Sons, Ltd; 2000.
31 Molstad P, Andersen K. Reduced mortality after acute myocardial infarction. *Tidsskr Nor Laegeforen* 2002; **122**:1271–1275.
32 Van de Werf F, Ardissino D, Betriu A, Cokkinos DV, Falk E, Fox KA, *et al.* Management of acute myocardial infarction in patients presenting with ST-segment elevation. The Task Force on the Management of Acute Myocardial Infarction of the European Society of Cardiology. *Eur Heart J* 2003; **24**:28–66.
33 Scholte op Reimer W, de Swart E, De Bacquer D, Pyorala K, Keil U, Heidrich J, *et al.* Smoking behaviour in European patients with established coronary heart disease. *Eur Heart J* 2006; **27**:35–41.
34 Wiggers LC, Smets EM, de Haes JC, Peters RJ, Legemate DA. Smoking cessation interventions in cardiovascular patients. *Eur J Vasc Endovasc Surg* 2003; **26**:467–475.
35 Rigotti NA, Munafo MR, Murphy MF, Stead LF. Interventions for smoking cessation in hospitalised patients. *Cochrane Database Syst Rev* 2003:CD001837.
36 Simpson E, Pilote L. Quality of life after acute myocardial infarction: a systematic review. *Can J Cardiol* 2003; **19**:507–511.
37 Muller-Nordhorn J, Kulig M, Binting S, Voller H, Gohlke H, Linde K, *et al.* Change in quality of life in the year following cardiac rehabilitation. *Qual Life Res* 2004; **13**:399–410.
38 Oldridge NB. Cardiac rehabilitation and risk factor management after myocardial infarction. Clinical and economic evaluation. *Wien Klin Wochenschr* 1997; **109** (**Suppl 2**):6–16.