

ORIGINAL ARTICLE

Rehabilitation status three months after first-time myocardial infarction

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Abstract

Objective. To describe the rehabilitation status three months after first-time myocardial infarction (MI) to identify focus areas for long-term cardiac rehabilitation (CR) in general practice. **Design.** Population-based cross-sectional study. **Setting and subjects.** Patients with first-time MI in 2009 from the Central Denmark Region. Data were obtained from patient questionnaires and from registers. **Results.** Of the 1288 eligible patients, 908 (70.5%) responded. The mean (SD) age was 67.1 (11.7) years and 626 (68.9%) were men. Overall, 287 (31.6%) of the patients lived alone and 398 (45.4%) had less than 10 years of education. Upwards of half (58.5%) of the patients stated that they had participated in hospital-based rehabilitation shortly after admission. A total of 262 (29.2%) were identified with anxiety or depressive disorder or both, according to the Hospital Anxiety and Depression Scale. Of these, 78 (29.8%) reported that they had participated in psychosocial support, and 55 (21.0%) used antidepressants. One in five patients smoked three months after MI although nearly half of the smokers had stopped after the MI. Regarding cardioprotective drugs, 714 (78.6%) used aspirin, 694 (76.4%) clopidogrel, 756 (83.3%) statins, and 735 (81.0%) beta-blockers. **Conclusion.** After three months, there is a considerable potential for further rehabilitation of MI patients. In particular, the long-term CR should focus on mental health, smoking cessation, and cardioprotective drugs.

Key Words: Depression, drug therapy, family practice, myocardial infarction, rehabilitation, smoking

Introduction

Acute myocardial infarction (MI) can cause substantial disability and is a major cause of death [1]. Cardiac rehabilitation (CR) is an effective approach to improve the prognosis [2,3]. CR is the sum of activities to ensure patients the best possible physical, mental, and social conditions [3]. Core components of CR include: exercise training, educational course, risk factor behaviour modification (smoking cessation counselling, diet counselling), medical therapy, and psychosocial management [3]. CR implies a multidisciplinary professional approach and has been divided into three phases: (I) in-hospital acute phase for a few days, (II) reconditioning phase in an outpatient setting for 8–12 weeks, and (III) lifelong community-based improvement and maintenance phase [3,4].

General practice is supposed to play an important coordinating role in phase III CR where rehabilitation

should be maintained, optimized, or established depending on the rehabilitation provided in phase II, the current health status, and the specific needs of the patients [4]. Knowledge concerning these needs is a requisite for an efficient phase III CR.

In April 2009, we initiated a population-based cohort study of patients with first-time MI to examine phase III CR in Denmark. The present paper describes the rehabilitation status of these patients three months after discharge to identify focus areas for phase III CR.

Material and methods

Design and setting

We conducted a population-based cohort study based on information from registers and patient

The rehabilitation status three months after myocardial infarction and before long-term rehabilitation in general practice is unknown.

- Approximately 60% of the patients stated that they had received some kind of cardiac rehabilitation during the first three months after discharge.
- There is a considerable potential for further rehabilitation focusing on mental health, smoking cessation, and cardioprotective drugs.

questionnaires in the Central Denmark Region (1 250 000 inhabitants).

Study participants

We consecutively invited all patients above 18 years, discharged with first-time MI from 1 January 2009 to 31 December 2009 and living in the Central Denmark Region. The patients were identified from the Danish National Hospital Register (DNHR) [5] that stores information on discharge diagnoses classified according to the International Classification of Diseases (ICD-10) on all patients treated as in- or outpatients at any Danish hospital. We received data monthly from the DNHR on patients discharged with MI (code I21 (ICD-10)) [6]. To identify incident cases, we excluded those who had previously been discharged with MI according to the DNHR. Information on name, current address, and vital status was obtained from the Civil Registration System (CRS) (Figure 1) [7].

Data collection

A questionnaire was mailed to all patients between 14 and 16 weeks after discharge. The following validated scales were used: the British Medical Research Council (MRC) dyspnoea scale [8], the Short-Form 12 version 2 (SF-12v2) [9], and the Hospital Anxiety and Depression Scale (HADS) [10]. We prepared and included ad-hoc questions based on an extensive literature search and our clinical experience. Health behaviours were self-reported and classified according to the general recommendations from the Danish National Board of Health (see Table II). We asked the patients about their height and weight, and calculated their body-mass index (BMI) (weight [kg] per height [m²]). We defined rehabilitation in the questionnaire as: "After your admission, aftercare at the hospital or by your local health service can encompass educational course, exercise

training, and diet and smoking cessation counselling", and asked the patients whether they had participated in phase II CR with the following question: "Were you provided with aftercare at the hospital or by your local health service after your admission?". Those who responded "yes, and I took part" were classified as "participants", those who responded "yes, but I didn't take part" or "no" were classified as "non-participants". We assessed the participation in the core components of phase II CR in the same way. To validate the diagnosis from the DNHR the patients were asked whether they had been admitted to hospital due to coronary heart disease. Those who answered "no" (n = 33) were excluded and those who answered "yes" (n = 930) were asked to specify the diagnosis. If the patient did not report a diagnosis or reported other diagnoses than MI, bypass operation or percutaneous coronary intervention (n = 177), we reviewed the discharge summary. Patients were excluded if they did not fulfil the European Society of Cardiology criteria for MI (n = 14) or if they did not give us permission to retrieve the discharge summary (n = 8). The questionnaire was pilot-tested regarding comprehension and ability to discriminate answers by interviewing five MI patients and reviewing the questionnaires of 30 MI patients discharged in December 2008. The pilot-test gave rise to minor linguistic rewordings. Non-responders received a reminder after 19 and 29 days. The questionnaire was designed and processed in Teleform.

Drug prescription data were obtained from the prescription database covering the entire Central Denmark Region. The database provided information on all reimbursed drugs according to the ATC classification, dispensing date, and the total number of tablets dispensed. Data on aspirin (ATC code B01AC06), clopidogrel (ATC code B01AC04), statins (ATC code C10AA), beta-blockers (ATC code C07), ACE inhibitors/angiotensin 2 receptor blockers (ATC code C09), and antidepressants (ATC code N06A) were collected. We calculated whether the patient had tablets available on the day we sent the questionnaire, and defined the patient as receiving treatment if tablets were available.

Sociodemographic data from 2008 were retrieved from the Danish IDA database [11] that holds this information on the entire Danish population.

Statistics

We present categorical data as numbers (percentages) and normally distributed continuous data as means, standard deviations, and ranges. Data were analysed using STATA 10.0 (StataCorp LP, College Station, TX, USA).

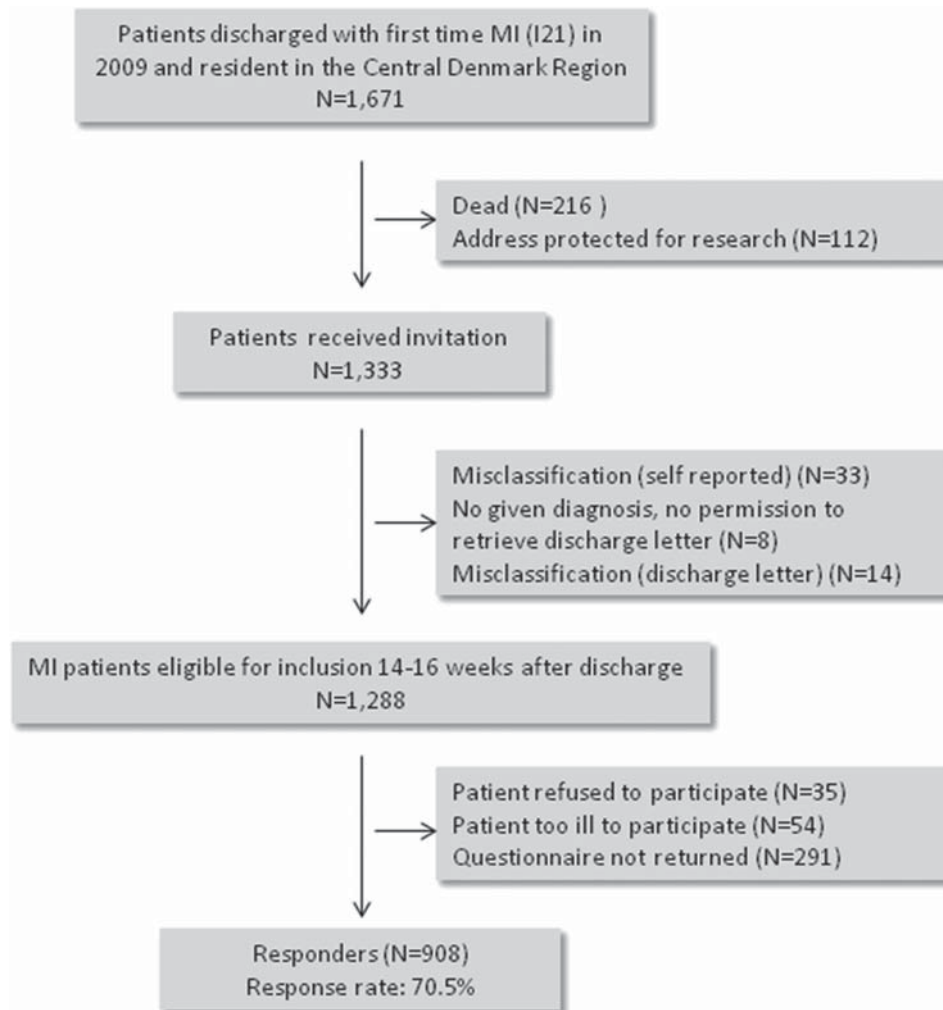


Figure 1. Flowchart for cohort.

Results

Among a total of 1288 eligible patients with first-time MI, 908 (70.5%) completed a questionnaire (see Figure 1). The median response time was 13 (interquartile range 7–25) days. The mean (SD, range) age was 67.1 (11.7, 28.2–94.4) years, and 626 (68.9%) were men. Overall, 287 (31.6%) of the patients lived alone and 398 (45.4%) had less than 10 years of education (Table I). Significantly fewer women, patients older than 80 years, and patients with low socioeconomic resources responded.

Overall, 713 (79.0%) patients stated that they had received an offer of aftercare at the hospital or by the local health service after the MI and 528 (58.5%) stated that they had participated. The majority of these had participated in exercise training and consultation with a doctor regarding medication. Less than one-third took part in psychosocial support and 30 (3.3%) patients reported that they were examined for anxiety or depression by questionnaire.

Of the 345 (38.4%) patients who smoked prior to admission, 89 (26.0%) stated that they were offered smoking cessation counselling and 29 (8.5%) that they had participated (Table II).

We found that 262 (29.2%) had anxiety, depressive disorder, or both according to the Hospital Anxiety and Depression Scale. Among these, 78 (29.8%) reported that they had participated in psychosocial support and 55 (21.0%) had received antidepressants. One in five patients smoked 14–16 weeks after MI although nearly half of the smokers had stopped after the MI (Table III).

Regarding cardioprotective drugs, 714 (78.6%) used aspirin, 694 (76.4%) clopidogrel, 756 (83.3%) statins, and 735 (81.0%) beta-blockers. An ACE inhibitor/angiotensin 2 receptor blocker, which is only recommended to high-risk patients (heart failure, diabetes, hypertension, chronic kidney disease, peripheral artery disease), was used by 48.1% (see Table III).

Table I. Sociodemographic data of patients with first-time MI in 2009.¹

	n	% (95% CI)
Age, mean (range, SD)		67.1 (28.2–94.4,11.7)
Sex, male	626	68.9 (65.9–72.0)
Marital status:		
Married/cohabiting	621	68.4 (65.4–71.4)
Living alone	287	31.6 (28.6–34.6)
Education:		
< 10 years (primary and lower secondary school)	398	45.4 (42.1–48.7)
10–12 years (upper secondary school or vocational training)	362	41.3 (38.0–44.5)
> 12 years (higher education)	117	13.3 (11.1–15.6)
Labour market status:		
Working	323	35.6 (32.5–38.7)
Retirement pension	446	49.1 (45.9–52.4)
Early retirement pension	52	5.7 (4.2–7.2)
Out of the workforce (incapacity benefit, sickness benefit)	87	9.6 (7.7–11.5)

Note: ¹Values are numbers, percentages (95% confidence interval) unless stated otherwise.

Discussion

Main findings

Our study describes the rehabilitation status of first-time MI patients 14–16 weeks after discharge. Overall, 58.5% participated in some rehabilitation, 29.2% had anxiety, or depression, or both, 19.9% were smokers, and 83.3% used statins. Our study indicates that there is further potential for rehabilitation and identifies three major focus areas for the long-term CR, that is: mental health, smoking cessation, and cardioprotective drugs.

Table II. Self-reported participation in phase II cardiac rehabilitation and core components of phase II cardiac rehabilitation of patients with first-time MI in 2009.¹

	n	% (95% CI)
Phase II cardiac rehabilitation	528	58.5 (55.3–61.7)
Core components of phase II cardiac rehabilitation:		
Smoking cessation counselling ²	29	8.5 (5.5–11.4)
Diet counselling	333	37.0 (33.8–40.1)
Educational course	298	33.1 (30.0–36.2)
Exercise training	382	42.3 (39.1–45.5)
Consultation with a doctor concerning medication	384	42.6 (39.3–45.8)
Psychosocial support ³	278	30.8 (27.7–33.8)

Note: ¹Values are numbers, percentages (95% confidence interval).

²Only smokers prior to admission (n=349).

³Conversational course by nurse, doctor, or psychologist.

Table III. Short Form 12 (SF-12), anxiety, depression, self-reported MRC dyspnoea score, body mass index, smoking status, alcohol consumption, physical activity, intake of fruit and vegetables, fish and fish oil, and drug treatment of patients with first-time MI in 2009, 14–16 weeks after discharge.¹

	n	% (95% CI)
Health status:		
SF-12 physical component score (pcs), mean (SD) ²		43.0 (11.3)
SF-12 mental component score (mcs), mean (SD) ³		48.1 (11.1)
Anxiety, HADS-A ≥ 8	211	23.6 (20.8–26.3)
Depression, HADS-D ≥ 8	167	18.6 (16.1–21.2)
Anxiety or depression, HADS-A ≥ 8 or HADS-D ≥ 8	262	29.2 (26.3–32.2)
MRC dyspnoea score ≥ 3	184	20.5 (17.9–23.2)
Body mass index:		
≥ 30 kg/m ² (obese)	170	19.3 (16.7–22.0)
25–30 kg/m ² (overweight)	369	42.0 (38.7–45.2)
< 25 kg/m ² (normal)	340	38.7 (35.5–41.9)
Smoking status:		
Current smokers	179	19.9 (17.3–22.5)
Ex-smokers, stopped after MI	166	18.5 (15.9–21.0)
Ex-smokers, stopped before MI	339	37.7 (34.5–40.9)
Never smokers	215	23.9 (21.1–26.7)
Alcohol consumption > 14/21 units per week ⁴	43	4.8 (3.4–6.2)
Physical activity (≥ 30 min per day):		
0–3 days per week	272	30.3 (27.3–33.3)
4–6 days per week	195	21.7 (19.0–24.4)
7 days per week	430	47.9 (44.7–51.2)
Fruit and vegetables (1 portion = 100 g):		
0–4 portions per day	811	90.0 (88.0–92.0)
5–6 portions per day	67	7.4 (5.7–9.2)
> 6 portions per day	23	2.6 (1.5–3.6)
Fish:		
0–2 times per week	563	62.7 (59.5–65.9)
3–4 times per week	182	20.3 (17.6–22.9)
> 4 times per week	153	17.0 (14.6–19.5)
Fish oil supplement	257	28.5 (25.6–31.5)
Drug treatment:		
Aspirin	714	78.6 (76.0–81.3)
Clopidogrel	694	76.4 (73.7–79.2)
Statin	756	83.3 (80.8–85.7)
Beta-blocker	735	81.0 (78.4–83.5)
ACE inhibitor/Angiotensin 2 receptor blocker	441	48.6 (45.3–51.8)
Antidepressants	102	11.2 (9.2–13.3)

Notes: ¹Values are numbers, percentages (95% confidence interval) unless stated otherwise. ²Mean PCS score (standard deviation) in Danish adults age 18–74: 51.0 (8.1) [24]. ³Mean MCS score (standard deviation) in Danish adults age 18–74: 52.8 (8.3) [24].

⁴The Danish National Board of Health advises (in 2009) women to drink < 14 units per week, and men < 21 units per week.

Strengths and limitations of the study

The major strengths of our study are the high response rate, the population-based nature, the ability to identify first-time MI patients, and the high validity of the MI diagnosis. To identify first-time cases, we excluded patients previously discharged with MI according to the DNHR from 1994 to the start of the study period. We acknowledge that a few participants may have had MI before 1994, but it is unlikely to have affected our results. The MI diagnosis in the DNHR has a high sensitivity (90%) and specificity (92%) [6]. The validity is even higher in our study because we asked the patients to confirm the diagnosis and reviewed the discharge summary. We reduced the risk of information bias by using previously translated and validated scales, pilot-testing the questionnaires among MI patients, and using high-quality register data. A major concern in any cross-sectional study is whether the participants are representative of the population from which they are drawn. In our study, we had a high response rate at 70.5%. However, patients older than 80 years, women, and patients with low socioeconomic resources were underrepresented. Since non-responders may be frailer than participants, we may have underestimated the level of disease and poor health behaviour, and overestimated the participation rate in phase II CR. The cross-sectional nature of the data presented in this paper does not allow us to make any causal interpretations.

Comparison with existing literature

Approximately 60% of the patients in this study participated in some phase II CR, with great variation among the different core components. The participation in CR varies markedly from one country to another, ranging from 10% to 60% [12]. This variation may be due to differences in organization, culture, and prioritizing of resources.

The impact of MI on mental health is of considerable concern. Depression after MI has been reported to impair quality of life [13] and increase mortality [14], and MI even increases the risk of suicide [15]. In our study, approximately one-third of patients had anxiety, depressive disorder, or both according to the HADS. Nevertheless, only a few patients were examined for anxiety or depression and few were offered psychological support after the MI. Our findings are consistent with those of previous studies showing that 16–35% [16,17] of patients had anxiety and 13–28% [16,17] had depression. Mental health seems to be an important focus area for phase III CR. As recommended, patients should be systematically examined for depressive disorders, to identify those who need treatment [18].

There is a substantial potential to change the health behaviour and reduce the risk of recurrent disease and mortality for the patients in our study. In particular, many patients smoke (19.9%). In accordance with this, the EUROASPIRE study [19] of 1743 MI patients from 22 European countries found that 20.7% smoked. In the EUROASPIRE study, the patients were not first-time cases of MI and they were interviewed at least six months after hospitalization. Smoking cessation in patients with cardiovascular disease is associated with a major reduced risk of total mortality [20] and smoking cessation should be given high priority in phase III CR.

Cardioprotective drug therapies have been reported to reduce mortality in patients with MI [21]. Statins are recommended for all MI patients, but only after an individual assessment of patients with ejection fraction <45%, and not for patients who develop adverse effects from statins. In our study 83.3% of the patients used statins. This proportion is higher than in other studies (77.9% in the EUROASPIRE study) and reasons for the lack of treatment are unknown [19]. The challenge in phase III CR is to advocate statin treatment in the long term, but also to increase the number of patients being treated.

Lack of social support and low education increases mortality after MI [22,23]. In our study 31.6% were living alone and 45.4% had less than 10 years of education. These patients may have special rehabilitation requirements to compensate for the social inequalities in health.

Implications for clinical practice and future research

After three months, there is a considerable potential for further rehabilitation of patients with first-time MI, for example concerning mental health, smoking cessation, and cardioprotective drugs; phase III CR should, however, include all core components of CR as suggested by current guidelines [3,4].

The basis of our study was the three-phase CR described in the official programme for cardiovascular disease in the Central Denmark Region [4]. Future studies should examine whether the three-phase approach provides a coherent health care system that integrates primary and secondary care, and ensures coordination between caregivers.

Ethics

The study was approved by the Danish Data Protection Agency (journal number 2009-41-3018). Participants provided written informed consent.

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Conflict of interest

None.

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