

RESEARCH ARTICLE

Healthcare Contacts after Myocardial Infarction According to Mental Health and Socioeconomic Position: A Population-Based Cohort Study

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Abstract

Objective

To examine the long-term use of healthcare contacts to general practice (GP) and hospital after a first-time myocardial infarction (MI) according to mental health and socioeconomic position.

Methods

Population-based cohort study of all patients discharged with first-time MI in the Central Denmark Region in 2009 (n=908) using questionnaires and nationwide registers. We estimated adjusted incidence rates and incidence rate ratios (IRR) for GP and hospital contacts according to depressive and anxiety symptoms, educational level and cohabitation status.

Results

During the 24-month period after the MI, patients with anxiety symptoms had 24% more GP contacts (adjusted IRR 1.24, 95% confidence interval (CI) 1.12–1.36) than patients with no anxiety symptoms. In contrast, patients with depressive symptoms (1.05, 0.94–1.16) and with short and medium education (<10 years: 0.96, 0.84–1.08; 10–12 years: 0.91, 0.80–1.03) and patients living alone (0.95, 0.87–1.04) had the same number of GP contacts as their counterparts (patients with no depressive symptoms, with long education [>12 years] and patients living with a partner). During the first 6 months after the MI, patients living alone had 13% fewer hospital contacts (0.87, 0.77–0.99), patients with short education had 16% fewer hospital contacts (<10 years: 0.84, 0.72–0.98) and patients with anxiety symptoms had 27% fewer hospital contacts (0.73, 0.62–0.86) than their counterparts. In contrast, patients with depressive symptoms (0.92, 0.77–1.10) and medium education (10–12 years: 1.05, 0.91–1.22) had the same number of hospital contacts as their counterparts.

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Conclusions

This study indicates that patients with depressive symptoms, short and medium education and patients living alone have a lower long-term use of healthcare contacts following MI than patients without these risk factors. Patients with depressive symptoms and low socioeconomic position would be expected to have a higher need of healthcare after MI as they have a poorer prognosis.

Introduction

Mounting evidence suggests that mental health [1–3] and socioeconomic position [4–6] play an important role for the prognosis after myocardial infarction (MI). The underlying mechanisms remain poorly understood even if several possible pathways have been suggested. A biological pathway suggests that depressive and anxiety symptoms may negatively affect mortality through increased inflammation, decreased heart rate variability and endothelial dysfunction. [7,8] A behavioural pathway suggests that depressive symptoms, living alone and short education may negatively affect mortality through low adherence to recommended lifestyle [9–12] and secondary prophylactic medication. [9,11] The behavioural pathway may also include low use of healthcare after MI among patients with poor mental health and low socioeconomic position. It is well-documented that cardiac rehabilitation programmes after MI reduce mortality through risk factor management. [13,14] However, in short-term cardiac rehabilitation programmes, it has been difficult to recruit patients with poor mental health and low socioeconomic position. [15–18] No study has evaluated the long-term overall use of healthcare after MI according to mental health and socioeconomic position.

We aimed to examine the long-term use of general practice (GP) and hospital after a first-time MI according to depressive and anxiety symptoms, educational level and cohabitation status.

Methods

We conducted a population-based cohort study comprising people living in the Central Denmark Region (1,250,000 inhabitants) with a first-time MI. The cohort has been used in several other studies, [2,3,19–21] and the establishment of the cohort is described in Larsen et al. [19] In this study we used the same baseline patient characteristic data as in the previous studies, but in addition we included new data on healthcare contacts.

Patients and participants

We consecutively invited all patients above 18 years who were 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) [22] 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 on patients discharged with MI (code I21) from the DNHR on a monthly basis. To identify incident cases, we excluded those who had been discharged with MI between 1994 and 2008 according to the DNHR. There were no other exclusion criteria. Information on name, current address and vital status was obtained from the Civil Registration System, [23] which also provided the unique personal identification number used to link data between registers and questionnaires.

A pilot-tested hard-copy questionnaire was sent to all eligible participants 12 to 14 weeks after their discharge from hospital; and non-responders received two reminders. The study was approved by the Danish Data Protection Agency (J.no. 2009-41-3018) and the Scientific Research Evaluation Committee of the Danish Academy of General Practitioners (ref. no. 03-2009), and written informed consent was obtained from all participants.

Healthcare contacts

In Denmark, healthcare services are tax-financed and available to the patients free of charge. The general practitioners act as gatekeepers and as first-line providers in the sense that referral from a general practitioner is always required to initiate in- and outpatient hospital treatment (except for emergency treatment). [24] The long-term chronic care management of MI and depression treatment primarily takes place in GP.

General practice. All GP services in daytime and out-of-hours (OOH) provided to citizens in Denmark are registered prospectively with specific codes in the Danish National Health Service Register. [25] The registration is based on a fee-for-service remuneration to the provider and is thus considered very accurate. [25] We included all contacts in daytime (consultations, home visits, e-mail and telephone consultations) and OOH (consultations, home visits and telephone consultations).

Hospital. We included all somatic outpatient visits, hospital admissions and emergency department visits based on data from the DNHR [22].

We collected information on healthcare contacts from 12 months before to 24 months after the MI. For all contact types (GP contact in daytime, OOH contact, outpatient visit, hospital admission, emergency department visit), only one contact was included per day per patient.

Participant characteristics

Socioeconomics. Data on age (<60, 60–80, >80 years) at MI and sex were obtained from the Civil Registration System. [23] Data on education (<10 years: primary and lower secondary school; 10–12 years: vocational education and upper secondary school; >12 years: short, medium, and long-term higher education) and cohabitation status (cohabiting, living alone) from the year before MI (2008) were retrieved from the Danish Integrated Database for Labour Market Research. [26]

Depressive and anxiety symptoms. We assessed depressive and anxiety symptoms using the Hospital Anxiety and Depression Scale (HADS). [27] The participants were categorised as having depressive or anxiety symptoms if they had a score of ≥ 8 on the HADS-D or the HADS-A scale. The HADS is designed to be valid in clinical populations with symptoms of physical disease, and it hence leaves out items that may be endorsed by physical rather than mental states. [27,28] The HADS has previously been validated in MI patients and has proven to have satisfactory reliability (HADS-D and HADS-A Cronbach's $\alpha \approx 0.80$). [29,30] Among MI patients, a HADS-D ≥ 8 identified possible cases of depression with a sensitivity of 65% and a specificity of 90% (compared with a diagnosis of depression based on a structured clinical interview for DSM-IV). [31] Among acute coronary syndrome patients, a HADS-A ≥ 8 identified possible cases of anxiety with a sensitivity of 91% and a specificity of 61% (compared with a diagnosis of generalised anxiety disorder based on a structured clinical interview for DSM-IV). [32]

Dyspnoea score. In epidemiological studies, a score ≥ 3 on the Medical Research Council dyspnoea scale [33] (i.e. walks slower than contemporaries on level ground because of breathlessness, or has to stop for breath when walking at own pace, or worse) has been shown to provide a simple and valid method for predicting all-cause [34,35] and cardiovascular mortality. [35]

Comorbidity. The DNHR [22] provided information on stroke (ICD-10: I61, I63, I64) and heart failure (ICD-10: I11.0, I13.0, I13.2, I42.0, I42.6, I42.7, I42.9, I50.0, I50.1, I50.9) from 1994 to 2008. The Danish National Diabetes Register provided information on diabetes from 1990 to 2008 according to an algorithm developed on the basis of information from four nationwide registers. [36]

Drug prescription data. These were obtained from the prescription database. [37] Data on aspirin (ATC: B01AC06), clopidogrel (ATC: B01AC04), statins (ATC: C10AA), β -blockers (ATC: C07), ACE-inhibitors/angiotensin 2 receptor blockers (ATC: C09), and antidepressants (ATC: N06A) were collected. We calculated whether the participant had tablets available on the day that we sent the questionnaire (the number of tablets on the last redeemed prescription before the questionnaire was sent \geq the number of days to the questionnaire was sent) and defined the participant as 'receiving treatment' if tablets were available. We defined the participant as 'receiving secondary prophylactic medication' if the participant was receiving treatment with three or more of the following drugs: aspirin, clopidogrel, statins and β -blockers.

Health behaviour. Data on smoking and physical activity were self-reported in the questionnaire. [3]

Statistical analysis

For all patients discharged with a first-time MI, we estimated monthly contact rates to GP and hospital from 12 months before to 24 months after the MI. For all patients, we further calculated average contact rates per month for the periods 12 months before, 2–24 months after (for GP contacts), 2–6 months after (for hospital contacts) and 7–24 months after (for hospital contacts) the first-time MI.

For participants (those who returned the questionnaire), we estimated 3-monthly contact rates to GP and hospital according to depressive symptoms, anxiety symptoms, educational level and cohabitation status. We calculated unadjusted and adjusted contact rates, and adjusted incidence rate ratios (IRRs) per 3 months from 12 months before to 24 months after the MI. We further calculated adjusted IRRs for the first 6 months after (for hospital contacts) and the 24 month-period after (for GP contacts) the MI. Adjustment were carried out by standardising to mean values of depressive symptoms, anxiety symptoms, educational level, cohabitation status, dyspnoea score, comorbidity, sex and age. In sub-analyses of all patients discharged with a first-time MI, we estimated unadjusted 3-monthly contact rates to GP according to the available patient characteristics (cohabitation status and educational level).

A negative binomial model was applied for the calculation of estimates and corresponding 95% confidence intervals (CI) for incidence rates and IRRs. Robust variance estimation with clustering at patient level was used to account for heterogeneity between subjects. To account for differences in follow-up time, log-transformed risk time was included in the model with the regression parameter restricted to 1. To account for differences in follow-up, censoring was done when a person died or emigrated. The index date and the day prior to the index date were contained in the first period after the MI diagnosis to allow for the possibility of delay in the administrative coding of the MI diagnosis. No variable had more than 3.4% missing data, and analyses were performed on complete data only.

Results

Patients and participants

A total of 1,671 patients were discharged with a first-time MI in 2009 in the Central Denmark Region. Among them, 1,288 were eligible for inclusion after 14–16 weeks, and 908 (70.5%)

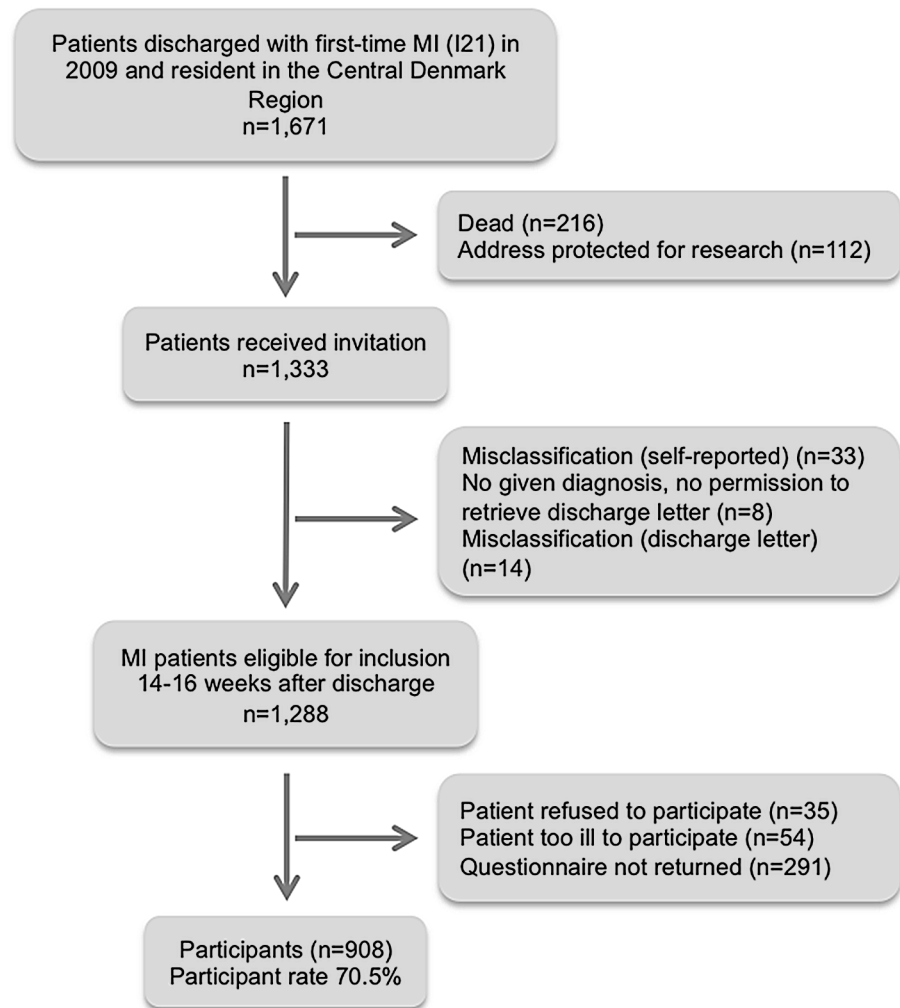


Fig 1. Flowchart for cohort.

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returned the questionnaire and were included as participants (Fig 1). Participants (n = 908) were more likely to be men, younger, have a longer education, live with a partner, and not have a comorbid condition than were both the entire group of patients discharged with first-time MI (n = 1,671) and the eligible patients (n = 1,288) (Table 1).

Before the MI, the patients (n = 1,671) had a stable level of 1.14 (95% CI 1.09–1.19) GP contacts per month. In the first month after the MI, a substantial increase to 2.97 (2.86–3.09) was observed, and during the 2–24-month period after the MI the rate of GP contacts stabilised around 1.58 (1.53–1.64) GP contacts per month (Fig 2).

Before the MI, the patients had a stable level of 0.40 (95% CI 0.35–0.46) hospital contacts per month. In the first month after the MI, a substantial increase to 3.98 (3.81–4.16) was observed. In the hospital rehabilitation period (2–6 months after the MI), they had 1.74 (1.65–1.84) contacts, and the level of contacts subsequently stabilised around 0.59 (0.53–0.65) hospital contacts per month (Fig 2).

Table 1. Characteristics of patients and participants.

Characteristics	All MI patients (n = 1,671) ^a	Eligible patients (n = 1,288) ^a	Participants (n = 908) ^a
Male sex, No. (%)	1056 (63.2)	834 (64.8)	626 (68.9)
Age, mean (SD)	69.7 (13.6)	68.5 (12.9)	67.1 (11.7)
Education, No. (%) ^b			
<10 years	764 (50.5)	586 (48.6)	398 (45.4)
10–12 years	566 (37.4)	469 (38.9)	362 (41.3)
>12 years	183 (12.1)	150 (12.4)	117 (13.3)
Cohabitation status, living alone, No. (%) ^b	709 (43.0)	508 (39.4)	287 (31.6)
Depressive symptoms, HADS-D ≥8, No. (%) ^c	-	-	167 (18.6)
Anxiety symptoms, HADS-A ≥8, No. (%) ^c	-	-	211 (23.5)
Dyspnoea score ≥3, No. (%) ^c	-	-	184 (20.5)
Comorbidity, No. (%) ^d	477 (28.5)	338 (26.2)	195 (21.5)

^aNumbers may not sum to their respective totals due to missing data.

^bInformation collected the year before MI (in 2008).

^cInformation collected three months after MI.

^dInformation collected at the time of MI.

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GP contacts

During the 24 months following the MI, patients with anxiety symptoms had 24% more GP contacts (adjusted IRR 1.24, 95% CI 1.12–1.36) than patients with no anxiety symptoms. In contrast, patients with depressive symptoms (1.05, 0.94–1.16), short and medium education (<10 years: 0.96, 0.84–1.08; 10–12 years: 0.91, 0.80–1.03) and patients living alone (0.95, 0.87–1.04) had a number of GP contacts similar to that of their counterparts (patients with no depressive symptoms, with long education (>12 years) and patients living with a partner) (Fig 3).

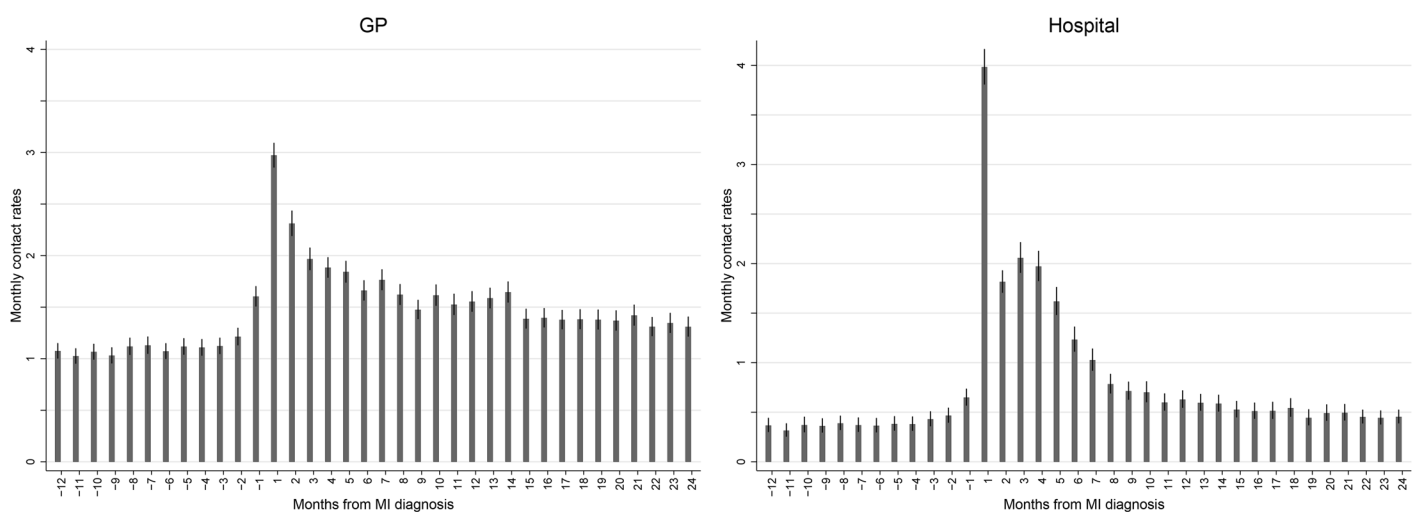


Fig 2. Monthly contact rates (with 95% CI) to general practice and hospital for all MI patients (n = 1,671) before and after first-time MI. The date of MI is contained in the first period after the MI diagnosis.

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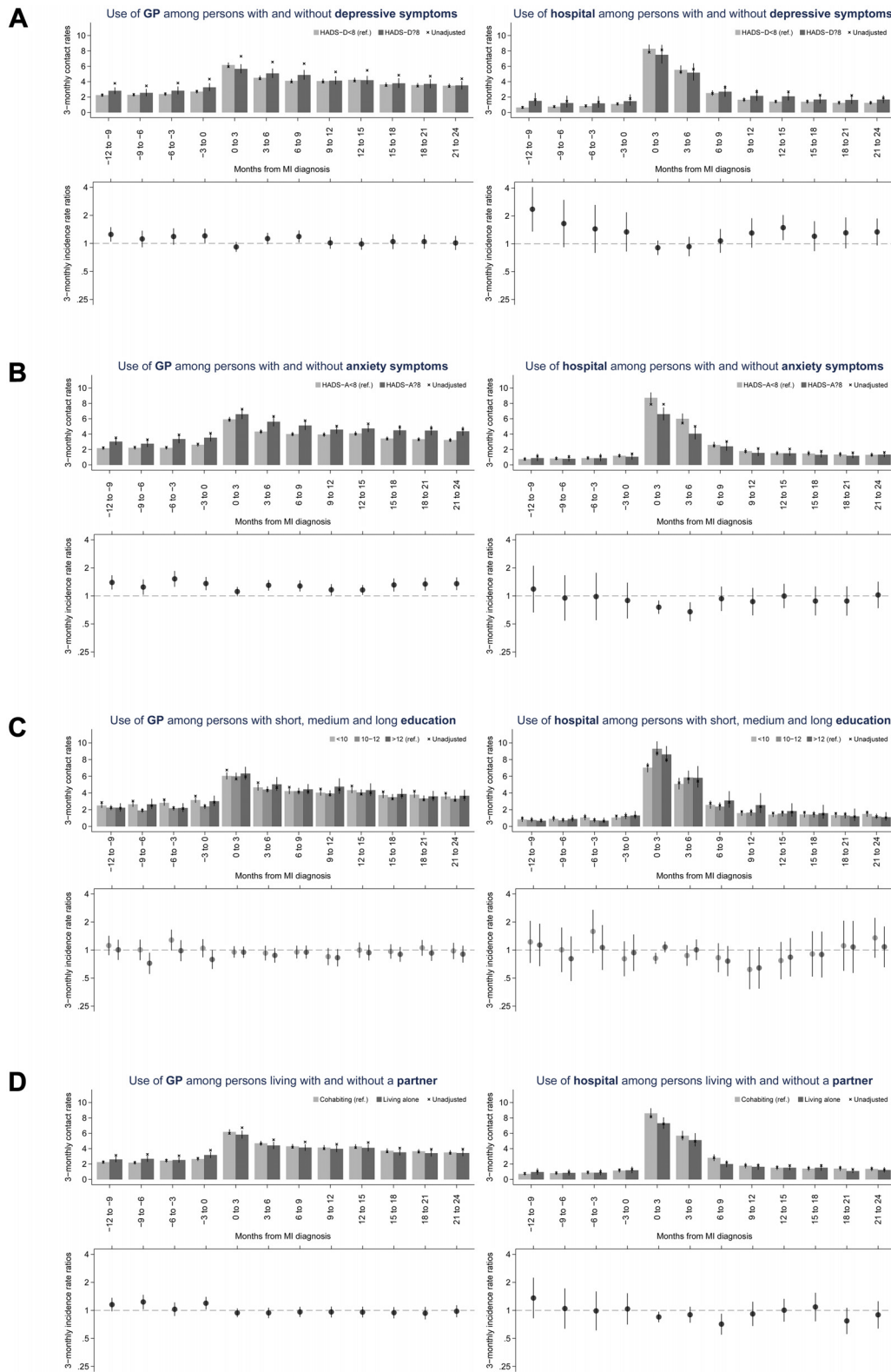


Fig 3. Use of general practice and hospital before and after first-time MI per 3-months periods according to mental health and socioeconomic position. Upper part: Unadjusted and adjusted (with 95% CI) contact rates. Lower part: Adjusted incidence rate ratios (with 95% CI). The date of MI is contained in the first period after the MI diagnosis.

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Table 2. Drug prescription data and health behaviour for patients at inclusion according to mental health and socioeconomic position.

	Depressive symptoms		Anxiety symptoms		Educational level			Cohabitation status	
	HADS-D \geq 8	HADS-D $<$ 8	HADS-A \geq 8	HADS-A $<$ 8	<10 years	10–12 years	>12 years	Living alone	Married/cohabiting
Aspirin, %	77.3	78.9	79.2	78.4	79.9	79.0	72.7	79.1	78.4
Clopidogrel, %	74.3	77.5	77.7	76.8	74.4	79.6	79.5	72.8	78.1
β -Blocker, %	82.0	80.6	80.6	80.9	78.14	84.5	78.6	77.7	82.5
Statin, %	83.2	83.3	83.4	83.4	79.9*	87.6	85.5	77.0*	86.2
ACE-inhibitors/AT-II-receptor block, %	55.1	46.7	48.8	48.0	51.5	48.3	42.7	51.6	47.2
Antidepressants, %	22.2*	8.4	19.0*	8.5	11.3	11.6	9.4	15.0*	9.5
Secondary prophylactic medication**, %	65.9*	73.7	69.7	73.0	71.9	69.6	78.6	69.7	73.1
Physical activity, days/week, mean	3.7*	5.2	4.2*	5.2	4.8	4.9	5.3	4.7	5.0
Current smokers, %	25.9*	18.7	26.2*	18.2	21.5	18.7	16.4	23.0	18.5

*p<0.05

**We defined the participant as 'receiving secondary prophylactic medication' if the participant was receiving treatment with three or more of the following drugs: aspirin, clopidogrel, statins and β -blockers.

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Hospital contacts

During the first 6 months after the MI, the hospital contact rate was the same among patients with depressive symptoms (adjusted IRR 0.92, 95% CI 0.77–1.10) and patients with medium education (10–12 years: 1.05, 0.91–1.22) as among their counterparts. Inversely, the hospital contact rate was lower among patients living alone (0.87, 0.77–0.99) and among patients with short education (<10 years: 0.84, 0.72–0.98) and with anxiety symptoms (0.73, 0.62–0.86) than among their counterparts (Fig 3).

Drug prescriptions and health behaviour

Patients with depressive symptoms were less likely to receive secondary prophylactic medication than patients without depressive symptoms (65.9% vs. 73.7%, p = 0.041). Patients with short education (79.9% vs. 87.6% and 85.5%, p = 0.014) and patients living alone (77.0% vs. 86.2%, p = 0.001) were less likely to receive statin treatment compared to their counterparts. Among patients with depressive symptoms, 22.2% received antidepressants, whereas 19.0% of patients with anxiety symptoms and 15.0% of patients living alone received antidepressants. Patients with depressive symptoms and anxiety symptoms were physical active fewer days per week and were more often current smokers than their counterparts (Table 2).

Discussion

In this population-based cohort study, we found that post-MI patients living alone, with short and medium education and with depressive symptoms had a number of healthcare contacts that was similar to or lower than that of patients without these risk factors. On the other hand, MI patients with anxiety symptoms had a higher use of GP, but a lower use of hospital than patients without anxiety symptoms.

No previous studies have examined MI patients' long-term overall use of the healthcare system (GP and hospital) according to mental health and socioeconomic position. However, previous studies of short-term hospital-based rehabilitation have also found a lower level of

participation among MI patients living alone, with short education and with depressive symptoms than among MI patients without these risk factors. [15–18]

Low socioeconomic position [4–6] and depressive symptoms [1,2] after MI have consistently been associated with mortality, whereas anxiety symptoms have not. [21,38,39] Part of this difference in prognosis may be explained by differences in the use of healthcare. Patients with low socioeconomic position and depressive symptoms would be expected to have a higher need of healthcare contacts after the MI as they have a higher prevalence of risk factors and a poorer prognosis. Therefore even a similar level of healthcare contacts between patients with and without these risk factors may be alarming. Our and previous [15–18] studies indicate that patients with low socioeconomic position and depressive symptoms does not have a higher level of healthcare contacts after MI than patients without these risk factors, and several possible explanations for this have been suggested. Compared with patients with a long education, patients with a short education may have lower health literacy and lower awareness of physician diagnoses and recommendations. This may result in lower recognition of cardiac symptoms, fewer contacts to the healthcare system and less adherence to recommended lifestyle and medication. [16,40] Patients living with a partner may display less distress than their single-living counterparts as a partner can share the emotional burden and provide appropriate social support. A partner may also encourage the patient to seek medical help, attend cardiac rehabilitation and be adherent to secondary prophylactic medication. [41] It has previously been hypothesised that patients with anxiety may have a ‘constructive worrying’ capacity and therefore be more likely to seek help in response to less severe somatic symptoms, attend cardiac rehabilitation and be more adherent to secondary prophylactic medication, [42–44] whereas the opposite may be true for MI patients with depression. [7] Our results support this hypothesis as patients with anxiety symptoms had significantly more GP contacts after the MI than patients without anxiety symptoms. In contrast, patients with depressive symptoms only had the same number of GP contacts as patients without depressive symptoms. This underlines the importance of identification of depression as a part of routine care after MI, which is, regrettably, rarely performed. [20]

Contacts to the healthcare system are a requisite for rehabilitation after MI. More healthcare contacts may increase compliance and persistence to recommended lifestyle such as smoking cessation and regular physical activity. Regular evaluation of the medication may increase medication compliance, increase the probability of optimal secondary prophylactic treatment and potential drug side effects can be taken care of. Healthcare contacts are a requisite for a fast and correct diagnosis and thereby treatment of any new cardiovascular events. More healthcare contacts for patients with low socioeconomic position may improve their understanding of their disease and thereby improve their compliance and recognition of new cardiac symptoms. Healthcare contacts are also a requisite for diagnostics and treatment of a potential depression or anxiety disorder.

Physical activity among patients with depressive and anxiety symptoms may need extra attention, as these patients were less physical active than patients without these mental health problems in our study. Regarding secondary prophylactic medication, especially patients with depressive symptoms may need extra attention, whereas particularly statin treatment may need extra attention among patients with short education and patients living alone. Smoking cessation may also need extra attention, especially among patients with depressive and anxiety symptoms, as they were more often current smokers compared to patients without mental health problems. Only 22.2% of the patients with depressive symptoms were treated with antidepressants, this could indicate a gap in the diagnostics and treatment of patients with depression.

More contacts to the healthcare system among MI patients with depressive symptoms and low socioeconomic position may lead to better risk factor management, a more optimised

medical treatment, less severe cardiac disease and lower mortality. This may be achieved through differentiated and outreaching treatment strategies for patients with these risk factors. A study on the short-term hospital-based rehabilitation has shown that social inequality in referral, attendance and adherence to rehabilitation can be remedied by systematic referral and a socially differentiated, individualised approach, [45] and that an extended rehabilitation program for socially vulnerable patients can increase the share of patients achieving treatment goals. [46] Katon et al. [47] conducted a study on collaborative care in a GP setting for patients with depression and diabetes and/or coronary heart disease. They found that compared with usual care, an intervention involving nurses who provided guideline-based, patient-centred management of depression and chronic disease significantly improved control of medical disease, depression, quality of life and satisfaction with care. Similarly, Richards et al. [48] found that collaborative care had persistent positive effects on depression up to 12 months after care initiation and was preferred by patients over usual care. These studies indicate that a systematic, stratified and outreaching approach may be the road ahead both in hospital and GP rehabilitation care. However, further studies are needed to examine if these interventions can also improve prognosis.

Strengths and limitations of the study

The major strengths of this study are its population-based nature and its homogeneous study population; we invited all patients discharged with first-time MI during one year in a well-defined area. Our response rate was reasonably high (70.5%), and information on outcome was collected without loss to follow-up. Non-participants were more likely to be women, older, have fewer socioeconomic resources and a comorbid condition. In order to address the potential risk of selection bias, we estimated unadjusted GP contact rates for all the patients discharged with MI according to the available patient characteristics (cohabitation status, $n = 1,671$, and education, $n = 1,513$). In general, the patients with socioeconomic risk factors had more GP contacts than patients without these risk factors, but these trends tended to be smaller than the corresponding estimates for the participants. Thus, our results may overestimate the use of GP among patients with risk factors compared with patients without risk factors (S1 and S2 Figs).

Information on MI was registered prospectively and did not rely on the patients' memory. The MI diagnosis was based on the current European Society of Cardiology criteria, coded by the physician in charge of the discharge, and is known to have a high sensitivity (90%) and specificity (92%). [49] The specificity was even higher in our study because we confirmed the MI diagnosis by reviewing the discharge summaries. We also reduced the risk of information bias by using previously translated and validated scales, by pilot-testing the questionnaire among MI patients, and by using high-quality register data. A diagnosis of depression or anxiety should ideally be based on a diagnostic interview. Since a previous study has estimated the sensitivity of the HADS-D ≥ 8 for identification of depression to be 65% in MI patients, [31] a substantial number of participants with depression may have been misclassified as not having depression. However, we identified 18.6% with depressive symptoms in our population, which is in keeping with the prevalence of post-MI depression identified by structured clinical interviews in other studies (19.8%). [50] We found no studies reporting on the sensitivity and specificity of HADS-A in an MI population. However, among patients with acute coronary syndrome, a HADS-A ≥ 8 had a sensitivity of 91%. [32] Accordingly, we most likely identified the majority of patients with anxiety symptoms. We evaluated depressive and anxiety symptoms 3 months after MI. This allowed the participants to naturally overcome depressive or anxiety symptoms after a stressful life event. We had information only on the number of healthcare contacts, but not on the reason for encounter or the contents of the contacts.

We accounted for the effect of confounding by depressive symptoms, anxiety symptoms, educational level, cohabitation status, dyspnoea score, comorbidity, sex and age. However, we cannot rule out the possibility of residual confounding.

Conclusions

Patients with depressive symptoms, with short and medium education and patients living alone may have a lower long-term use of healthcare following MI than patients without these risk factors. Patients with depressive symptoms and low socioeconomic position would be expected to have a higher need of healthcare after MI as they have a poorer prognosis. A systematic, stratified and outreaching approach in the rehabilitation care may improve the quality of care among MI patients with mental health and socioeconomic risk factors.

Supporting Information

S1 Fig. Use of general practice before and after first-time MI per 3-month period according to educational level. Unadjusted contact rates (with 95% CI) for all patients discharged with MI and for participants. The date of MI is contained in the first period after the MI diagnosis. (EPS)

S2 Fig. Use of general practice before and after first-time MI per 3-month period according to cohabitation status. Unadjusted contact rates (with 95% CI) for all patients discharged with MI and for participants. The date of MI is contained in the first period after the MI diagnosis. (EPS)

Author Contributions

Conceived and designed the experiments: TJN MV MF BC KKL. Performed the experiments: KKL. Analyzed the data: TJN MF. Contributed reagents/materials/analysis tools: KKL. Wrote the paper: TJN.

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