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Association of patient-reported psychosocial healthcare and risk of readmissions and mortality in patients with ischemic heart disease: A population-based cohort study

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ABSTRACT

Objective: Psychosocial risk factors are common in patients with ischemic heart disease (IHD) and linked to poor prognosis. Psychosocial healthcare is recommended in international guidelines and has demonstrated positive effects, primarily on psychosocial symptoms. We examined the association between patient-reported psychosocial healthcare and hospital readmissions and mortality in patients with IHD.

Methods: A population-based cohort study with register-based follow-up. Patient-reported psychosocial healthcare was measured by seven items in a survey sent to a random sample of patients with incident IHD in Denmark in 2014. We used multivariable Cox proportional hazards models and Poisson regression to examine the association between psychosocial healthcare and readmissions and all-cause mortality.

Results: In total, 1083 (57%) patients were followed up to 4½ years. Low psychosocial support was reported by 53.4%, medium by 26.2% and high by 20.4% patients. The hazard of acute cardiac readmission for patients reporting low psychosocial healthcare was 2.08 higher than for patients reporting high psychosocial healthcare (95%CI:1.01–4.30). No association was found with time to first all-cause readmission. The acute cardiac readmission rate was 3.24 (95%CI:1.66–6.29) and 4.23 (95%CI:2.15–8.33) times higher among patients reporting low and medium psychosocial healthcare compared to high, and the all-cause readmission rate was 1.30 (95%CI:1.16–1.46) and 1.32 (95%CI:1.17–1.49) times higher. The hazard of death was 2.86 (95%CI:1.23–6.69) and 2.88 (95%CI:1.18–7.04) times higher among patients reporting low and medium psychosocial healthcare compared to high.

Conclusion: In patients with IHD, a high level of patient-reported psychosocial healthcare was significantly associated with reduced hospital readmissions and all-cause mortality.

1. Introduction

Ischemic heart disease (IHD) is the leading cause of death worldwide and the second leading cause of disability-adjusted life-years, a measure capturing both premature mortality and severity of ill health [1,2]. In the US, more than 20 million people ≥20 years of age live with IHD, and it accounts for about 1.0 million hospitalizations and 366,000 deaths each year (approximately 13% of all deaths) [3].

Psychosocial risk factors are highly prevalent in IHD patients, with 20–30% showing symptoms of depression, anxiety and loneliness [4–6]. Moreover, psychosocial risk factors have been linked to poor prognosis through behavioral mechanisms, such as unhealthy lifestyle, low adherence to medication and cardiac rehabilitation, and through biological mechanisms, such as autonomic nervous system dysfunction [4,7–12]. Accordingly, the European Society of Cardiology recommends psychosocial healthcare by multimodal interventions integrating

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psychosocial approaches and assessment of psychosocial risk factors [13]. They advocate that the healthcare system has a responsibility to prevent and treat psychosocial risk factors, as healthcare professionals in clinical practice can directly support patients regarding psychosocial risk factors [13]. The American Heart Association acknowledges psychosocial interventions as a core component of secondary prevention and rehabilitation, and recommends screening for depression if patients have access to care support [14–17]. Different types of psychosocial healthcare have demonstrated positive effects on psychosocial symptoms, while effects on readmissions and all-cause mortality are unclear [18–25]. In this study we define psychosocial healthcare as patients' experiences of receiving information and being offered support from healthcare staff regarding psychosocial aspects of importance according to heart patients.

The aim of this study was to examine the association between patient-reported psychosocial healthcare and the risk of hospital readmissions and all-cause mortality in a random sample of incident IHD patients with register-based follow-up.

2. Methods

2.1. Study design

This was a cohort study with prospectively collected register-based follow-up. Participants can be followed over time by linking information at individual level because all Danish residents have a unique personal identification number given at birth or immigration which is available in all registries [26].

2.2. Setting

The study was conducted in Denmark (5.8 million residents). The Danish healthcare system is universal with free and equal access to healthcare for all residents. Hospitals have inpatient and outpatient clinics; the latter often being used for pre- or post-hospitalization diagnosis and treatments. Primary healthcare services are provided by general practitioners (GPs) and municipalities, whose responsibilities include disease prevention and rehabilitation outside of the hospital [27–29].

2.3. Sample

The study population consisted of a random population-based sample of 2116 patients with incident IHD (ICD-10: I20–I25) diagnosed in 2013 selected from the Danish National Patient Registry (NPR) [30]. The NPR was established in 1977 and includes information on all inpatient contacts and since 1995 also outpatient contacts in all public and private hospitals in Denmark. The sample was extracted from a cohort of 5000 heart patients with IHD, atrial fibrillation, heart failure and heart valve disease. The type of heart disease was expected to modify the association between patient-reported psychosocial healthcare and readmissions and mortality, and the mechanisms linking patient-reported healthcare with the outcomes might differ between the four diagnostic groups. Thus, we selected the largest group only. Patients had none of the four specified heart diseases in the previous 5 years, were ≥ 35 years of age, residents of Denmark and alive when the sample was established in October 2014 [31].

2.4. Data collection

From October to December 2014, we conducted a survey to examine heart patients' experiences with the Danish healthcare system and their health status. This study examines patient-reported experiences with psychosocial healthcare based on elements from the survey. We sent a paper questionnaire, a cover letter and a pre-paid return envelope to the patients. Patients' home addresses were obtained from the Danish Civil

Registration System (CRS) [26]. The questionnaire was developed based on a literature review and qualitative interviews. A total of 19 heart patients, four relatives and eight healthcare professionals (e.g., cardiologist, nurse, psychologist) participated in the qualitative interviews, and another 15 patients participated in the pilot test. The focus was to ensure the questionnaire covered aspects of healthcare quality important to heart patients. The development of the questionnaire has been described in detail elsewhere [31]. Information on baseline characteristics and readmissions and mortality were obtained from national registries.

2.5. Variables

2.5.1. Patient-reported psychosocial healthcare

The exposure 'patient-reported psychosocial healthcare' was measured by seven items in the survey and covered the patient journey, from first contact with the healthcare system to the inpatient and outpatient treatment and rehabilitation at the hospital, the GP and the municipality (Table 1). Four items measured patient-reported information on psychosocial aspects, which tapped into whether patients experienced being offered information on emotional reactions (own and relatives) and whether the disease influenced social life and sex life. Three items measured patient-reported psychosocial rehabilitation and support, which concerned patients' experiences of being offered support and guidance on these matters, and if healthcare professionals had asked about emotional problems. We recoded 'do not know' responses to 'no'. The responses were added, and an average score was calculated (range of score: 0–3) for patients with at least four responses. They were then categorized into three subgroups low (score < 1.0), medium (score 1.0–1.9) and high (score ≥ 2.0) level of patient-reported healthcare.

2.5.2. Hospital readmissions and all-cause mortality

The outcome variables were time to and number of acute cardiac readmissions, all-cause readmissions, and all-cause mortality. We obtained information on hospital readmissions from the NPR based on

Table 1
Survey items measuring patient-reported psychosocial healthcare.

Question	Reply options, categorization and values
Now we want to ask how informed you feel overall about your heart disease from the hospital, your general practitioner or from your municipality (e.g., healthcare centre)	3: Yes, to a great degree 2: Yes, to some degree 1: To a lesser degree 0: No (no, not at all; do not know)
1) Do you feel informed about the emotional reactions you may experience because of your disease?	
2) Do you feel informed about the emotional reactions your relatives may experience because of your disease?	
3) Do you feel informed about how the disease may affect your relationship with family, friends, and others?	
4) Do you feel informed about what the disease can mean for your sex life and relationships?	
5) Did healthcare staff at any time ask whether you had experienced emotional problems in connection with your disease?	3: Yes (yes, at the hospital; yes, at my GP; yes, in my municipality) 0: No (no, not at any time; do not know)
6) Have you been offered emotional support in connection with your disease?	3: Yes (yes, and I accepted the offer; yes, but I rejected the offer).
7) Have you been offered guidance on sex life and relationships in connection with your disease?	0: No (no; do not know)

GP: general practitioner.

All questions cover the patient journey from first contact with the healthcare system to the inpatient and outpatient treatment and rehabilitation at the hospital, the general practitioner, and the municipality.

primary diagnosis upon discharge from an inpatient contact. Acute cardiac readmissions were defined according to previous work [32,33] and in consultation with a cardiologist (AZ) as myocardial infarction (ICD-10: I21-I22), stroke (ICD-10: I60-I64), cardiac arrest (ICD-10: I46), chronic heart failure (ICD-10: I11.0, I42.0, I42.6, I42.8, I42.9, I50), ventricular tachycardia and ventricular fibrillation (ICD-10: I49.0). We chose a relatively restricted definition of cardiac readmissions to attain high validity of the diagnoses. All-cause readmissions included both acute and elective readmissions, but not outpatient contacts. Information on all-cause mortality were obtained from the Danish Register of Causes of Death [34].

2.5.3. Covariates

Confounders were selected a priori based on directed acyclic graphs (DAGs), depicting our knowledge from current evidence and assumptions about the possible causal interrelationships between the exposure and outcome (supplementary Fig. S1). The following confounders were selected: age at diagnosis, sex (women, men), region (Capital Region of Denmark, Central Denmark Region, North Denmark Region, Region of Southern Denmark, Region Zealand), anxiety or depression based on hospital diagnosis from 1977 or > 1 redeemed prescription of antidepressants and anxiolytic medication from 1995 up to disease onset (current: <90 days, recent: 90–364 days, past: 1–38 years, or none: since 1977), and somatic comorbidity for a 5-year period according to the Charlson comorbidity index (none (score = 0), mild (score = 1), severe (score ≥ 2)) all prior to IHD, and acute coronary syndrome (yes/no, ICD-10: I21, I240, I248, I249 [35]) and contact with their GP in relation to IHD (yes, no). Additional covariates were included for description of the population (respondents and non-respondents): ethnic background, educational level, cohabitation, employment status, body mass index (BMI) and smoking status prior to IHD. Further information about the covariates and data sources are available in supplementary Table S1.

2.6. Statistical analyses

Baseline characteristics were calculated in percentages, means and standard deviations (SD), and the incidence rates (IR) of readmissions and mortality were calculated per 1000 person-years. We used Cox proportional hazards models to examine the association between psychosocial healthcare and time to readmission and death, and Poisson regression models to examine the number of readmissions. For the analysis of readmissions, patients were followed 6 months from time of diagnosis in 2013, providing time for clinicians to 'expose' patients to psychosocial healthcare, and adjusted for readmissions during the first 6 months. With mortality as the outcome, follow-up time started from time of completing the survey in October 2014 to avoid immortal time bias. Patients were followed until time of endpoint (readmission or death), censoring (emigration or death), or end of follow-up, whichever came first. Death was handled as censoring when readmission was the outcome. End of follow-up was 31 December 2017 for readmissions and 31 December 2018 for death. Time was used as the underlying time scale. In Poisson regression models with total number of readmissions as the outcome and logarithmic transformation of follow-up time, patients were followed until censoring (emigration or death) or end of follow-up. We adjusted all analyses for the confounders selected based on DAGs, and for each analysis we evaluated if age should be adjusted for as either a continuous or a categorical variable (<60, 61–65, 66–70, 71–75, >75 years). Results are reported as hazard ratios (HRs) and incidence rate ratios (IRR) with 95% confidence intervals (CIs). The assumption of proportional hazard functions was evaluated visually using log-log plots and testing interaction terms between time and exposure. If the assumption was not fulfilled, we conducted a Poisson regression of incidence rates (i.e., with number of events as outcome and logarithm of follow-up time as offset, also referred to as piecewise exponential model) as a sensitivity analysis. Data were analyzed using SAS, version 9.4.

2.6.1. Sensitivity analyses

Sensitivity analyses were performed using multiple imputations. For the analyses of readmissions, we also carried out analyses accounting for the competing outcome of death and with follow-up time starting at time of diagnosis up until 6 months. Last, we compared non-respondents to respondents.

2.7. Ethics

The study was approved by the University of Southern Denmark (no. 17/8592 (10.735)). According to Danish law, this type of study does not require further formal ethical approval. The letter sent to patients together with the survey explained the study aim, assuring them that participation was voluntary and that results would be anonymous. Participants provided informed consent for participation by returning the questionnaire.

3. Results

A total of 2116 individuals were invited to participate in the study and 1302 completed the questionnaire. Five died before data collection and 219 responded they had no heart disease in 2013 and were excluded from the original sample. Thus, we adjusted the sample size to 1892 of which 1083 had eligible responses (57%) (see flowchart in supplementary Fig. S2). In the analyses of readmissions, another respondent was excluded, because immigration was the first migration after diagnosis, thus emigration date (censoring date) is unknown. Baseline characteristics and exposure status of the study population are presented in Table 2. The mean age was 66.9 years, 62.2% were men, 32.9% had mild or severe comorbidity, and 11.7% had anxiety or depression. Low psychosocial support was reported by 53.4% patients, medium by 26.2% and high by 20.4% patients.

3.1. Time to readmissions

Among the 1082 patients, a total of 98 acute cardiac readmissions occurred during the total follow-up time of 4008 person-years, corresponding to a mean follow-up time of 3.7 person-years. IR (per 1000 person-years) were 28.8, 24.4 and 11.7 in the groups reporting low, medium, and high psychosocial healthcare, respectively. After adjusting for confounders, the hazard of acute cardiac readmission for patients reporting low psychosocial healthcare was 2.08 (95% CI: 1.01–4.30) times higher than for patients reporting high psychosocial healthcare. The same tendency was seen for patients reporting medium psychosocial healthcare (HR = 1.95, 95% CI: 0.89–4.25), although this was not statistically significant (Table 3). The evaluation of the assumption of proportional hazard functions was inconclusive, but the sensitivity analyses using Poisson regression confirmed the results (supplementary Tables S2).

A total of 679 all-cause readmissions occurred during the total follow-up time of 2440 person-years, amounting to mean IR of 278.3 readmissions per 1000 person-years. IR (per 1000 person-years) were 296.7, 259.6 and 240.8 in the groups reporting low, medium and high psychosocial healthcare, respectively. The hazards of readmission in the adjusted analysis did not differ between patients reporting low (HR = 0.99, 95% CI: 0.79–1.24), or medium (HR = 1.02, 95% CI: 0.79–1.30) compared to high (reference) psychosocial healthcare (Table 3). The assumption of proportional hazard functions was inconclusive, but the sensitivity analyses using Poisson regression confirmed the results (supplementary Tables S2).

3.2. Number of readmissions

Among the 1082 patients, 98 patients experienced a total of 172 acute cardiac readmissions during the follow-up period of 4186 person-years. Among the 521 patients reporting low psychosocial healthcare,

Table 2
Baseline characteristics and exposure status of the study population.

	All		Patient-reported psychosocial healthcare*					
			Low		Medium		High	
	n = 1083 (100%)		n = 522 (53.4%)		n = 256 (26.2%)		n = 200 (20.4%)	
	N	%	N	%	N	%	N	%
Covariates included as confounders								
Age, years								
<65	421	38.9	169	41.9	128	31.8	106	26.3
65–74	415	38.2	202	54.7	95	25.7	72	19.5
>74	247	22.8	151	73.3	33	16.0	22	10.7
Mean (SD)	66.9	(10.7)	68.3	(11.0)	64.7	(9.8)	63.3	(9.6)
Sex								
Women	366	33.8	200	63.1	75	23.7	42	13.2
Men	717	66.2	322	48.7	181	27.4	158	23.9
Acute coronary syndrome								
Yes	468	43.2	206	48.7	115	27.2	102	24.1
No	615	56.8	316	56.9	141	25.4	98	17.7
Comorbidity								
None (score = 0)	727	67.1	326	49.1	179	27.0	159	23.9
Mild (score = 1)	200	18.5	106	59.9	42	23.7	29	16.4
Severe (score ≥ 2)	156	14.4	90	65.7	35	25.5	12	8.8
Prior anxiety or depression								
None	649	59.9	278	47.6	164	28.1	142	24.3
Past	256	23.6	148	62.4	<50	<21.1	<45	<19.0
Recent	51	4.7	24	49.0	<20	<40.8	<5	<10.2
Current	127	11.7	72	60.9	26	20.6	14	18.5
Region								
Capital Region of Denmark	266	24.6	136	54.6	65	26.1	48	19.3
Central Denmark Region	263	24.3	121	51.3	62	26.3	53	22.5
North Denmark Region	122	11.3	59	56.7	28	26.9	17	16.3
Region of Southern Denmark	243	22.4	116	53.0	54	24.7	49	22.4
Region Zealand	189	17.5	90	52.9	47	27.6	33	19.4
Contact with GP								
Yes	863	82.3	413	51.5	213	26.6	176	21.9
No	186	17.7	107	61.8	42	24.3	24	13.9
Missing	34							
Other covariates								
Ethnic background,								
Danish origin	1008	93.1	487	53.4	240	26.3	185	20.3
Immigrant or descendant	75	6.9	35	53.0	16	24.2	15	22.7
Educational level								
Lower-secondary school	386	35.8	197	59.7	67	20.3	66	20.0
Upper-secondary or vocational school	452	41.9	199	48.1	121	29.2	94	22.7
Higher education	240	22.3	125	54.1	66	28.6	40	17.3
Missing	5							
Cohabitation								
Yes	804	74.2	354	48.0	203	27.5	181	24.5
No	279	25.8	168	70.0	53	22.1	19	7.9
Employment								
Employed	314	29.0	108	36.4	105	35.4	84	28.3
Unemployed	65	6.0	26	42.6	15	24.6	20	32.8
Outside the labour force	704	65.0	388	62.6	136	21.9	96	15.5
BMI								
Underweight	12	1.2	6	28.6	<10	<47.6	<5	<23.8
Normal	312	31.5	151	51.9	<80	<27.5	<60	<20.6
Overweight	439	44.3	203	50.6	106	26.4	92	22.9
Obese	229	23.1	105	51.2	53	25.9	47	22.9
Missing	91							
Smoking status								
Never smoker	295	30.1	132	50.0	69	26.1	63	23.9
Ex-smoker	418	42.6	207	54.6	98	25.9	74	19.5
Current smoker	268	27.3	126	50.4	69	27.6	55	22.0
Missing	102							

SD: standard deviation, BMI: body mass index, GP: general practitioner.

* A total of 105 had missing information about patient-reported psychosocial healthcare.

90 acute cardiac readmissions occurred during 1996 person-years, amounting to 45.1 readmissions per 1000 person-years. For comparison, the IRs were 56.3 and 12.7 per 1000 person-years for patients reporting medium and high psychosocial healthcare, respectively. In the adjusted analyses, the acute cardiac readmission rates were 3.24 (95% CI: 1.66–6.29) and 4.23 (95% CI: 2.15–8.33) times higher among

patients reporting low and medium psychosocial healthcare, respectively, than patients reporting high psychosocial healthcare (Table 4).

A total of 3216 all-cause readmissions occurred among 679 patients during the follow-up period of 4186 person-years. IRs (per 1000 person-years) were 868.8, 767.5 and 503.3 in the groups reporting low, medium and high psychosocial healthcare, respectively. When adjusting for

Table 3

Association between patient-reported psychosocial healthcare and time to readmission (acute cardiac and all-cause) and all-cause mortality.

	Events	Person years at risk	IR per 1000 person years	HR (95% CI), Unadjusted*	HR (95% CI), adjusted†
Acute cardiac readmissions					
Psychosocial healthcare					
Low	55	1906	28.8	2.45 (1.21–4.95)	2.08 (1.01–4.30)
Medium	23	944	24.4	2.07 (0.96–4.47)	1.95 (0.89–4.25)
High	9	767	11.7	1 (ref)	1 (ref)
All-cause readmissions					
Psychosocial healthcare					
Low	340	1146	296.7	1.21 (0.98–1.49)	0.99 (0.79–1.24)
Medium	153	589	259.6	1.08 (0.85–1.37)	1.02 (0.79–1.30)
High	114	473	240.8	1 (ref)	1 (ref)
All-cause mortality					
Psychosocial healthcare					
Low	72	1993	36.1	4.91 (2.14–11.30)	2.86 (1.23–6.69)
Medium	27	1009	26.8	3.63 (1.50–8.80)	2.88 (1.18–7.04)
High	6	811	7.4	1 (ref)	1 (ref)

IR: Incidence rate, HR: hazard ratio (estimated using Cox regression model).

* 105 respondents excluded due to missing values.

† Adjusted for age, sex, region, acute coronary syndrome, anxiety or depression, somatic comorbidity and contact with general practitioner in relation to ischemic heart disease. Analyses of readmissions were also adjusted for readmissions during the first 6 months. A total of 108 respondents were excluded due to missing values.

confounders, patients reporting low and medium psychosocial healthcare had a 1.30 (95% CI: 1.16–1.46) and 1.32 (95% CI: 1.17–1.49) times higher all-cause readmission rate than patients reporting high psychosocial healthcare, respectively (Table 4).

3.3. Death

A total of 122 deaths occurred during the total follow-up time of 4211 person-years, corresponding to IR of 29.0 per 1000 person-years. IRs (per 1000 person-years) were 36.1, 26.8 and 7.4 in the groups reporting low, medium and high psychosocial healthcare, respectively. In the adjusted analysis, the hazards of death were 2.86 (95% CI: 1.23–6.69) and 2.88 (95% CI: 1.18–7.04) among patients reporting low and medium psychosocial healthcare, respectively (Table 3). The assumption of proportional hazard was fulfilled.

3.4. Sensitivity analyses

Overall, sensitivity analyses using multiple imputations (supplementary Tables S3-S4) and analyses accounting for the competing outcome of death (supplementary Table S5) confirmed the results, except for the outcome time to acute cardiac readmissions. The same tendency was found in both analyses, however, it was not statistically significant. Regarding the other outcomes, the analyses generally did not alter the results. However, in the analyses using multiple imputations for all-cause mortality and the number of acute cardiac readmissions, estimates were lower and confidence intervals narrower. We also conducted an analysis excluding one patient with 13 acute cardiac

Table 4

Association between patient-reported psychosocial healthcare and number of readmissions (acute cardiac and all-cause).

	Events*	Person years at risk	IR per 1000 person years	IRR (95% CI), Unadjusted†	IRR (95% CI), Adjusted‡
Acute cardiac readmissions					
Psychosocial healthcare					
Low	90	1996	45.1	3.55 (1.85–6.82)	3.24 (1.66–6.29)
Medium	56	995	56.3	4.43 (2.26–8.68)	4.23 (2.15–8.33)
High	10	787	12.7	1 (ref)	1 (ref)
All-cause readmissions					
Psychosocial healthcare					
Low	1734	1996	868.8	1.73 (1.55–1.93)	1.30 (1.16–1.46)
Medium	764	995	767.5	1.53 (1.35–1.72)	1.32 (1.17–1.49)
High	396	787	503.3	1 (ref)	1 (ref)

IR: Incidence rate, IRR: incidence rate ratio (estimated using Poisson regression model).

* Sum of events. A patient can have more than one event.

† 105 respondents excluded due to missing values.

‡ Adjusted for age, sex, region, acute coronary syndrome, anxiety or depression, somatic comorbidity and contact with general practitioner in relation to ischemic heart disease and readmissions during the first 6 months. A total of 108 respondents were excluded due to missing values.

readmissions – considering the patient as an outlier – as all others had up to four acute cardiac readmissions. This lowered the readmission rate in the group reporting medium-level psychosocial healthcare (supplementary Table S6). The analyses with follow-up time starting at time of diagnosis until 6 months, the period where patients are not yet likely to be exposed, showed insignificant associations and associations in the opposite direction (supplementary Tables S7-S8). When comparing non-responders with responders, we found that non-responders were more likely to be younger, women, employed, current smokers, have lower level of education, more prior anxiety or depression, less acute coronary syndrome and have higher readmission and all-cause mortality rates (supplementary Tables S9-S10).

4. Discussion

This study showed that acute cardiac readmissions occurred twice as fast among patients reporting low psychosocial healthcare than for patients reporting high psychosocial healthcare. The same tendency was observed in the sensitivity analyses, although the difference was not statistically significant. No association was found with time to first all-cause readmission. The acute cardiac readmission rate was more than three times higher in patients reporting low and medium psychosocial healthcare compared to patients reporting high psychosocial healthcare; the all-cause readmission rate was 1.3 times higher, and the hazard of death was more than twice as high.

Several psychosocial risk factors have been associated with a two-fold increased risk of all-cause mortality, cardiac mortality and cardiac events [7,10,36], but contrary to our study most of the existing studies of psychosocial healthcare has not been able to detect an association with decreased risk on these outcomes [18,20,21,23,24,37,38]. This may be related to the study design. In these randomized controlled trials (RCT), the control may have received psychosocial healthcare in other healthcare settings, and they were conducted in the context of cardiac rehabilitation, where participants tend to be more motivated and have fewer psychosocial problems [39]. Thus, although RCT studies

reach high internal validity, the external validity may be challenged [40]. Moreover, psychosocial healthcare may only have a positive effect if patients perceive receiving it. Our observational study was conducted in a real-world setting, based on a register-based random sample of patients, covered a patient journey across sectors and was patient-reported. Previous observational studies investigating patient-reported ratings of healthcare quality has in line with our results found that good overall ratings were associated with better prognosis in patients with myocardial infarction [41–43], and experiences with psychosocial healthcare have been found to be important for the overall ratings of care [41,44]. The theoretical foundation of how patient-reported psychosocial healthcare can improve health outcomes is not fully understood, but previous research has demonstrated that different kinds of patient-reported psychosocial healthcare are associated with adherence to medication and increased use of preventive services [45], which are possible mediators of the link between patient-reported psychosocial healthcare and health outcomes.

We found a dose-response relationship in the crude analyses (IR, and unadjusted HR and IRR). Nonetheless, when adjusting for confounders, the estimates for low and medium level patient-reported healthcare were very similar. This indicates that a high level of patient-reported psychosocial healthcare is needed to influence prognosis in IHD patients. This includes information about psychosocial aspects, and support on these matters, all of which are important according to patients and in line with international and national guidelines [13,29,46,47]. Only one fifth (20.5%) of patients reported a high level of psychosocial healthcare. Thus, there appears to be a great potential to improve prognosis and reduce healthcare utilization in IHD patients by integrating psychosocial healthcare in clinical practice.

The association between patient-reported psychosocial healthcare and the number of readmissions and deaths was strong, suggesting that patients' experiences with and effect of psychosocial healthcare are likely to be stable and long-term. The association was more pronounced for acute cardiac readmissions than all-cause readmission. While this was expected because acute readmissions are more preventable than planned readmissions, larger studies should be conducted to evaluate the size of the estimates. This also illustrates that readmission is a complex measure, as different definitions lead to different results.

4.1. Perspectives

Enhancing patients' experiences with psychosocial healthcare in clinical practice is important for patients, the healthcare system and society at large as our study showed that patient-reported psychosocial healthcare could potentially reduce readmissions and mortality in patients with IHD. For this to succeed, educational programs of healthcare professionals should include training in psychosocial care, and in particular communication [37,48,49]. Studies have found that health professionals feel insecure about how to address psychosocial problems, but that communication training enhances detection of patients' psychosocial problems [50,51]. Inadequate time and economic resources in a continuously pressured healthcare system may refrain leadership from promoting psychosocial healthcare [49]. However, an emphatic communication style, e.g. asking about patient worries, does not necessarily take up extra time, is important for the patient and more often reveals important information for the diagnosis and treatment [50]. Experts have pointed out that psychosocial healthcare should be implemented throughout the patient journey, in inpatient and outpatient hospital cardiology care, in cardiac rehabilitation and in primary care [37].

Our measure of patient-reported psychosocial healthcare was based on what heart patients in Denmark found important [31], but we acknowledge that we do not capture all aspects of psychosocial healthcare. The concept is complex and subject to different cultural understandings. Future research is warranted to extend the understanding of the concept, and to explore when and how often it should be

provided, in which way and by whom, and how it can be tailored to individual patients' needs. Psychosocial healthcare may even prove to be an instrument to reduce disparities in cardiac prognosis [52], because psychosocial problems are more frequent among patients with low socio-economic status [5], and psychosocial factors have been found to mediate the effect of socio-economic status on physical health in IHD patients [53].

4.2. Strengths and limitations

National registers in a country with free access to healthcare for all residents enabled us to access a large random sample of incident IHD patients and to follow them for a period up to 4½ years with minimal loss to follow-up, minimizing the risk of selection bias substantially. The registers also provided us with information without recall bias on confounders identified by the DAG.

An important limitation of our study is that we had limited information on the timing, frequency, content, form, and context of psychosocial healthcare. Psychosocial healthcare is not a one point in time exposure, but according to national guidelines, it should be provided within 6 months after diagnosis [46], and we, therefore, started follow-up time 6 months after diagnosis providing time for clinicians to expose patients to psychosocial healthcare. The sensitivity analyses showed that recall of psychosocial healthcare is unlikely to be influenced by severity of disease as low patient-reported psychosocial healthcare within the first 6 months was not associated with higher readmission rates. Time from diagnosis to questionnaire response varied by 12 months which could bias the results if the variation in time is associated with patient-reported psychosocial healthcare. Previous analysis has shown that this is not the case [54]. For obvious reasons only patients alive could complete the questionnaire, and this may cause selection bias if the patients who had died could have benefitted more or less from psychosocial healthcare, than those alive. However, we have no reason to believe this. Almost twice as many men than women were included in our study. We do not expect this to influence the results as we presume sex does not modify the association between psychosocial healthcare and the outcomes (readmissions and death). However, larger studies should be conducted to explore if some patient groups benefit more from psychosocial healthcare than others, for instance men or women, patients with low socio-economic status, current anxiety or depression, and patients without supportive relatives. The proportion of respondents (57%) is comparable to other survey-based studies within this patient group, but selection bias cannot be ruled out because non-responders deviated from the responders in some characteristics. Caution should be exercised when generalizing our findings to other patient groups or countries with different cultures and healthcare systems. Nonetheless, studies on the link between psychosocial risk factors and poor prognosis have been found in multiple countries, [4,7–10] suggesting that our findings are also internationally relevant.

5. Conclusions

In patients with IHD, a high level of patient-reported psychosocial healthcare was significantly associated with reduced hospital readmissions and all-cause mortality. The association was stronger for acute cardiac readmissions compared with all-cause readmissions, and for the number of readmissions compared with time to readmission. These findings support the health benefits of psychosocial healthcare and demonstrate a need for enhanced provider education in psychocardiology to integrate psychosocial healthcare in clinical practice.

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Declarations of interest

None.

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Appendix A. Supplementary data

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