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ORIGINAL ARTICLE

Inequalities in therapeutic treatment during cardiac inpatient rehabilitation in Germany

Thomas Altenhöner · Carolin Baczkiewicz · Heide Weishaar · Marcus Kutschmann

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Abstract
Objective Cardiac patients of low socio-economic status (SES) display low health status and increased need for rehabilitation. This study's objective was to examine whether and to what extent inequalities in the provision of rehabilitative health care occur in Germany.
Methods We conducted an observational study with two points of measurement on 543 patients in cardiac inpatient rehabilitation. We used logistic regression and analysis of covariance to explore whether patients experience unequal therapeutic rehabilitative treatment.
Results Patients of low SES were less frequently physically active, more likely to smoke and displayed a higher number of physical and psychological symptoms when entering rehabilitation. They were less likely to receive a number of therapies with differences being significant for core therapies of cardiovascular rehabilitation. Patients of higher SES received fewer hours of dietary counselling on average.
Conclusions While the latter difference might be in line with the needs of different socio-economic groups, most differences are unlikely to be tailored to patients' needs. Potential causes of inequalities in service provision like structural factors and aspects of the doctor–patient encounter should be further investigated.

Keywords Myocardial infarction · Rehabilitation · Therapeutic treatment · Inequalities · Socio-economic status

T. Altenhöner (✉) · C. Baczkiewicz
Department of Health and Nursing, University of Applied Sciences of the Saarland, Saarbrücken, Germany
e-mail: taltenhoener@htw-saarland.de

H. Weishaar
Centre for Population Health Sciences, University of Edinburgh, Edinburgh, UK

M. Kutschmann
Institute for Quality and Patient Safety, Düsseldorf, Germany

Introduction

The existence of a health gradient to the disadvantage of lower socio-economic status (SES) groups has been unequivocally established and health inequalities seem to have increased over the last years (Mackenbach 2006). Accordingly, people of lower SES show higher incidence and prevalence rates and higher rates of premature mortality for most illnesses, including coronary heart disease (CHD) (e.g. Geyer 2008; Mackenbach 2006). Different factors have been identified as contributing to such health inequalities with health service provision being named as one of several factors that have a potential impact. In support of this, unequal access to acute health care has been identified in international studies. Pell et al. (2000) showed that Scottish CHD-patients of lower SES had to wait longer for medical intervention and received fewer cardiac angiographies compared to CHD-patients of higher SES. An increased risk of a myocardial infarction (MI) was also identified when such medical investigations were not undertaken (Sehkri et al. 2008). In Germany, no comparable findings exist. Brause et al. (2006), for example, found no substantial differences in the provision of adequate invasive cardiac procedures.

International studies which analysed disparities in access to cardiac rehabilitative treatment detected differences regarding income and employment status (Nielsen et al. 2008), with higher SES and higher educational level

seemingly promoting access to rehabilitation (e.g. Jackson et al. 2005). However, international findings of studies on unequal access to cardiac rehabilitation are mixed and cannot be assumed to apply to the German context (Altenhöner et al. 2005), particularly because a number of features seem to be specific to German cardiac rehabilitation: despite increasing outpatient rehabilitative care similar to the provision of rehabilitative care as an outpatient service in other industrialised countries, German cardiac rehabilitation is still usually provided over a period of 3 weeks in specialised inpatient rehabilitation hospitals (Bjarnason-Wehrens 2009). In Germany, the opportunity for all patients to access rehabilitation services following MI has resulted in a highly differentiated rehabilitation system and in comparatively high access rates to cardiac rehabilitation (around 50%). In other developed countries post MI rehabilitation is received by only 30–40% of patients (Wood 2008). To date, no disparities in access to cardiac rehabilitation have been identified for Germany (Janßen et al. 2009). However, CHD-patients seem to have different preferences for rehabilitation depending on their SES. Patients of higher SES or those with higher educational levels are more willing to access alternative and outpatient rehabilitation services whereas those of lower SES seem to prefer traditional inpatient rehabilitative care (Karoff et al. 2002).

Apart from a lack of research on differential access to cardiac rehabilitation, inequalities in the provision of German health care generally and cardiac rehabilitation in particular are under-researched (Janßen et al. 2009), causing a considerable need for systematic research in this area (von dem Knesebeck et al. 2009; Vogel and Jäckel 2007). An association between SES and the types of therapies prescribed was identified in a study by Deck (2008) of orthopaedic, psychiatric, oncological and respiratory patients. Deck (2008) showed that patients of lower SES received more "traditional" therapy like physiotherapy, whereas patients of higher SES received more relaxation and exercise therapies. The differences could not sufficiently be explained by different demands and needs (Deck 2008). On the other hand, an analysis by Grande and Romppel (2005) of cardiac patients showed no crucial differences in the provision of care. Initial research further indicates that rehabilitative success might be influenced by social factors (Deck 2008; Hofreuter et al. 2008). Patients of lower SES generally report a lower health status when entering rehabilitation services and their health status continues to be worse than that of patients of higher SES when being discharged. Deck (2008) did not find a correlation between SES and the course of rehabilitation. However, Hofreuter et al. (2008) found that patients of higher SES achieved better outcomes in terms of occupational rehabilitation.

The review of the literature shows a gap of knowledge of health inequalities in cardiac rehabilitation. In order to explore whether SES influences care received during cardiac rehabilitation, the following research questions were investigated in this study:

1. Do patients of different SES attending cardiac rehabilitation differ with regard to baseline characteristics?
2. Do patients of different SES receive differential therapeutic treatment?
3. Do weekly frequencies of therapies received differ according to patients' SES?

Methods

Design

An observational study was employed with two points of measurement. Patients who attended inpatient rehabilitation following MI and their physicians were surveyed using standardised questionnaires (1) at admission to inpatient rehabilitative treatment (T1) and (2) at discharge from rehabilitation centres (T2). Patients were recruited from 14 German specialist inpatient rehabilitation centres and were included if they took part in cardiac rehabilitation for the first time. As patients had to fill in questionnaires autonomously and in order to avoid a selection bias overrepresenting elderly patients with above average cognitive capacity, patients above 75 years of age were excluded from the study. Patients who had undergone bypass operation were excluded because they tended to be treated differently due to the type of operation. 543 patients were recruited to the study between September 2002 and August 2003.

Questionnaires

Physicians

In order to measure the severity of disease for each patient at the time of admission (T1), physicians were asked to indicate the magnitude of MI on a three-point scale (small, medium, large) and the damage sustained by the heart (light, medium, severe). In addition, physicians rated the cardiac symptoms of each patient according to a four-point scale based on the classification of the Canadian Cardiovascular Society (CCS) for angina pectoris and on the New York Heart Association classification (NYHA) for dyspnoea. They further reported cardiac performance during a stress electrocardiogram. Physicians also recorded the prevalence of a number of risk factors including hypertension, hypercholesterolemia and diabetes mellitus. In order to assess the treatment received, at the end of the rehabilitation period (T2) physicians reported which therapies had been received by the patient with which frequency.

Patients

The patient questionnaire assessed socio-demographic factors including age, sex, number of persons living in the household and socio-economic criteria including job status, education and household income. The latter three variables were used to form a three-point, unweighted, additive socio-economic index according to Winkler (1998). The additive Winkler Index is calculated by point values which are given for education, job status and household income. According to the point values, respondents are classified into low, medium and high socio-economic status groups. In contrast to the original Winkler Index, the income groups in this study were formed using the equivalent household income (for detailed information, see Altenhöner 2006). Patients also self-reported their height, weight and health-related behaviour including smoking and physical activity. Psychological distress was assessed using the German version of the Hospital Anxiety and Depression Scale (HADS-D) (Herrmann et al. 1995). Cronbach's Alpha for each scale was 0.78.

Patients' characteristics

The mean patient age was 58.8 years, with women (25% of all participants) being on average about 3 years older ($M = 61.5$ years, SD = 9.6 years) than men ($M = 57.8$ years, SD = 10.6 years; $T = 3.6$, $P < 0.001$). Approximately one quarter of all patients was categorised as of high (22%) and low (24%) SES, and the remaining 54% were categorised as of medium SES. Women were more likely to be assigned to the low (38%) and less likely to be assigned to the high (12%) socio-economic group whereas men were more likely to belong to the high (26%) and less likely to belong to the low (19%; $\chi^2 = 23.7$, $P < 0.001$) socio-economic group (Table 1).

Table 1 Distribution of variables

	Missing	Sample		Men		Women		*P* value
	N	*M*	SD	*M*	SD	*M*	SD	
Age	0	58.8	10.5	57.8	10.6	61.5	9.6	<0.001
	Missing	Sample		Men		Women		*P* value
	N	*N*	%	*N*	%	*N*	%	
Sex	0	543	100	407	75	136	25	–
Socio-economic status group	2							<0.001
Low		129	24	78	19	51	38	
Medium		292	54	224	55	68	50	
High		120	22	104	26	16	12	
Physical therapies								
Ergometric training	0	515	95	390	96	125	92	0.074
Group physiotherapy	0	534	98	400	98	134	99	0.844
Group water exercises	0	189	35	151	37	38	28	0.052
Advanced medical training	0	131	24	101	25	30	22	0.515
Physiotherapy	0	85	16	61	15	24	18	0.460
Massages	0	280	52	204	50	76	56	0.245
Spa treatment	0	164	30	134	33	30	22	0.017
Psychological therapies								
Relaxation techniques	0	324	60	244	60	80	59	0.817
Individual psychological therapy	0	74	14	52	13	22	16	0.317
Psychological group therapy	0	120	22	86	21	34	25	0.346
Smoking cessation services	0	81	15	65	16	16	12	0.233
Socio-educational therapies								
Information events/lectures	0	529	98	400	98	129	95	0.029
Dietary advice	0	397	73	302	74	95	70	0.322
Cookery courses	0	162	30	111	27	51	38	0.024
Occupational/social advice	0	146	27	115	28	31	23	0.214

Table 2 Impact of socio-economic status on health parameters at start of rehabilitation

Results of logistic regression analyses. Controlled for age and sex. Reference category: low socio-economic status. Percentages indicate the rate of patients in the corresponding socio-economic status group for each health parameter

[a] More than 2 h of physical activity per week

Health parameter	*N*	Socio-economic status group							
		Low		Medium			High		
		%	OR	%	OR (95% CI)	*P*	%	OR (95% CI)	*P*
Hypertension	541	70	1	64	0.84 (0.52–1.35)	0.473	60	0.70 (0.40–1.23)	0.213
Hypercholesterolemia	541	85	1	88	1.45 (0.79–2.64)	0.232	88	1.52 (0.73–3.18)	0.267
Diabetes mellitus	541	23	1	16	0.63 (0.37–1.07)	0.087	18	0.65 (0–34–1.25)	0.193
Obesity (BMI > 30 kg/m^2)	541	29	1	26	0.87 (0.54–1.39)	0.561	22	0.70 (0.39–1.27)	0.240
Smoker (at time of myocardial infarction)	541	45	1	43	0.67 (0.40–1.11)	0.117	40	0.55 (0.30–1.01)	0.052
Smoker (at start of rehabilitation)	541	18	1	7	0.31 (0.16–0.61)	0.001	6	0.27 (0.11–0.68)	0.005
Physical activity[a]	527	33	1	41	1.40 (0.89–2.20)	0.152	45	1.58 (0.92–2.71)	0.098

Data analysis

For bivariate analyses, χ^2 tests, *t* tests and analyses of variance were employed. For multivariate analyses, logistic regressions and analyses of covariance controlling for different covariates were used. The impact of SES on several nominal scaled health parameters, including for example hypertension, was analysed by means of logistic regression. Also, logistic regression was employed to analyse the impact of SES on participation (yes vs. no) in several therapeutic treatments (e.g. group physiotherapy). The impact of SES on several interval scaled physical and psychological health criteria (e.g. infarct size) as well as on the number of therapeutic treatments per week was examined for patients who participated in these treatments (e.g. group physiotherapy) by means of analyses of covariance. Levene tests were used to test the assumption of variance homogeneity. The normal distribution assumption was not checked, because analysis of covariance is robust against its violation if the sample size is considerably high (e.g. Bortz 2005). Age and sex were controlled for in all analyses. To identify potential confounders, bivariate associations between SES and baseline characteristics as well as between baseline characteristics and therapies received were checked beforehand. The following parameters showed associations with SES as well as with therapies and were therefore considered as covariates in logistic regressions and analyses of covariance: physical activity, diabetes mellitus, angina pectoris, depression and cardiac performance. Due to high correlation between depression and anxiety, angina pectoris (CSS) and dyspnoea (NYHA), anxiety and dyspnoea were not controlled for in order to avoid suppression effects (for more detail, see Altenhöner 2006). All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS Version 19).

Results

Inequalities in health parameters at baseline

For hypertension, hypercholesterolemia, diabetes mellitus and obesity, no significant differences between the SES groups were found (Table 2). However, hypertension, diabetes mellitus and obesity were more frequent in the lower socio-economic groups.

With regard to the health-related behaviour parameters smoking and physical activity, only smoking at the start of rehabilitation showed significant differences (see Table 2): for patients with low SES the chance to smoke was more than three times higher than for patients with medium (OR = 0.31, $P = 0.001$) or high (OR = 0.27, $P = 0.005$) SES. Remarkable was also the decrease in the rate of smokers: at least 40% of patients in each status group reported smoking at the time of MI whereas at the start of rehabilitation, the rate of smokers had dropped to 6, 7 and 18% in the high, medium and low status groups.

Inequalities in physical and mental health criteria at baseline

Regarding infarct size and myocardial lesion, no significant differences between socio-economic status groups could be detected. Other health parameters, however, showed gradients to the disadvantage of patients of low SES. The estimated mean of cardiac function of patients of high SES, for example, was nearly 25% higher than that of patients of low SES. Also, cardiac symptoms (angina pectoris and dyspnoea) were significantly more severe among patients of low SES (see Table 3).

Differences between socio-economic groups were particularly apparent with regard to mental health. Significant differences existed for depression ($P = 0.001$) and anxiety

Table 3 Impact of socio-economic status on physical and psychological health criteria at start of rehabilitation

Criteria	*N*	Socio-economic status group			*F*	*P*
		Low Adj. Mean (SE)	Medium Adj. Mean (SE)	High Adj. Mean (SE)		
Infarct size	532	2.47 (0.08)	2.48 (0.05)	2.40 (0.08)	0.34	0.712
Myocardial lesion	529	2.30 (0.05)	2.33 (0.04)	2.19 (0,06)	2.26	0.106
Angina pectoris (CCS)	530	1.39 (0.05)	**1.26** (0.03)	**1.17** (0.05)	5.36	0.005
Dyspnoea (NYHA)	541	1.54 (0.05)	**1.38** (0.03)	**1.26** (0.05)	8.94	<0.001
Cardiac function	513	101.55 (2.79)	**111.16** (1.18)	**125.22** (2.83)	17.76	<0.001
Depression (HADS-D)	540	6.23 (0.31)	**5.06** (0.20)	**4.59** (0.32)	7.76	0.001
Anxiety (HADS-D)	537	7.40 (0.32)	**6.32** (0.21)	**5.86** (0.33)	5.94	0.003

Results of analyses of covariance. Controlled for age and sex

Bold letters indicate significant differences according to contrast analyses: reference category = low socio-economic status, level of significance = 0.05, contrast = simple

Table 4 Impact of socio-economic status on participation in therapeutic treatment

Therapeutic treatment	*N*	Socio-economic status group							
		Low		Medium			High		
		%	OR	%	OR (95% CI)	*P*	%	OR (95% CI)	*P*
Physical therapies									
Ergometer[a]	488	89	1	–	–	–	97	1.78 (0.52–6.01)	0.356
Group physiotherapy[a]	488	95	1	–	–	–	99	3.98 (0.64–24.68)	0.138
Group water exercises	488	30	1	39	1.22 (0.73–2.02)	0.445	28	0.61 (0.32–1.16)	0.130
Advanced medical training	488	12	1	26	1.75 (0.94–3.23)	0.076	33	1.79 (0.88–3.66)	0.109
Physiotherapy	488	19	1	15	0.83 (0.43–1.59)	0.574	14	1.00 (0.45–2.20)	0.996
Massages	488	55	1	50	0.99 (0.61–1.59)	0.961	53	1.37 (0.76–2.47)	0.291
Spa treatment	488	23	1	35	1.57 (0.92–2.70)	0.099	25	0.78 (0.40–1.54)	0.472
Psychological therapies									
Relaxation techniques	488	64	1	58	0.80 (0.49–1.31)	0.379	59	0.79 (0.44–1.42)	0.420
Individual psychological therapy	488	7	1	15	3.34 (1.36–8.18)	0.008	17	4.50 (1.64–12.33)	0.004
Psychological group therapy	488	20	1	24	1.26 (0.71–2.22)	0.432	21	1.12 (0.55–2.26)	0.756
Smoking cessation services	488	18	1	15	0.97 (0.46–2.06)	0.940	12	0.65 (0.25–1.71)	0.384
Socio-educational therapies									
Information events/lectures[a]	488	96	1	–	–	–	98	1.45 (0.40–5.24)	0.572
Dietary advice	488	69	1	73	1.12 (0.67–1.89)	0.661	77	1.39 (0.72–2.67)	0.326
Cookery courses	488	28	1	30	1.32 (0.78–2.26)	0.304	33	1.66 (0.87–3.14)	0.122
Occupational/social advice	488	26	1	28	1.06 (0.60–1.86)	0.849	25	1.03 (0.52–2.06)	0.925

Results of logistic regression analyses. Controlled for age, sex, physical activity, diabetes mellitus, angina pectoris, performance in watt and depression (and smoking at start of rehabilitation additionally as indicated by smoking cessation services). Reference category: low socio-economic status

Percentages indicate the rate of patients in the corresponding socio-economic status group participating in the respective therapeutic treatment

[a] Due to small numbers in each cell, the medium and high socio-economic group were combined for these treatments

($P = 0.003$). Based on percentages of conspicuous depression and anxiety (Herrmann et al. 1995, not presented in tables), every fourth patient in the low socio-economic group suffered from pathological depression (27%) or anxiety (24%) whereas the equivalent percentages in the higher socio-economic group were between 14 and 9% and therefore considerably lower [medium socio-economic status group: 13% (depression), 14% (anxiety); high socio-economic status group: 13% (depression), 9% (anxiety)].

Table 5 Impact of socio-economic status on the number of therapeutic treatments per week

Therapeutic treatment	*N*	Socio-economic group			*F*	*P*
		Low Adj. Mean (SE)	Medium Adj. Mean (SE)	High Adj. Mean (SE)		
Physical therapies						
Ergometer	473	4.09 (0.12)	4.30 (0.07)	4.49 (0.11)	2.97	0.052
Group physiotherapy	481	4.57 (0.15)	4.67 (0.09)	4.94 (0.14)	1.72	0.180
Group water exercises	168	2.34 (0.25)	2.94 (0.13)	3.11 (0.26)	2.65	0.073
Advanced medical training	121	2.34 (0.33)	2.62 (0.15)	2.97 (0.23)	1.37	0.259
Physiotherapy	70	2.07 (0.33)	2.30 (0.23)	1.56 (0.33)	1.72	0.187
Massages	247	2.10 (0.07)	2.13 (0.05)	2.14 (0.07)	0.07	0.932
Spa treatment	141	2.22 (0.19)	2.48 (0.09)	**2.98** (0.19)	4.15	0.018
Psychological therapies						
Relaxation techniques	289	2.07 (0.10)	2.10 (0.07)	2.14 (0.11)	0.11	0.894
Individual psychological therapy	68	1.12 (0.24)	0.97 (0.09)	1.03 (0.14)	0.20	0.820
Psychological group therapy	107	2.35 (0.29)	1.94 (0.16)	1.54 (0.27)	1.95	0.148
Smoking cessation services	74	1.26 (0.19)	1.38 (0.12)	1.34 (0.22)	0.15	0.860
Socio-educational therapies						
Information events/lectures	476	2.48 (0.12)	2.49 (0.07)	2.22 (0.11)	2.20	0.112
Dietary advice	354	1.09 (0.07)	**0.79** (0.04)	**0.60** (0.07)	12.45	<0.001
Cookery courses	141	1.12 (0.13)	1.24 (0.07)	1.19 (0.11)	0.41	0.664
Occupational/social advice	133	0.43 (0.03)	0.39 (0.02)	0.47 (0.03)	2.70	0.071

Results of analyses of covariance. Controlled for age, sex, physical activity, diabetes mellitus, angina pectoris, performance in watt and depression (and smoking at start of rehabilitation additionally as indicated by smoking cessation services)

Bold letters indicate significant differences according to contrast analyses: reference category = low socio-economic status, level of significance = 0.05, contrast = simple

Inequalities in the provision of health care—therapeutic treatment received

Almost all patients received ergometric training (95%) and group physiotherapy (98%) as part of their cardiac rehabilitation (see Table 1). These therapeutic sessions are established core elements of physical therapy after MI, aiming particularly to improve cardio-pulmonary fitness. Patients of low SES received these treatments less frequently, but these findings did not prove to be significant (see Table 4). Only a fraction of all patients received other physical therapies, suggesting that these were much more dependent on the precondition of each individual patient (see Table 1). Patients of medium SES received spa treatment slightly more often and patients of low SES received advanced medical training (specific training to balance functional deficits and increase muscle size, Bundesversicherungsanstalt für Angestellte (BfA) 2000) less frequently than patients of the other groups (12 vs. 26% in the medium and 33% in the high socio-economic group).

Some patients received psychological treatment (see Table 1). Psychotherapeutic relaxation techniques were the most frequently attended therapy with 60% of all patients taking part in them, suggesting that they are prescribed as a sort of "basic psycho-therapeutic agent" (Karoff 1999) to increase emotional stability and decrease psycho-physical tension. No socio-economic differences could be detected regarding attendance at relaxation technique sessions, psychological group therapy and smoking cessation treatment (see Table 4). A clear social gradient was apparent with regard to individual psychological counselling sessions which were received by only a small minority of patients of low SES (7%) but by more than twice as many patients of medium (15%, $P = 0.008$) or high (17%, $P = 0.004$) SES.

No socio-economic differences could be identified regarding participation in socio-educational therapies. Almost all patients (97%) took part in information events and lectures on health promotion (see Table 1). Almost three quarters (73%) of all patients received specific dietary advice on healthy and appropriate eating (Bundesversicherungsanstalt für Angestellte (BfA) 2000) and 30% took part in cookery courses. Approximately one quarter (27%) of all patients received occupational counselling dealing with issues of professional re-integration or upcoming retirement.

Inequalities in the provision of health care—frequency of therapies received

Apart from analysing general access to therapeutic treatment, differences in frequency and intensity of treatments received were assessed (see Table 5). To do this, the weekly average of therapies received was measured. In terms of somatic treatment, ergometric training and physiotherapy were attended almost daily. Frequencies of physical therapies were lower in the low socio-economic status group compared to the other two groups (significant for spa treatment only). The only exception was physiotherapy which patients of high SES received less often than patients of low or medium SES.

Psychological therapies were received considerably less often than core physical therapies (see Table 1). On average, two sessions of relaxation techniques and psychological group therapies were run per week. Patients who received individual psychological therapy were assigned only one session per week. As the average rehabilitation period was approximately 3 weeks, patients therefore received a maximum of three individual counselling sessions in total. No significant differences regarding the frequency of psychological therapies were identified between the socio-economic groups (see Table 5).

Lectures or other information events were the most attended socio-educational intervention (see Table 5). The adjusted means for attendance of other socio-educational therapies were considerably lower with some of them being attended less than once per week. Therefore, many patients received only two or three sessions of dietary advice or one session of occupational and social advice during their entire stay. In contrast to the other findings concerning socio-educational therapies, patients of low SES received dietary advice more frequently than patients belonging to higher socio-economic groups ($P < 0.001$).

Discussion

This article explores to what extent health status and prevalence of risk factors differ among cardiac patients of different SES at the beginning of rehabilitation. It further analyses whether patients are treated equally during rehabilitative treatment after controlling for several health parameters at baseline. Regarding the situation at the start of rehabilitation, a higher prevalence of risk factors for most variables was confirmed for socially disadvantaged cardiac patients at a descriptive level. Regarding physical inactivity and smoking, significant differences could be detected. Although patients did not differ regarding severity of MI, increased health impediments caused by cardiac and psychological symptoms were detected among patients of lower SES. These results confirm previous research which has identified health inequalities among the general population (e.g. Mielck 2000) and among patients who suffer from specific diseases (Altenhöner et al. 2005; Deck 2008; Grande and Romppel 2005). These findings suggest a "specific" and, from a quantitative perspective, higher need for rehabilitative care among lower SES patients, a result that has also been reported by studies that focus on other health indicators (e.g. Deck 2008). While an overall unequal need regarding both somatic and psychosocial aspects of care can be identified, differences seem to be particularly pronounced with regard to psycho-social needs. The lower smoking prevalence at the start of rehabilitation among patients of high SES despite no differences at the time of MI further suggests that patients of higher SES might be better able to modify their health-related behaviours. In fact, approximately 85% of patients in the two higher SES groups who had smoked at the time of myocardial infarction had quit smoking prior to rehabilitation whereas only 60% of patients in the low SES group had stopped smoking. Similar difficulties in modifying behaviour among socially disadvantaged groups have been confirmed by other studies (e.g. Businelle et al. 2010) and identified as a priority for health promotion (e.g. Nuffield Council on Bioethics 2007).

If the differential health needs apparent at baseline were appropriately reflected in the provision of care, patients of low SES would receive a higher number of therapies than those of high SES. Our study suggests that this is not the case but rather that a converse tendency can be observed. Although our analyses do not consistently show significant differences, patients of low SES receive a variety of therapies less frequently or receive them with lower intensity. Such differences have previously been identified for traditional, evidence-based somatic therapies such as ergometric training (Deck 2008) and also for the provision of individual psychological therapy. In accordance with Deck (2008), our study thus raises questions about the appropriateness of disparities in the provision of rehabilitative care.

Our study has a number of limitations. We analysed data from patients who underwent rehabilitative care in 14 different rehabilitation hospitals. Therefore, a mixed model approach might be considered to be an appropriate analytical design. We decided, however, not to consider a respective random effect or additional covariates in order to avoid unstable results. Despite this, our study provides valuable results and might serve as a basis for future analyses.

Due to the design of the study, no conclusions can be drawn about the potential effects of inequalities in health care or about the medium and long-term impact of the sometimes small differences on patients' health-related behaviour and health status after cardiac rehabilitation. The design of the study further implies that explanations of

inequalities in service provision beyond the patients' SES have to be based on theoretical considerations. In the following, two determinants which might be of particular relevance will be discuss: (1) unequal structural conditions in rehabilitation clinics and (2) the doctor–patient encounter.

The disparities in service provision found in our study might be caused by the structure of rehabilitative care. German rehabilitation clinics are usually run by health care insurance providers or pension funds and few clinics work on an independent basis. This sponsorship of a certain clinic by a specific health insurance provider or pension fund essentially leads to clinics providing care for a certain group of patients, e.g. for patients insured through either private or statutory insurance funds. It needs to be acknowledged that a patient's insurance status tends to be a result of structural differences with those of low SES being least likely to be privately insured. Accordingly, daily rates and staff ratios might differ depending on patient characteristics and funding and disparities in service provision might be influenced by different lump sums paid by certain providers.

Despite high standardisation of rehabilitative treatment, doctors might be less likely to prescribe therapies for patients of low SES. Some research suggests that doctors' assumptions that patients of low SES are less suited or less motivated for rehabilitative treatment could be the reason for differential medical behaviour (Bergman et al. 2008; Weich et al. 2007). Accordingly, a study on target-setting by doctors by Grande and Romppel (2005) shows that doctors are less likely to identify stress reduction as an aim for patients of lower SES and Farin et al.'s (2002) research indicates that psychological diagnoses in patients of lower SES are often ignored in cardiac rehabilitation. In addition, research has shown that physicians are more likely to employ an authoritarian communication style when talking to patients of low SES, whereas they are more likely to engage in shared decision-making with patients of higher SES (Willems et al. 2005). Patients of lower SES also receive less information and less verbal emotional support from physicians (Willems et al. 2005) with potentially negative impacts on the care process.

Such attitudes on part of the doctor might be exacerbated by patients' characteristics. Patients of higher SES have been shown to be less likely to perceive communication barriers when interacting with doctors or medial personnel (Faller 2003; Taylor-Clark et al. 2007), more likely to pursue specific rehabilitation targets (cf. Grande and Romppel 2005) and more interested in actively participating in the care process (cf. Faller 2003). It might be that due to the pursuit of more specific targets, patients of higher SES have a stronger desire to attend a large number of therapies and are better able to express themselves. Patients of low SES, on the other hand, might be less likely to express their expectations in the medical encounter, less likely to voice desires and, if they do, more likely to say that they want to relax and not be burdened by "too many" therapies. Given that patients of lower SES are less likely to mention "stress reduction" as one of their rehabilitation targets (Grande and Romppel 2005), they might particularly be less receptive to psychological treatment (Boesen et al. 2007) and—despite experiencing higher psychosocial stress and having fewer resources at their disposal to handle stress (Skodova et al. 2008)—less likely to perceive their situation as needing to be addressed during cardiovascular rehabilitation (Anderson et al. 2006).

Conclusion

While we can only speculate about potential factors that might contribute to the disparities in rehabilitative care identified in the study, our research clearly highlights the need for systematic research on the causes of health inequalities (Bauer 2009; von dem Knesebeck et al. 2009) and their implications for service provision. The study has some important implications for medical rehabilitation. First and foremost, the risk and existence of inequalities in a comparatively highly standardised area of service provision (cf. Bitzer et al. 2003) needs to be acknowledged. Rehabilitation needs to take account of the strikingly higher need for rehabilitation of patients of low SES, particularly when bearing in mind that long-term success can be achieved among these patients when appropriate therapies are adopted (Bjarnason-Wehrens et al. 2007). The higher demand identified should not result in an overall higher and potentially inadequate provision of services. However, attention should be paid to psychological stress and respective treatment in order to specifically support patients in the development of specific skills (cf. Bitzer et al. 2003) to better cope with chronic illness and successfully modify their lifestyles. Graham and Kelly (2004) argue that policies, including those concerned with health care, should not only aim to improve key determinants of health overall, but take account of social inequalities and aim at health equity. In accordance with this claim, our findings highlight the pertinence of discussions about the potential of health care interventions and rehabilitation services in addressing and reducing pre-existing health inequalities.

Conflict of interest None.

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