Transpl Int (2004) 17: 424–431
DOI 10.1007/s00147-004-0732-5

ORIGINAL ARTICLE

Fabienne Dobbels
Sabina De Geest
Sandra Martin
Johan Van Cleemput
Walter Droogne
Johan Vanhaecke

Prevalence and correlates of depression symptoms at 10 years after heart transplantation: continuous attention required

Received: 5 June 2003
Revised: 14 November 2003
Accepted: 10 March 2004
Published online: 28 August 2004

F. Dobbels (✉) · S. De Geest
Centre for Health Services and Nursing Research, School of Public Health, Faculty of Medicine, Katholieke Universiteit Leuven, Kapucijnenvoer 35/4, 3000 Leuven, Belgium
E-mail: fabienne.dobbels@med.kuleuven.ac.be
Tel.: +32-16-336975
Fax: +32-16-336970

F. Dobbels · S. Martin · J. Van Cleemput
W. Droogne · J. Vanhaecke
Leuven Heart Transplant Programme, University Hospital of Leuven, Katholieke Universiteit Leuven, Leuven, Belgium

S. De Geest
Institute of Nursing Science, University of Basel, Basel, Switzerland

Abstract This study investigates the presence and correlates of symptoms of depression at 5 and 10 years after heart transplantation, with particular attention given to patients showing symptoms at both time points. Prevalence of depression symptoms were studied in 41 patients, prospectively, at 5 and 10 years after heart transplantation. We examined potential correlates of depression symptoms (i.e. worse functional capacity, inadequate coping mechanisms and lack of social contacts) 10 years after transplantation. The prevalence of depression symptoms was 30% at 5 years and 22% at 10 years. Of the 41 patients, 20% were depressed at both time points. Those patients had significantly higher scores on passive coping and had significantly lower club membership. They also tended to have more negative emotions (i.e. anger, hostility and irritability) and less engagement in sports activities. Functional capacity was not different. Depression symptoms were prevalent and persistent in the long-term after heart transplantation. This study opens perspectives for beyond-standard pharmacological and psychotherapeutic treatment for depression, i.e. training patients who are using passive coping to use problem-solving capacities instead and motivating them to engage in social life and sports activities.

Keywords Heart transplantation · Depression · Long-term study

Introduction

Long-term survival after heart transplantation (HTX) has improved to a level where it can no longer be considered as the only measure of success of transplantation. Strategies for minimising side effects of immunosuppressants, prevention and treatment of concomitant illnesses and prevention of the progression of the original disease, such as atherosclerosis [1], indicate a clear focus on preserving the quality of the life-years added.

Depression is an important parameter of psychosocial functioning and a risk factor for poor outcome in a number of chronically ill patient populations [2, 3]. Depression is also a risk factor for morbidity and mortality in cardiovascular disease [4, 5, 6]. It negatively affects the quality of life of patients and families; it is a risk factor for noncompliance with medical treatment

[2]; and it has economic implications for the patient and society [7, 8, 9].

Apart from its prevalence, the persistence of depression symptoms in patients with chronic illness also needs attention. The risk factors for presence and persistence of depression symptoms in heart transplant populations have not been studied, so far, beyond the first 3 years after transplantation, although some risk factors have been identified in the early post-transplantation period, such as worse physical functioning, longer hospitalisation, lower level of social support and inadequate coping strategies [10, 11, 12, 13, 14, 15, 16, 17].

The available epidemiological data are largely confined to the pre-transplant and early post-transplant period [10, 11, 12, 13, 14]. Research on long-term quality of life and psychosocial risk factors after heart transplantation (i.e. beyond 3 years after transplantation) is rare and does not specifically focus on depression [18, 19].

The purpose of this study, therefore, is to investigate prospectively the presence of symptoms of depression at 5 and 10 years after heart transplantation and to explore potential correlates of persistent depression in heart transplant recipients 10 years after transplantation.

Patients and methods

Design

This study combines a prospective and a cross-sectional design. A prospective design was used to determine the prevalence of symptoms of depression at 5 and 10 years after transplantation to identify patients showing symptoms of depression at both time points.

A cross-sectional design was used to assess potential correlates of depression symptoms (i.e. worse disease status, inadequate coping mechanisms and lack of social contacts) 10 years after transplantation. To determine why these patients had never fully recovered from depression or had developed a new episode of depression, we were particularly interested in the patients who suffered from depression symptoms at both time points.

Sample recruitment and setting

Patients were included if they were older than 18 years when they had had their HTX, had been screened for depression 5 years after HTX [10], and were still alive 10 years after HTX. Patients participating in this study had undergone transplant surgery between January 1988 and December 1991. The data collection of the prospective study ended in December 2001 (i.e. 10 years after HTX). Patients were excluded if they did not give their informed consent or if their mental status precluded reliable answers when they were assessed at both times. Mental clarity was assessed on the basis of the clinical judgement of the nurse specialist responsible for the scheduled follow-up visits (i.e. at a minimum frequency of every 3 months), and was also based on the observation of the cardiologist and other team members during the annual in-hospital check-up.

Variables and measurement

Demographic parameters

Demographic characteristics (i.e. age, gender, marital status, years of education and employment status) were recorded 5 and 10 years after transplantation surgery by means of a self-report questionnaire developed for the purpose of this study.

Symptoms of depression

Presence and severity of depression symptoms at 5 and 10 years after transplantation was assessed with the original version of the Beck depression inventory (BDI) [20, 21], as the official Dutch translation of the BDI-II had not been published at the time the data were collected. The BDI consists of 21 items related to cognitive, emotional and physical symptoms of depression, each consisting of four statements increasing in level of severity, to which the scores of 0 to 3 are linked. The total score is calculated by summation of the item scores, to yield a score between 0 and 63. Patients are classified according to the level of severity of their depression: no symptoms of depression (score 0–9), mild symptoms of depression (score 10–15), moderate symptoms of depression (score 16–23) and severe symptoms of depression (score 24–63) [20]. The internal consistency and the validity of this self-administered questionnaire have been analysed in various populations, and have shown adequate validity and reliability [21]. The internal consistency reliability (i.e. Cronbach's alpha) for the BDI in this study was 0.81 at 5 years and 0.87 at 10 years.

Coping

The Utrecht Coping List (UCL) was used to assess HTX patients' coping styles [22]. The UCL is a 47-item Dutch self-report questionnaire assessing seven different coping styles, i.e. active coping (alpha 0.82), palliative coping (alpha 0.76), avoidance coping (alpha 0.73), social support seeking (alpha 0.83), passive coping (alpha 0.70), expression of emotions (alpha 0.74) and using reassuring thoughts (alpha 0.77). Reliability and validity, tested in both patient and general populations, are adequate [22].

The internal consistency reliability (i.e. Cronbach's alpha) for the different coping styles is provided between brackets after each subscale of the UCL.

Social isolation and social contacts

An instrument was developed for this study, in the absence of an assessment tool for the Dutch-speaking population, to assess social isolation and social contacts. The investigators decided, by consensus, that the following dichotomous variables were good proxies of social contacts: "presence or absence of a stable relationship (i.e. being married or living together)", "presence or absence of club membership (i.e. yes/no)", "satisfaction with social contacts (i.e. yes/no)", "doing leisure time activities (i.e. yes/no)" and "doing sports (i.e. yes/no)".

Functional capacity

Objective parameters related to disease status measured in this study were: exercise capacity; functional status; and co-morbidity.

Exercise capacity was assessed by the 6-min walk test (6MWD) [23, 24]. Analysis of exercise capacity is based on the actual distance covered during the 6MWD. In addition to the actual distance covered during the test, the percentage of predicted walking distance was calculated to control for age, gender, height and weight. The test was supervised in all patients by the same physiotherapist.

Functional status was measured by means of the Specific Activity Scale (SAS), an interview that assesses exercise tolerance based on the metabolic costs of activities [25]. A decision tree is followed over 35 items, resulting in a classification of patients into four classes, with a higher class corresponding to more functional limitations. Functional status was assessed in all patients by one clinician, using this method. Cross-validation studies have shown that the SAS is a more reliable and valid method to assess the degree of cardiovascular disability than the New York Heart Association (NYHA) classification and the Canadian Cardiovascular Society (CCS) criteria [25]. Internal consistency reliability (i.e. Cronbach's alpha) of the Specific Activity Scale in our study was 0.73.

Co-morbidity

Co-morbidity in this study was defined as the number of hospitalisations, total number of hospitalisation days, median number of hospitalisation days per hospital admission, reason(s) for hospitalisation in the last 10 years, and by selected clinical outcome data. Calculations were made for the 10 years after transplantation, as well as for the period before inclusion (0–5 years after HTX) and the 5-year follow-up period (5–10 years after HTX). The annual 2 to 3 days in-hospital check-up, which is part of the standardised post-transplant care in the Leuven Heart Transplant Programme, was not included in the calculations. Data were retrieved from chart review.

Clinical outcome data obtained by chart review were: the number of acute rejections, the presence of cardiac allograft disease or chronic rejection and creatinine clearance. Acute rejection was defined as a histologically proven grade $>1B$ biopsy, using the standard ISHLT criteria for gradation [26]. Both early acute rejections (<3 months after HTX) and late acute rejections (>3 months after HTX) were considered. Coronary artery disease (CAD) was defined as any degree of coronary artery narrowing observed on any of the routine annual coronary angiograms. Creatinine clearance was calculated with the Cockcroft equation [27].

Procedure

Patients were invited to participate in the study during the in-hospital annual check-up at 5 and 10 years after their heart transplantation. The purpose of the study was explained, and written informed consent was obtained at both time points. All questionnaires and tests were completed during the hospitalisation period. Demographic characteristics and symptoms of depression were assessed at both time points. Potential correlates of symptoms were measured at 10 years after HTX in patients showing symptoms of depression 5 and 10 years after transplantation, i.e. coping, social contacts, functional capacity and co-morbidity. The local ethics committee approved the informed consent procedure and study protocol.

Data analysis

Descriptive statistics (i.e. mean, standard deviation, median, inter-quartile range and frequencies) were calculated as appropriate and depending on the level of measurement and data distribution. The chi-square or Fisher's exact test was used in the prospective 5-year follow-up to compare two proportions, i.e. prevalence of depression at 5 years after HTX vs prevalence of depression at 10 years after HTX.

Patients showing symptoms of depression at both time points were compared to patients without continuation of symptoms in terms of various correlates. The Mann–Whitney U test was used to compare continuous skewed or ordinal data. A chi-square test was used to compare nominal variables. Fisher's exact test was used to compare dichotomous variables, as this is a more

accurate technique than the chi-square test for small samples. Multivariate analysis was not possible because of the small sample size in our study.

The statistical program SPSS 9.0 for windows (SPSS, Chicago, Ill., USA) was used to analyse the data. To correct for multiple testing, statistical significance was set at $P < 0.01$.

Results

Sample size

The cohort at baseline (i.e. 5 years after HTX) consisted of 52 patients in the Leuven HTX programme that were alive 5 years after HTX. Of the 52 patients, 41 were included 10 years after HTX. One patient was excluded, having developed dementia in the mean time, and ten patients died during the 5-year follow-up. Causes of death were malignancy ($n=4$), transplant vasculopathy ($n=3$), infection ($n=1$) and unknown ($n=2$). None of these patients had committed suicide.

Despite having symptoms of depression 5 years after HTX, none of the patients was taking antidepressants or had received psychiatric or psychotherapeutic treatment during the follow-up period.

Demographic and clinical characteristics

Table 1 summarises the demographic and clinical characteristics of the study cohort at 5 years after HTX. These characteristics were not different in the eleven patients from the original cohort who were not included.

Table 1 Demographic and clinical characteristics at inclusion (i.e. at 5 years after transplantation) (*CMP* cardiomyopathy)

Variable	Study sample ($n=41$)
Gender (% male)	87.8 ($n=36$)
Age (years)	Me = 57 (IQR = 13)
Formal education (years)	Me = 11 (IQR = 7)
Full-time or part-time employment (%)	29.3 ($n=12$)
Underlying diagnosis (%)	
Ischaemic CMP	56.1 ($n=23$)
Dilated CMP	31.7 ($n=13$)
Congenital CMP	7.3 ($n=3$)
Other	4.9 ($n=2$)
Stable relationship (%)	75.6 ($n=31$)
Early acute rejection (%)	29.3 ($n=12$)
Late acute rejection (%)	4.9 ($n=2$)
Chronic rejection (%)	24.4 ($n=10$)
Creatinine clearance (ml/min)	Me = 46.7 (IQR = 21)

Prevalence of depression symptoms

The median score on the Beck depression inventory (BDI) for the entire patient group 5 years after transplantation was 6 (Q1 = 3; Q3 = 10.5). That score was not significantly different from those of the drop outs [median = 6 (Q1 = 3, Q3 = 13), Mann–Whitney U test = 224; $P=0.973$]. The median BDI score at 10 years after transplantation was 5 (Q1 = 2, Q3 = 9), indicating that, on average, the patients were not depressed. Yet, 30% of the patients showed symptoms of depression 5 years after HTX ($n=12$), and 22% ($n=9$) 10 years after HTX ($P=0.011$, Table 2).

Two-thirds of the patients (66.7%) that were depressed 5 years after HTX also reported symptoms of depression at the 10-year follow-up ($n=8$). This means that 20% of the entire study cohort showed symptoms of depression at both time points. In addition, four patients (i.e. 10% of the total sample) had symptoms of depression 5 years after transplantation but not at 10 years, and one patient had no symptoms of depression at 5 years but showed symptoms at 10 years after HTX (i.e. 2% of the total sample). No symptoms of depression could be observed at both time points in 68% of the patients ($n=28$).

Individual changes in BDI scores were also analysed. Seventeen patients had lower scores at 5 years than at 10 years after transplantation (mean rank = 16.9), whereas 22 patients had higher scores at 5 years than at 10 years (mean rank = 22.4). No change occurred in two patients (Wilcoxon signed ranks test = −1.4, $P=0.152$).

Correlates of symptoms of depression

Demographic factors

In terms of demographic characteristics, patients with symptoms of depression at both time points did not differ significantly from those patients who did not continue being depressed (Table 3).

Table 2 Prevalence and severity of symptoms of depression on the BDI at 5 and 10 years after HTX

Symptoms of depression (BDI)	5 years after HTX	10 years after HTX
None (score 0–9)	70.7% ($n=29$)	78% ($n=32$)
Mild (score 10–15)	14.6% ($n=6$)	19.5% ($n=8$)
Moderate (score 16–23)	14.6% ($n=6$)	–
Severe (score 24–63)	–	2.4% ($n=1$)

Table 3 Demographic characteristics in patients with ($n=8$) and without ($n=33$) symptoms of depression at both time points (*CMP* cardiomyopathy)

Variable	Persistent depression ($n=8$)	Others ($n=33$)	*P*
Gender (% male)	100 ($n=8$)	84.8 ($n=28$)	$P>0.99$ (a=0.98)
Age (years)	Me=53.5 (IQR=16.5)	Me=61 (IQR=7)	$P=0.11$ (b=62)
Education (years)	Me=10 (IQR=2.25)	Me=11.5 (IQR=7.75)	$P=0.126$ (b=58)
Full-time or part-time employment (%)	37.5 ($n=3$)	27.3 ($n=9$)	$P>0.99$ (a=0.06)
Underlying diagnosis (%)			
Ischaemic CMP	50 ($n=4$)	57.6 ($n=19$)	$P=0.649$ (c=1.6)
Dilated CMP	50 ($n=4$)	27.3 ($n=9$)	
Congenital	–	9.1 ($n=3$)	
Other	–	6.1 ($n=2$)	

[a]Fisher's exact test
[b]Mann–Whitney U test
[c]Chi square test

Coping mechanisms

Coping mechanisms are depicted in Fig. 1. Patients who were depressed at both time points were using passive coping styles significantly more often than the patients who were not depressed (13.67 vs 9.20, $P<0.001$) and showed a tendency towards expressing significantly more negative emotions (6.83 vs 5.11, $P=0.020$). Passive coping means that the person is fully occupied by his or her problems and situation, is constantly worrying, and is feeling incapable of doing something about the situation. Expressed negative emotions are anger, hostility and irritability.

Social contacts

The presence of a stable relationship, as well as having leisure time activities, was not significantly different between patients with symptoms of depression at both time points and the other patients (Table 4). Yet, symptoms of depression at 5 and 10 years was associated with significantly less frequent club membership and a tendency towards less frequent participation in sports activities.

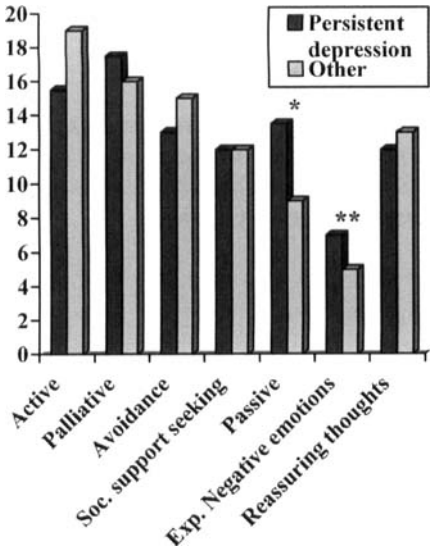

Fig. 1 Coping styles (UCL) in patients with ($n=8$) and without ($n=33$) symptoms of depression at both time points. *$P<0.001$; **$P<0.05$

Functional capacity

No significant differences could be found in exercise capacity. Median (Me) walking distance was 442 m [interquartile range (IQR) =161] for the patients depressed at both time points compared to 480 m (IQR=200) in the control group (Mann–Whitney U test=61.5; $P=0.272$). Yet, 6-min walking distance in both groups was lower than predicted, i.e. exercise capacity in both groups was lower than that in the healthy control subjects [Me=59% of the predicted walking distance for the depressed group (IQR=27) vs 72% in the control group (IQR=26); Mann–Whitney U test=48, $P=0.093$].

Functional status at 10 years after transplantation, as assessed by means of the Specific Activity Scale, was also similar in both groups (chi square test =1.296; $P=0.523$).

Co-morbidity

No differences in co-morbidity could be found between either groups. Median number of hospitalisation days was 34.5 (IQR=76) for the depressed patients vs 41 days (IQR=47) for the patients that were not depressed (Mann–Whitney U test=101, $P=0.900$). Similarly, number of hospitalisations (Mann–Whitney U test=101, $P=0.900$), median number of hospitalisation days per hospitalisation (Mann–Whitney U test=100, $P=0.872$), and reason for hospitalisation (i.e. rejection; infection; cardiovascular problems; gastrointestinal complaints; oncological, orthopaedic and renal function problems) were comparable between both groups. Also, the number of early and late acute rejections (Fischer's exact test =1.5, $P=0.157$ and Fischer's

Table 4 Social contact variables in patients with ($n=8$) and without ($n=33$) symptoms of depression at both time points

[a]Fischer's exact test

Variable	Persistent ($n=8$)	Others ($n=33$)	P
Stable relationship (%)	50 ($n=4$)	81.8 ($n=27$)	$P=0.143$ (a = 2.5)
Leisure-time activities (%)	75 ($n=6$)	87.8 ($n=29$)	$P>0.99$ (a = 0.11)
Corporate life (%)	0	66.7 ($n=22$)	$P=0.005$ (a = 8.6)
Sports (%)	12.5 ($n=1$)	42.4 ($n=14$)	$P=0.039$ (a = 6.4)

exact test = 2.1, $P=0.274$, respectively), the incidence of cardiac allograft disease (Fischer's exact test = 0.3, $P=0.622$) and creatinine clearance (Mann–Whitney U test = 94, $P=0.706$) were comparable.

Discussion

Identification of depression, in this study, was based on self-report and not on a structured or semi-structured clinical diagnostic interview, which is currently the prevailing gold standard for the screening of depression. The main reason for the use of a self-report assessment tool was a practical one: an interview is too time consuming (it takes 90–120 min to complete a diagnostic interview) and could not be fitted in with the scheduled follow-up examinations during the short annual hospital stay of 2 to 3 days. Also, a cross-sectional design was used to study potential correlates of depression at 10 years after transplantation, and only symptoms of depression were assessed prospectively. A prospective design investigating factors at 5 years after transplantation, potentially predicting symptoms of depression at 10 years after transplantation, would have been much stronger. To correct for multiple-testing type I error inflation, we set the significance level at $P<0.01$ instead of at $P<0.05$. A larger sample may increase the power to find significant differences.

The prevalence of depression in our study cohort (29.3% and 22% at 5 and 10 years after HTX, respectively) is three-times to four-times higher than in healthy control subjects [28, 29], yet this prevalence is comparable to that found in other chronic diseases, such as diabetes, cancer and cardiovascular disease [3].

The severity scores of depression symptoms at both time points most closely resemble the DSM-IV diagnostic criteria of minor depressive disorder [28]. Symptoms of depression seem to be recurrent or persistent in the long-term after heart transplantation, as two thirds of the patients showing symptoms of depression at 5 years (i.e. 20% of the entire study cohort) continued to be depressed at 10 years. Together with the mild severity scores, this may indicate a dysthymic disorder rather than a major depressive disorder [28]. Dysthymic disorder is a milder, chronic depression that is present every day and lasts for at least 2 years or longer. People with dysthymia generally experience little or no joy in their lives; some of them do not realise that they have been depressed for their whole life. In other words, it seems to be part of their personality [28].

Because depression is a prevalent and a seemingly persistent problem in the long-term after heart transplantation, its treatment should receive continuous attention. No patient in our sample was taking antidepressants. A potential explanation for the lack of treatment might be that patients with depression show only mild symptoms, making the diagnosis more difficult. However, assessment of psychosocial functioning during long-term follow-up after transplantation should be a part of the comprehensive management of the heart transplant patient. Patients should be screened carefully on a regular basis (i.e. annually), as research in other cardiovascular populations [4, 5, 6] shows that even mild symptoms of depression are predictive for morbidity and mortality. Besides more traditional treatment with antidepressants and/or cognitive or interpersonal therapy, interventions could also target important correlates of symptoms of depression [3, 7, 8, 9]. Although multivariate analysis in this study was not possible, due to the small sample size, objective disease status seems not to be a decisive factor in the recurrence or persistence of symptoms in patients that were depressed at 5 years after HTX.

Our finding that the use of passive coping mechanisms and lack of social contacts is associated with continuation of depression is in keeping with data from other patient populations [30, 31, 32, 33, 34, 35]. Thus, our study emphasises the importance of teaching problem-solving techniques to those patients identified as using passive coping. Social support should also be increased in socially isolated individuals. A possibility is to motivate them to engage in club membership and sports activities, as these determinants were inversely associated with persistent depression. A meta-analysis by Lawlor and Hopker [36], as well as evidence from cardiac rehabilitation programmes, clearly shows that exercise, both aerobic and non-aerobic, has a beneficial effect in the management of depression [36, 37, 38, 39], presumably through a combination of psychological, social and physiological mechanisms. Those interventions are neither expensive nor difficult, and, with the prerequisite that pharmacological and/or psychothera-

peutic treatment is provided first, they may improve patients' psychosocial well being in the long-term after heart transplantation.

Acknowledgements Prof. Dr. J. Vanhaecke holds the Michael Ondetti Chair in Cardiology at Leuven University Medical School.

References

1. Hertz MI, Taylor DO, Trulock EP, et al. The registry of the International Society for Heart and Lung Transplantation: nineteenth official report-2002. J Heart Lung Transplant 2002; 21:950.
2. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med 2000; 160:2101.
3. Robertson M, Katona C. Depression and physical illness. Wiley, Chichester, 1997.
4. Frasure-Smith N, Lesperance F, Talajic M. Depression following myocardial infarction. JAMA 1993; 270:1819.
5. Frasure-Smith N, Lesperance F, Talajic M. Depression and 18-month prognosis after myocardial infarction. Circulation 1995; 91:999.
6. Lesperance F, Frasure-Smith N, Juneau M, Theroux P. Depression and 1-year prognosis in unstable angina. Arch Intern Med 2000; 160:1354.
7. Murray CJ, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. Lancet 1997; 349:1436.
8. Simon GE, VonKorff M. Recognition, management, and outcomes of depression in primary care. Arch Fam Med 1995; 4:99.
9. Williams JW Jr, Kerber CA, Mulrow CD, Medina A, Aguilar C. Depressive disorders in primary care: prevalence, functional disability, and identification. J Gen Intern Med 1995; 10:7.
10. De Geest S, Abraham I, Moons P, et al. Late acute rejection and subclinical noncompliance with cyclosporine therapy in heart transplant recipients. J Heart Lung Transplant 1998; 17:854.
11. Dew MA, Roth LH, Schulberg HC, et al. Prevalence and predictors of depression and anxiety-related disorders during the year after heart transplantation. Gen Hosp Psychiatry 1996; 18:48S.
12. Dew MA, Kormos RL, DiMartini AF, et al. Prevalence and risk of depression and anxiety-related disorders during the first three years after heart transplantation. Psychosomatics 2001; 42:300.
13. Freeman AM, Folks DG, Sokol RS, Fahs JJ. Cardiac transplantation: clinical correlates of psychiatric outcome. Psychosomatics 1988; 29:47.
14. Skotzko CE, Rudis R, Kobashigawa JA, Laks H. Psychiatric disorders and outcome following cardiac transplantation. J Heart Lung Transplant 1999; 18:952.
15. Bunzel B, Wollenek G. Heart transplantation: are there psychosocial predictors for clinical success of surgery? Thorac Cardiovasc Surg 1994; 42:103.
16. Trumper A, Appleby L. Psychiatric morbidity in patients undergoing heart, heart and lung, or lung transplantation. J Psychosom Res 2001; 50:103.
17. Bohachick P, Taylor MV, Sereika S, Reeder S, Anton BB. Social support, personal control, and psychosocial recovery following heart transplantation. Clin Nurs Res 2002; 11:34.
18. DeCampli WM, Luikart H, Hunt S, Stinson EB. Characteristics of patients surviving more than ten years after cardiac transplantation. J Thorac Cardiovasc Surg 1995; 109:1103.
19. Hetzer R, Albert W, Hummel M, et al. Status of patients presently living 9 to 13 years after orthotopic heart transplantation. Ann Thorac Surg 1997; 64:1661.
20. Beck AT, Steer RA, Garbin MG. Psychometric properties of the Beck depression inventory: Twenty-five years of evaluation. Clin Psychol Rev 1988; 8:77.
21. Richter P, Werner J, Heerlein A, Kraus A, Sauer H. On the validity of the Beck depression inventory: a review. Psychopathology 1998; 31:160.
22. Schreurs PJG, Van De Willige G, Brosschot JF, Tellegen B, Graus GMH. The Utrecht Coping List: UCL. Dealing with problems and circumstances [De Utrechtse Coping Lijst: UCL. Omgaan met problemen en gebeurtenissen]. Swets and Zeitlinger, Lisse, 1988.
23. Demers C, McKelvie RS, Negassa A, Yusuf S. Reliability, validity, and responsiveness of the six-minute walk test in patients with heart failure. Am Heart J 2001; 142:698.
24. Troosters T, Gosselink R, Decramer M. Six minute walking distance test in healthy elderly subjects. Eur Respir J 1999; 14:270.
25. Goldman L, Hashimoto B, Cook EF, Loscalzo A. Comparative reproducibility and validity of systems for assessing cardiovascular functional class: advantages of a new Specific Activity Scale. Circulation 1981; 64:1227.
26. Billingham ME, Cary NR, Hammond ME, et al. A working formulation for the standardization of nomenclature in the diagnosis of heart and lung rejection: Heart Rejection Study Group. J Heart Lung Transplant 1990; 9:587.
27. Cockcroft DW, Gault MH. Prediction of creatinine clearance from serum creatinine. Nephron 1976; 16:31.
28. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 4th edn. American Psychiatric Association, Washington DC, 1994.
29. Blazer D, Swartz M, Woodbury M, Manton KG, Hughes D, George LK. Depressive symptoms and depressive diagnoses in a community population. Use of a new procedure for analysis of psychiatric classification. Arch Gen Psychiatry 1988; 45:1078.
30. Barnett PA, Gotlib IH. Psychosocial functioning and depression: distinguishing among antecedents, concomitants, and consequences. Psychol Bull 1988; 104:97.
31. Blazer D, Hughes DC, George LK. Age and impaired subjective support: predictors of depressive symptoms at one-year follow-up. J Nerv Ment Dis 1992; 180:172.
32. George LK, Blazer DG, Hughes DC, Fowler N. Social support and the outcome of major depression. Br J Psychiatry 1989; 154:478.
33. Krishnan KR, George LK, Pieper CF, et al. Depression and social support in elderly patients with cardiac disease. Am Heart J 1998; 136:491.
34. Sherbourne CD, Hays RD, Wells KB. Personal and psychosocial risk factors for physical and mental health outcomes and course of depression among depressed patients. J Consult Clin Psychol 1995; 63:345.

35. Van Weel-Baumgarten EM, van den Bosch WJ, van den Hoogen HJ, Zitman FG. The long-term perspective: a study of psychopathology and health status of patients with a history of depression more than 15 years after the first episode. Gen Hosp Psychiatry 2000; 22:399.
36. Lawlor DA, Hopker SW. The effectiveness of exercise as an intervention in the management of depression: systematic review and meta-regression analysis of randomised controlled trials. BMJ 2001; 322:763.
37. Lavie CJ, Milani RV. Benefits of cardiac rehabilitation and exercise training. Chest 2000; 117:5.
38. Milani RV, Lavie CJ, Cassidy MM. Effects of cardiac rehabilitation and exercise training programs on depression in patients after major coronary events. Am Heart J 1996; 132:726.
39. Milani RV, Lavie CJ. Prevalence and effects of cardiac rehabilitation on depression in the elderly with coronary heart disease. Am J Cardiol 1998; 81:1233.